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Via U.S. First Class Mail and Electronic Mail to: alfred.a.pantano@usace.army.mil

Colonel Alfred A. Pantano, Jr.
District Commander
U.S. Army Corps of Engineers, Jacksonville District
701 San Marco Boulevard
Jacksonville, FL 32207-0019

**Re: Public Comments on Via Verde Natural Gas Pipeline Project, Permit Application
No. SAJ 2010-02881 (IP-EWG)**

Dear Colonel Pantano:

The U.S. Army Corps of Engineers (the "Corps") is currently reviewing an application for a dredge-and-fill permit under Section 404 of the Clean Water Act ("CWA") submitted by the Puerto Rico Electric Power Authority (the "Applicant") for the proposed Via Verde natural gas pipeline project (the "Via Verde project" or the "proposed project").¹ We appreciate having this opportunity to comment on the proposed project, and we offer these comments to assist the Corps in its review of the permit application. We are submitting these comments on behalf of

¹ GOV'T OF P.R., OFFICE OF THE GOVERNOR, PLANNING BOARD, FEDERAL AND COMMONWEALTH JOINT PERMIT APPLICATION FOR WATER RESOURCE ALTERATIONS IN WATERS, INCLUDING WETLANDS, OF PUERTO RICO (Aug. 2010, *modified* Nov. 2010) (hereafter "JOINT PERMIT APPLICATION") (App. at 608).

our clients, Juan Cortés Lugo; Sofia Colón Matos; Luis Guzmán Meléndez; Ana Oquendo Andújar; Iván Vélez González; Francisca M. Montero Colón; Sol María De Los Ángeles Rodríguez Torres; Iván Carlos Belez Montero; Arístides Rodríguez Rivera; Ada I. Rodríguez Rodríguez; Alex Noel Natal Santiago; Miriam Negrón Pérez; Francisco Ruiz Nieves; Silvy Jordán Molero; Ana Serrano Maldonado; Félix Rivera González; William Morales Martínez; Trinita Alfonso Vda. De Folch; Alejandro Saldaña Rivera; Dixie Vélez Vélez; Dylia Santiago Collaso; Ernesto Forestier Torres; Miriam Morales González; Fernando Vélez Vélez; Emma González Rodríguez; Samuel Sánchez Santiago; Raquel Ortiz González; Maritza Rivera Cruz; Virginio Heredia Bonilla; Lilian Serrano Maldonado; Yamil A. Heredia Serrano; Jean Paul Heredia Romero; Pablo Montalvo Bello; Ramona Ramos Dias; Virgilio Cruz Cruz; Cándida Cruz Cruz; Amparo Cruz Cruz; Gilberto Padua Rullán; Sabrina Padua Torres; Maribel Torres Carrión; Hernán Padín Jiménez; Rosa Serrano González; Jesús García Oyola; Sucesión de Ada Torres, compuesta por Carmen Juarbe Pérez, Margarita Forestier Torres y Ernesto Forestier Torres; Comité Bo. Portugués Contra el Gasoducto; María Cruz Rivera; Cristóbal Orama Barreiro; Haydee Irizarry Medina; Comité Utuadeño en Contra del Gasoducto; Miguel Báez Soto; and Gustavo Alfredo Casalduc Torres, all of whom will be affected by the proposed Project and some of which are also represented by Puerto Rico Legal Services, Inc. Our clients are farmers whose lands and/or water supply for their crops will be directly impacted by the project; people whose personal security and proprietor interests will be affected due to the proximity of the pipeline to their homes; environmental groups whose aesthetical and environmental interests depend on the ecological integrity of lands, including natural reserves, which will be directly impacted by the project, among many others. These comments have been prepared in consultation with the Environmental and Natural Resources Law Clinic (“ENRLC”) at Vermont Law School.²

For the reasons discussed in these comments, we respectfully urge the Corps to deny the dredge-and-fill permit for the proposed Via Verde project because the Applicant has failed to overcome the strong presumption that less environmentally damaging alternatives exist and that alternatives which avoid wetlands and other special aquatic sites are less environmentally damaging. As a result, the Applicant has failed to make the “clear demonstration” that it must in order to meet its burden of demonstrating that its proposed project is the least environmentally damaging practicable alternative. If and when the Applicant submits sufficient information to allow the Corps to adequately consider its permit application, we urge the Corps to engage in formal consultation with both the U.S. Fish and Wildlife Service (“FWS”) and the National Marine Fisheries Service (“NMFS”) concerning the impacts of the proposed project on federally listed endangered and threatened species, as required under Section 7 of the Endangered Species Act (“ESA”). Moreover, we respectfully urge the Corps to prepare an environmental impact statement (“EIS”) to fully inform both government decisionmakers and citizens about the environmental consequences of the proposed project, as required under the National Environmental Policy Act (“NEPA”). Our comments are organized as follows:

I. OVERVIEW

² We appreciate the substantial contributions to these comments made by student clinicians Kyle Davis, Casey Gray, and Tara Franey from the ENRLC at Vermont Law School, as well as student clinicians Verónica Vidal, Heriberto Torres and Luis Scoutto, from the Legal Aid Clinic at the Inter American University of Puerto Rico School of Law.

- II. THE CORPS CANNOT APPROVE A DREDGE-AND-FILL PERMIT FOR THE VIA VERDE PROJECT AT THIS TIME BECAUSE THE APPLICANT HAS FAILED TO COMPLY WITH SECTION 404 OF THE CLEAN WATER ACT AND CORPS IMPLEMENTING REGULATIONS.
- A. The Applicant Has Failed to Provide Sufficient Information to Allow the Corps to Fully Evaluate Impacts and Ensure Protection of All Waters of the United States.
 - B. The Applicant Has Inappropriately Described the Project Purpose So Narrowly That It Precludes Consideration of Practicable Alternatives.
 - C. The Applicant Has Failed to Demonstrate That the Preferred Alternative Is the "Least Environmentally Damaging Practicable Alternative."
 - D. The Applicant Has Failed to Show That It Has Avoided and Minimized Adverse Impacts.
 - E. The Applicant Has Failed to Demonstrate That It Will Mitigate All Unavoidable Impacts to Aquatic Resources.
- III. THE CORPS MUST ENSURE THAT ITS PERMITTING DECISION CONCERNING THE VIA VERDE PROJECT COMPLIES WITH THE ENDANGERED SPECIES ACT.
- A. The Corps Has a Duty to Ensure That the Proposed Project Will Not Jeopardize Any Endangered or Threatened Species.
 - B. The Corps Must Make an Initial Inquiry to NMFS to Determine What Marine Species "May be Present" in the Action Area.
 - C. The Corps Must Prepare a Biological Assessment Encompassing Both the Terrestrial and Marine Species in the Action Area.
 - D. Because the Proposed Project Is Likely to "Adversely Affect" Multiple Endangered and Threatened Species, the Corps Must Engage in Formal Consultation with Both FWS and NMFS.
 - E. The Corps Cannot Authorize Any Action That Constitutes an "Irreversible and Irretrievable Commitment of Resources" During the Consultation Process.
 - F. The Corps Must Ultimately Ensure That the Proposed Project Avoids Jeopardy By Incorporating Terms and Conditions Required by FWS and/or NMFS Through "Reasonably Prudent Alternatives" and/or "Incidental Take Statements" into the Permit; or, If Necessary, By Denying the Permit.
- IV. THE CORPS MUST PREPARE A FULL ENVIRONMENTAL IMPACT STATEMENT FOR THE VIA VERDE PROJECT UNDER NEPA.
- A. The Proposed Project Is a "Major Federal Action."
 - B. The Proposed Project "Significantly Affects the Quality of the Human Environment."
 - C. The Applicant Has Not Demonstrated that Mitigation Measures Would Reduce All Impacts to Below the Significance Threshold.
 - D. The Corps Cannot Avoid Preparing an EIS Under NEPA By Tiering to the Puerto Rico EIS.

- V. THE CORPS MUST INCLUDE A THOROUGH ANALYSIS OF THE VIA VERDE PROJECT IN ITS ENVIRONMENTAL IMPACT STATEMENT.
- A. The Corps EIS Must Include a Broader and More Accurate Statement of the Purpose and Need for the Proposed Project.
 - B. The Corps EIS Must Analyze a Reasonable Range of Alternatives.
 - C. The Corps EIS Must Include a Thorough Analysis of the Direct and Indirect Effects of the Proposed Project.
 - D. The Corps EIS Must Include a Thorough Analysis of the Cumulative Impact Associated with the Proposed Project.
 - E. The Corps EIS Should Be Prepared in Conjunction with FWS and NMFS as Cooperating Agencies.
- VI. THE CORPS SHOULD INCLUDE EXTENSIVE PUBLIC INPUT AND PARTICIPATION AT EVERY STAGE IN THE DEVELOPMENT OF THE ENVIRONMENTAL IMPACT STATEMENT FOR THE VIA VERDE PROJECT.
- VII. CONCLUSION

I. OVERVIEW

The proposed Via Verde project involves the construction of a major industrial pipeline facility directly through one of the most important biodiversity hotspot regions in the world.³ Because this project would have substantial adverse impacts on a large number of endangered species, protected nature reserves, unique karst formations, and other sensitive receptors in the vicinity of the proposed project, as well as on the local communities in Puerto Rico that use and enjoy these resources, the project must be carefully analyzed by the Corps before approval. Indeed, it is difficult to imagine a project more deserving of careful scrutiny and consideration by both government decision makers and members of the public.

According to the Applicant, the proposed project would involve the construction of a 92-mile natural gas pipeline that would run from the EcoEléctrica Liquefied Natural Gas (“LNG”) Terminal in Peñuelas on the southern coast, northward across the interior of the island to the Cambalache Termoeléctricas Authority Central power plant in Arecibo on the northern coast, and then eastward along the northern coast to the Palo Seco power plant in Toa Baja and the San Juan power plant in San Juan.⁴ The proposed project’s footprint would cover approximately

³ See *Herbario del Departamento de Biología Universidad de Puerto Rico-Río Piedras*, HERBARIO UPRRP, <http://dps.plants.ox.ac.uk/bol/UPRRP/Home/Index> (last visited Apr. 18, 2011) (describing the Caribbean region as one of the top three most important biodiversity hotspots).

⁴ JOINT PERMIT APPLICATION, *supra* note 1, App. at 614. Prior to this proposed project, the Applicant submitted an application for a similar project – a 42-mile long natural gas pipeline called Gasoducto del Sur – to connect the EcoEléctrica LNG Terminal in Peñuelas to the Aguirre power plant. This project would have necessitated modification of the LNG terminal to install two heat exchange vaporizers, and it required NEPA review. Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Kimberly D. Bose, Sec’y, Fed. Energy Regulatory Comm’n (Oct. 25, 2010) (App. at 910). Construction on Gasoducto del Sur commenced in 2008. *Id.* As a result, communities on the southern coast generated much public outcry over the project, which led to the project being abandoned in 2008. Letter from Donald W. Kinard, Chief, Regulatory Div., U.S. Army. Corps of Engineers-Antilles Office, to Lawrence Evans, Senior Env’tl. Expert, PC Peabody (Oct. 8, 2010) (App. at 887).

1,114 acres, and it would require a 150 to 300-foot wide construction right-of-way (“ROW”) and a 50-foot permanent maintenance ROW.⁵ The Applicant has acknowledged that the Via Verde project would involve 158 waters of the U.S., impacting an estimated 369 acres in those waters.⁶ Additionally, FWS has indicated that 32 endangered or threatened species under its jurisdiction may be present in the vicinity of the proposed pipeline,⁷ and there may be additional federally listed coastal and marine species under the jurisdiction of NMFS present in the vicinity of the proposed project.⁸ Because the 92-mile pipeline would travel across the interior of the island as well as along much of its northern coastline, it would traverse several ecologically sensitive and protected land areas, including Commonwealth Forests, Natural Reserves, forested volcanic and karst areas, and portions of privately-owned lands participating in conservation programs due to their high ecological value.⁹

The Corps has already received a wide range of comments from the public and interested federal agencies.¹⁰ Many of these comments have emphasized the magnitude of the environmental impacts of the project.¹¹ For instance, the U.S. Department of Agriculture (“USDA”) has submitted comments stating that “[i]n the many years we have been examining permits for activities that affect [waters of the U.S.] in Puerto Rico, we have never seen one with such broad scale effects.”¹² Similarly, FWS has provided extensive critical comments emphasizing the likelihood that the proposed project would have adverse impacts on endangered and threatened species.¹³

In light of these substantial threats to some of the most unique and sensitive ecological resources in the world, it is critical that the Corps fulfill its statutory responsibilities under the CWA, ESA, and NEPA to ensure that a project of this magnitude is evaluated comprehensively and transparently with the goal of avoiding and minimizing environmental impacts to the maximum extent possible.

⁵ See JOINT PERMIT APPLICATION, *supra* note 1, App. at 618; P.R. Electric Power Auth., *Chapter 6: Impacts*, in ENVTL. IMPACT STATEMENT (2010) (App. at 443).

⁶ *Id.* App. at 655.

⁷ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Yousev Garcia, Dir. Asesores Ambientales y Educativos, Inc. (June 30, 2010) (App. at 587–90).

⁸ E-mail from Lisamaire Carrubba, Protected Resources Div., Nat’l Marine Fisheries Serv.-Caribbean Office, to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps of Engineers-Antilles Office (Nov. 19, 2010, 4:17:58 PM) (App. at 948).

⁹ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Sindulfo Castillo, Chief, Regulatory Section, U.S. Army Corps Eng’s-Antilles Office (Oct. 18, 2010) (App. at 889–90).

¹⁰ Letter from Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps of Engineers-Antilles Office, to Francisco E. Lopez, Eng’r, Autoridad de Energia Electrica (Dec. 22, 2010) (App. at 1147–48).

¹¹ *Id.*

¹² Letter from Ariel E. Lugo, Dir., Int’l Inst. Tropical Forestry, U.S. Dept. Agric., to Sindulfo Castillo, Section Chief, U.S. Army Corps Engineers-Antilles Office (Dec. 3, 2010) (App. at 1092).

¹³ See *infra* Section III-C of these comments (discussing FWS technical advice and deficiencies of the Applicant’s survey protocols).

II. THE CORPS CANNOT APPROVE A DREDGE-AND-FILL PERMIT FOR THE VIA VERDE PROJECT AT THIS TIME BECAUSE THE APPLICANT HAS FAILED TO COMPLY WITH SECTION 404 OF THE CLEAN WATER ACT AND CORPS IMPLEMENTING REGULATIONS.

The Corps has a duty to restore and protect the integrity of waters of the United States, including wetlands.¹⁴ The Corps carries out this duty by issuing permits for the “discharge of dredged or fill material into the navigable waters.”¹⁵ Through regulations and guidance, the Corps has established a process, standards, and requirements for the issuance of such permits.¹⁶ Most importantly, these permits must be issued in strict compliance with the guidelines established by EPA and the Corps under Section 404(b)(1) of the CWA (“Guidelines”).¹⁷

The Applicant has asked the Corps to approve the Via Verde project without substantial review by seeking authorization under a series of nationwide permits (“NWP”). The Corps has appropriately rejected this request and stated that its evaluation will proceed under the agency’s individual permitting process because the proposed project raises “environmental and public interest concerns which cannot be adequately evaluated under a NWP.”¹⁸ We agree with the Corps that the review of this proposed project should proceed under the agency’s individual permitting process because of the large-scale nature of the proposal and the large number of surface waters, wetlands, hydrological systems, and other receptors that would be affected by the construction and operation of the proposed project.

As explained below, however, the Applicant has failed to provide sufficient information in support of its permit application, making it impossible for the Corps to adequately review or approve this permit in accordance with the Guidelines unless it receives substantial additional information from the Applicant. The Corps has the authority to simply deny the permit application now rather than struggling to obtain the necessary information from the Applicant. In our view, a permit denial would be the most efficient and appropriate course of action at this time.

A. The Applicant Has Failed to Provide Sufficient Information to Allow the Corps to Fully Evaluate Impacts and Ensure Protection of All Waters of the United States.

The Guidelines require that “dredged and fill material should not be discharged into the aquatic ecosystem, unless it can be demonstrated that such a discharge will not have an unacceptable adverse impact either individually or in combination with known and/or probable impacts of other activities affecting the ecosystems of concern.”¹⁹ Additionally, the degradation and destruction of wetlands and other special aquatic sites are considered “among the most severe

¹⁴ 33 U.S.C. § 1251(a) (2006).

¹⁵ 33 U.S.C. § 1344 (2006).

¹⁶ 33 C.F.R. § 320.4 (2010); 40 C.F.R. §§ 230.1-98 (2010).

¹⁷ 33 U.S.C. § 1344(b)(1) (2006); 40 C.F.R. § 230.1 (2010).

¹⁸ Letter from Donald W. Kinard, Chief, Regulatory Div., U.S. Army. Corps of Engineers-Antilles Office, to Lawrence Evans, Senior Env'tl. Expert, PC Peabody (Oct. 8, 2010) (App. at 887).

¹⁹ 40 C.F.R. § 230.1(c) (2010).

environmental impacts.”²⁰ In recognition of their importance, the Corps’ stated policy for wetlands is “no net loss.”²¹ Corps regulations specifically identify wetlands as a “special aquatic site,” and detail their outstanding value and particular sensitivity to disturbances.²²

With respect to the Via Verde project, the Corps does not have sufficient information to determine the extent of the adverse impacts on aquatic ecosystems or otherwise make the necessary factual determinations required by the Guidelines.²³ The following are just a few examples of the information gaps and flawed analysis in the Applicant’s submissions:

- The Applicant has indicated that the proposed project would involve 165 crossings of waters of the United States.²⁴ Ninety-nine of these crossings are characterized as impacting wetlands.²⁵ The Corps has not yet ground-truthed the Applicant’s Jurisdictional Determination, so these numbers may not represent the full scale of the waters impacted.²⁶ The Applicant describes eight of these wetland crossings as having no impact, yet fails to provide any supporting analysis or demonstration showing that there will be no impacts.²⁷ These eight crossings are separate from the crossings that would be constructed using a method that the Applicant asserts will produce no impacts, as discussed below.
- The Applicant has also indicated that 20 of the crossings would be constructed using a horizontal directional drilling (“HDD”) technique, and the Applicant calculates zero acres of temporary impacts for these crossings without providing supporting analysis.²⁸ The Applicant’s assumption of zero impacts is unreasonable given the possibility of release of the drilling fluid during construction, or a failure of the pipeline during operation, as well as the impacts associated with the required staging areas.²⁹ The Applicant states that staging areas at entry and exit sites for HDD crossings should be considered a part of temporary impacts, unless entirely contained in uplands areas, and the Applicant allocates a fixed area for such

²⁰ 40 C.F.R. § 230.1(d) (2010).

²¹ Compensatory Mitigation for Losses of Aquatic Resources, 73 Fed. Reg. 19594 (April 10, 2008).

²² 30 C.F.R. § 230.14 (2010).

²³ 40 C.F.R. § 230.11 (2010).

²⁴ JOINT PERMIT APPLICATION, *supra* note 1, Table 5, App. at 657 and Table 6, App. at 659.

²⁵ *Id.*, Table 6, App. at 659.

²⁶ Letter from Francisco E. Lopez Garcia, Head, Evtl. Protection & Quality Assurance Div., P.R. Electric Power Auth., to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps of Engineers-Antilles Office (Jan 28, 2011) (App. at 1214).

²⁷ JOINT PERMIT APPLICATION, *supra* note 1, Table 6, App. at 659.

²⁸ *Id.*, Table 5, App. at 657.

²⁹ Letter from Carl-Axel P. Soderberg, Dir. Caribbean Evtl. Prot. Agency, to Joseph M. Rosado, Deputy Dist. Engineer for the Antilles, U.S. Army Corps of Engineers-Antilles Office (Dec. 21, 2010) (App. at 1138); Letter from Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps of Engineers-Antilles Office, to Francisco E. Lopez, Eng’r, Autoridad de Energia Electrica (Dec. 22, 2010) (App. at 1151)

impacts at 40,000 square feet per work pad.³⁰ However, in the Applicant's table quantifying the temporary impacts, no impacts for HDD work pads are identified.³¹

- The Applicant asserts that 48 crossings would be constructed using flume, dam-and-pump, or open-ditch methods.³² With respect to these crossings, the Applicant identifies temporary impacts of 2.59 acres.³³ This calculation is flawed, however. The Applicant states in one place that the temporary impacts to non-wetland waters of the United States were calculated by multiplying a 150-foot ROW width by the linear length of the crossing.³⁴ However, the Applicant actually calculated the amount of temporary impacts for these crossings by multiplying the linear length of the crossing by 100 feet.³⁵
- The Applicant classifies 90 crossings as "wetland crossings" and these crossings will have 182.15 acres of temporary impacts.³⁶ The Applicant reached this area by multiplying the linear length of the crossings by a 50-foot ROW, instead of a 150-foot ROW. While the Applicant has stated that only the 50-foot ROW will be cleared for some wetland crossings, this does not adequately demonstrate that impacts will be restricted to those 50-feet.³⁷ EPA has specifically commented upon the continual confusion that results from the Applicant's references to 150, 100, and 50-foot ROWs.³⁸
- The Applicant quantifies the total area of temporary impacts as 151.76 acres.³⁹ However, adding all the "temporary impacts" calculated by the Applicant in Tables 5 and 6 of the permit application yields a total temporary impact area of 184.74 acres.⁴⁰ The inconsistency of these figures calls the Applicant's entire analysis of the extent of water impacts into question.

³⁰ JOINT PERMIT APPLICATION, *supra* note 1, at 656.

³¹ *Id.*, Table 5, App. at 657, and Table 6, App. at 659. For example, the crossing C-2 is listed as having a length of 65 feet, but the Applicant lists the temporary impacts associated with this crossing as 0 acres. C-2 is listed as a Type 1, or HDD crossing, in Table 7, App. at 679.

³² *Id.* App. at 674 and Table 5, App. at 657.

³³ *Id.*, Table 5, App. at 657. We calculated this number by summing the values in the "Temporary Impacts" column of the table.

³⁴ *Id.* App. at 656.

³⁵ *Id.* App. at 657. For example, the crossing designated C-9 is listed as having a length of 44 feet. Under the Applicant's stated method of calculation of temporary impacts, the area of impact would be 0.15 acres. However, the acreage listed in the table is 0.10 acres, which would be obtained if the length was multiplied by 100 feet, rather than 150 feet.

³⁶ *Id.*, Table 6, App. at 659. We calculated this number by summing the values in the "Temporary Impacts" column of the table.

³⁷ Letter from Andrew Goetz, President, BC Peabody, to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps Eng's-Antilles Office (Feb. 24, 2011) (App. at 1396).

³⁸ Letter from Carl-Axel P. Soderberg, Dir. Caribbean Env'tl. Prot. Agency, to Sindulfo Castillo, Chief, Regulatory Div., U.S. Army. Corps of Engineers-Antilles Office (April 1, 2011) (App. at 1415).

³⁹ JOINT PERMIT APPLICATION, *supra* note 1, App. at 663.

⁴⁰ JOINT PERMIT APPLICATION, *supra* note 1, Tables 5, App. at 657, and Table 6, App. at 659.

- The Applicant’s limitation of impacts to the ROW width (even the 150-foot ROW) in the calculations above is flawed in and of itself. The Applicant has not considered impacts from the construction work and maintenance of the ROW that may extend beyond the ROW by disrupting water flow or segmenting aquatic habitats. The Corps is required to make written findings on these and other kinds of secondary impacts.⁴¹
- The Applicant mistakenly categorizes the impacts in the above analyses as temporary. Although the Applicant claims that the construction areas will be re-graded to the original topography, topsoil will be replaced, and fill material will be removed, there is no accompanying analysis or demonstration showing that these practices will completely restore the aquatic resources to their previous state.⁴² Both FWS and USDA point out the flaws in this “temporary impacts” approach, noting that slipshod construction practices and soil compaction can create permanent impacts to wetland areas.⁴³ EPA also questions the Applicant’s concept of temporary impacts.⁴⁴ This inappropriate categorization of the impacts as temporary will be discussed in more detail in sub-section D of this Section.

As noted above, the Corps has acknowledged that it has not yet ground-truthed the Applicant’s Jurisdictional Determination, so there may be additional impacts to waters of the U.S.⁴⁵ In light of the major flaws described above – including unreasonable assumptions, calculation errors, information gaps, and other problems – the task ahead of the Corps is far more than mere ground-truthing. The Corps simply cannot rely on the information provided by the Applicant. In order to determine whether the proposed Via Verde project will, either individually or in combination with other activities, have any “unacceptable adverse impact” on wetlands, aquatic ecosystems, special aquatic sites, or other ecosystems of concern, and to determine whether its permitting decision will conform to its “no net loss” policy, the Corps would have to conduct its own complete analysis of the extent of aquatic resource impacts, as well as the efficacy of proposed measures to avoid or minimize such impacts.

B. The Applicant Has Inappropriately Described the Project Purpose So Narrowly That It Precludes Consideration of Practicable Alternatives.

The Corps should reject the narrow project purpose suggested by the Applicant because it inappropriately precludes consideration of practicable alternatives. In order to obtain a dredge-and-fill permit, the Applicant must show that the proposed project is the “least environmentally damaging practicable alternative.”⁴⁶ A permit applicant may not artificially narrow its purpose

⁴¹ 40 C.F.R. § 230.11 (2010).

⁴² JOINT PERMIT APPLICATION, *supra* note 1, App. at 664.

⁴³ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Col. Alfred A. Pantano, Jr., Dist. Commander, U.S. Army Corps Eng’s-Jacksonville Dist. (Dec. 15, 2010) (App. at 1112); Letter from Ariel E. Lugo, Dir., Int’l Inst. Of Tropical Forestry, U.S. Dep’t Agric., to Sindulfo Castillo, Section Chief, U.S. Army Corps Eng’s-Antilles Office (Dec. 3, 2010) (App. at 1092).

⁴⁴ Letter from Carl-Axel P. Soderberg, Dir. Caribbean Env’tl. Prot. Agency, to Sindulfo Castillo, Chief, Reg. Div., U.S. Army. Corps Eng’s-Antilles Office (April 1, 2011) (App. at 1415).

⁴⁵ Letter from Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps Eng’s-Antilles Office, to Francisco E. Lopez, Eng’r, Autoridad de Energia Electrica (Dec. 22, 2010) (App. at 1146).

⁴⁶ 40 C.F.R. § 230.10(a) (2010).

statement to constrict the practicable alternatives to the proposed project at hand.⁴⁷ The Corps must independently evaluate and define the purpose for the proposed project in order to conduct the appropriate public interest review⁴⁸ and to comply with NEPA.⁴⁹ In doing so, the Corps must balance what the Applicant has proffered with its own review of the facts⁵⁰ and exercise a degree of skepticism in dealing with self-serving statements from the Applicant.⁵¹ In its own decision documents, the Corps has cautioned that giving too much deference to the Applicant's definition of the project purpose may lead to a "characterization of project purpose in such a way as to preclude the existence of practicable alternatives."⁵² Furthermore, the Corps has stated that when an applicant's purpose consists of specific components located in one specific area, "a question of fact arises: i.e., whether all component parts or some combination of them, or none, really must be built or must be built in the specific identified area for the project to be viable..."⁵³

Here, the Applicant has narrowly defined the purpose of the Via Verde project as being "to reduce [the Applicant's] dependence on oil for the production of electricity by converting electrical power generation facilities along the north coast of Puerto Rico from oil based fuels to natural gas in the most economical and practical method possible and using available infrastructure whenever possible."⁵⁴ Other information provided by the Applicant, however, contradicts this narrow statement by indicating that the actual purpose of the project is to serve the more general goal of reducing its dependence on oil and providing an alternative fuel supply – natural gas – to its integrated electric generating system. For instance, the Applicant's strategic plan mandates a more general goal of reducing its dependence on oil used to produce electricity to below 50 percent by the year 2014.⁵⁵ The Governor of Puerto Rico has also issued an Emergency Order requiring the implementation of an expedited process to develop a new electric generation system across the entire island that uses alternative sources of energy, particularly renewable and sustainable energy.⁵⁶ The Emergency Order specifically proposes natural gas,

⁴⁷ See *Florida Clean Water Network, Inc. v. Grosskruger*, 587 F. Supp. 2d 1236, 1244 (citing *Sylvester v. U.S. Army Corps Eng'rs*, 882 F.2d 407, 409 (9th Cir. 1989)) ("[D]efinition of a project purpose may not be used by the sponsor as a tool to artificially exclude what would otherwise be practicable alternatives to the project, in other words, the sponsor's project purpose must be 'legitimate.' Thus, the project purpose may not be defined so narrowly that it make what is practicable appear impracticable... ." This same issue also arises in the NEPA context, as discussed further in Section V-A of these comments.

⁴⁸ 33 C.F.R. § 320.4 (2010).

⁴⁹ 33 C.F.R. Pt. 325 app. B §§ 7(b) and 9(b)(4) (2010); *Citizens against Burlington, Inc. v. Busey*, 938 F.2d 190, 196 (D.C. Cir. 1991).

⁵⁰ Memorandum Thru Commander, U.S. Army Engineer Division, Lower Mississippi Valley Re: Permit Evaluation, Plantation Landing Resort (April 21, 1989) (App. at 5)(stating that although the Corps should consider an applicant's statement of project purpose, "the Corps must determine and evaluate these matters itself, with no control or direction from the applicant, and without undue deference to the applicant's wishes").

⁵¹ *Simmons v U.S. Army Corps Eng's*, 120 F.3d 664, 669 (7th Cir. 1997); *Citizens against Burlington, Inc.*, 938 F. 2d at 209.

⁵² Memorandum Thru Commander, U.S. Army Engineer Division, Lower Mississippi Valley Re: Permit Evaluation, Plantation Landing Resort (April 21, 1989) (App. at 5).

⁵³ *Id.* App. at 7.

⁵⁴ JOINT PERMIT APPLICATION, *supra* note 1, App. at 618.

⁵⁵ *Id.* App. at 617.

⁵⁶ Letter from the Office of the Governor, to Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office (December 3, 2010) (App. at 978) ("Executive Order OE-2010-034 the Governor declared an

solar, biomass, hydroelectric, marine, and wind energy as appropriate alternatives to oil.⁵⁷ Additionally, various other statements and information provided by the Applicant indicate that the purpose of the Via Verde project is to deliver natural gas from the EcoEléctrica LNG Terminal to its integrated system, encompassing plants on both the north and south coasts of Puerto Rico.⁵⁸

The Applicant's purpose statement also appears too narrow when viewed in conjunction with the various questions regarding the capacity of the EcoEléctrica LNG Terminal to supply sufficient natural gas to operate the northern power plants along the Via Verde pipeline route without further modification of the LNG Terminal facility, which would require approval from the Federal Energy Regulatory Commission ("FERC"). The Applicant contends that the EcoEléctrica LNG Terminal can provide enough natural gas to serve the stated purpose of the Via Verde project (i.e., running the Applicant's three northern power plants, Cambalache, Palo Seco, and San Juan plants at a reasonable capacity) without any additional FERC approval.⁵⁹ For the reasons discussed in more detail in Section V-A of these comments, however, it remains unclear whether EcoEléctrica can in fact provide the Via Verde project with enough natural gas to run the three northern power plants and other plants in the Applicant's system at a reasonable capacity, without further modification of the LNG terminal or another storage and delivery option for natural gas.

Based on the information provided and statements made by the Applicant, the Corps should properly define the project purpose as helping the Applicant achieve a generalized goal of reducing its dependence on oil by providing for the delivery of one or more alternative fuel

emergency regarding the electric generation infrastructure of Puerto Rico and ordered the utilization of an expedited process to develop projects that would produce a new energy generation infrastructure that uses alternative sources than those derived from oil, sources of renewable suitable energy and alternative renewable energy in Puerto Rico.") (Translated by ENRLC).

⁵⁷ Resolution of the Governor of Puerto Rico Office of the Governor, Junta De Planificacion de Puerto Rico, Consulta No. 2010-62-0210-JGE-T (Dec. 1, 2010) (App. at 979).

⁵⁸ See Letter from Francisco E. Lopez Garcia, Head, Envntl. Protection & Quality Assurance Div., P.R. Electric Power Auth., to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps of Engineers-Antilles Office (Jan 28, 2011) (App. at 1218) ("[C]onsidering the modifications already approved by [FERC], the EcoEléctrica facility will be able to supply the Via Verde natural gas needs; determined at full capacity, for the San Juan 5 & 6 and Cambalache Combined Cycle Units. Additional product will be available to fuel the Costa Sur 5 & 6 steam units based on [the Applicant]'s operating determination."); See also Letter from Angel Rivera Santa, Dir., Planning & Envntl. Protection, P.R. Electric Power Auth., to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps of Engineers-Antilles Office (Mar. 7, 2011) (App. at 1408) ("[T]he natural gas supply for the Project (approximately 93MM scf/day) will be purchased by [the Applicant] in accordance with the Order and Authorization granted by FERC in 2009. This amount of gas will be utilized by [the Applicant] in fueling the power plants that are part of its generating system . . . [W]ith the natural gas volumes mentioned above, [the Applicant] will be able to fuel, on different operational and loads ratios, Units 5 & 6 of the San Juan Steam Plant, Units 5 & 6 that recently were converted into dual fuel operation located at the South Coast plant, and [the Applicant]'s other co-fired generating units."); See also JOINT PERMIT APPLICATION, *supra* note 1, at 616 (stating that the goal of the Via Verde project is provide efficient, cost effective electricity in compliance with state and federal regulations "to convert existing electrical power generation facilities from oil based fuels to natural gas."); See also P.R. ELEC. POWER AUTH. Chapter 4: Study of Alternatives and Selection of the Alignment, in ENVTL. IMPACT STATEMENT (2010) (App. at 350) (indicating the Applicant included a wider range of alternatives in the state EIS: wind, PV, and solar heaters).

⁵⁹ Letter from Angel L. Rivera Santana, Director, Planning and Environmental Division, to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps of Engineers-Antilles Office (March 7, 2011) (App. at 1408).

sources to its electricity generating system. This is important in the permitting context because there may be other practicable alternatives that would meet this goal of promoting alternative energy use besides constructing a natural gas pipeline across the interior of the island from south to north, and along a long stretch of the northern coastline. The selection of one of these alternatives could potentially avoid some of the most problematic impacts associated with the proposed project, including damage to wetlands and other ecologically sensitive and protected waters of the United States, such as those found in Commonwealth Forests, Natural Reserves, and forested volcanic and karst areas, especially those which serve as important habitat for endangered and threatened species.

C. The Applicant Has Failed to Demonstrate That the Preferred Alternative Is the “Least Environmentally Damaging Practicable Alternative.”

As noted above, in order to obtain a dredge-and-fill permit, the Applicant bears the burden of showing that the proposed project is the “least environmentally damaging practicable alternative.”⁶⁰ In addition, for a non-water dependent project, there is a presumption that a less environmentally damaging practicable alternative exists.⁶¹ This presumption is “very strong,”⁶² and it requires more than consideration of a range of alternatives – the presumption must be rebutted by a “clear demonstration.”⁶³ There is also a presumption that any practicable alternative that does not involve special aquatic sites is less environmentally damaging than one that does.⁶⁴ Practicability should be assessed in terms of cost, technology, and logistics in light of the overall project purpose, but “[t]he mere fact that an alternative may cost somewhat more does not necessarily mean it is not practicable.”⁶⁵ The Corps is required to actually evaluate the criteria used to compare alternative sites, and its analysis must be “objective and balanced, and not be used to provide a rationalization for the applicant’s preferred result.”⁶⁶

Although the Applicant claims the project’s purpose is water dependent,⁶⁷ the Corps is correct in stating that it is not water dependent.⁶⁸ Accordingly, the strong presumption concerning the existence of less environmentally damaging practicable alternatives is applicable to the proposed project. The Applicant has failed to overcome this presumption. Indeed, the materials submitted by the Applicant in support of its permit application do not make the necessary clear demonstration that no other less environmentally damaging alternatives exist, nor do the Applicant’s materials establish the Via Verde project as the least environmentally damaging practicable alternative.

⁶⁰ *Korteweg v. U.S. Army Corps Eng’s*, 650 F. Supp. 603, 604 (D. Conn. 1986); 40 C.F.R. § 230.10(a) (2010).

⁶¹ *Greater Yellowstone Coalition v. Flowers*, 359 F.3d 1257, 1269 (10th Cir. 2004); 40 C.F.R. § 230.1(a)(3) (2010).

⁶² *Friends of Magurrewock, Inc. v. U.S. Army Corps Eng’s*, 498 F. Supp. 2d 365, 371 (D. Me. 2007).

⁶³ *Nw. Bypass Group v. U.S. Army Corps Eng’s*, 552 F. Supp. 2d 97, 108 (D.N.H. 2008) (requiring the Corps to do more than consider a range of alternatives); 40 C.F.R. § 230.1(a)(3) (2010)(requiring clear demonstration).

⁶⁴ 40 C.F.R. § 230.10(a)(3).

⁶⁵ 45 Fed. Reg. 85,336, 85,339 (Dec. 24, 1980). See *Bahia Park, S.E. v. United States*, 286 F. Supp. 2d 201, 207 (D.P.R. 2003)(holding that high-cost alone did not eliminate an alternative from consideration).

⁶⁶ U.S. Dept. Army, Hartz Mountain 404(q) Elevation: HQUSACE Findings (July 25, 1989) (App. at 25).

⁶⁷ JOINT PERMIT APPLICATION, *supra* note 1, App. at 616.

⁶⁸ E-mail from Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps Eng’s-Antilles Office, to Lawrence Evans, Senior Env’tl. Expert, PC Peabody (Oct. 20, 2010, 10:29 p.m.) (App. at 903).

As a result of the Applicant's unduly narrow statement of purpose described above, its alternatives analysis is fundamentally flawed. For instance, the Applicant's alternatives analysis does not include some of the alternatives discussed in the Puerto Rico EIS.⁶⁹ Although the Applicant has attempted to correct this deficiency by informing federal agencies that the alternatives analysis in the permit application and in the Puerto Rico EIS should be reviewed together to provide a complete alternatives analysis, the collective information still does not adequately address all practicable alternatives.⁷⁰ If a broader and more appropriate statement of purpose is utilized, additional alternatives and combinations of alternatives are available and should be evaluated. For instance, the alternatives analysis should include the possibility of converting one or more of the Applicant's south coast power plants to natural gas to meet the goal of reducing the island's overall dependence on oil, as established by the Applicant's Strategic Plan and the Governor's Emergency Order.⁷¹ For example, the Costa Sur plant could be converted to natural gas along with one of the northern power plants, which may eliminate the need for the east-west portion of the Via Verde project, particularly if other alternative energy sources could be utilized to supplement energy demand in urban areas like San Juan. Other alternatives for the storage and delivery of natural gas to the Applicant's system should also be considered. In fact, the Applicant appears to be currently contracting for one or more floating storage and regasification units ("FSRUs") that could provide natural gas any number of its facilities.⁷²

Even if the Corps accepts the Applicant's narrow purpose of providing natural gas to the northern power plants, the alternatives analysis must include alternatives that could achieve this objective with less environmental damage than the proposed project. For instance, FSRUs should have been fully evaluated for each north coast plant. An alternative that eliminates or scales back a portion of the proposed pipeline, such as the east-west portion, should have also been evaluated. Given the presumption in favor of alternatives that do not affect wetlands or other special aquatic sites, the alternatives analysis also should have included one or more routes specifically designed to maximize avoidance of these areas. Although the Applicant provided some supplemental alternatives analysis, it still only analyzes the same three broad alternatives that were included in the initial permit application, fails to include other renewable energy

⁶⁹ Compare JOINT PERMIT APPLICATION, *supra* note 1, App. at 628 (analyzing the no action, terrestrial pipeline, new San Juan terminal, and deepwater port alternatives); with P.R. ELECTRIC POWER AUTH. *Chapter 4: Study of Alternatives and Selection of the Alignment*, in ENVTL. IMPACT STATEMENT (2010) (App. at 332) (analyzing the no action, terrestrial pipeline, new San Juan terminal, deepwater port, and the use of renewable energy alternatives).

⁷⁰ Letter from Francisco E. Lopez Garcia, Head, Envtl. Protection & Quality Assurance Div., P.R. Electric Power Auth., to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps Eng's-Antilles Office (Jan. 28, 2011) (App. at 1214).

⁷¹ See *infra* Section V-A of these comments.

⁷² *Excelerate Awarded Puerto Rico FSRU Contract*, ICIS HEREN (Mar. 7, 2011, 15:32:05) <http://www.icis.com/heren/articles/2011/03/07/9441498/lng/lmd/excelerate-awarded-puerto-rico-fsru-contract.html>. According to Francisco E. Lopez, a general manager for the Applicant, Excelerate has been handed a contract to provide the Applicant with a FSRU, which will provide an entry point for LNG on the southern end of the island to coincide with the Via Verde project. Furthermore, "[the Applicant] plans to issue a second tender for a FSRU on the island's northern coast." *Id.*

alternatives, and does not include reasonable combinations of methods to provide alternative energy to the Applicant's system or even its facilities on the north coast.⁷³

The Applicant's alternatives analysis fails to provide sufficient detail or evaluation for compliance with the Guidelines.⁷⁴ It is wholly lacking in detail and includes general, conclusory statements about the practicability of the considered alternatives. For example, the Applicant dismisses the Central San Juan deepwater port alternative, in part, because "installing a pipe on the seabed ... would raise issues of safety with Homeland Security," "there are low-income communities close to the project," and "after an analysis of environmental impacts the project would not be favored."⁷⁵ The Applicant's supplemental alternatives analysis still suffers from this flaw, indicating on its rating table that the "terrestrial route" has only temporary impacts to aquatic species, but the buoys and import terminal alternatives have permanent impacts, but fails to fully explain the rationale for this different assessment of impacts.⁷⁶

The Applicant also analyzes the proposed alternatives incorrectly. For instance, the Applicant weighs the environmental impacts and practicability considerations together, which is not what the law requires.⁷⁷ The Applicant must separately analyze (1) whether an alternative is more or less environmentally damaging than the applicant's preferred alternative and (2) whether an alternative is or is not practicable in terms of cost, technology, and logistics.⁷⁸ This flaw is evident, for instance, in the Applicant's pipeline route selection. To select between three different pipeline routes, the Applicant creates a matrix including land use, number of water body crossings, forest and nature reserves, endangered species, architectural and archaeological findings, highway crossings, zoning, topography, and residences.⁷⁹ For each route section, the Applicant has assigned a point to whichever route had the least impacts for each category.⁸⁰ Through this analysis, the Applicant has improperly blended together environmental impacts (such as water body crossings, forest and nature reserves, and endangered species) with other considerations that may impact cost or logistics (such as highway crossings, zoning, and residences). This flaw is also apparent in the supplemental alternatives analysis, where the Applicant includes some criteria relevant to identifying the least environmentally damaging practicable alternative.⁸¹ However, the Applicant also includes factors such as cost, ease of access, and number of road crossings.⁸² Although such considerations may factor into whether an

⁷³ Extended Alternatives Analysis (hereinafter "Extended Alternatives Analysis") (App. at 523). We believe this to be the supplemental alternatives material attached to BCPeabody's February 24, 2011 letter (App. at 1396), however, it is not clear based on the information we received from the Corps.

⁷⁴ While the Applicant may utilize the information developed for a NEPA analysis, the Guidelines indicate that this information may not be sufficient in detail to meet the requirements for factual determinations under the Guidelines. 40 C.F.R. § 230.10(a)(4) (2010).

⁷⁵ JOINT PERMIT APPLICATION, *supra* note 1, App. at 639.

⁷⁶ Extended Alternatives Analysis, App. at 543.

⁷⁷ JOINT PERMIT APPLICATION, *supra* note 1, App. at 639, 640 (discussing the alternatives in sections 1.7.3.1, 1.7.3.2, and 1.7.3.3, the applicant states: "[a]fter an analysis of environmental impacts the project would not be favored.").

⁷⁸ 40 C.F.R. § 230.10(a)(3) (2010).

⁷⁹ JOINT PERMIT APPLICATION, *supra* note 1, App. at 642.

⁸⁰ JOINT PERMIT APPLICATION, *supra* note 1, App. at 645.

⁸¹ Extended Alternatives Analysis, App. at 543.

⁸² *Id.*

alternative is practicable, the Applicant's method of analysis potentially allows for a significant environmentally damaging alternative to be selected because it is more practicable. This is particularly true where, as in the Applicant's supplemental analysis, the factor of cost is weighted more than an environmental factor such as essential fish habitat.⁸³

The Applicant's route selection analysis also fails to sufficiently evaluate the impacts of each route on aquatic resources. Although the Applicant considers the number of water body crossings, the numbers given do not match up with the final route descriptions of water body crossings as provided in the calculation of temporary impacts,⁸⁴ and they provide no indication of the extent, acreage, or severity of the impacts. Moreover, even if this were a sufficient analysis of the impacts associated with different routes, the Applicant selects the West-East Route C, which crosses more water bodies, implicates more endangered species habitat, and crosses a greater portion of forest and nature reserve land than West-East Route B.⁸⁵ The Applicant explicitly states that Route C was favored simply because it avoided more residences than the other routes.⁸⁶ This choice was made without an adequate evaluation of whether the chosen route was the least environmentally damaging alternative, nor any analysis demonstrating that all other less damaging alternatives than the selected alternative were not practicable.

For the reasons discussed above, the Applicant has failed to overcome the strong presumption that less environmentally damaging alternatives exist and that alternatives which avoid wetlands and other special aquatic sites are less environmentally damaging. As a result, the Applicant has failed to make the "clear demonstration" that it must in order to meet its burden of demonstrating that its proposed project is the least environmentally damaging practicable alternative. Accordingly, the Corps cannot issue a permit in compliance with the Guidelines based on the record before it.

D. The Applicant Has Failed to Show That It Has Avoided and Minimized Adverse Impacts.

In addition to the foregoing, the Applicant must avoid aquatic resource impacts associated with its selected alternative, and it must take "all appropriate and practicable steps" to minimize the potential adverse impacts on the aquatic ecosystem.⁸⁷ Since the Applicant has, to date, failed to demonstrate the Via Verde project will meet this requirement, the Corps cannot issue a permit for the proposed project.

Section 1.8 of the permit application, entitled "Avoidance and Minimization," indicates that the pipeline route was selected to avoid impacts to the human environment, and it includes procedures that the Applicant asserts will minimize impacts to certain endangered species.⁸⁸ Section 4 of the permit application, entitled "Construction Details," provides further information

⁸³ *Id.*

⁸⁴ JOINT PERMIT APPLICATION, *supra* note 1, Table 5, App. at 657.

⁸⁵ JOINT PERMIT APPLICATION, *supra* note 1, App. at 645.

⁸⁶ JOINT PERMIT APPLICATION, *supra* note 1, App. at 644. Route C was awarded two points for avoiding more residences than the other two routes. *Id.*

⁸⁷ 40 C.F.R. § 230.10(d) (2010).

⁸⁸ JOINT PERMIT APPLICATION, *supra* note 1, App. at 646.

on some construction measures the Applicant asserts will limit the amount of water pollution.⁸⁹ In a January 28, 2011 letter, the Applicant lists a series of other avoidance and minimization measures, including the use of minimally invasive construction methods, avoidance of conservation lands, historic properties, HDD safety measures, and turbidity and erosion prevention measures.⁹⁰ In a February 24, 2011 letter, the Applicant's consultant, BC Peabody, summarizes further measures to avoid and minimize impacts, including avoidance of future development along the ROW, avoidance of El Bosque del Pueblo State Forest, Rio Abajo State Forest, and De la Vega State Forest, as well as avoidance of impacts to Mogotes (rare and sensitive limestone hill karst formations), and the use of HDD in the San Pedro Swamp area.⁹¹

The Applicant's discussion of supplemental avoidance measures is inadequate. While the Applicant indicates the proposed route will be revised to avoid impacts to the above-referenced State Forests and the Mogotes area of Manati, the Applicant does not make any showing that these measures would actually avoid impacts to wetlands or other waters of the United States. The Applicant also provides no information regarding the extent, nature, or degree of impacts that would be avoided through the use of these measures. The Applicant also fails to explain why similar avoidance is not possible for other areas and waters along its selected route.

The Applicant's discussion of minimization measures is similarly insufficient. As noted above, the Applicant has sporadically identified several measures and practices it may take to minimize impacts to aquatic resources during the construction of the Via Verde project in various submissions. However, a significant portion of these submissions are conclusory and fail to sufficiently explain how, and to what extent, the measures will actually minimize impacts.⁹² They also leave the Applicant with too much leeway, especially when determining what is "possible."⁹³ Because the Applicant has not adequately detailed or evaluated its minimization efforts and has specifically left itself as the sole decision-maker concerning what may be "possible" or "practicable" during construction, it is unclear whether "all appropriate steps" have been taken to minimize the impacts of the Via Verde project. The Applicant's proposal for minimization of aquatic resource impacts largely focuses on its use of HDD. The Applicant has failed, however, to adequately consider the adverse impacts of the HDD process itself.⁹⁴ The Applicant provides a Frac-Out Plan and indicates that the North American Society for Trenchless Technology guidelines and recommendations for karst environments will be followed. The referenced guidelines and recommendations are not provided, however, and there is no

⁸⁹ JOINT PERMIT APPLICATION, *supra* note 1, App. at 666.

⁹⁰ Letter from Francisco E. Lopez Garcia, Head, Env'tl. Protection & Quality Assurance Div., P.R. Electric Power Auth., to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps Eng's-Antilles Office (Jan 28, 2011) (App. at 1225).

⁹¹ Letter from Andrew Goetz, President, BC Peabody, to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps Eng's-Antilles Office (Feb. 24, 2011) (App. at 1396).

⁹² JOINT PERMIT APPLICATION, *supra* note 1, App. at 668 ("To minimize disturbance to woody riparian vegetation within extra workspaces adjacent to the construction right-of-way at waterbody crossings, the Contractor shall minimize grading and grubbing of waterbody banks.").

⁹³ JOINT PERMIT APPLICATION, *supra* note 1, App. at 668 ("The contractor shall preserve as much vegetation as possible"; soil should be pushed away from waterbodies "when possible"; temporary sediment barriers shall be installed within 24 hours "when practicable.")

⁹⁴ JOINT PERMIT APPLICATION, *supra* note 1, App. at 664.

evaluation of the harm to the environment along the proposed project route that could result from an unanticipated frac-out.⁹⁵

Compliance with the Guidelines requires avoidance and minimization of adverse impacts to jurisdictional waters. Without this evaluation, the Corps is unable to make the necessary factual and compliance determinations required by the Guidelines or to complete the required public interest review, and this precludes it from issuing a permit at this time.

E. The Applicant Has Failed to Demonstrate That It Will Mitigate All Unavoidable Impacts to Aquatic Resources.

In addition to demonstrating avoidance and minimization of impacts, the Applicant must show that all unavoidable impacts will be mitigated.⁹⁶ The Applicant has failed to make such a showing.

Mitigation is accomplished through compensatory mitigation, mitigation bank credits, or in-lieu fee program credits.⁹⁷ In contrast, the Applicant states in Section 2.4.4 of the permit application, entitled “Wetland Mitigation,” that, “as compensation for construction of the pipeline the [A]pplicant will incur the costs of horizontal directional drilling.”⁹⁸ This minimization strategy is not among the permissible forms of mitigation.⁹⁹ Compensatory mitigation must be based on either a functional evaluation or the use of a 1:1 acreage ratio.¹⁰⁰

Additionally, the Corps must consider other factors that could affect wetland functions, many of which have not yet been evaluated by the Applicant, such as the likelihood of success of proposed mitigation measures, difference between the functions lost and the functions gained or preserved by the mitigation project, temporal losses, and the difficulty of restoring the desired resource functions.¹⁰¹ While the Corps is allowed to require a mitigation ratio of less than 1:1, this is disfavored and must be based on a “rigorous functional assessment method” and not conclusory statements made by the Applicant.¹⁰² The Applicant must submit a draft mitigation plan to the Corps for review, which should contain specific and comprehensive information about the proposed mitigation measures, including performance standards and a long-term management plan.¹⁰³

⁹⁵ Letter from Francisco E. Lopez Garcia, Head, Envtl. Protection & Quality Assurance Div., P.R. Electric Power Auth., to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps Eng’s-Antilles Office (Jan. 28, 2011) (App. at 1224). The Frac-Out Plan is Appendix F to the permit application, and is available at http://www.saj.usace.army.mil/Divisions/Regulatory/DOCS/interest/ViaVerde/31_I-FinalViaVerdeFrac-outPlan_12Sep10.pdf.

⁹⁶ 40 C.F.R. § 230.91(c) (2010).

⁹⁷ 40 C.F.R. § 230.91 (2010).

⁹⁸ JOINT PERMIT APPLICATION, *supra* note 1, App. at 663.

⁹⁹ See 40 C.F.R. § 230.93 (2010) (“Compensatory mitigation may be performed using the methods of restoration, enhancement, establishment, and in certain circumstances preservation”).

¹⁰⁰ 40 C.F.R. § 230.93(f)(1) (2010).

¹⁰¹ 40 C.F.R. § 230.93(f)(2) (2010).

¹⁰² Compensatory Mitigation for Losses of Aquatic Resources, 73 Fed. Reg. 19594, 19506 (April 10, 2008).

¹⁰³ 40 C.F.R. § 230.94(c)(2)-(14) (2010).

The information provided by the Applicant does not demonstrate that appropriate compensatory mitigation will be conducted. First, no functional assessment has been performed for the Via Verde project. To determine the amount of mitigation that would be “sufficient to replace lost aquatic resource functions,” the Corps must first assess what aquatic resource functions would be lost.¹⁰⁴ The Applicant has made several different representations about planned mitigation ratios (stating that they anticipate that mitigation for the temporary impacts to be less than a ratio of 1 acre of temporary impacts to 0.01 acres of compensatory mitigation,¹⁰⁵ and at other times stating that the mitigation for permanent impacts would be completed at a 3:1 ratio¹⁰⁶) without first conducting a functional assessment to determine what mitigation is required.

The Corps should begin by establishing the baseline function of the aquatic resources that would be affected by the proposed project. Then, the Corps would be in a position to evaluate the loss of resource function that would be caused by the construction and the extent to which minimization and restoration measures proposed by the Applicant would be likely to reduce that loss. This analysis should thoroughly evaluate the Applicant’s claims that all impacts to aquatic resources will be temporary.¹⁰⁷ Corps regulations mandate that the Corps issue, in writing, factual findings detailing the short-term and long-term effects of the discharges associated with a proposed project on aquatic resources.¹⁰⁸ These findings must specifically include the cumulative effects and secondary impacts on the resource.¹⁰⁹ Thus, the Applicant’s unsupported statements that there will be no permanent impacts to aquatic resources because the Applicant plans to restore construction areas to their preexisting condition are insufficient.¹¹⁰ Only after the nature and extent of anticipated aquatic resource loss is established could the Corps approve a mitigation ratio and mitigation plan.

Second, the Applicant has failed to submit a draft mitigation plan. This plan must set forth a mitigation ratio that ensures the replacement of lost aquatic resource functions, while accounting and compensating for the method of mitigation, the likelihood of success, differences between function lost and replacement function, temporal losses, the difficulty of restoring or establishing the desired aquatic resource type, and the distance between the compensation site and the lost aquatic resource function.¹¹¹ The only information provided by the Applicant appears to be a single sentence describing the planned mitigation, which would include lowering the elevation of

¹⁰⁴ 40 C.F.R. § 230.93(f)(1) (2010).

¹⁰⁵ JOINT PERMIT APPLICATION, *supra* note 1, App. at 664.

¹⁰⁶ Letter from Francisco E. Lopez Garcia, Head, Env'tl. Protection & Quality Assurance Div., P.R. Electric Power Auth., to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps Eng's-Antilles Office (Jan 28, 2011) (App. at 1255).

¹⁰⁷ *Id.* App. at 1254.

¹⁰⁸ 40 C.F.R. § 230.11 (2010).

¹⁰⁹ Cumulative effects are “the changes in an aquatic system that are attributable to the collective effect of a number of individual discharges of dredged or fill materials.” 40 C.F.R. § 230.11(g) (2010). Secondary impacts are “effects on the aquatic ecosystem that are associated with a discharge of dredged or fill materials, but do not result from the actual placement of the dredged or fill material.” 40 C.F.R. § 230.11(h) (2010).

¹¹⁰ JOINT PERMIT APPLICATION, *supra* note 1, App. at 664.

¹¹¹ 40 C.F.R. § 230.93(f)(2) (2010).

sections of the project right-of-way and “establishing” additional herbaceous wetland habitat.¹¹² The Applicant does not designate any particular area for this mitigation or describe the method of reestablishment. Without any indication of how or where the proposed mitigation would occur, the Corps cannot evaluate the likelihood of success, the comparative function of the replacement wetlands, or the distance between the lost and replacement wetlands. The Applicant also mentions a possible restoration and enhancement project in the Caño Tiburones wetland reserve, where the area is dominated by invasive cattails, but only provides that “the method of installing the pipeline in this area will allow replacing the cattail vegetation that existed before the construction with a desirable aquatic species.”¹¹³ Here again, the Applicant has failed to specify the method, the replacement species, and the likelihood of success of the mitigation. The information provided by the Applicant on mitigation is wholly inadequate, and no information has been provided indicating how the Applicant proposes to monitor and evaluate the success of the compensatory mitigation or perform any necessary maintenance.

For the reasons discussed above, the Applicant has failed to provide the Corps with an adequate mitigation plan. Without such a plan, the Corps cannot complete its review or issue the permit in compliance with the Guidelines. The Applicant also has not supplied sufficient information to allow the Corps to proceed with a public interest review. If and when the Corps obtains enough information to review the Via Verde project, it should conduct a rigorous public interest review and permit evaluation with the aim of fully protecting the “chemical, biological, and physical integrity of the Nation’s waters” in accordance with the CWA.¹¹⁴

Corps regulations require that public comments should be considered both in the public interest review and in the permit decision itself.¹¹⁵ Those regulations also allow for public hearings to assist the Corps in making a decision.¹¹⁶ Because of the large scale and controversial nature of the proposed project, the Corps should prioritize public participation. For these reasons and the reasons cited in Section VI of these comments, the Corps should emphasize public participation by extending public comment periods, holding extensive public hearings, and considering this additional material in the public interest review and final determination.

III. THE CORPS MUST ENSURE THAT ITS PERMITTING DECISION CONCERNING THE VIA VERDE PROJECT COMPLIES WITH THE ENDANGERED SPECIES ACT.

The ESA is “the most comprehensive legislation for the preservation of endangered species ever enacted by any nation.”¹¹⁷ The ESA’s “language, history and structure” convinced the U.S. Supreme Court “beyond doubt” that “Congress intended endangered species to be afforded the highest of priorities.”¹¹⁸ Indeed, the “plain intent of Congress in enacting [the ESA] was to halt

¹¹² JOINT PERMIT APPLICATION, *supra* note 1, App. at 664.

¹¹³ Letter from Andrew Goetz, President, BC Peabody, to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps Eng’s-Antilles Office (Feb. 24, 2011) (App. at 1401).

¹¹⁴ 33 U.S.C. § 1251 (2006).

¹¹⁵ 33 C.F.R. § 337.1(d),(f) (2010).

¹¹⁶ 33 C.F.R. § 327.4 (2010).

¹¹⁷ *Tennessee Valley Auth. v. Hill*, 437 U.S. 153, 180 (1978).

¹¹⁸ *Id.* at 174.

and reverse the trend toward species extinction . . .”¹¹⁹ In light of these lofty objectives, the Supreme Court declared that “endangered species [have] priority over the ‘primary missions’ of federal agencies.”¹²⁰ Furthermore, federal Circuit Courts have held that the ESA imposes an “affirmative duty on each federal agency to conserve each listed species.”¹²¹ As the permitting agency for a Section 404 permit, the Corps is required to ensure that its decision complies with all of the substantive and procedural requirements of the ESA.¹²²

A. The Corps Has a Duty to Ensure That the Proposed Project Will Not Jeopardize Any Endangered or Threatened Species.

In order to achieve the objective of endangered species conservation, the ESA mandates that federal agencies “shall ... ensure that any action authorized, funded, or carried out by such agency . . . is not likely to jeopardize the continued existence of any endangered species or threatened species . . . or adverse modification of habitat of such species.”¹²³

FWS has indicated that the proposed Via Verde pipeline project could adversely impact 32 listed species and one species proposed for listing within its jurisdiction.¹²⁴ As noted previously, the proposed project would bisect the heart of pristine species habitat and require a 150–300-foot construction ROW and a 50-foot permanent ROW.¹²⁵ Moreover, the 92-mile pipeline would traverse Commonwealth Forests, Natural Reserves, forested volcanic and karst areas, and portions of privately-owned lands participating in conservation programs due to their high ecological value.¹²⁶

Many of these areas are recognized in the Puerto Rico Comprehensive Wildlife Conservation Strategy as Critical Wildlife Areas.¹²⁷ They include pristine, undeveloped habitat that is home to Puerto Rico’s most endangered species. For instance, as currently proposed, the pipeline could impact the Bosque Estatal de Río Abajo, a location chosen as a site to establish a second wild population for the critically endangered Puerto Rican parrot. This endemic species is the only native parrot in the United States, and it is considered one of the ten most endangered birds in the

¹¹⁹ *Id.* at 184.

¹²⁰ *Id.* at 185.

¹²¹ *Sierra Club v. Glickman*, 156 F.3d 606, 616 (5th Cir. 1998); *Florida Key Deer v. Paulison*, 522 F.3d 1133, 1138 (11th Cir. 2008).

¹²² U.S. FISH & WILDLIFE SERVICE & NAT’L MARINE FISHERIES SERV., ENDANGERED SPECIES CONSULTATION HANDBOOK 72 (Mar. 1998) (hereinafter “CONSULTATION HANDBOOK”).

¹²³ 16 U.S.C. § 1536(a)(2) (2006).

¹²⁴ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Yousev Garcia, Dir. Asesores Ambientales y Educativos, Inc. (June 30, 2010) (App. at 587–90).

¹²⁵ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Sindulfo Castillo, Chief, Regulatory Section, U.S. Army Corps Eng’s-Antilles Office (Oct. 18, 2010) (App. at 889); E-mail from Felix Lopez, Contaminants Specialist, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Marelisa Rivera, Assistant Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office (Jan. 12, 2011, 08:37 AM) (App. at 1181).

¹²⁶ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Sindulfo Castillo, Chief, Regulatory Section, U.S. Army Corps Eng’s-Antilles Office (Oct. 18, 2010) (App. at 889).

¹²⁷ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Col. Alfred A. Pantano, Jr., Dist. Commander, U.S. Army Corps Eng’s-Jacksonville Dist. (Dec. 15, 2010) (App. at 1113).

world. There are only 22-28 individuals in the Rio Abajo Forest, out of an estimated total of 50 individuals remaining overall.¹²⁸ In an effort to protect endangered and threatened species in Puerto Rico, FWS has spent \$180,000 dollars on restoration activities on private lands participating in conservation programs that the Via Verde project may impact.¹²⁹

With respect to the Via Verde project, NMFS has stated that, since the Applicant noted the project will impact 28.5 acres of essential fish habitat (“EFH”), the Corps “shall not” authorize the project as proposed.¹³⁰ Furthermore, NMFS stated that “no clearing” shall be authorized for areas that support seagrass and mangroves.¹³¹ In light the significant potential for impacts to protected species and their habitat, we write in support of the diligence shown by the Corps, FWS, and NMFS thus far, but we believe continued oversight is required in order to comply with the ESA.

In order to comply with its overriding “no jeopardy” obligation, the Corps must comply with several requirements of the ESA before authorizing any aspect of the Via Verde project to move forward. As discussed in more detail below, the Corps must: (1) make an initial inquiry to NMFS, as it has already done with FWS, to determine what marine species “may be present” in the action area; (2) prepare a biological assessment (“BA”) addressing both terrestrial and marine species that may be present in the project area, and make a determination based on the BA regarding whether the proposed project “may affect” any federally listed species; (3) initiate formal consultation with both FWS and NMFS and cooperate in their efforts to prepare a biological opinion (“BiOp”) to evaluate the effects of the proposed project on listed species; (4) ensure that no “irretrievable or irreversible commitments of resources” are made prior to the completion of the formal consultation process; and (5) incorporate the terms and conditions required by FWS and/or NMFS through any “reasonably prudent alternatives” (“RPAs”) and/or incidental take statement (“ITS”) into the permit to ensure that the Via Verde project will not jeopardize listed species; or if it is not possible to avoid jeopardy, the Corps must deny the permit for the Via Verde project.

¹²⁸ U.S. FISH & WILDLIFE SERV., RECOVERY PLAN FOR THE PUERTO RICAN PARROT iii (2009) *available at* <http://endangered.fws.gov/recovery/index.html#plans>. *See also Puerto Rican Parrot*, <http://www.fws.gov/southeast/prparrot/> (last updated Feb. 19, 2010) (stating less than 30 species may be left in the wild).

¹²⁹ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Col. Alfred A. Pantano, Jr., Dist. Commander, U.S. Army Corps Eng’s-Jacksonville Dist. (Dec. 15, 2010) (App. at 1111–1112). Although the Applicant claims these areas will not be impacted, we have seen no plans amending the Via Verde route or other information discussing how impacts will be avoided on these lands. Letter from Francisco E. Lopez Garcia, Head, Env’tl. Protection & Quality Assurance Div., P.R. Electric Power Auth., to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps of Engineers-Antilles Office (Jan 28, 2011) (App. at 1251–52).

¹³⁰ Letter from Miles M. Croom, Assistant Regional Admin’r, Nat’l Marine Fisheries Serv. S.E. Regional Office, to Col. Alfred Pantano, Dist. Commander, U.S. Army Corps Eng’s-Jacksonville Dist. (Dec. 19, 2010) (App. at 1126). This letter also asks that surveys be conducted for organisms in the estuarine areas that the proposed project impacts. *Id.* To date, the Applicant has not conducted the requested surveys.

¹³¹ *Id.*

B. The Corps Must Make an Initial Inquiry to NMFS to Determine What Marine Species “May be Present” in the Action Area.

Under the ESA, consultation is required for any “agency action”¹³² – including the issuance of a 404 permit¹³³ – that “may affect” endangered and threatened species or their habitat. Since the agency action is the issuance of a permit, the Corps must make an initial inquiry to NMFS and the FWS for a list of species that “may be present,” in the “action area” early on in its consideration of such a permit.¹³⁴

It is our understanding that the Corps has already made such an inquiry to FWS, and that this prompted the FWS’s response on June 30, 2010 providing a list of 32 endangered and threatened terrestrial species that “may be present” in the Via Verde action area.¹³⁵ As far as we know, however, the Corps has not yet made a similar inquiry to NMFS regarding the coastal, marine, or anadromous species that “may be present” in the action area of the proposed project.¹³⁶

Since “action area” is broadly defined, the coastal and marine impacts associated with the Via Verde project, not just the impacts occurring within the project footprint, must be assessed.¹³⁷ As currently proposed, the Via Verde project would be constructed along the northern coast of Puerto Rico,¹³⁸ would adversely impact EFH,¹³⁹ would result in increased tanker ship traffic and other vessel traffic to and from the EcoEléctrica LNG Terminal,¹⁴⁰ and may involve two or more FSRUs off the coast of Puerto Rico in one or more locations in order to provide the natural gas for the pipeline.¹⁴¹ These activities and others associated with the proposed project are likely to

¹³² 16 U.S.C. § 1536(a)(3) (2006); 50 C.F.R. § 402.02 (2010).

¹³³ *Fund for Animals v. Rice*, 85 F.3d 535, 542 (11th Cir. 1996); *Riverside Irrigation Dist. v. Andrews*, 758 F.2d 508, 515 (10th Cir. 1985).

¹³⁴ See 50 C.F.R. § 402.14(a) (2010) (requiring a federal action agency to “review its action . . . to determine whether any action may affect listed species or critical habitat”).

¹³⁵ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Yousev Garcia, Dir. Asesores Ambientales y Educativos, Inc. (June 30, 2010) (App. at 587–90).

¹³⁶ *Regulatory Division-Actions of Interests: Via Verde Natural Gas Pipeline*, U.S. ARMY CORPS ENG’S-JACKSONVILLE DIST., <http://www.saj.usace.army.mil/Divisions/Regulatory/news.htm> (last updated Apr. 4, 2011).

¹³⁷ 50 C.F.R. § 402.02 (2010) (defining action area as “areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action”).

¹³⁸ JOINT PERMIT APPLICATION, *supra* note 1, App. at 659, 750–754, 795–801.

¹³⁹ Letter from Miles M. Croom, Assistant Regional Admin’r, Nat’l Marine Fisheries Serv. S.E. Regional Office, to Col. Alfred Pantano, Dist. Commander, U.S. Army Corps Eng’s-Jacksonville Dist. (Dec. 19, 2010) (App. at 1126). We agree with the Corps decision to initiate consultation with NMFS for EFH pursuant to the Magnuson-Stevens Fishery Conservation Management Act. DEP’T OF DEFENSE, JACKSONVILLE DIST. CORPS. OF ENGINEERS-ANTILLES OFFICE, PERMIT APPLICATION NO. SAJ-2010-02881, PUBLIC NOTICE (Nov. 19, 2010) (App. at 955–56). We encourage the Corps to conduct the EFH consultation in conjunction with their ESA duties. NAT’L MARINE FISHERIES SERV., OFFICE OF HABITAT CONSERVATION, ESSENTIAL FISH HABITAT CONSULTATION GUIDANCE 13 (2004).

¹⁴⁰ Order Amending Authorization Under Section 3 of the Natural Gas Act, 127 FERC ¶ 61,044 (April 16, 2009) (App. at 300–01).

¹⁴¹ *Excelerate Awarded Puerto Rico FSRU Contract*, ICIS HEREN (Mar. 7, 2011, 15:32:05) <http://www.icis.com/heren/articles/2011/03/07/9441498/lng/lmd/excelerate-awarded-puerto-rico-fsru-contract.html>. According to Francisco E. Lopez, a general manager for the Applicant, Excelerate has been handed a contract to provide the Applicant with a FSRU, which will provide an entry point for LNG on the southern end of the island to

impact multiple federally listed coastal, marine, and/or anadromous species. For example, the proposed project would be constructed near the coast in the municipalities of Toa Baja and Catano in northern Puerto Rico.¹⁴² The endangered Hawksbill Sea Turtle is listed as inhabiting the coastal areas of Toa Baja.¹⁴³ The endangered Green Sea Turtle and the Hawksbill Sea Turtle reside in the coastal zones of Catano.¹⁴⁴ The entire coastline of Puerto Rico is designated as critical habitat for endangered Elkhorn and Staghorn Coral,¹⁴⁵ and some of the smaller islands of Puerto Rico and other nearby islands are designated as critical habitat for endangered Hawksbill, Green, and Leatherback Sea Turtles.¹⁴⁶ Increased water pollution, shipping traffic, noise, lights, explosion risks, and other impacts associated with the construction and operation of the proposed project could be detrimental to these species as well as other marine mammals, sea turtles, corals, fish.

For all these reasons, the Corps must submit an initial inquiry to NMFS in order to determine what species “may be present” in the action area.¹⁴⁷ NMFS has already suggested this course of action by opining that further consultation may be required for marine species.¹⁴⁸

C. The Corps Must Prepare a Biological Assessment Encompassing Both the Terrestrial and Marine Species in the Action Area.

The initial inquiry begins the informal consultation process, and the next step is the preparation of a BA by the action agency for submission to FWS and NMFS for review and approval.¹⁴⁹ During this process, the action agency is required to confirm whether and to what extent listed species are present in the action area and whether the proposed project “may adversely affect” such species.¹⁵⁰ The BA must address both listed species and candidate species.¹⁵¹ In the BA,

coincide with the Via Verde project. Furthermore, “[the Applicant] plans to issue a second tender for an FSRU on the island’s northern coast.” *Id.*

¹⁴² JOINT PERMIT APPLICATION, *supra* note 1, App. at 795–801.

¹⁴³ U.S. FISH & WILDLIFE SERV., CARIBBEAN ENDANGERED SPECIES MAP 83 (2007).

¹⁴⁴ *Id.* at 22.

¹⁴⁵ *Elkhorn Coral*, NOAA FISHERIES-OFFICE OF PROTECTED RESOURCES, <http://www.nmfs.noaa.gov/pr/species/invertebrates/elkhorncoral.htm> (last visited Apr. 14, 2011); *Staghorn Coral*, NOAA FISHERIES-OFFICE OF PROTECTED RESOURCES, <http://www.nmfs.noaa.gov/pr/species/invertebrates/staghorncoral.htm> (last visited Apr. 14, 2011).

¹⁴⁶ *See Hawksbill Sea Turtle*, NOAA FISHERIES-OFFICE OF PROTECTED RESOURCES, <http://www.nmfs.noaa.gov/pr/species/turtles/hawksbill.htm> (last visited Apr. 14, 2011) (showing Mona Island, PR as critical habitat for endangered Hawksbill sea turtles); *Green Sea Turtle*, NOAA FISHERIES-OFFICE OF PROTECTED RESOURCES, <http://www.nmfs.noaa.gov/pr/pdfs/criticalhabitat/greenturtle.pdf> (last visited Apr. 14, 2011) (showing Culebra Island, PR as critical habitat for endangered Green sea turtles); *Leatherback Sea Turtle*, NOAA FISHERIES-OFFICE OF PROTECTED RESOURCES, <http://www.nmfs.noaa.gov/pr/pdfs/criticalhabitat/leatherbackturtle.pdf> (last visited Apr. 14, 2011) (showing St. Croix Island, USVI, near Puerto Rico as critical habitat for endangered Leatherback sea turtles).

¹⁴⁷ 50 C.F.R. § 402.12 (2010).

¹⁴⁸ E-mail from Lisamaire Carrubba, Protected Resources Div., Nat’l Marine Fisheries Serv.-Caribbean Office, to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps Eng’s-Antilles Office (Nov. 19, 2010, 4:17:58 p.m.) (App. at 948) (stating that consultation under Section 7 may be required, and that EFH consultation “will likely be required”).

¹⁴⁹ CONSULTATION HANDBOOK, *supra* note 121, at 63.

¹⁵⁰ *Id.* at 61, 67.

the action agency must determine an “Environmental Baseline” for the present listed species and then determine the project’s effects on such species.¹⁵² In determining the effects, the BA must analyze the project’s direct and indirect¹⁵³ effects, including the project’s impacts on sensitive periods of a species’ life cycle, the duration of the proposed action; the disturbance frequency, intensity, severity, and other effects.¹⁵⁴ The effects analysis must account for all interrelated and interdependent activities that “but for” the Via Verde project would not occur.¹⁵⁵ This analysis requires the Applicant to disclose the full scope of the Via Verde project. The BA should include site-specific inspections conducted by relevant species’ experts using properly approved protocols and methodologies, review of relevant literature, and an analysis of the potential effect of the action on listed species.¹⁵⁶ The BA must also address how the project will affect the behaviors of listed species and propose site-specific measures to avoid or minimize possible adverse affects.¹⁵⁷ The action agency must either prepare a BA itself or direct the applicant to do so,¹⁵⁸ although the Corps is ultimately responsible for the content of the BA as well as the “may adversely affect” finding.¹⁵⁹

The Via Verde project requires a BA because numerous listed species may be present in the action area, as discussed above. Moreover, FWS has concluded that the Via Verde project constitutes a “major construction activity”¹⁶⁰ and, as such, requires a BA.¹⁶¹ According to FWS, the construction of a “pipeline” is a “major construction activity.”¹⁶² Here, the Corps appears to be relying on the Applicant to conduct the species surveys necessary for the preparation of a BA. The surveys are utilized for the BA to determine the presence and abundance of species and whether the project “may affect” listed species.¹⁶³ FWS has requested additional surveys from

¹⁵¹ *Id.* at 72.

¹⁵² 50 C.F.R. § 402.02 (2010). The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early Section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. *Id.*

¹⁵³ See *Andrews*, 758 F.2d at 512 (requiring the Corps to determine the effects increased water consumption from a dam would cause on critical whooping crane habitat. The court reasoned that an agency could not wear “blindness” and ignore indirect but casually related effects of certain actions).

¹⁵⁴ CONSULTATION HANDBOOK, *supra* note 122, at 107–08.

¹⁵⁵ 51 Fed. Reg. 19126, 19932 (June 3, 1986); *Sierra Club v. Marsh*, 816 F.2d 1376, 1387 (9th Cir. 1987); CONSULTATION HANDBOOK, *supra* note 121, at 4-6. For example, the Applicant must evaluate the potential impacts of increased vessel traffic on endangered species as well as the impacts of FSRU’s on trust species. The Applicant must also address EcoEléctrica plant modifications, additional pipelines to connect the plants to Via Verde, maintenance roads and activities, or additional facilities in this analysis.

¹⁵⁶ 50 C.F.R. § 402.12(f) (2010).

¹⁵⁷ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Col. Alfred A. Pantano, Jr., Dist. Commander, U.S. Army Corps Eng’s-Jacksonville Dist. (Dec. 15, 2010) (App. at 1109).

¹⁵⁸ 50 C.F.R. § 402.12 (2010).

¹⁵⁹ CONSULTATION HANDBOOK, *supra* note 121, at 72.

¹⁶⁰ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Col. Alfred A. Pantano, Jr., Dist. Commander, U.S. Army Corps Eng’s-Jacksonville Dist. (Dec. 15, 2010) (App. at 1107).

¹⁶¹ See *Nat’l Wildlife Fed’n v. Nat’l Park Serv.*, 669 F. Supp. 384, 390 (D. Wyo. 1987); CONSULTATION HANDBOOK, *supra* note 121, at 48.

¹⁶² CONSULTATION HANDBOOK, *supra* note 121, at 71.

¹⁶³ See Interagency Cooperation—Endangered Species Act of 1973, 51 Fed. Reg. 19926, 19949 (June 3, 1986) (codified at 50 C.F.R. pt. 402) (stating that the term “may affect” has been broadly interpreted to mean “any possible

the Applicant for the Via Verde project because the surveys conducted for the Puerto Rico EIS were deficient.¹⁶⁴ FWS has stated that “the purpose of [the] requested surveys . . . [is] for the development of the [BA].”¹⁶⁵ Moreover, FWS has provided extensive technical assistance to the Applicant in developing acceptable survey methodologies for various listed species, and it has noted deficiencies in various aspects of survey designs.¹⁶⁶ The Applicant has been communicating with FWS regarding survey protocols and methodology for endangered plants, raptors, and nightjars.¹⁶⁷ However, the Applicant has not submitted survey protocols or methodology for FWS review for the endangered Puerto Rican boas, Puerto Rican crested toads, coqui ilanero in Toa Baja, or the critically endangered Puerto Rican parrot despite FWS requests that it do so.¹⁶⁸ Also, the FWS has advised the Corps that it “needs to make an effect determination with regards to the endangered Antillean Manatee [an FWS protected species] for the EcoEléctrica modifications, because the Environmental Baseline has changed since the original modification authorization.”¹⁶⁹ FWS has pointed out many deficiencies in the surveys the Applicant is conducting.

Regarding the plant surveys, FWS’s most recent comments note the lingering deficiencies in the protocols.¹⁷⁰ In these comments, FWS recommends using four parallel transects instead of three, and using four surveyors instead of three to increase the likelihood of spotting listed plants in the dense vegetation of the evaluation area.¹⁷¹ Additionally, FWS notes the Applicant failed to explain the length of the transects, despite continuous recommendations to surveying the whole length of the interest area due to the patchy distribution of rare plants.¹⁷² Although FWS agrees with the Applicant’s retention of Dr. Axelrod, who is a qualified plant expert, to head the surveys, FWS advises the Applicant to obtain another qualified local expert to increase the chances of finding rare plants.¹⁷³ Furthermore, FWS cannot effectively evaluate the proposed protocol without knowing the complete scope of the project.¹⁷⁴ For example, the Applicant

effect, whether beneficial, benign, adverse, or of an undetermined character,” can trigger the consultation requirement).

¹⁶⁴ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Col. Alfred A. Pantano, Jr., Dist. Commander, U.S. Army Corps Eng’s-Jacksonville Dist. (Dec. 15, 2010) (App. at 1109).

¹⁶⁵ E-mail from Marelisa Rivera, Assistant Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Daniel Pagan Rose, Asesores Ambientales y Educativos Inc. (Jan. 14, 2011, 04:00 PM) (App. at 1187).

¹⁶⁶ See *supra* Section III-C of these comments (discussing survey protocols and deficiencies).

¹⁶⁷ *Id.*

¹⁶⁸ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Col. Alfred A. Pantano, Jr., Dist. Commander, U.S. Army Corps Eng’s-Jacksonville Dist. (Dec. 15, 2010) (App. at 1108–1112).

¹⁶⁹ *Id.* App. at 1109; 50 C.F.R. § 402.16(a)–(b) (2010).

¹⁷⁰ E-mail from Omar Monsegur, Botanist, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Daniel Pagan Rose, Asesores Ambientales y Educativos Inc. (Feb. 07, 2011) (App. at 1377–1382). See also E-mail from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Marelisa Rivera, Assistant Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office (Jan. 31, 2011, 15:34:14 p.m.) (App. at 1374) (“According to [the Applicant’s] letter we received today from the Corps, it is stated that surveys for plants have been taking place. If that is the case why should we evaluate and approve this protocol after the fact?”).

¹⁷¹ E-mail from Omar Monsegur, Botanist, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Daniel Pagan Rose, Asesores Ambientales y Educativos Inc. (Feb. 07, 2011) (App. at 1377).

¹⁷² *Id.* App. at 1377–78.

¹⁷³ *Id.* App. at 1378.

¹⁷⁴ *Id.*

states that Mogotes (limestone karst hill formations) from Manati to Vega Alta will be avoided by re-routing the pipeline or using a push/pull bore method to tunnel under the landscape,¹⁷⁵ but provides no documentation indicating whether or not Motoges will be impacted by the Applicant's ROW clearing, drilling methods, and/or construction of access roads and staging areas. Moreover, due to the presence of the endangered palo de rose in the Mogotes area, the Applicant should survey the entire Mogote area for presence of this species as well as additional species.¹⁷⁶ The Applicant must conduct plant surveys with the latest pipeline alignment so that evaluation of the precise impacted area is conducted. For example, in Penuelas the surveys were conducted outside the center line of the project, and do not correspond with the area FWS suggested the Applicant survey.¹⁷⁷ Finally, despite FWS's continued recommendations, the Applicant has yet to provide a survey protocol for the Adjuntas area, which is several kilometers west of the only known population of nogel and may be a depository of the species.¹⁷⁸ Until the Applicant corrects these deficiencies in the plant surveys, the Corps cannot consider its BA complete nor rely on it for purposes of making a preliminary "may adversely affect" determination, subject to FWS and NMFS approval. Moreover, the Corps should ensure that the Applicant includes all FWS recommendations in the survey protocols and the BA.

In addition to the issues involving endangered plant surveys, the Applicant's animal surveys are also insufficient. For example, the most recent nightjar survey protocol provided by the Applicant is inadequate in several ways. First, FWS recommends that transects 1 and 3 should start 150 meters from the forest edge to avoid human, road, or trail effects on the surveys.¹⁷⁹ Second, the Applicant did not note, as recommended by the FWS, that the *Leucaena* patches provide roosting habitat not nesting habitat.¹⁸⁰ Third, the Applicant has failed to provide a detailed map with GPS coordinates. Fourth, the project still impacts the area designated as a mitigation area for the Gasoducto del Sur, an area identified by species experts as the "best habitat to be protected in the Guayanilla-Penuelas area" for the nightjar.¹⁸¹ FWS has recommended that the project be re-routed, and that the Applicant investigate impacts on the entire area, not just the area to be acquired for mitigation.¹⁸² To date, however, the Applicant has failed to address FWS's repeated concerns regarding this mitigation area. Furthermore, we have not seen a revised survey protocol incorporating the above mentioned deficiencies.

¹⁷⁵ Letter from Andrew Goetz, President, BC Peabody, to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps of Engineers-Antilles Office (Feb. 24, 2011) (App. at 1398).

¹⁷⁶ E-mail from Omar Monsegur, Botanist, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Daniel Pagan Rose, Asesores Ambientales y Educativos Inc. (Feb. 07, 2011) (App. at 1378).

¹⁷⁷ *Id.*

¹⁷⁸ *Id.* Also, the Applicant has failed to provide a detailed work schedule, despite constant urging, so that FWS can provide on-site assistance. *Id.*

¹⁷⁹ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Daniel Pagan Rose, Asesores Ambientales y Educativos Inc. (Feb. 16, 2011) (App. at 1389-90).

¹⁸⁰ *Id.*

¹⁸¹ *Id.*

¹⁸² *Id.* Also, FWS raises the same objection with regards to animal surveys as it did with plant surveys, the Applicant must submit a field work schedule so that FWS can participate in the surveys. *Id.*

In addition to the nightjar surveys, FWS has also asked the Applicant to conduct a survey for the critically endangered Puerto Rican parrot¹⁸³ in the Rio Abajo Forest, but to date, the Applicant has not begun conducting such a survey.¹⁸⁴ In response to FWS's requests, the Applicant has noted the project will not impact this area because the pipeline will utilize the PR-10 easement.¹⁸⁵ However, this answer is vague and conclusory and does not sufficiently address FWS's concerns. For instance, will the ROW width be modified at all, or will construction require additional ROW width for staging areas? Moreover, will the construction activities within the ROW have any impact on the species in terms of human presence or noise, or allow access for invasive or pest species such as feral cats? The Corps should ensure the Applicant conducts all the surveys recommended by FWS and follows all technical assistance FWS provides.

The Corps should ensure strict compliance with FWS technical assistance because the Applicant has a history of conducting inadequate species surveys. For example, for the Gasoducto Del Sur project, the same Applicant determined no species were present in the action area; however, after conforming their studies to the FWS's specifications and allowing FWS personnel to accompany surveyors, three species of listed plants—including over 300 individuals of one species—and 55 male nightjars were found.¹⁸⁶ Here, the Applicant continues to provide survey methodology to FWS for scrutiny, but has failed provide work schedules so that FWS personnel may participate during the survey process.¹⁸⁷ Because the Corps is ultimately responsible for the content of the BA, it should ensure that the Applicant works cooperatively with the FWS, incorporates its comments and protocol modifications, and allows FWS personnel to participate in surveys. The Corps should not provide a BA to FWS until the Applicant adequately addresses all concerns raised by FWS and conforms its methodology to FWS specifications. For comparison, the Applicant worked with FWS for a period of two years to minimize the possible effects on listed species for the previous Gasoducto del Sur project.¹⁸⁸ Here, the Applicant is attempting to evaluate species impacts in a matter of months for a project that is nearly double in size and transects pristine species habitat.

In sum, the Via Verde project requires a BA, and currently the Corps cannot submit an adequate BA to FWS or NMFS for review and approval. The Corps would need a great deal more information and analysis in order to prepare a sufficient BA.

¹⁸³ See U.S. FISH & WILDLIFE SERV., RECOVERY PLAN FOR THE PUERTO RICAN PARROT iii (2009) available at <http://endangered.fws.gov/recovery/index.html#plans> (stating that this endemic species is considered one of the ten most endangered birds in the world. Out of a total of around 50 individuals, 22-28 individuals reside in the Rio Abajo Forest).

¹⁸⁴ E-mail from Marelisa Rivera, Assistant Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Daniel Pagan, Biologist, Tetra Tech Ecological Serv. (Jan. 12, 2011, 04:55 PM) (App. at 1173-76).

¹⁸⁵ Letter from Andrew Goetz, President, BC Peabody, to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps of Engineers-Antilles Office (Feb. 24, 2011) (App. at 1397).

¹⁸⁶ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Sindulfo Castillo, Chief, Regulatory Section, U.S. Army Corps of Engineers-Antilles Office (Oct. 18, 2010) (App. at 893).

¹⁸⁷ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Daniel Pagan Rose, Asesores Ambientales y Educativos Inc. (Feb. 16, 2011) (App. at 1389).

¹⁸⁸ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Col. Alfred A. Pantano, Jr., Dist. Commander, U.S. Army Corps of Engineers-Jacksonville Dist. (Dec. 15, 2010) (App. at 1105).

D. Because the Proposed Project Is Likely to “Adversely Affect” Multiple Endangered and Threatened Species, the Corps Must Engage in Formal Consultation with Both FWS and NMFS.

If the BA concludes the proposed project “may adversely affect” listed species or their critical habitat, then formal consultation between the action agency and FWS and/or NMFS is required. The term “may . . . affect” has been interpreted to mean “any affect.”¹⁸⁹ The action agency makes a preliminary “may affect” determination, subject to FWS and NMFS review and approval.¹⁹⁰

Due to the extensive direct and indirect effects of the proposed Via Verde pipeline project on many acres of pristine habitat, protected areas, and numerous listed species, as well as the likelihood of many interrelated and interdependent activities associated with this project, the Via Verde project is “likely to adversely affect” listed species in a manner that is not “discountable, insignificant, or beneficial.”¹⁹¹ In addition, FWS has noted that transplanting listed species from an action area, especially plant species, is not an effective means of avoiding impacts on the species.¹⁹² Instead, the project ROW should be rerouted to avoid impacting present species.¹⁹³ If an applicant intends to implement this approach, the effect of transplantation on protected plants necessitates a “may adversely affect” determination.¹⁹⁴

Since there are likely to be substantial impacts on listed species and their habitat, a BiOp will be required for both terrestrial and marine species.¹⁹⁵ For comparison, on July 30, 2010, FWS completed a BiOp for a natural gas project involving the replacement of three pipeline segments in the San Francisco River, which is inhabited by the threatened loach minnow. The excavation area for that project was 2.75 total acres, the temporary total project area was 10.15 acres, and the estimate of permanent wetlands effects was 0.30 acres. Furthermore, the project required only 58 days to complete.¹⁹⁶ The Via Verde project involves a vastly greater number of listed species, acres of affected wetlands, number of protected areas, unique and sensitive resources, as well as a much more extensive construction project and long-term change in the landscape, including ongoing maintenance, increased shipping traffic, and other operations. Accordingly, there appears to be no doubt that a BiOp will be required for the Via Verde project. Indeed, the Corps has already acknowledged this likelihood in an April 4, 2011 news release stating that, once the Applicant submits a BA, it will initiate formal consultation with both FWS and

¹⁸⁹ CONSULTATION HANDBOOK, *supra* note 121, at xvi.

¹⁹⁰ 50 C.F.R. § 402.12(g) (2010).

¹⁹¹ 50 C.F.R. § 402.12 (2010); CONSULTATION HANDBOOK, *supra* note 121, at 3-13.

¹⁹² Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Sindulfo Castillo, Chief, Regulatory Section, U.S. Army Corps Eng’s-Antilles Office (Oct. 18, 2010) (App. at 899).

¹⁹³ *Id.* App. at 899–900.

¹⁹⁴ *See id.* App. at 899 (describing the effects of transplantation on plant species and high rate of fatality).

¹⁹⁵ 16 U.S.C. § 1536(b) (2006); 50 C.F.R. § 402.14 (2010).

¹⁹⁶ Letter from Steven L. Spangle, Field Supervisor, U.S. Fish & Wildlife Serv.-Ariz. Office, to Ron Fowler, Project Supervisor, U.S. Army Corps of Engineers-Los Angeles Dist. (July 30, 2010) (App. at 596).

NMFS.¹⁹⁷ We agree with and support the Corps' willingness to proceed with formal consultation.

The purpose of formal consultation between an action agency, FWS, and NMFS is to determine whether the proposed project will "jeopardize the continued existence of any [listed] species."¹⁹⁸ The action agency is responsible for providing FWS and NMFS with the best available scientific and commercial data upon initiation of formal consultation.¹⁹⁹ The action agency must also provide a list of cumulative effects, including effects of future State, tribal, local, and private actions, not involving Federal action, that are reasonably certain to occur within the action area under consideration.²⁰⁰ Courts will critically review the cumulative effect analysis in a BiOp to ensure adequate examination of the impacts of reasonably foreseeable private projects on listed species.²⁰¹ Courts have set aside BiOps that failed to conduct a detailed and "comprehensive" discussion of a project's effects because they failed to analyze the total impacts on a species.²⁰² Furthermore, formal consultation must be initiated and completed for the entire project as a whole, not just a segment of it.²⁰³ Pursuant to the ESA, an applicant cannot subvert ESA requirements by segmenting the project and initiating consultation for incremental steps.²⁰⁴ Therefore, before commencing formal consultation, the Corps should ensure that the Applicant clearly defines and describes the entire scope of the project, including the Applicant's plans for acquiring the additional natural gas that appears to be necessary to supply the plants on the north coast and all impacts associated with the project as a whole, not a constrained view based on the project footprint or other inappropriate limitations.

When the formal consultation process does commence, we encourage the Corps, FWS, and NMFS to ensure strict compliance with ESA obligations, implementing regulations, and The Consultation Handbook.²⁰⁵ In the meantime, we encourage the agencies to continue monitoring the proposed project and working to ensure that the Applicant submits all information necessary to review the project within the parameters set forth by statute and regulation.

¹⁹⁷ U.S. ARMY CORPS OF ENGINEERS, JACKSONVILLE DIST, U.S. ARMY CORPS OF ENGINEERS CONTINUES THOROUGH REVIEW OF VIA VERDE NATURAL GAS PIPELINE PERMIT APPLICATION (Apr. 4, 2011) (App. at 1417).

¹⁹⁸ 16 U.S.C. § 1536(a)(2) (2006).

¹⁹⁹ 50 C.F.R. § 402.14(d) (2010).

²⁰⁰ 50 C.F.R. § 402.14(g)(3)-(4) (2010).

²⁰¹ *Nat'l Wildlife Fed'n v. Norton*, 332 F. Supp. 2d 179, 185 (D.D.C. 2004).

²⁰² *Defenders of Wildlife v. Babbitt*, 130 F. Supp. 2d 121, 130 (D.D.C. 2001) (citing *Greenpeace v. NMFS*, 80 F. Supp. 2d 1137, 1149 (D. Wash. 2000)). See also *Pac. Coast Fisherman's Associations v. Nat'l Marine Fisheries Serv.*, 265 F.3d 1028, 1035-38 (9th Cir. 2001) (finding that the biological opinion was inadequate because it failed to consider and explain cumulative impacts and short-term impacts of the actions).

²⁰³ 50 C.F.R. § 402.12(k) (2010).

²⁰⁴ *Id.*

²⁰⁵ 16 U.S.C. § 1536(a)(1)-(a)(2) (2006); 50 C.F.R. § 402 (2010); CONSULTATION HANDBOOK, *supra* note 121.

E. The Corps Cannot Authorize Any Action That Constitutes an “Irreversible and Irretrievable Commitment of Resources” During the Consultation Process.

Section 7(d) prohibits both the Corps and the Applicant from making any “irreversible and irretrievable commitment of resources” during consultation that forecloses the formulation and implementation of reasonably prudent alternatives (“RPAs”).²⁰⁶ Moreover, ESA regulations mandate that if a project is a “major construction activity” it automatically requires a BA, and the BA must be completed prior to issuance of any contracts or start of construction.²⁰⁷ In this case, FWS has concluded that the Via Verde project “constitutes” a “major construction activity” because it affects “1672 acres of land, including 369 acres of wetlands, several Commonwealth Forests or Reserves, forested mountain and karst areas, and known habitat of more than 30 federally listed . . . species. Only when the project enters the San Juan metropolitan area do the environmental impacts drop significantly.”²⁰⁸

We agree with the Corps’ stern warning to the Applicant that unpermitted work could be subject to enforcement action under the CWA, but the Corps must also ensure the ESA’s prohibition against an “irreversible and irretrievable commitment of resources” is not violated.²⁰⁹ FWS specifically instructed the Applicant that “[a] BA shall be completed before any contract for construction is let and before construction is begun.”²¹⁰ Disregarding these requirements, the Applicant issued a Request for Proposal (“RFP”) for Major Material Acquisition with a March 18, 2011 execution date.²¹¹ The contract would be between the Applicant and a chosen third party for all services required to supply natural gas pipe and pipe bends for the Via Verde project.²¹² Moreover, the RFP indicates the Applicant has already contracted with a Construction Manager.²¹³ Furthermore, according to Rep. Luis V. Gutierrez, a construction contract for 10 million dollars has been granted for the project.²¹⁴ Finally, the Applicant may be contracting for two FSRUs that are related to the Via Verde project.²¹⁵

²⁰⁶ 16 U.S.C. § 1536(d) (2006).

²⁰⁷ 50 C.F.R. § 402.12(b)(1)–(2) (2010); CONSULTATION HANDBOOK, *supra* note 121, at 47.

²⁰⁸ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Col. Alfred A. Pantano, Jr., Dist. Commander, U.S. Army Corps of Engineers-Jacksonville Dist. (Dec. 15, 2010) (App. at 1107).

²⁰⁹ Letter from Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps of Engineers-Antilles Office, to Francisco E. Lopez, Head, Env’tl. Protection & Quality Assurance Div, P.R. Power Auth. (Mar. 18, 2011) (App. at 1410).

²¹⁰ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Col. Alfred A. Pantano, Jr., Dist. Commander, U.S. Army Corps Eng’s-Jacksonville Dist. (Dec. 15, 2010) (App. at 1109) (citing 50 C.F.R. § 402.12(b)(2)).

²¹¹ P.R. ELECTRIC POWER AUTH., REQUEST FOR PROPOSAL-MAJOR MATERIALS ACQUISITION VIA VERDE NATURAL GAS PIPELINE 1 (Jan. 31, 2011) (App. at 1260).

²¹² *Id.*

²¹³ *Id.* App. at 1257. *See also* P.R. ELECTRIC POWER AUTH., REQUEST FOR QUALIFICATIONS (Oct. 29, 2010) (App. at 913–14) (requesting applications for construction services).

²¹⁴ Luis V. Gutierrez, Representative, U.S., Address to Congress Regarding the Via Verde Project (Apr. 14, 2011) (*available at* http://www.gutierrez.house.gov/index.php?option=com_content&view=article&id=660:rep-gutierrezs-remarks-on-puerto-rico-natural-gas-pipeline-project&catid=50:2011-press-releases).

²¹⁵ *Excelsior Awarded Puerto Rico FSRU Contract*, ICIS HEREN (Mar. 07, 2011, 15:32:05) <http://www.icis.com/heren/articles/2011/03/07/9441498/lng/lmd/excelerate-awarded-puerto-rico-fsru-contract.html>. The Applicant has already opined that such units did not constitute a feasible alternative for NEPA alternative

The Corps should investigate the contracts entered into by the Applicant to ensure that the Applicant is not violating the prohibition against contracting or construction activities prior to the completion of the BA. Furthermore, the Corps should ensure adequate transparency from the Applicant and take any action necessary to ensure compliance with the ESA and its associated regulations, including the prohibition against an irreversible and irretrievable commitment of resources.

F. The Corps Must Ultimately Ensure That the Proposed Project Avoids Jeopardy By Incorporating Terms and Conditions Required by FWS and/or NMFS Through “Reasonably Prudent Alternatives” and/or “Incidental Take Statements” into the Permit; or, If Necessary, By Denying the Permit.

The ESA mandates that, shortly after the conclusion of formal consultation, the consulting agency must provide a written statement on whether the proposed project will jeopardize the continued existence of listed species or adversely modify their critical habitat.²¹⁶ The regulations prohibit any agency action “that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival *and* recovery of a listed species in the wild.”²¹⁷ If the BiOp makes a jeopardy finding, FWS and NMFS must set forth Reasonable and Prudent Alternatives that will avoid that consequence.²¹⁸ The Ninth Circuit has determined that choosing an RPA that does not explain how the measure will protect species and their habitat does not comply with the ESA mandates.²¹⁹

If the BiOp makes a jeopardy finding or includes RPAs to avoid jeopardy, FWS and NMFS must also include an Incidental Take Statement.²²⁰ The ITS must include the impact of the incidental taking,²²¹ reasonable and prudent measures necessary or appropriate to minimize the impact, and set forth the terms and conditions that must be complied with in implementing the reasonable and prudent measures identified in the statement.²²² If the ITS concerns marine mammals, the

analysis requirements because they will significantly impact sensitive marine environments such as coral reefs. Letter from Francisco E. Lopez Garcia, Head, Env'tl. Prot. & Quality Assur. Div., P.R. Electric Power Auth., to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps Eng's-Antilles Office (Jan 28, 2011) (App. at 1236-38).

²¹⁶ 16 U.S.C. § 1536(b)(3)(A) (2006); 50 C.F.R. § 402.14(g)(1)-(8) (2010).

²¹⁷ 50 C.F.R. § 402.02 (2010) (emphasis added). *See also Nat'l Wildlife Fed'n v. Nat'l Marine Fisheries Serv.*, 524 F.3d 917, 931-33 (9th Cir. 2008) (holding a BiOp legally deficient because it failed to consider both the impact on survival and on recovery).

²¹⁸ 50 C.F.R. § 402.14(g) (2010). An RPA is an alternative that is consistent with the purpose of the proposed action, within the scope of the agency's jurisdiction and authority, economically and technologically feasible, and is believed would avoid jeopardizing the continued existence of listed species or adverse modification of critical habitat. 50 C.F.R. § 402.02 (2010). In addition to RPAs, the consulting agency could provide “conservation recommendations” to assistance in avoiding or reducing impact of the project. 50 C.F.R. § 402.14(j) (2010).

²¹⁹ *Pac. Coast Fed'n of Fisherman's Associations v. U.S. Bureau of Reclamation*, 426 F.3d 1082, 1094 (9th Cir. 2005).

²²⁰ 50 C.F.R. § 402.02(14)(i) (2010).

²²¹ The “impact” should be provided in terms of a numerical cap on authorized take. *Oregon Natural Resources Council v. Allen* 476 F.3d 1031, 1037-38 (9th Cir. 2007).

²²² 16 U.S.C. § 1536(b)(4)(c)(i)-(iv) (2006); 50 C.F.R. § 402.14(i)(1) (2010). *See also Pac. Shores Subdivision Ca. Waste Dist. v. U.S. Army Corps of Engineers*, 538 F. Supp. 2d 242, 259 (D.D.C. 2008) (invalidating a BiOp as

specified measures must comply with Section 101(a)(5) of the Marine Mammal Protection Act.²²³

Due to the vast impacts the Via Verde project could have on listed species and their habitat, FWS and NMFS could impose reporting requirements on the Corps or the Applicant in order to monitor the impacts of the take.²²⁴ Also, if the amount or extent of authorized take is exceeded, the Corps must immediately reinitiate consultation.²²⁵ If FWS and NMFS make a jeopardy finding and issue a BiOp containing RPAs and an ITS, the Corps and Applicant must: (1) choose an RPA; (2) reject the permit or abandon the application; (3) reinitiate consultation by modifying the project or proffering an RPA not yet considered; or (4) choose an action that complies with Section 7(a)(2) of the ESA.²²⁶ The Corps must notify FWS and NMFS of its final permitting decision on a proposed activity that has received a jeopardy or adverse modification BiOp.²²⁷

IV. THE CORPS MUST PREPARE A FULL ENVIRONMENTAL IMPACT STATEMENT FOR THE VIA VERDE PROJECT UNDER NEPA.

The purpose of NEPA is to ensure that both public officials and citizens are informed of the impacts associated with the Via Verde project before decisions are made and actions are taken.²²⁸ The Corps should prepare a full EIS because, as detailed in these comments, the Via Verde project is a major federal action significantly affecting the quality of the human environment. The Applicant has not demonstrated that mitigation measures will reduce all impacts below the significance threshold. The Corps cannot merely tier to the Puerto Rico EIS because it is deficient procedurally and substantively. We encourage the Corps to adopt the position of FWS that the proposed Via Verde project warrants a full EIS.²²⁹ Furthermore, since it is already overwhelmingly clear that this project will have significant effects, it would be most efficient for the Corps to proceed directly to the preparation of an EIS without first preparing an Environmental Assessment (“EA”).²³⁰

arbitrary and capricious that failed include terms and conditions governing the implementation of reasonable and prudent alternatives).

²²³ 16 U.S.C. § 1536(b)(4)(c)(i)–(iv) (2006); 50 C.F.R. § 402.14(i)(1) (2010).

²²⁴ 50 C.F.R. § 402.14(i)(2) (2010).

²²⁵ 50 C.F.R. § 402.14(1)(4) (2010).

²²⁶ CONSULTATION HANDBOOK, *supra* note 121, at 51–52. *See also Bennett v. Spear*, 520 U.S. 154, 169 (1997) (“[A]ny person’ who knowingly ‘takes’ an endangered or threatened species is subject to substantial civil and criminal penalties, including imprisonment.”)

²²⁷ 50 C.F.R. § 402.15(b) (2010).

²²⁸ 40 C.F.R. § 1500.1(b) (2010).

²²⁹ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Angel Rivera Santa, Dir., Planning & Env’tl. Protection P.R. Electric Power Auth., (Jan. 20, 2011) (App. at 1198) (“We continue to believe that the project as currently proposed constitutes a major construction activity with significant potential adverse effects to the human environment. Therefore, we continue recommending the development of a federal [EIS] as required under NEPA.”).

²³⁰ 33 C.F.R. Pt. 325, App. B § 7 (2010). *See also Southwest Gulf Railroad Company—Construction and Operation Exemption—Medina County, TX*, 69 Fed. Reg. 25657 (May 7, 2004) (The Surface Transportation Board received a petition for the construction of a 7 mile wholly intrastate rail line to connect a quarry to the Union Pacific rail line. The Surface Transportation Board required the preparation of an EIS because the proposed project was likely to be highly controversial).

A. The Proposed Project Is a “Major Federal Action.”

The Via Verde project is a major federal action because it is subject to federal control and responsibility.²³¹ The proposed project will traverse the island of Puerto Rico through 235 rivers and wetlands, covering 369 acres of jurisdictional waters of the United States,²³² impacts to which require approval under a 404 permit from the Corps.²³³ Because the Via Verde project cannot be constructed without a 404 permit and other federal direction or approval from FWS, NMFS, and the Federal Highway Administration, the federal government exercises the requisite level of control over the project to make it a major federal action.²³⁴

B. The Proposed Project “Significantly Affects the Quality of the Human Environment.”

An EIS must be prepared when a proposed project significantly affects the quality of the human environment.²³⁵ A project triggers the need for an EIS when there are substantial questions raised as to whether a project may cause significant degradation to the human environment.²³⁶ The human environment must be viewed comprehensively to include “the natural and physical environment and the relationship of people with that environment.”²³⁷ The significance of the impacts is determined by examining their context and intensity.²³⁸

The Via Verde project involves the construction of a pipeline that would traverse the entire main island of Puerto Rico from south to north, then travel west to east across the island through highly sensitive ecosystems and protected areas. The Corps must evaluate the significance of the

²³¹ See 40 C.F.R. § 1508.18(a) (2010) (stating major federal actions with effects are those actions that may be major and are potentially subject to federal control and responsibility including activities and projects entirely or partly financed, assisted, conducted, regulated, or approved by federal agencies). Additionally, the Applicant is financing the project through Build America Bonds, under the American Recovery and Reinvestment Act of 2009, ACT OF 2009, PL 111-5, February 17, 2009, 123 Stat 115, which allows state and local governments to issue taxable bonds for capital projects and to receive a new direct federal subsidy payment from the Treasury Department for a portion of their borrowing costs. See Business wire: “Fitch Rates Puerto Rico Electric Power Authorities Approximately \$500MM Series EEE ‘BBB+’; Outlook Stable,” <http://www.businesswire.com/news/home/20101220006548/en/Fitch-Rates-Puerto-Rico-Elec-Power-Auths>. Last viewed 4/5/2011 (last visited Apr. 17, 2011). Without this financing mechanism, the Applicant may not have been able to secure the necessary financing for the Via Verde project.

²³² U.S. DEPT. DEFENSE, JACKSONVILLE DIST. CORPS. ENG’S-ANTILLES OFFICE, PERMIT APPLIC. NO. SAJ-2010-02881, PUBLIC NOTICE (Nov. 19, 2010) (App. at 953).

²³³ See 33 U.S.C. § 1211(a) (2006) (stating the CWA prohibits the discharge of a pollutant into navigable waters of the US from a point source); 33 U.S.C. § 1344(a) (2006) (stating the Secretary may issue permits for the discharge of dredge or fill material into navigable waters).

²³⁴ 33 C.F.R. Pt. 325, App. B, 7b (2010); *Tillamook Co. v. U.S. Army Corps Engineers*, 288 F.3d 1140, 1142 (9th Cir. 2002). See also *White Tanks Concerned Citizens, Inc. v. Strock*, 563 F.3d 1033, 1039-1040 (2009).

²³⁵ 42 U.S.C. § 4332(2)(c) (2006).

²³⁶ *Ocean Advocates v. U.S. Army Corps of Engineers*, 402 F.3d 846, 864 (9th Cir. 2005).

²³⁷ 40 C.F.R. § 1508.14 (2010).

²³⁸ 40 C.F.R. § 1508.27 (2010); See also 32 C.F.R. § 651.39 (2010) (“Significance of impacts is determined by examining both the context and intensity of the proposed action.”)

project's impacts in several contexts – Puerto Rican society as a whole, the affected region, the affected interests, and the specific localities – and from both a short and long-term perspective.²³⁹

Within all of these contexts, the Corps must then consider several factors in order to determine the intensity of the impacts, including but not limited to: the degree to which the environmental impacts are highly controversial and uncertain; the effect on public health or safety; proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas; the impact on threatened or endangered species or their habitat; and whether the action is related to other actions with individually insignificant but cumulatively significant impacts.²⁴⁰ For purposes of whether or not the significance threshold is met, it does not matter if the impacts are beneficial or adverse.²⁴¹ A significant impact may exist even if the Corps finds that, on balance, the Via Verde project would be beneficial.²⁴²

The Applicant's assertion that various impacts associated with the Via Verde project are temporary is not relevant for the significance threshold finding.²⁴³ The CEQ regulations state, "[s]ignificance exists if it is reasonable to anticipate a cumulatively significant impact on the environment . . . [s]ignificance cannot be avoided by terming an action temporary or by breaking it down into small component parts."²⁴⁴ The issue of whether some of the impacts associated with the Via Verde project are temporary in nature is still in dispute, but even if this were certain, the temporary nature of these impacts would not render them insignificant for purposes of the Corps' significance determination under NEPA, and it would not eliminate the many other significant impacts. Based upon the information provided to date, the impacts associated with the Via Verde project far exceed the significance threshold. The following are just a few examples of the scope and intensity of the impacts:

- **The environmental impacts of the Via Verde project are highly controversial and uncertain.**²⁴⁵ The documents available to date indicate that federal agencies, the public,²⁴⁶ and the Applicant disagree as to the number and level of impacts associated with the Via Verde project. Federal agencies, such as NMFS, FWS, and USDA, assert the Via Verde

²³⁹ 40 C.F.R. § 1508.27 (2010) ("The significance of an action must be analyzed in several contexts such as society as a whole . . . the affected region, the affected interest, and the locality.").

²⁴⁰ *Id.*

²⁴¹ *Id.*

²⁴² *Id.*

²⁴³ Letter from Andrew Goetz, President, BC Peabody, to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps of Engineers-Antilles Office (Feb. 24, 2011) (App. at 1397) ("In the case of wetlands, the impact is a temporary one, and will occur during installation of the pipeline."); Letter from Francisco E. Lopez Garcia, Head, Env'tl. Prot. & Quality Assur. Div., P.R. Electric Power Auth., to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps Eng's-Antilles Office (Jan. 28, 2011) (App. at 1219) ("It is important to stress that all impacts to the wetlands and surface waters will be temporary in nature."); JOINT PERMIT APPLICATION, *supra* note 1, App. at 646.

²⁴⁴ 40 C.F.R. § 1508.27 (2010).

²⁴⁵ 40 C.F.R. § 1508.24(b)(4)-(5) (2010).

²⁴⁶ Letter from Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps of Engineers-Antilles Office, to Francisco E. Lopez, Eng'r, Autoridad de Energia Electrica (Dec. 22, 2010) (App. at 1145-52).

project would have substantial adverse impacts to the environment.²⁴⁷ For instance, FWS has specifically recommended that a Coastal Zone Management Compatibility Certificate not be issued until the adverse impacts are adequately evaluated.²⁴⁸ In contrast, the Applicant indicates the Via Verde project would only have minimal impacts²⁴⁹ or that the impacts would be temporary and limited to the ROW.²⁵⁰ Specifically, the Applicant believes only 152 acres of wetlands would be temporarily impacted,²⁵¹ though the exact amount of wetlands and the full extent of the impacts on wetlands remain in dispute. In this case, an EIS is required to clarify and evaluate the amount and level of the impacts that would directly, indirectly, and cumulatively impact the human environment. The “preparation of an EIS is mandated where uncertainty may be resolved by further collection of data [and] where the collection of such data may prevent ‘speculation on potential . . . effects.’”²⁵² The Corps stated it “believes that project impacts have not been adequately quantified . . . [and] are concerned about the potential direct, indirect, and cumulative impacts of the project on the aquatic resources.”²⁵³ In light of the uncertainty surrounding the impacts associated with the Via Verde project, an EIS is critical in this case to assess and evaluate all potential impacts on the human environment. Additionally, the discrepancies between the information the Corps is receiving from the Applicant versus federal agencies and the public indicates the Via Verde project and its impacts are controversial.

- **The Via Verde project involves significant risks to human health and safety.**²⁵⁴ One of the risks associated with the Via Verde project is the risk of an explosion.²⁵⁵ The Applicant

²⁴⁷ See e.g. Letter from Miles M. Croom, Asst. Reg. Admin'r, Nat'l Marine Fisheries Serv. S.E. Regional Office, to Col. Alfred Pantano, Dist. Commander, U.S. Army Corps Eng's-Jacksonville Dist. (Dec. 19, 2010) (App. at 1126) (“[T]he project would have substantial adverse impacts on EFH.”); Letter from Ariel E. Lugo, Dir., Int'l Inst. of Tropical Forestry, U.S. Dept. Agric., to Sindulfo Castillo, Section Chief, U.S. Army Corps Eng's-Antilles Office (Dec. 3, 2010) (App. at 1092) (“[W]e have never seen [a permit] with such a broad scale of effects.”); E-mail from Aaron Valenta, Chief, Conservation Partnerships, U.S. Fish & Wildlife Serv. Boqueron Office, to Jerry Ziewitz, Conservation Planning Assistance Coordinator, U.S. Fish & Wildlife Serv. Boqueron Office (Jan. 13, 2011, 03:19 PM) (App. at 1186) (“[T]he proposed work will have substantial and unacceptable impacts on aquatic resources of national importance”); Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Mr. Angel Rivera Santana, P.R. Electric Power Auth. (Jan. 20, 2011) (App. at 1198) (“We continue to believe that the project as currently proposed constitutes a major construction activity with potential significant adverse effects to the human environment.”).

²⁴⁸ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Max L. Vidal Vazquez, Dir. Interno, Subprograma Planes de Usos de Terrenos (Feb. 23, 2011) (App. at 1392).

²⁴⁹ U.S. DEPT. DEFENSE, JACKSONVILLE DIST. CORPS. ENGINEERS-ANTILLES OFFICE, PERMIT APPLIC. NO. SAJ-2010-02881, PUBLIC NOTICE (Nov. 19, 2010) (App. at 952–56); Letter from Miles M. Croom, Asst. Reg. Admin'r, Nat'l Marine Fisheries Serv. S.E. Regional Office, to Col. Alfred Pantano, Dist. Commander, U.S. Army Corps Eng's-Jacksonville Dist. (Dec. 19, 2010) (App. at 1126).

²⁵⁰ Letter from Francisco E. Lopez Garcia, Head, Env'tl. Protection & Quality Assurance Div., P.R. Electric Power Auth., to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps of Engineers-Antilles Office (Jan 28, 2011) (App. at 1219, 1220).

²⁵¹ *Id.* App. at 1222.

²⁵² *Native Ecosystems Council v. U.S. Fish & Wildlife Serv.*, 428 F.3d 1233, 1240 (9th Cir. 2005).

²⁵³ Letter from Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps of Engineers-Antilles Office, to Francisco E. Lopez, Eng'r, Autoridad de Energia Electrica (Dec. 22, 2010) (App. at 1146).

²⁵⁴ 40 C.F.R. § 1508.27(b)(2) (2010).

²⁵⁵ Letter from Donald W. Kinard, Chief, Regulatory Div., U.S. Army. Corps of Engineers-Antilles Office, to Lawrence Evans, Senior Env'tl. Expert, PC Peabody (Oct. 8, 2010) (App. at 887).

has indicated the pipeline would be located a minimum distance of 150 feet from residences.²⁵⁶ Though there are no regulations specifying a minimum distance, there have been several natural gas pipeline explosions in the past few years that have had impacts greatly exceeding the 150-foot buffer the Applicant proposes.²⁵⁷ Additionally, seismic activities may amplify the risk to human health and safety. Puerto Rico lies in an active plate boundary zone, and earthquakes are a "constant threat."²⁵⁸ As Congressman Luis Gutierrez noted on the floor of the U.S. House of Representatives, on April 13, 2011, the area experienced a 5.1 magnitude earthquake 118 miles from Puerto Rico, felt all over the island, and was one of 2500 earthquakes in the least three years.²⁵⁹ The risk of seismic activity disrupting the pipeline is of especially significant concern in the densely populated area of San Juan.

- **The Via Verde project poses significant threats to endangered and threatened species and their habitat.**²⁶⁰ As discussed in detail in Section III of these comments, the Via Verde project would pass through various habitats of threatened and endangered species.²⁶¹ Although, insufficient data has been collected on the various threatened and endangered species, FWS indicates 32 threatened and endangered species are likely to occur within the project area.²⁶² To date, six endangered faunal species have been positively identified as occurring within the ROW.²⁶³ Some surveys are currently being conducted to clarify the extent of threatened and endangered species present in the project area, but consultation with NMFS is required and surveys for additional terrestrial and marine species are likely needed.²⁶⁴ Furthermore, the proposed route runs adjacent to the coastal zones in Tao Baja and Catona and would likely impact these ecologically important areas.²⁶⁵ The Applicant has not effectively evaluated these potential impacts.²⁶⁶

²⁵⁶ P.R. Electric Power Auth., *Chapter 6: Impacts*, in ENVTL. IMPACT STATEMENT (2010) (App. at 440); JOINT PERMIT APPLICATION, *supra* note 1, App. at 645.

²⁵⁷ *Gasoducto Impacto Potencial*, CASA PUEBLO <http://www.casapueblo.org> (last visited Apr. 18, 2011) (containing five images overlaying the explosion impact radii of previous pipeline explosions along the proposed Via Verde project route).

²⁵⁸ Uri ten Brink, Chief Scientist U.S. Geological Survey, *The Puerto Rico Trench: Implications for Plate Tectonics and Earthquake and Tsunami Hazards*, NAT'L OCEANIC ATMOSPHERIC ADMIN (DEC. 4, 2006), <http://oceanexplorer.noaa.gov/explorations/03trench/trench/trench.html> (last visited Apr. 17, 2011).

²⁵⁹ Luis V. Gutierrez, Representative, U.S., Address to Congress Regarding the Via Verde Project (Apr. 14, 2011) (available at http://www.gutierrez.house.gov/index.php?option=com_content&view=article&id=660:rep-gutierrez-remarks-on-puerto-rico-natural-gas-pipeline-project&catid=50:2011-press-releases); Earthquake Hazards Program website, United States Geological Survey, <http://earthquake.usgs.gov/earthquakes/recenteqsww/Quakes/pr11103000.php> (last visited April 15, 2011).

²⁶⁰ 40 C.F.R. § 1508.27(b)(a) (2010).

²⁶¹ Letter from Francisco E. Lopez Garcia, Head, Env'tl. Prot. & Quality Assur. Div., P.R. Elec. Power Auth., to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps Eng's-Antilles Office (Jan. 28, 2011) (App. at 1216).

²⁶² Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Yousev Garcia, Dir. Asesores Ambientales y Educativos, Inc. (June 30, 2010) (App. at 587-90).

²⁶³ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Francisco E. Lopez, Head, Env'tl. Protection & Quality Assurance Div, P.R. Power Auth. (Nov. 10, 2010) (App. at 923-25).

²⁶⁴ See *supra* Section III-C of these comments.

²⁶⁵ JOINT PERMIT APPLICATION, *supra* note 1, App. at 795-801 and see also Section III of these comments.

²⁶⁶ Letter from Andrew Goetz, President, BC Peabody, to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps Eng's-Antilles Office (Feb. 24, 2011) (App. at 1396-1402).

- **The Via Verde project would significantly affect historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.**²⁶⁷ The total number of historic and culturally important sites in proximity to the Via Verde project remains unclear. As of February 24, 2011, the State Office of Historic Preservation (“SHPO”) was still waiting on the results of a Stage 1 Archeological Reconnaissance survey.²⁶⁸ The SHPO has already identified one archaeological site and six historic sites located within a one-kilometer buffer that runs along the proposed route.²⁶⁹ One of these sites has four individually listed properties.²⁷⁰ The Via Verde project would be in close proximity to cultural and historic sites.²⁷¹ Furthermore, FWS has stated the “project area consists of about 1,113.8 acres of which 738.6 acres are wetlands . . . Commonwealth Forests, Natural Reserves, forested volcanic and karst areas, habitat for federally listed threatened and endangered species and privately-owned lands participating in conservation programs because of their high ecological values for our trust resources.”²⁷²

For all these reasons, there is no question that the Via Verde project will result in significant impacts to the human environment and thus requires the preparation of a full EIS.

C. The Applicant Has Not Demonstrated That Mitigation Measures Would Reduce All Impacts to Below the Significance Threshold.

It is not possible for the Corps or the Applicant to avoid preparing an EIS for the Via Verde project simply by referring to proposed mitigation measures. Evaluation of mitigation measures proposed by the Applicant and additional mitigation measures not already included in the proposed action or alternatives should be evaluated by the Corps in an EIS.²⁷³ Corps regulations direct that the nature and extent of mitigation conditions are necessarily linked with the agency’s public interest review,²⁷⁴ which evaluates the impacts, including cumulative impacts, of the proposed Via Verde project and its intended use on the public interest.²⁷⁵ Mitigation in this context occurs throughout the Corps review process and includes avoiding, minimizing, rectifying, reducing or compensating for resource losses.²⁷⁶ Corps regulations dictate that additional mitigation may be required to ensure compliance with the Guidelines and as a result of the public interest review process.²⁷⁷ As discussed in Section IV-B of these comments, the Via Verde project consists of highly controversial and uncertain impacts to various resources that

²⁶⁷ 40 C.F.R. § 1508.27(b)(3) (2010).

²⁶⁸ Letter from Carlos A. Rubio Cancela, Architect, State Historic Preservation Office, to Francisco E. Lopez Garcia, Head, Env’t Prot. & Quality Assur. Div., P.R. Electric Power Auth. (Feb. 24, 2011) (App. at 1394–95).

²⁶⁹ *Id.*

²⁷⁰ *Id.*

²⁷¹ *Id.*

²⁷² Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Sindulfo Castillo, Chief, Regulatory Section, U.S. Army Corps Eng’s-Antilles Office (Oct. 18, 2010) (App. at 889).

²⁷³ 40 C.F.R. § 1502.14(f) (2010).

²⁷⁴ 33 C.F.R. Pt. 325, App. B (2010).

²⁷⁵ 33 C.F.R. § 320.4(a) (2010).

²⁷⁶ 33 C.F.R. § 320.4(r) (2010).

²⁷⁷ 33 C.F.R. § 320.4(r)(1)(ii)-(iii) (2010).

have yet to be fully defined in nature or scope. Based on the information provided to date, the Applicant has failed to fully demonstrate what mitigation would be undertaken and whether that mitigation would compensate for, render minor, or act as an adequate buffer against the significant environmental impacts associated with the Via Verde project.

The Applicant has not demonstrated that mitigation measures would eliminate all impacts or reduce them so substantially as to render them insignificant. The Applicant has merely listed a few mitigation measures, mainly associated with the impacts to aquatic resources. For example, the Applicant generally states: HDD would be used to avoid a discharge; pipeline construction would be designed to incorporate the use of vertical wall trenching whenever possible; excess fill or dredge material would be removed and preconstruction wetland elevations would be reestablished; wetland organic topsoil would be separated during trench excavation and stockpiled in a separate area to be re-used in restoration of the area where possible; all stream embankments where trenching occurs would be restored and covered with matting to prevent erosion; and mats would be used whenever possible to avoid the need for temporary fill.²⁷⁸ However, the Applicant makes no attempt to evaluate the nature or extent of the impacts that would need to be mitigated, or the degree or likelihood of success of its proposed mitigation measures in actually reducing impacts to aquatic resources.

The Applicant has also failed to evaluate or quantify any impacts associated with one of the primary mitigation measures it is relying on, HDD, itself. For example, the Applicant indicates that impacts to estuarine forests would be mitigated by implementing HDD technology.²⁷⁹ Yet the Applicant fails to evaluate the possibility of discharges from the staging areas the Applicant would use when preparing for drilling, conducting the drilling, and breaking down the drilling work area, nor does it take into account the potential discharge of bentonite mud from the drilling or discharges that may result from the spraying activities to reduce excessive dust in the work area. The Applicant does indicate it would complete and implement various plans such as a Frac-Out Plan, an Erosion and Control Plan, and a Storm Water Pollution Prevention plan to attempt to minimize the impacts associated with its chosen mitigation measure,²⁸⁰ but makes no attempt to evaluate the potential impacts associated with this drilling method, even with safety plan in place. This information is needed so the Corps can appropriately analyze and off-set any claimed credit in mitigation for use of HDD.

Further, the Applicant has failed to propose, evaluate, or quantify, using analytical data, mitigation measures to reduce the other direct, indirect, and cumulative impacts associated with

²⁷⁸ See JOINT PERMIT APPLICATION, *supra* note 1, App. at 663; Letter from Andrew Goetz, Pres., BCPeabody, to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps Eng's-Antilles Office (Feb. 24, 2011) (App. at 1400) ("We explained why an extensive compensatory mitigation plan was not submitted upfront with the permit application. Since there will be no permanent fill of waters of the U.S., and secondary impacts to these same wetlands is expected to be minimal due to the size of pipe and its method of placement, temporal impacts to the aquatic resource is the remaining impact that may require compensation . . . In the rest of the project corridor . . . reforestation will occur naturally or through mitigation plans coordinated with Department of Natural and Environmental Resources . . . The method of installing the pipeline in this area will allow replacing the cattail vegetation that existed before the construction with a desirable aquatic species.").

²⁷⁹ Letter from Francisco E. Lopez Garcia, Head, Env'tl. Protection & Quality Assurance Div., P.R. Electric Power Auth., to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps of Engineers-Antilles Office (Jan 28, 2011) (App. at 1216).

²⁸⁰ *Id.* App. at 1224, 1226.

the Via Verde project beyond those to aquatic resources. As detailed in Sections III, IV.B, and V.C, D of these comments, there are various other impacts associated with the Via Verde project that are significant and the Applicant has provided very little information as to whether or how it proposes to mitigate these impacts. In the absence of information clearly demonstrating that all impacts associated with the Via Verde project will be reduced to an insignificant level, the Corps must prepare an EIS that fully analyzes the significant impacts associated with the Via Verde project.

For the reasons discussed above, the Corps must prepare an EIS for the Via Verde project, as an EA and FONSI would be inappropriate. An EA is prepared when it is unclear whether a project would have substantial environmental impacts.²⁸¹ In cases where it is obvious that an EIS is required, the Corps can forego preparing an EA and move directly to the preparation of an EIS.²⁸² Based on the information provided to date from the public and various federal agencies, the Via Verde project would have substantial impacts on the human environment due to its effect on aquatic resources, threatened and endangered species, public health and safety, its proximity to historic and cultural sites, and other aspects of the human environment. In this case, an EIS is the appropriate environmental document for compliance with NEPA.

D. The Corps Cannot Avoid Preparing an EIS Under NEPA By Tiering to the Puerto Rico EIS.

The Corps cannot tier to or substantially rely on the Puerto Rico EIS. A federal agency is prohibited from tiering to a document that has not, itself, been subject to NEPA review because this circumvents the purposes of NEPA.²⁸³ The Puerto Rico EIS was not prepared in compliance with NEPA procedures, and it is inadequate to comply with federal standards because it does not adequately consider or evaluate the direct, indirect, and cumulative impacts associated with the Via Verde project.²⁸⁴ Indeed, the Corps has informed the Applicant that the information provided in the permit application and the Puerto Rico EIS is inadequate.²⁸⁵ The Corps stated, “[b]e advised that the information and or referenced materials provided is largely deficient, very conceptual, and failed to adequately address the issues raised by the agencies and the general public . . . the Corps believes that the project impacts have not been adequately quantified, thus precluding proper evaluation of the project’s direct and secondary impacts on the aquatic environment.”²⁸⁶ The Corps cannot tier to the Puerto Rico EIS because it has not procedurally or substantively met the requirements of NEPA.

Moreover, CEQ regulations only allow tiering when a broad EIS has been prepared and a lesser statement is being prepared “on an action included *within* the entire program or policy,” which is not the case here.²⁸⁷ Additionally, the Corps cannot tier to an EIS prepared by the Applicant

²⁸¹ *Greater Yellowstone Coal. v. Flowers*, 359 F.3d 1257, 1274 (10th Cir. 2004).

²⁸² 33 C.F.R. Pt. 325, App. B § 7 (2010); 40 C.F.R. § 1508.9 (2010).

²⁸³ *Kern v. U.S. Bureau Land Mgmt.*, 284 F.3d 1062, 1073 (9th Cir. 2002).

²⁸⁴ See *supra* Section V-C, D of these comments.

²⁸⁵ Letter from Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps Eng’s-Antilles Office, to Francisco E. Lopez, Eng’r, Autoridad de Energia Electrica (Dec. 22, 2010) (App. at 1145–46).

²⁸⁶ *Id.*

²⁸⁷ 40 C.F.R. § 1502.20 (2010).

because that is an impermissible delegation of federal authority and responsibility to a “local, interested entity that would not likely bring the needed objectivity to the mandated evaluation of federal interests.”²⁸⁸ The Corps has a duty to exercise independent judgment²⁸⁹ to ensure the action taken, if any, will be informed by “accurate scientific analysis, expert agency comments, and public scrutiny.”²⁹⁰

V. THE CORPS MUST INCLUDE A THOROUGH ANALYSIS OF THE VIA VERDE PROJECT IN ITS ENVIRONMENTAL IMPACT STATEMENT.

The Corps must require the completion of a comprehensive EIS. To do so, the Corps, as the lead agency, must request that the federal agencies with jurisdiction and special expertise such as NMFS and FWS to be cooperating agencies. The EIS should be based on a broader and more accurate statement of the Via Verde project purpose; include an analysis of a reasonable range of alternatives that flow from that project purpose; and thoroughly analyze the direct, indirect and cumulative impacts associated with the Via Verde project. Furthermore, to ensure compliance with NEPA, the Corps must make a concerted effort to include the public in every stage of the process.

A. The Corps EIS Must Include a Broader and More Accurate Statement of the Purpose and Need for the Proposed Project.

An EIS must include a statement of the underlying purpose and need to which the agency is responding in proposing the alternatives.²⁹¹ It is the agency’s responsibility to define, at the outset, the purpose of the action.²⁹² Furthermore, the Corps must consider and express the underlying purpose and need from the public’s perspective.²⁹³

As discussed above in Section II-B of these comments, the Applicant has proffered an unduly narrow statement of purpose, and “the Corps has a duty under NEPA to exercise a degree of skepticism in dealing with self-serving statements from a prime-beneficiary of the project.”²⁹⁴ The Corps should skeptically view the self-serving purpose proffered by the Applicant which artificially bifurcates the island and the Applicant’s wholly integrated system by narrowly defining the project purpose as “to economically construct a pipeline to deliver natural gas to three existing power facilities [on the northern coast of Puerto Rico] operated by [the

²⁸⁸ *Sierra Club v. U.S. Army Corps Engineers*, 701 F.2d 1011, 1038 (2d Cir. 1983).

²⁸⁹ 33 C.F.R. Pt 325, App. B (2010).

²⁹⁰ 40 C.F.R. § 1500.1 (2010).

²⁹¹ 40 C.F.R. § 1502.13 (2010); 33 C.F.R. Pt. 325, App. B § 9(4) (2010); 40 C.F.R. § 1502.14 (2010).

²⁹² 33 C.F.R. Pt 325, App. B § 9 (2010) (“Also, while generally focusing on the applicant’s statement, the Corps, will in all cases, exercise independent judgment in defining the purpose and need for the project from both the applicant’s and the public’s perspective.”).

²⁹³ 33 C.F.R. Pt. 325, App. B § 9 (2010) (“[T]he Corps also should consider and express that activity’s underlying purpose and need from a public interest perspective . . . for example, . . . ‘to meet the public’s need for electric energy.’”).

²⁹⁴ *Simmons v U.S. Army Corps Engineers*, 120 F. 3d 664, 669 (7th Cir. 1997); *Citizens Against Burlington, Inc. v Busey*, 938 F.2d 190, 209 (D.C. Cir. 1991).

Applicant].”²⁹⁵ The Corps should instead adopt a broader statement of the purpose and need that is consistent with the actual stated objective of the Via Verde project, which is to achieve a 50 percent reduction in the use of oil to fuel the Applicant’s electricity generation system. The following review of the Via Verde project history and evolution will further illustrate why the Applicant’s narrow statement of the purpose and need for the project is not accurate.

EcoEléctrica’s LNG terminal was the first, and remains the only source of natural gas in Puerto Rico.²⁹⁶ On May 15, 1996, FERC authorized EcoEléctrica to construct and operate the LNG terminal, which was to include two storage tanks, six vaporizers, a gas line to serve the Applicant’s Costa Sur plant, and various other components.²⁹⁷ EcoEléctrica only constructed one storage tank and two vaporizers, and FERC’s approval for the remaining components lapsed.²⁹⁸ On April 16, 2009, FERC authorized EcoEléctrica to construct two additional vaporizers and other facilities associated with the vaporizers to supply natural gas to the Applicant’s Aguirre power plant.²⁹⁹ The Applicant’s Costa Sur plant was not converted to natural gas,³⁰⁰ and the pipeline project that was to be constructed to supply the Aguirre plant was later cancelled.³⁰¹

On November 15, 2010, EcoEléctrica informed FWS, copying FERC, that it planned to modify the LNG terminal, as approved by FERC in 2009, and would supply natural gas to the Applicant’s Costa Sur plant.³⁰² EcoEléctrica stated, “the current Expansion Modification is not part of [the Applicant’s] recently announced Via Verde Pipeline Project, [and] EcoEléctrica would need to request FERC’s approval for any physical or operational modifications that might be necessary at its facility as a function of the Via Verde Pipeline Project.”³⁰³ Contrary to EcoEléctrica’s statements, the Applicant, on January 28, 2011, indicated the modification occurring at EcoEléctrica, already approved by FERC, would supply the Via Verde project with natural gas:

... determined at full capacity, for the San Juan 5 & 6 and Cambalache Combined Cycle Units. Additional product will be available to fuel Costa Sur 5 & 6 steam units based on [the Applicant’s] operating determination. Moreover, approved FERC modifications will allow [the Applicant] to fully utilize available natural

²⁹⁵ JOINT PERMIT APPLICATION, *supra* note 1, App. at 616.

²⁹⁶ Order Amending Authorization under Section 3 of the Natural Gas Act, 127 FERC ¶ 61,044 (April 16, 2009) (App. at 298–99).

²⁹⁷ Order Granting NGA Section 3 Authorization for the Siting, Construction, and Operation of LNG Facility, 75 FERC ¶ 61,157 (May 15, 1996) (App. at 39).

²⁹⁸ Order Amending Authorization under Section 3 of the Natural Gas Act, 127 FERC ¶ 61,044 (April 16, 2009) (App. at 304–05).

²⁹⁹ *Id.*

³⁰⁰ *Id.*

³⁰¹ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Kimberly D. Rose, Secretary, Federal Energy Regulatory Commission (Oct. 25, 2010) (App. at 910).

³⁰² Letter from Robert C. Wyatt, Env’tl. Affairs Assistant, EcoEletrica, to Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office (Nov. 15, 2010) (App. at 927–27).

³⁰³ *Id.* EcoEléctrica indicated that, because the delivery of natural gas to the Applicant’s Costa Sur plant had already undergone environmental review by FERC and was approved in its 1996 Order, the change of delivery from Aguirre back to Costa Sur did not require any additional review or approval by FERC. *Id.*

gas to fuel its entire north coast facilities based on the capacity established factor, which considers individual heat rates and predetermined fuel mixtures operating characteristics.³⁰⁴

On March 7, 2011 the Applicant stated it would purchase natural gas (approximately 93MM scf/day) from EcoEléctrica, in accord with the 2009 FERC approval, and would be able to fuel, “on different operational and load ratios, Units 5 & 6 of the San Juan Steam Plant, Units 5 & 6 that recently were converted into dual fuel operation located at the South Coast plant, and [the Applicant’s] other co-fired generating units.”³⁰⁵ Although the Applicant has expressed confidence that there is, indeed, enough gas to supply the Via Verde project, it is unclear whether the supply will allow the Applicant to operate all three of its north coast plants and Costa Sur at a reasonable capacity or allow for some growth in demand.

The Applicant asserts that 93MMscf/day from EcoEléctrica would allow for enough natural gas to run units at San Juan, Cambalache and Costa Sur and vaguely indicates there will be enough to supply all three north coast facilities.³⁰⁶ However, a break down of the numbers indicates the Applicant may be overstating its ability to run its system, including all three northern plants, solely on the currently approved capabilities of the EcoEléctrica LNG terminal. We understand the EcoEléctrica plant currently has a contracted capacity of 507 MW and, with a normal dispatch, generally requires about 69 MMscf/day from EcoEléctrica. This only covers the facility’s current normal consumption of natural gas. The facility has a design capacity of 580 MW; therefore, the plant could need up to 93 MMscf/day from the LNG terminal to operate under different load scenarios. As the EcoEléctrica LNG terminal currently has two (93 MMscf/day) regasification stations (vaporizers), this allows the EcoEléctrica plant to operate up to its useable maximum design regasification capacity and leaves one regasification station for backup in order to maintain reliability.

For the Applicant’s natural gas supply, EcoEléctrica is adding two additional (93MMscf/day) regasification stations pursuant to the 2009 FERC approval. As with the EcoEléctrica plant, we understand one of these regasification stations must be used as a backup for reliability purposes. Therefore, the actual useable design regasification capacity that will be available to the Applicant is 93 MMscf/day under normal circumstances. If the Applicant only wanted to deliver gas to its three northern plants through the Via Verde project, it would require 416 MMscf/day to run those facilities simultaneously with a 100 percent load factor. If the Applicant added Costa Sur running at 100 percent along with the northern plants, they would need a total of 609 MMscf/day of gas to operate. We understand, however, that the plants do not generally run at 100 percent, so we looked at what amount of natural gas it would take to run the three northern plants at a 60 percent load factor:

Cambalache (247 MW): 41 MMScf/day

³⁰⁴ Letter from Francisco E. Lopez Garcia, Head, Env'tl. Protection & Quality Assurance Div., P.R. Electric Power Auth., to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps Eng's-Antilles Office (Jan 28, 2011) (App. at 1218).

³⁰⁵ Letter from Angel L. Rivera Santana, Director, Planning and Environmental Division, to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps of Engineers-Antilles Office (March 7, 2011) (App. at 1408).

³⁰⁶ *Id.* App. at 1408-09.

San Juan 5 and 6 Combined Cycle Units (440 MW): **45 MMscf/day**

San Juan 7-10 (400 MW): 67MMscf/day

Palo Seco 1 and 2 (200 MW): 33MMscf/day

Palo Seco 3 and 4 (401 MW): 63 MMscf/day

If Costa Sur of gas, running at a 60 percent load factor, is added, that plant alone would need **116 MMscf/day**. These numbers make clear that the Applicant does not have enough gas from EcoEléctrica to supply even the Costa Sur plant at 116 MMscf/day let alone adding the gas supply needed for the units at San Juan and Cambalache. Adding the numbers bolded above indicates that to run the units the Applicant states it can run with the gas supply from EcoEléctrica, it would require approximately 202 MMscf/day of gas, which is more than the current modifications will allow for (assuming that the Applicant would use both regasification stations and have no backup for reliability). These numbers help shed light on a recent article indicating Excelerate was awarded a contract for a FSRU and the Applicant intends to issue a second tender for another FSRU to provide natural gas to two facilities on the south coast of Puerto Rico.³⁰⁷ As discussed below, this information collectively suggests the Applicant would like to isolate the Via Verde project and bifurcate its system and the island in order to limit the amount of environmental review required.

Although the Applicant appears to believe it can change the delivery end point of the natural gas it will acquire from EcoEléctrica without any supplemental or additional environmental review of the change, the Corps must ensure that it defines the purpose and need for the Via Verde project in a manner that reflects the actual purpose and need, incorporating any related activities or actions that are necessitated by the proposed project or required for the proposed project. NEPA requires the Corps to address not only the impacts of the specific activity needing a permit, but the entire project where there is sufficient control and responsibility to warrant federal review.³⁰⁸ Under its own regulations, the Corps possesses sufficient control and responsibility when the regulated activity comprises a link in a corridor project and when there is cumulative federal control and responsibility.³⁰⁹ The Via Verde project is simply a link between the supply of natural gas and the Applicant's plants that will use the gas to create electricity. Also, the Via Verde project, the modifications occurring at the LNG terminal, and any other activities necessary to supply natural gas to the Applicant's plants have sufficient cumulative federal involvement through necessary approvals to require the Corps to analyze in an EIS all portions of the Via Verde project, including those that involve storing, supplying, or connecting natural gas to or for the pipeline.

The environmental review included in FERC's 1996 authorization for delivery of natural gas to Costa Sur from the LNG terminal is at least 15 years old, and the environmental review

³⁰⁷ *Excelerate Awarded Puerto Rico FSRU Contract*, ICIS HEREN (Mar. 07, 2011, 15:32:05)

<http://www.icis.com/heren/articles/2011/03/07/9441498/lng/lmd/excelerate-awarded-puerto-rico-fsru-contract.html>.

The Applicant has already opined that such units did not constitute a feasible alternative because they will significantly impact sensitive marine environments such as coral reefs. Letter from Francisco E. Lopez Garcia, Head, Envtl. Prot. & Quality Assur. Div., P.R. Electric Power Auth., to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps Eng's-Antilles Office (Jan 28, 2011) (App. at 1236-38).

³⁰⁸ 33 C.F.R. Pt. 325, App. B § 7(b) (2010).

³⁰⁹ *Id.*

associated with FERC's 2009 authorization only included the modification at the LNG terminal and a pipeline to deliver natural gas from EcoEléctrica to Aguirre, which was later canceled.³¹⁰ The Applicant now proposes, without concurrence from EcoEléctrica, to change the delivery endpoint of a significant portion of the acquired natural gas resulting from a modification approved by FERC and seeks to rely upon environmental reviews that are outdated and did not, in any way, anticipate or evaluate the delivery of natural gas to at least three separate power plants via a 92-mile pipeline that would transect the island of Puerto Rico.

The Applicant's practice of conveniently switching fuel delivery end points to any number of the plants within its system indicates the true intention of its historic and currently proposed activity, which is to reduce its dependence on oil by delivering natural gas to its system, not just its north coast plants. The source and method of delivering the natural gas to the Via Verde project is a necessarily interrelated project to the pipeline itself because, but for the supply of natural gas, the Via Verde project would not be worthwhile. The Corps recognized the Applicant's failure to discuss the supply of natural gas and any associated activities when it stated, "[w]ithout an actual connection to a natural gas supply system the Via Verde natural gas pipeline cannot be considered under [NEPA] as a single and complete project."³¹¹

The Corps should critically evaluate the Applicant's information and statements with regard to the supply and method of natural gas delivery to the Via Verde project and incorporate any interrelated activities that must occur to supply the project, particularly if those activities have outdated, otherwise insufficient, or no environmental reviews. Moreover, the Corps should revise the statement of purpose and need to more accurately reflect the true purpose of the Via Verde project. This is critically important because the statement of purpose and need defines the range of alternatives and the scope of the analysis of environmental consequences in an EIS, as discussed further below.

B. The Corps EIS Must Analyze a Reasonable Range of Alternatives.

NEPA requires an EIS to analyze alternatives to the proposed action. The range of alternatives is dictated by the nature and scope of the project purpose.³¹² The Corps must consider in detail a reasonable range of alternatives that meet the underlying project purpose and can be feasibly accomplished.³¹³ As discussed in Section V-A of these comments, the Applicant proposes a narrow project purpose that eliminates a critical set of reasonable alternatives, such as converting one or more of the power plants on the south coast to natural gas, developing renewable energy sources such as wind, PV, and solar heaters and any combination of these alternatives or other natural gas storage and delivery options for the Applicant's system. The Applicant has argued

³¹⁰ Order Amending Authorization under Section 3 of the Natural Gas Act, 127 FERC ¶ 61,044 (April 16, 2009) (App. at 303-04); Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Kimberly D. Rose, Secretary, Federal Energy Regulatory Commission (Oct. 25, 2010) (App. at 910).

³¹¹ Letter from Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps of Engineers-Antilles Office, to Francisco E. Lopez, Eng'r, Autoridad de Energia Electrica (Dec. 22, 2010) (App. at 1165).

³¹² See 33 C.F.R. Pt. 325, App. B (2010) (indicating the stated goal of a project dictates the scope of reasonable alternatives); *Illio'ulaokalani Coalition v. Rumsfeld*, 464 F.3d 1083, 1095 (9th Cir. 2006); *Friends of Southeast's Future v. Morrison*, 153 F.3d 1059, 1065 (9th Cir. 1998).

³¹³ 33 C.F.R. Pt. 325, App. B (2010).

that it is not necessary to take into account the southern plants in its analysis because the project purpose is narrowed to the northern plants.³¹⁴ Under this view, renewable energy sources are eliminated because they would not meet the narrow purpose of getting natural gas to the north coast power plants. The Corps has the duty to independently determine the project purpose in such a way that allows for reasonable alternatives to be considered. The purpose of the Via Verde project is to provide alternative fuel sources to the Applicant's overall electricity generation system and thereby reduce the electricity generated by oil in the Applicant's system. Accordingly, the Corps should conduct its alternatives analysis based on this broader purpose.

The Applicants alternatives analysis submitted is incomplete. The Corps noted that, even based on what was submitted, the alternatives analysis was narrower than the Applicant's prior proposals.³¹⁵ Specifically, the Corps noted the following inadequacies in the Applicant's submission:

The [A]pplicant's alternative analysis does not include PREPA's original plan to build a new natural gas combined cycle power plant close to the existing Costa Sur facility, and to retro fit both Costa Sur and Aguirre power plants to use natural gas. This was the [A]pplicant's preferred alternative in the past and now it is not mentioned in the [A]pplicant's alternatives analysis.³¹⁶

A comprehensive alternatives analysis would include an analysis of alternatives involving the conversion of the Aguirre and Costa Sur power plants on the south coast to natural gas.³¹⁷ Importantly, converting these two existing power plants would reduce the existing electricity generated from oil on the island by 59 percent.³¹⁸ A complete analysis would also require considering alternatives related to renewable energy developments such as wind, solar, and hydroelectric generation.³¹⁹ There are reasonable alternatives that would allow the Applicant to achieve the goal of providing an alternative source of energy to the market. The EIS needs to completely and objectively evaluate these reasonable alternatives.³²⁰

Furthermore, the Corps must consider the impacts beyond the project area because there is sufficient federal control and responsibility over the project. The Corps's NEPA obligations extend beyond the limits of the portion of the project at hand where "the cumulative Federal

³¹⁴ Letter from Francisco E. Lopez Garcia, Head, Env'tl. Protection & Quality Assurance Div., P.R. Elec. Power Auth., to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps Eng's-Antilles Office (Jan 28, 2011) (App. at 1217).

³¹⁵ Letter from Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps Eng's-Antilles Office, to Francisco E. Lopez, Eng'r, Autoridad de Energia Electrica (Dec. 22, 2010) (App. at 1148-49).

³¹⁶ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Col. Alfred A. Pantano, Jr., Dist. Commander, U.S. Army Corps of Engineers-Jacksonville Dist. (Dec. 15, 2010) (App. at 1107).

³¹⁷ *Id.*

³¹⁸ See *PREPA Is*, AUTORIDAD DE ENERGÍA ELÉCTRICA http://www.prepa.com/AEEES2_ENG.ASP (last visited Apr. 17, 2011) (indicating the total combined MW for the South Plants is 2482. The total MW for the North Plants is 1689.5. The total electricity generated by oil is 4171.5) (go to the Costa Sur Plant, Aguirre Plant, Cambalache Plant, San Juan Plant, and Palo Seco Plant links located under the tab labeled 'PREPA is').

³¹⁹ P.R. ELECTRIC POWER AUTH. Chapter 4: Study of Alternatives and Selection of the Alignment, in ENVTL. IMPACT STATEMENT (2010) (App. at 350-52).

³²⁰ 33 C.F.R. Pt. 325, App. B (2010).

involvement of the Corps and other agencies is sufficient to grant legal control over such additional portions of the project.”³²¹ The cumulative federal involvement extends the Corps’ responsibilities under NEPA to include analysis of the LNG terminal modifications as they require FERC approval.³²² This means any additional modifications to the LNG terminal or other LNG supply facilities must be considered as a part of the EIS.³²³

C. The Corps EIS Must Include a Thorough Analysis of the Direct and Indirect Effects of the Proposed Project.

The Corps must analyze the direct, indirect, and cumulative impacts³²⁴ of the Via Verde project.³²⁵ Direct effects are “caused by the action and occur at the same time and place.”³²⁶ Indirect effects are “caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable.”³²⁷ Specifically, the Corps must consider the federal and non-federal “ecological . . . aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative”³²⁸ impacts of the proposed project. The Second Circuit has held that the impacts must be compiled in good faith to provide sufficient information to allow a decision maker to fully consider all of the factors involved and make a reasoned choice by balancing the risks of harm to the benefits.³²⁹ The Applicant has not provided the Corps sufficient information to conduct such an analysis or make such a determination through the Puerto Rico EIS or the permit application. The impacts analysis should be based on the full scope of impacts from the broader project purpose as discussed in Section V-A of these comments. However, even if it were just limited to the Via Verde project itself, the impacts analysis is deficient.

The Applicant has noted that there would be some direct effects, but it has failed to provide complete information on these effects. As discussed in Section II above, the analysis of direct effects is inadequate with regard to aquatic impacts. Moreover, as discussed in Section III of these comments, the evaluation of endangered and threatened species and their habitat is only in the preliminary stages and much more work needs to be done before impacts can be adequately assessed.

Notably in a December 22, 2010 letter to the Applicant, the Corps has indicated that the Via Verde project’s impacts have not been adequately quantified; thus precluding proper evaluation of the project’s direct and secondary impacts on the environment and that the Applicant needs to

³²¹ 33 C.F.R. Pt. 325, App. B § 7b(2)(A) (2010); *Save Our Sonoran, Inc. v. Flowers*, 408 F.3d 1113, 1122 (9th Cir. 2004).

³²² Letter from Robert C. Wyatt, Env’tl. Affairs Assistant, EcoEletrica, to Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office (Nov. 15, 2010) (App. at 926–27).

³²³ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Col. Alfred A. Pantano, Jr., Dist. Commander, U.S. Army Corps of Engineers-Jacksonville Dist. (Dec. 15, 2010) (App. at 1095–1096).

³²⁴ These comments will use the terms impacts and effects interchangeably as allowed under 40 C.F.R. § 1508.8.

³²⁵ *Nat’l Resources Def. Council v. Callaway*, 524 F. 2d 79, 88 (2d Cir. 1975); 40 C.F.R. § 1508.8(a); 40 C.F. R. § 1508.25 (2010).

³²⁶ 40 C.F.R. § 1508.8(a) (2010).

³²⁷ 40 C.F.R. § 1508.8(b) (2010).

³²⁸ 40 C.F.R. § 1508.8(b) (2010).

³²⁹ 42 U.S.C. § 4332 (2006); *Sierra Club v. U.S. Army Corps*, 701 F. 2d 1011, 1030 (2nd Cir. 1983).

provide a more comprehensive and detailed response to address the issues of concern.³³⁰ In response to the Corps' December 22, 2010 letter, the Applicant supplemented its Application with letters on January 28, 2011 and February 24, 2011.³³¹ However, this supplemental material is still deficient because it in large part reiterates information found in the Puerto Rico EIS. For example, the Applicant responded to the Corps request for more information by stating: "We must profess some confusion on this point since Chapter VI in the [State EIS] . . . is quite detailed in discussing impacts expected to occur from the project."³³² This cross-reference to the inadequate Puerto Rico EIS does not address the need for additional information. While in some sections of the February 24, 2011 letter, the Applicant offers some additional information on the impacts on forests and wetlands, it remains deficient in scope and detail with regard to the other impacts.

The Applicant has not adequately responded to agencies requests for more information on the impacts. Not only does the January 28, 2011 disregard the Corps concern of potential impacts on the aquatic habitat, the February 24, 2011 response from the Applicant's consultant inadequately considers the projects impacts. A few examples can be found in the Applicant's treatment of the impacts to estuarine forested habitat, forests, and wetlands. First, the Applicant underestimates the direct impacts the proposed project will have on estuarine forested habitat by stating 'there will be no impacts' because they will use HDD technology. However, this underestimates the direct impacts of moving the drilling equipment into place, the impacts caused by error, frac-outs, and retention ponds to hold the toxic bentonite material used during this process. Second, the Applicant states the Rio Abajo State Forest will not be impacted because the pipeline will be placed within the existing PR-10 easement. This is incorrect. The Applicant fails to consider the secondary impacts resulting from construction: safety concerns, altered ecosystem from the management of the 50 foot permanent ROW, changes in the hydrology of groundwater, etc. Similarly the Applicant dismisses the secondary impacts on the State Forest De La Vega because it argues the impacts of the construction will be temporary. Because it argues the impacts are temporary, nowhere is there a consideration of the secondary impacts on the forests of Puerto Rico due to the proposed project. Third, the Applicant underestimates the impacts on wetlands by supposing the impacts will be limited to the 50 foot construction ROW and minimizing them by labeling them temporary.³³³ Limiting the impact to the construction ROW ignores the fact that any pollutants discharged have the ability to migrate. A discharge can have secondary impacts affecting the entire wetland as well as the hydrology of the area. These impacts could have short and long-terms affects on the groundwater and drinking water.

³³⁰ Letter from Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps of Engineers-Antilles Office, to Francisco E. Lopez, Eng'r, Autoridad de Energia Electrica (Dec. 22, 2010) (App at 1146).

³³¹ Letter from Edgar W. Garcia , Regulatory Project Manager, U.S. Army Corps of Engineers-Antilles Office, to Francisco E. Lopez, Head, Env'tl. Protection & Quality Assurance Div, P.R. Power Auth. (Mar. 18, 2011) (App. at 1410).

³³² Letter from Francisco E. Lopez Garcia, Head, Env'tl. Prot. & Quality Assur. Div., P.R. Elec. Power Auth., to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps Eng's-Antilles Office (Jan. 28, 2011) (App. at 1213-14).

³³³ Letter from Francisco E. Lopez Garcia, Head, Env'tl. Protection & Quality Assurance Div., P.R. Electric Power Auth., to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps of Engineers-Antilles Office (Jan 28, 2011) (App. at 1222-24).

Furthermore, the Applicant has failed to adequately address community concerns such as addressing safety concerns from potential seismic activity. Puerto Rico lies in an active plate boundary zone, and earthquakes are a "constant threat."³³⁴ The risk of seismic activity disrupting the pipeline is of especially significant concern in such the densely populated area of San Juan. The Applicant notes that the route crosses the Great Southwestern Puerto Rico Fault Zone³³⁵ and attempts to mitigate some of the most egregious risks posed by earthquake activity,³³⁶ but does not discuss the potential catastrophic impacts on local communities that could flow from a seismic event on or near the pipeline.

The Via Verde project would also have many significant indirect effects that have not been addressed at all. As noted above, indirect effects are those "which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable."³³⁷ Indirect effects may include "growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems."³³⁸ The Corps "must evaluate the reasonably foreseeable effects of the proposed action."³³⁹ The Applicant has not adequately evaluated the indirect impacts of the proposed project. For example, of the approximately twenty-three impacts listed in the Puerto Rico EIS,³⁴⁰ only seven of them include any consideration of secondary impacts: surface water, ground water, trenching, air quality, flora and fauna, water consumption, and agriculture.³⁴¹ Furthermore, the Applicant concludes that impacts on water bodies are only temporary.³⁴² The Applicant has not provided a good faith analysis of the reasonably foreseeable indirect impacts.

³³⁴ Uri ten Brink, Chief Scientist U.S. Geological Survey, *The Puerto Rico Trench: Implications for Plate Tectonics and Earthquake and Tsunami Hazards*, NAT'L OCEANIC ATMOSPHERIC ADMIN (DEC. 4, 2006).

³³⁵ See e.g., P.R. ELECTRIC POWER AUTH. *Chapter 6: Impacts*, in ENVTL. IMPACT STATEMENT (2010) (App. at 550).

³³⁶ *Id.* (App. at 464).

³³⁷ 40 C.F.R. § 1508.8 (2010).

³³⁸ 40 C.F.R. § 1508.8(b) (2010).

³³⁹ *Dubois v. U.S. Dept. Agric.*, 102 F. 3d 1273, 1286 (1st Cir. 1996).

³⁴⁰ The Puerto Rico EIS lists the impacts for: agricultural, surface water, ground water, wetlands, floodplains, infrastructure, water consumption, transportation, archaeological sites, noise, spills, hazardous waste, non hazardous solid waste, socioeconomic, economic, community, public service facilities, land acquisition, flora and fauna, endangered species, air quality, and human health. (App. at 440-577).

³⁴¹ P.R. ELECTRIC POWER AUTH. *Chapter 6: Impacts*, in ENVTL. IMPACT STATEMENT (2010) (App. at 569); JOINT PERMIT APPLICATION, *supra* note 1, App. at 814-50; Letter from Francisco E. Lopez Garcia, Head, Envtl. Prot. & Quality Assur. Div., P.R. Elec. Power Auth., to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps Eng's-Antilles Office (Jan. 28, 2011) (App. at 1213-54); Letter from Andrew Goetz, President, BCPeabody, to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps Eng's-Antilles Office (Feb. 24, 2011) (App. at 1396-1402).

³⁴² See e.g., P.R. ELECTRIC POWER AUTH. *Chapter 6: Impacts*, in ENVTL. IMPACT STATEMENT (2010) (App. at 477) ("No permanent effect on the bodies of water is anticipated. However, a temporary effect during the construction process in the crossing of river ravines is anticipated, which will be appropriately controlled."); See also *id.* at 448 ("In case, of wetlands the impact is temporary, during the installation of the pipeline that transports natural gas. As proposed the Project does not entail permanent impact in the wetlands, so it is not related to cumulative impacts that result from other actions").

For example, some of the potential indirect impacts on species can include increased access to the rainforest which could lead to an increase in predators³⁴³ (i.e. feral cats) of endangered species and increased access to these undisturbed areas to off-road vehicles which could impact the species behavioral patterns.³⁴⁴ Furthermore, the 50 foot permanent ROW maintenance could allow hunters and poachers access to these previously inaccessible areas, which could further impact species. The Applicant notes “poaching continue[s] to affect the population” of Puerto Rican boas, but fails to then address how the construction and permanent ROW could be utilized by poachers.³⁴⁵ Additionally, the Applicant has not addressed potential long-term indirect impacts on local communities related to safety issues associated with the pipeline including the risk of explosion.³⁴⁶ While the Applicant notes the risk from leaking oil during construction,³⁴⁷ the Applicant has not yet accounted for the long-term risks of water contamination related to the corrosion or failure of various segments of the pipeline.³⁴⁸ Accordingly, while the Puerto Rico EIS and the Permit Application note the impact from ground transportation and traffic during construction Applicant does not address impacts from disruption caused by the noise and pollution from activities related to the maintenance and repair of the pipeline.³⁴⁹ Finally, the Applicant fails to address the impacts of increased population growth and development and sprawl that will be facilitated by expanding energy capacity in various cities.³⁵⁰

Additionally, there are reasonably foreseeable future actions that must be considered in the EIS as indirect impacts concerning the Applicant’s own related operations that have not been evaluated to date. For example, the Applicant proposes to provide natural gas to the existing power plants on the north coast; however, as discussed in Section V-A of these comments, it is

³⁴³ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Col. Alfred A. Pantano, Jr., Dist. Commander, U.S. Army Corps of Engineers-Jacksonville Dist. (Dec. 15, 2010) (App. at 1107–08) (“[T]his long corridor . . . will create an avenue for invasive and noxious species to enter previously isolated areas of wildlife habitat”); Letter from Hector E. Quintero Vilella, Ph.D. Ecology, to Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office (Oct. 25, 2010) (App. at 906) (“The maintenance path will provide a corridor to exotic species like the mongoose, and to domestic and feral cats and dogs, the first two are the major predators of the Puerto Rican Night jar”).

³⁴⁴ Letter from Hector E. Quintero Vilella, Ph.D. Ecology, to Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office (Oct. 25, 2010) (App. at 906) (noting that the maintenance path could be used by a growing number of off-road vehicles' enthusiasts. This will be very detrimental to the species. This is a real problem in many costal and mountainous portions of the Island. One example is Peiiones de Melones in Cabo Rojo were dozens of off-roaders come together every weekend).

³⁴⁵ JOINT PERMIT APPLICATION, *supra* note 1, App. at 845.

³⁴⁶ David Vukusich, Member, Comunidad Toabajena en Defensa de la Zona Costera, Inc., to Col. Alfred A. Pantano Jr., Dist. Commander, U.S. Army Corps of Engineers-Jacksonville Dist. (Nov. 19, 2010) (App. at 950–52). *See also* Letter from Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps of Engineers-Antilles Office, to Francisco E. Lopez, Eng’r, Autoridad de Energia Electrica (Dec. 22, 2010) (App. at 1148) (noting that the Applicant has yet to address public safety issues).

³⁴⁷ P.R. ELECTRIC POWER AUTH. *Chapter 6: Impacts*, in ENVTL. IMPACT STATEMENT (2010) (App. at 479, 481).

³⁴⁸ *See* Letter from Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps of Engineers-Antilles Office, to Francisco E. Lopez, Eng’r, Autoridad de Energia Electrica (Dec. 22, 2010) (App. at 1148) (stating the Applicant has failed to address health hazards and its effects on the nearby communities).

³⁴⁹ *See* P.R. ELECTRIC POWER AUTH., *Chapter 6: Impacts*, in ENVTL. IMPACT STATEMENT (2010) (App. at 489) (addressing noise issues relating only to construction of the Via Verde project); JOINT PERMIT APPLICATION, *supra* note 1, App. at 666–67, 671 (addressing only construction related noise increases).

³⁵⁰ DEP’T OF DEFENSE, JACKSONVILLE DIST. CORPS. OF ENGINEERS-ANTILLES OFFICE, PERMIT APPLICATION NO. SAJ-2010-02881, PUBLIC NOTICE (Nov. 19, 2010) (App. at 953) (noting that the pipeline will pass along populated urban areas, roads, and highways).

not clear the EcoEléctrica LNG terminal has sufficient capacity to supply all three north coast power plants along with the Costa Sur plant. This strongly suggests the Via Verde project will lead to another expansion or modification of the LNG terminal or some other storage and delivery option for natural gas. These additional activities are reasonably foreseeable and may, in fact, be necessary for the Via Verde project; therefore, they must be a part of the indirect impact section of the EIS, and incorporated into other sections of the EIS as well.

D. The Corps EIS Must Include a Thorough Analysis of the Cumulative Impact Associated with the Proposed Project.

The cumulative impact analysis in an EIS must include all effects which result “from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions” and “can result from individually minor but collectively significant actions taking place over a period of time.”³⁵¹ The First Circuit has held that cumulative impacts must be considered if there are significant impacts that are reasonably foreseeable and sufficiently likely to occur.³⁵² The Ninth Circuit has held that similarities in underlying cause, proposed solution, and general geography are sufficient to place the actions outside the scope of the project purpose into the category of cumulative impacts.³⁵³ The Puerto Rico EIS limits its analysis of cumulative impacts to “sensitive or critical resources” but fails to indicate how it made this determination concerning what is sensitive or critical.³⁵⁴ The Puerto Rico EIS includes scattered references to other impacts such as earth movement activities for agriculture, an unnamed industrial landfill, a ROW of Gasoducto del Sur, clearing of land for the construction of houses and businesses, increased maritime traffic, increased traffic, noise, and demand for water from other unidentified projects, and impacts from other future developments.³⁵⁵ However, the Puerto Rico EIS completely fails to include the necessary specificity in order to conduct a comprehensive analysis of the cumulative impacts from all of this other development on all of the natural resources and local communities affected by the Via Verde project. Furthermore, it fails entirely to address the cumulative impact on mangroves and wetlands.³⁵⁶

These inadequacies were noted by FWS when it stated in its January 20, 2011 letter to the Applicant, in response to the supplemental information provided by the Applicant, that the Puerto Rico EIS did not “provide an in-depth analysis of direct, indirect, cumulative, interrelated and interdependent effects on our listed species and their habitats, aquatic resources . . . forested lands, and sinkholes in the northern karst region of Puerto Rico.”³⁵⁷ At this stage, the

³⁵¹ 40 C.F.R. § 1508.7 (2010).

³⁵² *Dubois*, 102 F.3d, at 1286.

³⁵³ *Earth Island Inst. v. U.S. Forest Serv.*, 351 F.3d 1291, 1306 (9th Cir. 2003).

³⁵⁴ P.R. ELECTRIC POWER AUTH. *Chapter 6: Impacts*, in ENVTL. IMPACT STATEMENT (2010) (App. at 440).

³⁵⁵ *See e.g.* P.R. ELECTRIC POWER AUTH. *Chapter 6: Impacts*, in ENVTL. IMPACT STATEMENT (2010) (App. at 450, 471, 502, 511–12).

³⁵⁶ *See* P.R. ELECTRIC POWER AUTH. *Chapter 6: Impacts*, in ENVTL. IMPACT STATEMENT 29 (2010) (App. at 440–577).

³⁵⁷ Letter from Edwin Muniz, Field Supervisor, U.S. Fish & Wildlife Serv. Boqueron Field Office, to Angel Rivera Santa, Dir., Planning & Env'tl. Protection P.R. Electric Power Auth., (Jan. 20, 2011) (App. at 1198); Letter from Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps Eng's-Antilles Office, to Francisco E. Lopez, Eng'r, Autoridad de Energia Electrica (Dec. 22, 2010) (App. at 1148, 1151); Letter from Miles M. Croom, Asst.

appropriate next step is for the Corps to prepare a cumulative impact analysis in its EIS that addresses the full extent of past, present, and future projects and activities affecting the human and natural resources in the vicinity of the Via Verde project.

E. The Corps EIS Should Be Prepared in Conjunction with FWS and NMFS as Cooperating Agencies.

The Corps has taken a positive first step by assuming the role of lead agency under NEPA,³⁵⁸ and by requesting that Federal Highway Administration and FERC join the NEPA process as cooperating agencies.³⁵⁹ Furthermore, the Corps already appears to be consulting with the FWS and NMFS regarding listed species and essential fish habitat, respectively. If the Corps has not already done so, however, it should invite the wildlife agencies to be cooperating agencies because they have jurisdiction by law and special expertise with respect to the endangered and threatened species issues implicated by the proposed project. FWS should be a cooperating agency because it has special expertise in conserving listed species and their habitat³⁶⁰ and jurisdiction under the ESA.³⁶¹ NMFS should be a cooperating agency because it has jurisdiction over marine, coastal, and anadromous species and their habitat under the ESA.³⁶² NMFS also has special expertise in evaluating the impacts of the Applicant's proposed alternatives: the deep water port and a new LNG terminal on the north coast. The cooperation of all of these agencies is essential in the development of an EIS.

VI. THE CORPS SHOULD INCLUDE EXTENSIVE PUBLIC INPUT AND PARTICIPATION AT EVERY STAGE IN THE DEVELOPMENT OF THE ENVIRONMENTAL IMPACT STATEMENT FOR THE VIA VERDE PROJECT.

As noted previously, the dual purposes of NEPA is to inform decision makers and the public.³⁶³ The purpose of an EIS is "to provide decision-makers with an environmental disclosure sufficiently detailed to aid in the substantive decision whether to proceed with the project in light of its environmental consequences . . . and provide the public with information on the environmental impact of a proposed project as well as encourage public participation in the development of that information."³⁶⁴ Public participation in the form of public comment letters,

Reg. Admin'r, Nat'l Marine Fisheries Serv. S.E. Regional Office, to Col. Alfred Pantano, Dist. Commander, U.S. Army Corps Eng's-Jacksonville Dist. (Dec. 19, 2010) (App. at 1125-27).

³⁵⁸ CEQ regulations stipulate that, when more than one Federal agency is involved in the same action or group of actions directly related because of functional interdependence, potential lead agencies must determine by letter of memorandum which shall be the lead agency. 40 C.F.R. § 1501.5 (2010).

³⁵⁹ Letter from Donald W. Kinard, Chief, Reg. Div., U.S. Army Corps Eng's-Jacksonville Dist., to Kimberly D. Bose, Sec'y, Fed. Energy Regulatory Comm'n (Dec. 23, 2010) (App. at 1160-61); Letter from Donald W. Kinard, Chief, Reg. Div., U.S. Army Corps Eng's-Jacksonville Dist., to Carlos Machado, Asst. Div. Admin'r, Fed. Highway Admin. (Dec. 23, 2010) (App. at 1158-59).

³⁶⁰ 16 U.S.C. § 1536 (2006); 42 U.S.C. § 4332(2)(c) (2006); 40 C.F.R. § 1501.6 (2010).

³⁶¹ *Id.*

³⁶² *Id.*

³⁶³ *Trout Unlimited v. Morton*, 509 F.2d 1276, 1287 (9th Cir. 1974).

³⁶⁴ *Id.* at 1282; *Calvert Cliffs Coord. Comm. v. Atomic Energy Comm'n*, 449 F.2d 1109, 1114 (D.C. Cir. 1971).

public meetings, and public hearings are an integral component of preparing an EIS.³⁶⁵ Public participation is essential to satisfy NEPA requirements.³⁶⁶

The Applicant attempts to narrow the public process and involvement when stating, “public hearings are held at the discretion of the District Engineer when a hearing provides additional information that is necessary for a thorough evaluation of pertinent issues not otherwise available.”³⁶⁷ For NEPA compliance, CEQ regulations require an agency “make diligent efforts to involve the public”³⁶⁸ in the process and hold public hearings or meetings “when there is substantial environmental controversy concerning the proposed action or substantial interest in holding the hearing.”³⁶⁹ Therefore we urge the Corps to use its discretion to involve the public in its NEPA process for the Via Verde project. Although the Applicant believes the public hearings held for the Puerto Rico EIS amount to sufficient public involvement, we believe it was inadequate because it was compiled on an expedited basis pursuant to an Executive Order by the Governor of Puerto Rico.³⁷⁰ Due to the expedited process under which the entire state approval process was conducted, the public involvement was not sufficient. The impacts of the proposed project are highly controversial, and extensive. The public has shown substantial interest in participating in the Corps process for the proposed project. Therefore, the Corps should exercise its discretion to include the public throughout the permit review because there is substantial environmental controversy and public interest.

In a memo accompanying Executive Order 12898, the President recognized the importance of the NEPA procedures in identifying environmental justice concerns.³⁷¹ The memorandum states, “each Federal agency shall analyze the environmental effects, including human health, economic and social effects, of Federal actions, including effect on minority communities and low-income communities, when such analysis is required by [NEPA].”³⁷² The memorandum directs “each Federal agency shall provide opportunities for community input in the NEPA process.”³⁷³ Additionally, agencies are directed to “identify potential effects and mitigation measures in consultation with affected communities, and improve the accessibility of meetings, crucial documents and notices.”³⁷⁴

The Corps must initiate the full EIS process beginning with the publication of a Notice of Intent stating the Corps is preparing an EIS for the proposed Via Verde project.³⁷⁵ To the extent it has not already done so, the Corps must begin the scoping process to determine the issues, interested

³⁶⁵ 40 C.F.R. § 1506.6 (2010).

³⁶⁶ 40 C.F.R. §§ 1502.1, 1503.1, 1506.6 (2010).

³⁶⁷ Letter from Francisco E Lopez Garcia, Head, Envntl. Protection & Quality Assurance Div., P.R. Electric Power Auth., to Edgar W. Garcia, Regulatory Project Manager, U.S. Army Corps of Engineers-Antilles Office (Jan 28, 2011) (App. at 1018).

³⁶⁸ 40 C.F.R. § 1506.6 (2010).

³⁶⁹ *Id.*

³⁷⁰ P.R. Exec. Order No. 2010-034 (July 19, 2010) (App. at 384).

³⁷¹ COUNCIL ON ENVTL. QUALITY, ENVIRONMENTAL JUSTICE: GUIDANCE UNDER THE NATIONAL ENVIRONMENTAL POLICY ACT 1 (1997) available at <http://ceq.hss.doe.gov/nepa/regs/ej/justice.pdf>.

³⁷² *Id.*

³⁷³ *Id.*

³⁷⁴ *Id.*

³⁷⁵ 40 C.F.R. §§ 1502.9, 1501.7 (2010).

organizations, lead agency, cooperating agency, and identify data gaps.³⁷⁶ The Corps should include the public in the scoping process through public meetings and comments.³⁷⁷ The Corps will also need to conduct all of the studies necessary to prepare a Draft EIS.³⁷⁸ The Draft EIS must include a statement of the underlying purpose and need; alternative ways of meeting the need; identify the preferred alternative; analyze the full range of direct, indirect, and cumulative effects of the preferred alternative as well as the reasonable alternatives of the action.³⁷⁹ The Corps should use its discretion to allow for an extended public comment period.³⁸⁰ The Final EIS must include a response to the substantive comments received.³⁸¹ Additionally, we ask that the Corps publish the Final EIS in the Federal Register.

So far, the permitting process for the Via Verde project has not been as transparent as it should be. First, all of the relevant documents are not easily accessible. For example, the Applicant states that the Puerto Rico EIS is available on the Applicant's website in a letter to FWS and provides a link to the website. However, the website only provides links to the Draft Puerto Rico EIS.³⁸² Second, as demonstrated by the numerous public comments and disagreements between and among the federal agencies and the Applicant, there is substantial environmental controversy surrounding the proposed project which clearly shows the need for additional hearings.³⁸³ In light of this heightened public interest and controversy surrounding proposed Via Verde project, the Corps should hold public hearings not only to provide additional public input and opportunities for the public to provide comments but also to gather additional information about the full extent of the proposed project's impacts. The Corps should extend the prescribed public comment periods beyond the 45-day minimum³⁸⁴ to facilitate as much public participation as possible.

VII. CONCLUSION

The proposed Via Verde project would cut a swath across the entire island of Puerto Rico as well as its sensitive northern coast region, traversing some of the most unique and richly diverse aquatic and biological habitat, not only in the United States but anywhere in the world. Evaluation of the proposed project's purpose and need, alternatives to, and impacts associated with the project on these precious resources calls upon the Corps to conduct a careful and comprehensive review in compliance with the CWA, ESA, and NEPA. For all the reasons discussed in these comments, the Applicant has failed to provide the Corps with sufficient information to allow the Corps to consider and evaluate the application; therefore, we request the Corps deny the dredge-and-fill permit for the Via Verde project. Specifically, the Applicant has

³⁷⁶ See e.g., Ian Levesque, et. al., CONSERVATION ANALYSIS IN THE MUNICIPALITY OF TOA BAJA, PUERTO RICO (May 3, 2006) available at www.wpi.edu/Pubs/E-project/Available/E-project-050206.../Report.pdf (noting the presence of community groups such as Casa Pueblo in Adjuntas, los Ciudadanos Pro Bosque del San Patricio in San Patricio, and los Ciudadanos pro Bosque del Plantio in Toa Baja) (App. at 70).

³⁷⁷ 40 C.F.R. §§ 1502.9, 1501.7, 1506.6 (2010).

³⁷⁸ 40 C.F.R. § 1502.9 (2010).

³⁷⁹ 40 C.F.R. § 1508.25 (2010).

³⁸⁰ 40 C.F.R. § 1506.10 (2010).

³⁸¹ 40 C.F.R. § 1502.9 (2010).

³⁸² *Declaración de Impacto Ambiental Final para el Proyecto Via Verde de Puerto Rico*, P.R. POWER AUTH., http://www.acepr.com/viaverde_DIAP2.asp (last visited on Apr. 17, 2011).

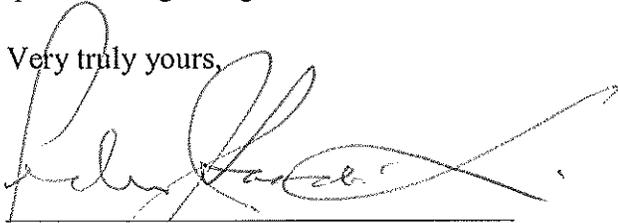
³⁸³ See *supra* Section VI of these comments.

³⁸⁴ 40 C.F.R. § 1506.10 (2010).

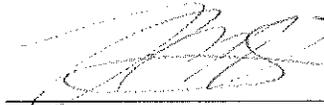
failed to overcome the strong presumption that less environmentally damaging alternatives exist and that alternatives which avoid wetlands and other special aquatic sites are less environmentally damaging. As a result, the Applicant has failed to make the "clear demonstration" that it must in order to meet its burden of demonstrating that its proposed project is the least environmentally damaging practicable alternative. If and when the Applicant submits an application with sufficient information, we urge the Corps to invite and encourage extensive public input and participation in all stages of its permitting and environmental review processes. We also urge the Corps to evaluate the Via Verde project in full compliance with all applicable laws and regulations, including the Guidelines, ESA and NEPA. The natural resources and human environment that could be irreversibly harmed through this large-scale industrial project are unique and extensive and, as the Corps recognized in its April 13, 2011 letter to EPA, the Applicant has failed to provide all of the relevant information necessary to process the permit and even then, the proposed project may still not be permissible. We appreciate the Corps' consideration of these comments and we urge the Corps to deny the Applicant's permit for the Via Verde project.

Thank you for your consideration of these comments. Please contact Pedro Saadé Llorens at saadellorensp@microjuris.com or Rafael Espasas at espasas@gmail.com if you have any questions regarding these comments.

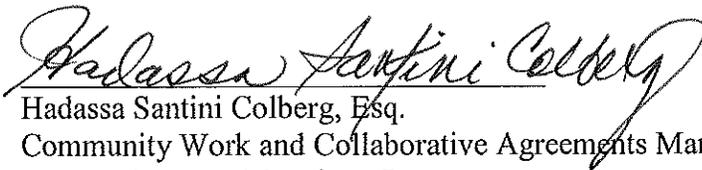
Very truly yours,



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Hadassa Santini Colberg, Esq.
Community Work and Collaborative Agreements Manager
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Enclosure: Compact Disc with Appendix to Comments regarding SAJ 2010-02881 (IP-EWG),
Via Verde Pipeline Project

cc: Edgar W. Garcia, *U.S. Army Corps of Engineers-Antilles Office*
Sindulfo Castillo, *Antilles Regulatory Section, U.S. Army Corps of Engineers*
Cynthia K. Dohner, *Regional Director, U.S. Fish and Wildlife Service*
Miles M. Croom, *Assistant Regional Administrator, National Marine Fisheries Service*
Carl-Axel P. Soderberg, *U.S. Environmental Protection Agency*
Judith A. Enck, *Regional Administrator, U.S. Environmental Protection Agency*
Carlos Machado, *Federal Highway Administration*
Kimberly D. Bose, *Federal Energy Regulatory Commission*

Carlos A. Rubio, *State Historic Preservation Officer*

Juan Cortés Lugo; Sofía Colón Matos; Luis Guzmán Meléndez; Ana Oquendo Andújar; Iván Vélez González; Francisca M. Montero Colón; Sol María De Los Ángeles Rodríguez Torres; Iván Carlos Belez Montero; Arístides Rodríguez Rivera; Ada I. Rodríguez Rodríguez; Alex Noel Natal Santiago; Miriam Negrón Pérez; Francisco Ruiz Nieves; Silvy Jordán Molero; Ana Serrano Maldonado; Félix Rivera González; William Morales Martínez; Trinita Alfonso Vda. De Folch; Alejandro Saldaña Rivera; Dixie Vélez Vélez; Dylia Santiago Collaso; Ernesto Forestier Torres; Miriam Morales González; Fernando Vélez Vélez; Emma González Rodríguez; Samuel Sánchez Santiago; Raquel Ortiz González; Maritza Rivera Cruz; Virginio Heredia Bonilla; Lilian Serrano Maldonado; Yamil A. Heredia Serrano; Jean Paul Heredia Romero; Pablo Montalvo Bello; Ramona Ramos Dias; Virgilio Cruz Cruz; Cándida Cruz Cruz; Amparo Cruz Cruz; Gilberto Padua Rullán; Sabrina Padua Torres; Maribel Torres Carrión; Hernán Padín Jiménez; Rosa Serrano González; Jesús García Oyola; Sucesión de Ada Torres, compuesta por Carmen Juarbe Pérez, Margarita Forestier Torres y Ernesto Forestier Torres; Comité Bo. Portugués Contra el Gasoducto; María Cruz Rivera; Cristóbal Orama Barreiro; Haydee Irizarry Medina; Comité Utuadeño en Contra del Gasoducto; Miguel Báez Soto; and Gustavo Alfredo Casalduc Torres, *Clients*

Teresa Clemmer, *VLS Environmental and Natural Resources Law Clinic*

Michelle Walker, *VLS Environmental and Natural Resources Law Clinic*

Sheryl Dickey, *VLS Environmental and Natural Resources Law Clinic*

Appendix

SAJ 2010-02881 (IP-EWG), Via Verde Pipeline Project



DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
WASHINGTON, D.C. 20314-1000

REPLY TO
ATTENTION OF:

CECC-E

9 May 1989

MEMORANDUM FOR: SEE DISTRIBUTION

SUBJECT: Permit Elevation, Plantation Landing Resort, Inc.

1. Enclosed for your information and guidance is the recent decision of the Director of Civil Works in the subject permit elevation case. This decision was prepared by the Office of the Chief Counsel, CECC-E, because it involves legal issues; however, it also involves major policy issues, and was approved by the Civil Works Directorate, CECW-ZA and CECW-OR. Moreover, this decision was fully coordinated with the Office of the Assistant Secretary of the Army (Civil Works) and the Office of the General Counsel of the Army. Please provide the enclosed extra copy of the document to your FOA's regulatory branch for their use and guidance.

2. In the near future, HQUSACE expects to promulgate a Regulatory Guidance Letter (RGL) based on the substance of this permit elevation decision. However, since some time may elapse while such a RGL is coordinated with EPA, the full text of the decision is provided now for your use.

FOR THE CHIEF COUNSEL:

Enclosures

LANCE D. WOOD
Assistant Chief Counsel
Environmental Law and
Regulatory Programs



DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
WASHINGTON, D.C. 20314-1000

REPLY TO
ATTENTION OF:

21 APR 1989

CECW-ZA

MEMORANDUM THRU Commander, U.S. Army Engineer Division, Lower
Mississippi Valley

FOR Commander, U.S. Army Engineer District, New Orleans

SUBJECT: Permit Elevation, Plantation Landing Resort, Inc.

1. By memorandum dated 3 February 1989, the Assistant Secretary of the Army (Civil Works) advised me that he had granted the request of the Environmental Protection Agency (EPA) and the Department of Commerce (DOC) to elevate the permit case for Plantation Landing Resort, Inc., to HQUSACE for national policy level review of issues concerning the practicable alternatives and mitigation provisions of the 404(b)(1) Guidelines. My review of the case record provided by the New Orleans District (NOD) leads me to conclude that Corps policy interpreting and implementing the 404(b)(1) Guidelines should be clarified in certain respects. Of course, general guidance interpreting the 404(b)(1) Guidelines ideally should be prepared and promulgated jointly by the Corps and the EPA. (See 40 CFR 230.2(c)). Consequently, representatives of the Office of the ASA(CW) and the Corps from time to time have worked with EPA attempting to develop joint interpretive guidance on important issues under the 404(b)(1) Guidelines, but no final inter-agency consensus has resulted to date. Although I hope and expect that eventually we will be able to promulgate joint Army/EPA guidance, in the interim I believe the guidance provided in the attachment is necessary and will serve a useful purpose.

2. Please re-evaluate the subject permit case in light of the guidance provided in the attachment, and take action accordingly.

FOR THE COMMANDER:

Attachment

Patrick J. Kelly
PATRICK J. KELLY
Brigadier General, USA
Director of Civil Works

Attachment

1. The Corps of Engineers permit regulations state the following at 33 CFR 320.4(a):

"For activities involving 404 discharges, a permit will be denied if the discharge that would be authorized by such permit would not comply with the Environmental Protection Agency's 404(b)(1) guidelines."

2. The 404(b)(1) Guidelines constitute one of the primary regulatory directives requiring the Corps' 404 program to protect wetlands and other special aquatic sites (defined at 40 CFR 230.3 (q-1)) from unnecessary destruction or degradation. Consequently, proper interpretation and implementation of the Guidelines is essential to ensure that the Corps provides the degree of protection to special aquatic sites mandated by the Guidelines and required by the Corps of Engineers wetlands policy (33 CFR 320.4(b)).

3. One key provision of the 404(b)(1) Guidelines which clearly is intended to discourage unnecessary filling or degradation of wetlands is the "practicable alternative" requirement, 40 CFR 230.10(a), which, in relevant part, provides that:

"... no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem ..."

As explained in the preamble to the Guidelines, this provision means that:

"... the Guidelines ... prohibit discharges where there is a practicable, less damaging alternative ... Thus, if destruction of an area of waters of the United States may reasonably be avoided, it should be avoided." (45 Fed. Reg. 85340, Dec. 24, 1980)

4. The 404(b)(1) Guidelines have been written to provide an added degree of discouragement for non-water dependent activities proposed to be located in a special aquatic site, as follows:

Where the activity associated with a discharge which is proposed for a special aquatic site (as defined in Subpart E) does not require access or proximity to or siting within the special aquatic site in question to fulfill its basic purpose (i.e., is not "water dependent"), practicable alternatives that do not involve special aquatic

sites are presumed to be available, unless clearly demonstrated otherwise. (40 CFR 230.10(a)(3))

The rebuttable presumption created by this provision is intended to increase the burden on an applicant for a non-water-dependent activity to demonstrate that no practicable alternative exists to his proposed discharge in a special aquatic site. This presumption is added to the Guidelines' general presumption against discharges found at 40 CFR 230.1(c), which already places the burden of proof on the applicant to demonstrate that his proposed discharge complies with the Guidelines, including the practicable alternative requirement of 40 CFR 230.10(a). (See 45 Fed. Reg. 85338, Dec. 24, 1980)

5. One essential aspect of applying the "practicable alternative" and "water dependency" provisions of the Guidelines to a particular 404 permit case is to decide what is the "basic purpose" of the planned activity requiring the proposed discharge of dredged or fill material. The preamble to the Guidelines provides the following guidance on the meaning of "basic purpose":

"Non-water-dependent" discharges are those associated with activities which do not require access or proximity to or siting within the special aquatic site to fulfill their basic purpose. An example is a fill to create a restaurant site, since restaurants do not need to be in wetlands to fulfill their basic purpose of feeding people. (45 Fed. Reg. 85339, Dec. 24, 1980; emphasis added)

6. The 404(b)(1) analysis for the Plantation Landing Resort, Inc., application, even when read in conjunction with the Statement of Findings (SOF) and the Environmental Assessment (EA), does not deal with the issues of practicable alternatives and water dependency in a satisfactory manner. The 404(b)(1) evaluation itself is essentially a standard form "checklist" with very little analysis or project-specific information. Nevertheless, when one reads the Statement of Findings and Environmental Assessment for the project, one can determine how the New Orleans District (NOD) analyzed the project for purposes of the 404(b)(1) review.

7. One significant problem in the NOD's approach to the 404(b)(1) review is found in the following, which is the only statement in NOD's 404(b)(1) evaluation document presenting a project-specific reference to the Plantation Landing case with respect to the practicable alternative requirement of the Guidelines:

Several less environmentally damaging alternatives were identified in the Environmental Assessment.

The applicant stated and supplied information indicating that these alternatives would not be practicable in light of his overall project purposes. Recent guidance from LMVD states that the applicant is the authoritative source of information regarding practicability determinations, therefore no less environmentally damaging practicable alternatives are available. (NOD's "Evaluation of Section 404(b)(1) Guidelines," Attachment 1, Paragraph 1.a.)

This statement appears to allow the applicant to determine whether practicable alternatives exist to his project. Emphatically, that is not an acceptable approach for conducting the alternatives review under the 404(b)(1) Guidelines. The Corps is responsible for controlling every aspect of the 404(b)(1) analysis. While the Corps should consider the views of the applicant regarding his project's purpose and the existence (or lack of) practicable alternatives, the Corps must determine and evaluate these matters itself, with no control or direction from the applicant, and without undue deference to the applicant's wishes.

8. In the instant case, the NOD administrative record gives the appearance of having given too much deference to the way the applicant chose to define the purpose of his project; this led to characterization of project purpose in such a way as to preclude the existence of practicable alternatives. First, the NOD's Statement of Findings (SOF) concludes the following regarding practicable alternatives:

"... alternative site analysis resulted in no available sites occurring on or near Grand Isle that would allow the applicant to achieve the same purpose as that intended on the property he now owns." (SOF at page 7)

Similarly, NOD's Environmental Assessment (EA) makes the following statement:

"Results of the investigation revealed that a practicable and feasible alternatives site did not exist on Grand Isle or vicinity that would satisfy the purpose and need of the recreational development as proposed on the applicant's own property." (EA at page 85)

9. A reading of the entire record indicates that NOD accepted the applicant's assertion that the project as proposed must be accepted by the Corps as the basis for the 404(b)(1) Guidelines practicability analysis. The applicant proposed a fully-integrated, waterfront, contiguous water-oriented recreational complex, in the form the applicant proposed.

Consequently, NOD apparently presumed that no alternative site could be considered if it could not support in one, contiguous waterfront location the same sort of fully integrated recreational complex that the applicant proposed to build. The EA addresses this point specifically, as follows:

There appear to be alternative sites for the placement of each component of the project. However, alternate sites are not preferable by the applicant because he owns the project site and wishes to realize commercial values from it. Real estate investigations revealed that Grand Isle at present does not offer a less damaging alternative site which satisfies the applicants purpose and need as proposed on his own property. (EA at pages 89-90)

10. The clearest statement from NOD on this point is the following statement from the SOF, which specifically addresses the practicable alternative issue:

In a letter dated August 19, 1988, EPA provided to the Corps verbal and graphic descriptions of their identified alternative project designs and/or sites. EPA requested the Corps and the applicant to consider and evaluate the possibility of utilizing one or a combination of their suggested alternatives for the proposed Plantation Landing Resort. The Corps by transmittal letter dated August 29, 1988, forwarded a copy of the EPA alternatives to the applicant's authorized agent, Coastal Environments, Inc. Coastal Environments, Inc. by letter dated September 12, 1988, provided to the Corps the applicant's response regarding the feasibility of the EPA alternatives. The applicant's response stated that implementation of any of the EPA alternative project designs and/or sites would result in a disarticulated project... Corps policy states that "an alternative is practicable if it enables the applicant to fulfill the basic purpose of the proposed project." After reviewing the applicant's response and evaluating the alternatives myself I have determined that EPA proposed alternatives are not feasible or practicable because they would not allow the applicant to fulfill his intended purpose of establishing a contiguous, fully-integrated waterfront resort complex. (SOF at page 10 emphasis added)

11. The effect of NOD's deferring to and accepting the applicant's definition of the basic purpose of his project as a contiguous, fully-integrated, and entirely waterfront resort

complex in the form the applicant had proposed was to ensure that no practicable alternative could exist. Nevertheless, the administrative record nowhere provides any rationale for why the applicant's proposed complex had to be "contiguous" or "fully integrated" or why all features of it had to be "waterfront." The only reason appearing on the record to indicate why NOD presumed that the project had to be contiguous, fully integrated, and entirely waterfront is that the applicant stated that that was his proposal, thus by definition that was the official project purpose which the Corps must use. That is not an acceptable approach to interpret and implement the 404(b)(1) Guidelines. Only if the Corps, independently of the applicant, were to determine that the basic purposes of the project cannot practicably be accomplished unless the project is built in a "contiguous", "fully integrated," and entirely "waterfront" manner would those conditions be relevant to the 404(b)(1) Guidelines' alternative review. The fact that those conditions may be part of the proposal as presented by the applicant is by no means determinative of that point. Once again, the Corps, not the applicant, must define the basic purpose underlying the applicant's proposed activity.

12. When an applicant proposes to build a development consisting of various component parts, and proposes that all those component parts be located on one contiguous tract of land (including waters of the United States), a question of fact arises: i.e., whether all component parts, or some combination of them, or none, really must be built, or must be built in one contiguous block, for the project to be viable. The applicant's view on that question of fact should be considered by the Corps, but the Corps must determine (and appropriately document its determination) whether in fact some component parts of the project (e.g., those proposed to be built in waters of the United States) could be dropped from the development altogether, or reconfigured or reduced in scope, to minimize or avoid adverse impacts on waters of the United States. For example, in the Hartz Mountain Development Corporation application case the Corps' New York District was faced with a "block development project" proposed to be built on one contiguous tract as an integrated project. Quite properly, the Corps refused to accept the applicant's proposal as a controlling factor in our 404(b)(1) analysis. As the U.S. District Court for New Jersey stated approvingly:

The applicant argued that the shopping center-office park-warehouse distribution center was an inextricably related project which required development on a single interconnected site. This critical mass theory would require any alternative to have the capability of handling the entire multi-faceted project. The Corps of Engineers rejected this theory. The Corps of Engineers considered the project as three separate activities, that is to say, shopping center, office

park, and warehouse distribution center. (National Audubon Society v. Hartz Mountain Development Corp., No. 83-1534D, D.N.J., Oct 24, 1983, 14 ELR 20724; case is cited only for the above-stated point.)

Similarly, the Corps must not presume that the Plantation Landing Resort necessarily needs to be built in one contiguous tract of land, or that it must be "fully integrated", or that all components of it must be "waterfront", or otherwise that the project must be built in the form or configuration proposed by the applicant. Once again, the applicant bears the burden of proof for all the tests of 40 CFR 320.10 to demonstrate to the Corps that his project, or any part of it, should be built in the waters of the United States. The Corps will evaluate the applicant's evidence and determine, independently of the applicant's wishes, whether all the requirements of the Guidelines have been satisfied.

13. The "[r]ecent guidance from LMVD" referred to the NOD's 404(b)(1) evaluation apparently was the 11 March 1987 document whereby the LMVD Commander transmitted to his four District Commanders the HQUSACE guidance letter of 22 April 1986. Clarification of our intentions in the HQUSACE guidance letter of 22 April 1986 is appropriate herein.

14. The language from the 22 April 1986 letter from HQUSACE relevant to this discussion is the following:

"Our position is that LWF v. York requires that alternatives be practicable to the applicant and that the purpose and need for the project must be the applicant's purpose and need."

The essential point of the HQUSACE policy guidance of 22 April 1986 was that under the 404(b)(1) Guidelines an alternative must be available to the applicant to be a practicable alternative. Thus, in the context of LWF v. York, where the applicant proposed to clear his wetland property to grow soybeans, the fact that other farmers might be able to supply the United States with an adequate soybeans supply would not necessarily preclude the applicant in that particular case from obtaining a 404 permit to clear his land to raise soybeans. On the other hand, if affordable upland farmland was available to the applicant, which he could buy, rent, expand, manage, or otherwise use to grow soybeans, that upland tract might constitute a practicable alternative under the Guidelines. The significance of the HQUSACE 22 April 1986 policy guidance regarding project "purpose" was that project purpose would be viewed from the applicant's perspective rather than only from the broad, "public" perspective. For example, in the LWF v. York case (761 F.2d at 1047) the Corps defined the basic purpose for the applicants' land clearing project as being "to increase soybean production or to increase net returns on assets owned by the company." That approach to project purpose, viewed from the

applicant's perspective, was upheld as permissible under the 404(b)(1) Guidelines. In contrast, the plaintiffs had urged that the Corps view project purpose only from the broad, public perspective, i.e., presumably by defining project purpose as "providing the U.S. public a sufficient supply of soybeans, consistent with protection of wetlands". (Obviously, the U.S. public arguably might get sufficient soybeans from other sources even without conversion of wetlands to soybean production.) The Court held that the Corps is not required by the Guidelines to define project purpose in the manner most favorable to "environmental maintenance", or only from the "public" perspective. However, the Court clearly indicated that the Corps was in charge of defining project purpose and determining whether practicable alternatives exist. Similarly, the HQUSACE guidance of 22 April 1986 was intended to follow the reasoning of the Court in LWF v. York that the Corps' 404(b)(1) analysis should include consideration of project purpose and practicable alternatives from the applicant's perspective. That guidance was not intended to allow the applicant to control those two or any other aspect of the 404(b)(1) Guidelines review, nor to require the Corps to accept or use the applicant's preferred definition of project purpose or to adopt without question the applicant's conclusion regarding the availability of practicable alternatives. One must remember that the Guidelines' "practicability" provision (40 CFR 230.10(a) uses the expression "basic purpose". Although the Corps may try to view a project's basic purpose from the applicant's perspective, that cannot change the Guidelines' mandate to use every project's basic purpose for the Guidelines' practicability review. The Guidelines' concept of "basic purpose" was quoted at paragraph 5, above: e.g., "resturants do not need to be in wetlands to fulfill their basic purpose of feeding people." The concept of basic purpose is further discussed in paragraphs 19 through 21, infra.

15. In addition, the LMVD transmittal letter of 11 March 1987 contains the following statement:

" ... minimization of cost is a legitimate factor in determining the applicant's purpose and the purpose of the project."

While the applicant's wish to minimize his costs is obviously a factor which the Corps can consider, that factor alone must not be allowed to control or unduly influence the Corps' definition of project purpose or "practicable alternative", or any other part of the 404(b)(1) evaluation. The preamble to the Guidelines states the following on this point:

The mere fact that an alternative may cost somewhat more does not necessarily mean it is not practicable ..." (45 Fed. Reg. at 85339, Dec. 24, 1980)

This is an important point, because often wetland property may be less expensive to a developer than comparably situated upland property. The Guidelines obviously are not designed to facilitate a shift of development activities from uplands to wetlands, so the fact that an applicant can sometimes reduce his costs by developing wetland property is not a factor which can be used to justify permit issuance under the Guidelines. On the other hand, the 404(b)(1) Guidelines do address the factor of cost to an applicant in the concept of the "practicability" of alternatives, defined at 40 CFR 230.10(a)(2). As the Guidelines' preamble states on this point, "If an alleged alternative is unreasonably expensive to the applicant, the alternative is not "practicable"." (45 Fed. Reg. at page 85343, Dec 24, 1980)

16. The 404(b)(1) Guidelines define the concept of practicable alternative as follows:

An alternative is practicable if it is available consideration cost, existing technology, and logistics in light of overall project purposes. If it is otherwise a practicable alternative, an area not presently owned by the applicant which could reasonably be obtained, utilized, expanded or managed in order to fulfill the basic purpose of the proposed activity may be considered. (40 CFR 230.10(a)(2); emphasis added)

This provision indicates that a site not presently owned by the applicant but which could be obtained, utilized, etc., to fulfill the basic purpose of the proposed activity qualifies as a practicable alternative. Consequently, the definition of "basic purpose" and "overall project purposes" is central to proper interpretation and implementation of the Guidelines' "practicable alternative" test. Moreover, part of the "practicable alternative" test of 40 CFR 230.10(a) is the "water dependency" provision, quoted in paragraph 4, supra, which also is based upon the concept of a project's "basic purpose." That is, the water dependency test states that a practicable alternative is presumed to exist for any proposed activity which does not have to be sited within or require access or proximity to water to fulfill its basic purpose (thus a 404 permit could not be issued unless the presumption is rebutted). (40 CFR 230.10(a)(3))

17. Acceptance of the applicant's proposal to build a fully-integrated, contiguous, waterfront recreational resort complex led NOD to conclude that:

" ... the Corps considers the project to be water dependent in light of the applicant's purpose (SOF, page 7)

This determination had the effect of finding that 339 condominium dwellings, 398 townhouse units, a motel, a restaurant, a cafe, a bar, a diving and fishing shop, and a convenience store, were all "water dependent," merely because they were said to be "integrated" with and "contiguous" to marina facilities. This approach is unacceptable, and contrary to Corps policy since 1976. If the approach used by NOD in the instant case were to gain general acceptance, then proponents of virtually any and all forms of development in wetlands could declare their proposals "water dependent" by proposing to "integrate" them with and to build them "contiguous" to a marina, or simply by adding the expression "waterfront" as a prefix to words such as "home", "motel", "restaurant", "bar", etc. The approach used by NOD in the instant case would render completely meaningless the water dependency provision of the Guidelines.

18. NOD's basis for declaring all aspects of the Plantation Landing Resort proposal to be water dependent was the following:

Individually most components comprising the proposed recreational complex are not dependent upon water to function. However, waterfront availability of proposed facilities is demanded by the public as clearly demonstrated by the success of similar waterfront facilities in adjoining gulf coastal states. Also local demand for waterfront housing is evident by the proposed expansion of Pirates Cove on Grand Isle and the presently ongoing installation of Point Fourchon at Fourchon. (EA at page 85)

One of the primary reasons why regulation of the filling of wetlands is an important Corps environmental mission is precisely because a strong economic incentive (i.e., "demand") exists to fill in many coastal wetlands for housing developments, condominium resorts, restaurants, etc. The fact that "demand" exists for waterfront development, and even the fact that "demand" exists for the filling in of wetlands for waterfront development, is irrelevant to the question of whether any proposed development in a special aquatic site is water dependent under the 404(b)(1) Guidelines. Waterfront development can take place without the filling in of special aquatic sites.

19. Significantly, in 1976 the HQUSACE dealt with essentially the same issues presented in the instant case (i.e., the meaning of "basic purpose" and "water dependency" and the nature of the practicable alternatives review) in the context of a permit case similar to the proposed Plantation Landing Resort case. That 1976 case involved the application of the Deltona Corporation to fill coastal wetlands at Marco Island, Florida, for what at that time was also proposed to be a fully integrated, contiguous, waterfront recreational resort and

housing complex. Although the wording of both the Corps regulations and the 404(b)(1) Guidelines have changed in certain technical respects since 1976, the essential mandate of both remains unchanged. Consequently, the following language quoted from the Chief of Engineers' 1976 decision document for the Marco Island case provides the essential guidance for analyzing the instant case. The Corps will apply the following to the "practicable alternatives" test of the Guidelines:

The benefits of the proposed alteration must outweigh the damage to the wetlands resource, and the proposed alteration must be necessary to realize those benefits. In determining whether a particular alteration is necessary, our regulations require that we primarily consider whether the proposed activity is dependent upon the wetland resources and whether feasible alternative sites are available. ... I recognize that these ... applications involve part of an overall, master planned development, and that it has been suggested that the location of this particular housing development with its related facilities is dependent on being located in this particular wetlands resource in order to complete the overall planned development. Such, however, is not the intended interpretation of this wetlands policy as the Corps perceives it. The intent, instead, was to protect valuable wetland resources from unnecessary dredging and filling operations to fulfill a purpose such as housing, which generally is not dependent on being located in the wetlands resources to fulfill its basic purpose and for which, in most cases, other alternative sites exist to fulfill that purpose. ... The basic purpose of this development is housing, and housing, in order to fulfill its basic purpose, generally does not have to be located in a water resource. Some have suggested that recreational housing requires such a location. But while a derived benefit of "recreational" housing may be the opportunity to recreate in or near the water resource, the basic purpose of it still remains the same: to provide shelter. (Report on Application for Department of the Army Permits to Dredge and Fill at Marco Island, Collier County, Florida, 6th Ind., 15 April 1976, pages 91-92)

20. It follows that the "basic purpose" of each component element of the proposed Plantation Landing Resort must be analyzed in terms of its actual, non-water-dependent function.

The basic purpose of the condominium housing is housing (i.e., shelter); the basic purpose of the restaurant is to feed people; etc. The Corps will not conclude that housing, restaurants, cafes, bars, retail facilities, or convenience stores are water dependent; they are essentially non-water-dependent activities. Moreover, they do not gain the status of water-dependent activities merely because the applicant proposes to "integrate" them with a marina, or proposes to build them on a piece of land contiguous to a marina, or proposes that any of these non-water-dependent facilities should be "waterfront" or built on waterfront land. The concepts of "integration", "contiguity", and "waterfront" must not be used to defeat the purpose of the "water dependency" and "practicable alternatives" provisions of the Guidelines, nor to preclude the existence of practicable alternatives.

21. In light of the foregoing guidance, your re-evaluation of the proposed Plantation Landing Resort (and comparable future proposals) should proceed as follows. First, determine whether each component part of the project is water dependent or not in light of that component's basic purpose. For example, the proposed marina is water dependent, but the proposed housing units, motel, restaurant, etc., are not. Second, for component parts of the project which are not water dependent, a presumption arises that an alternative, upland site is available. The applicant may be able to rebut that presumption with clear and convincing evidence. Closely related to this inquiry is the question whether the non-water-dependent components of the project actually must be integrated with or contiguous to the water dependent part(s) in such a manner as to necessitate their location in a special aquatic site. Once again, a presumption exists that the non-water-dependent components of the project do not have to be contiguous to or integrated with water-dependent parts (e.g., the marina) to be practicable (e.g., economically viable). As stated before, the applicant may be able to rebut the presumption with clear and convincing evidence. Only if the applicant rebuts these presumptions can the Corps conclude that some (or all) of the non-water-dependent components of the overall project pass the tests of 40 CFR 230.10(a)(3).

22. Another problem in NOD's approach to the plantation landing case is the District's assertion that the loss of wetlands which the project would cause is inconsequential, because "... project alterations of wetlands represents a very small portion of similar habitat within the project vicinity and coastal Louisiana... only 2.39% of the saline marsh on Grand Isle and only 0.005% of the saline marsh in coastal Louisiana..." (SOF at page 7). While this consideration may have some relevance to the decision of this case, it ignores the fact that the cumulative effects of many projects such as Plantation Landing can add up to very significant wetlands loss. The 404(b)(1) Guidelines and the Corps wetlands policy at 33 CFR 320.4(b) both

deal with cumulative losses of special aquatic sites as a significant concern. For example, the Guidelines define cumulative impacts at 40 CFR 230.11(g)(1) as follows:

Determination of cumulative effects on the aquatic ecosystem. Cumulative impacts are the changes in an aquatic ecosystem that are attributable to the collective effect of a number of individual discharges of dredged or fill material. Although the impact of a particular discharge may constitute a minor change in itself, the cumulative effect of numerous such piecemeal changes can result in a major impairment of the water resources and interfere with the productivity and water quality of existing aquatic ecosystems.

Among the mandatory provisions of the Guidelines which deal with cumulative effects is 40 CFR 230.10(c), which prohibits discharges "which will cause or contribute to significant degradation of the waters of the United States." It follows that the proposed destruction of 22 acres of special aquatic sites by the subject proposed development cannot be dismissed as unimportant.

23. An additional rationale given by NOD in this case to justify issuance of the permit with minimal required compensatory mitigation is the assertion that "the project site is eroding at a rapid rate and will be lost regardless of project implementation..." (SOF at page 7). To the extent that erosion rates can be reliably and accurately determined, the ongoing and predicted erosion of a wetland may be a legitimate consideration under the Corps public interest review. However, NOD's reliance on predicted erosion rates in the instant case is problematical, for at least two reasons. First, substantial doubt and disagreement apparently exist regarding how rapidly the marshland at issue here is likely to erode. Second, even if the more rapid projected rate of erosion is accepted as valid, that fact cannot negate the ecological value of the special aquatic site over time. That is, even if the marsh were to erode at the projected rate of the Environmental Assessment, it would still provide valuable detritus and fish and wildlife habitat for more than fifty years into the future, and would be replaced by ecologically valuable shallow water habitat even after erosion. Consequently, the marsh's status as a special aquatic site under the 404(b)(1) Guidelines remains, regardless of the erosion factor.

24. Of course, notwithstanding all of the above, in a particular, given case (which might or might not be the Plantation Landing Resort application) the Corps public interest review and the 404(b)(1) Guidelines may allow the District Engineer to grant a permit for the filling of wetlands, even for a non-water-dependent activity. This would occur only if the applicant has clearly rebutted the presumptions against filling

wetlands found at 40 CFR 230.10, and has clearly rebutted the presumptions of 230.10(a) with convincing evidence that no practicable alternative exists which would preclude his proposed fill. In such a circumstance the mitigation requirements of 40 CFR 230.10(b), (c), and (d) come into play. For some time the Corps has been working with the EPA to negotiate a mutually agreeable mitigation policy under the 404(b)(1) Guidelines. While no such common policy has yet been promulgated, the circumstances of the instant case demonstrate that some sort of interim guidance on mitigation is important.

25. In the Plantation Landing Resort case the NOD proposed to issue Corps permits authorizing the filling of 22 acres of tidal marsh and 37 acres of shallow bay bottom, according to NOD's Public Notice of 7 Dec 1987 (page 1). The EPA and NMFS contend that the proposed project would adversely impact a total of approximately 102 acres of wetlands and shallow open water bay bottom, considering both direct and indirect project impacts. Regardless of which figure for project impacts is more relevant, the fact remains that the total mitigation requirement which NOD proposed to satisfy 40 CFR 230.10 was to dispose of dredged material from the project's channel dredging operations in a manner which would create five acres of marsh, and to add thereto with subsequent dredged material from future maintenance dredging operations for the resort's channel. For impacts on wetlands and productive shallow bay bottom areas of a project such as the instant case presents, NOD's proposed mitigation requirement appears inadequate.

26. Pending the promulgation of further guidance on mitigation, NOD should require mitigation measures which will provide compensatory mitigation, to the maximum extent practicable, for those values and functions of the special aquatic site directly or indirectly adversely impacted by the proposed development activity. Of course, such mitigation measures should be developed after appropriate consultation with Federal and state natural resource agencies, but the decision regarding how much mitigation to require and regarding the form and nature of the mitigation will be made by the District Engineer.

27. The general conclusion to be drawn from the guidance given above is that the Corps should interpret and implement the 404(b)(1) Guidelines, and for that matter the Corps public interest review, in a manner which recognizes that most special aquatic sites serve valuable ecological functions, as specified at 33 CFR 320.4(b). Such valuable special aquatic sites should be protected from unnecessary destruction. Consequently, the Corps regulatory program should give potential developers of special aquatic sites the proper guidance to the effect that special aquatic sites generally are not preferred sites for development activities. Moreover, for ecologically valuable wetlands such as those at stake in the instant case, developers should understand that proposed non-water-dependent development activities will generally be discouraged.



DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
WASHINGTON, D.C. 20314-1000

REPLY TO
ATTENTION OF

CECW-OR

17 AUG 1989

MEMORANDUM THRU COMMANDER, NORTH ATLANTIC DIVISION
FOR COMMANDER, NEW YORK DISTRICT

SUBJECT: Permit Elevation, Hartz Mountain Development Corporation

1. By memorandum dated 26 May 1989, the Assistant Secretary of the Army (Civil Works) advised me that he had granted the request of the Environmental Protection Agency (EPA) and the Department of Interior (DOI) to elevate the permit case for Hartz Mountain Development Corporation. In this regard, the case was elevated to HQUSACE for national policy level review of issues concerning the mitigation and practicable alternatives provisions of the 404(b)(1) Guidelines.

2. Based on our review of the administrative record and meetings with your staff, the applicant, EPA and DOI, we have determined certain aspects of interpreting and implementing the guidelines should be clarified. Our conclusions are stated in the enclosed report titled Hartz Mountain 404(q) Elevation, HQUSACE Findings.

3. Please re-evaluate the subject permit in light of the guidance provided in our findings and take action accordingly. In order for us to comply with paragraph 8 of the Department of the Army/EPA Memorandum of Agreement, please notify HQUSACE Regulatory Branch as soon as you reach a permit decision. Questions or comments concerning this elevated case may be directed to Mr. Michael Davis of my regulatory staff at (202) 272-0201.

FOR THE COMMANDER:

Enclosure

Patrick J. Kelly
PATRICK J. KELLY
Brigadier General (P), USA
Director of Civil Works



WASHINGTON, D.C. 20310-0103

MIKE DAVIS
504 4197

17 AUG 1989

MEMORANDUM FOR THE DIRECTOR OF CIVIL WORKS

SUBJECT: Hartz Mountain Permit Elevation Case

This is in reply to your memorandum of July 26, 1989, concerning the subject elevated permit case. We have reviewed your draft findings and concur with your conclusions. You should notify the New York District to proceed in light of the guidance provided in your findings.

The findings provide an excellent analysis of the issues in a complex case. We particularly like the format used to present your analysis and recommend it be used as a model in the future. Mr. Michael Davis, the case action officer, is to be commended for his efforts.

Since much of the guidance and information contained in the findings is applicable to all Section 404 permit applications, please distribute to Corps FOAs.

A handwritten signature in black ink, appearing to read "Robert W. Page".

Robert W. Page
Assistant Secretary of the Army
(Civil Works)

HARTZ MOUNTAIN 404(q) ELEVATION

HQUSACE FINDINGS

PREPARED BY CECW-OR
26 JULY 1989



DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
WASHINGTON, D.C. 20314-1000

REPLY TO
ATTENTION OF:

CECW-OR

17 AUG 1989

Ms. Rebecca Hanmer
Acting Assistant Administrator
for Water
Environmental Protection Agency
Washington, DC 20460

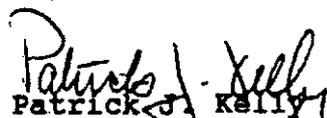
Dear Ms. Hanmer:

Pursuant to the Section 404(q) Memorandum of Agreement (MOA) between the Department of the Army and the Environmental Protection Agency, we are enclosing a copy of our "Findings" which addresses the policy issues you raised in reference to the Hartz Mountain permit case.

We have directed the Army Corps of Engineers, New York District to undertake additional review of the Hartz Mountain permit application in light of the conclusions presented in our findings. Specifically, additional information on practicable alternatives and the baseline values of the existing wetland and proposed wetland enhancement is required before a permit decision can be made. In accordance with paragraph 8 of the MOA we will notify you of the District's decision.

Your interest in this matter and the cooperation of your staff is appreciated. Questions or comments concerning this elevated case may be directed to Mr. Michael Davis of my regulatory staff at (202) 272-0201.

Sincerely,


Patrick J. Kelly
Brigadier General (P), U. S. Army
Director of Civil Works

Enclosure

HQUSACE REVIEW FINDINGS HARTZ MOUNTAIN PERMIT ELEVATION

The purpose of this document is to present the findings of the Headquarters Corps of Engineers (HQUSACE) review of policy issues associated with a permit application before the New York District (District). This review was undertaken in accordance with the 1985 Memoranda of Agreement (MOAs) between the Department of the Army and the Environmental Protection Agency (EPA) and the Department of Interior (DOI).

I. BACKGROUND

On 4 August 1986 the Hartz Mountain Development Corporation requested Department of the Army authorization to discharge fill material into 97.41 acres of tidal wetlands within the New Jersey Hackensack Meadowlands District for the purpose of constructing a 3,301 unit residential housing development. Specifically, the project involves the discharge of approximately 950,000 cubic yards of fill material into wetlands dominated by common reed (*Phragmites communis*). A public notice describing the proposal was issued on 22 May 1987, and a public hearing was conducted in June of 1987. A number of comments both for and against the project were received in response to the public notice and hearing. Three Federal agencies, EPA, Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) all objected to the issuance of a permit for the proposed project.

Interagency coordination on the permit application proceeded for approximately 18 months during which time additional information was submitted by Hartz Mountain and their consultants. In July 1988 the District completed the preliminary permit decision process and determined that the project was not contrary to the public interest provided that Hartz Mountain comply with certain restrictions and conditions aimed at minimizing the environmental impacts of the project. Since the Federal resource agencies continued to object to permit issuance, a meeting was held with each agency in accordance with the procedures of the MOAs. As a result of these meetings, each agency provided detailed written comments on their specific concerns. In general each agency's concerns centered on the application of the 404(b)(1) Guidelines practicable alternative requirements, the District's contention that the wetland was of very low value, and the adequacy of the mitigation plan to offset environmental impacts. The District forwarded these comments to Hartz Mountain for response and/or rebuttal. After considering the information contained within the

administrative record, the District completed decision-making in January 1989. Again, the District determined that the permit should be issued. In response to the District's decision, EPA, FWS and NMFS requested meetings with the North Atlantic Division Engineer (NAD) to discuss the permit decision in accordance with Paragraph 6 of the MOAs. As a result of these meetings, NAD forwarded comments and suggestions to the District on 8 March 1989. The comments and suggestions concerned the language of four special conditions which NAD recommended be reworded to increase the viability of the mitigation requirements. The District incorporated these recommendations into the permit conditions and a decision to issue the permit was made on 28 March 1989. On 28 March 1989, EPA, FWS and NMFS were given written notice of the District's "Intent to Issue" the permit.

In accordance with the MOAs, in letters of April 24 and 25, the DOI and EPA, respectively, requested that the Assistant Secretary of the Army (Civil Works) [ASA(CW)] elevate the Hartz Mountain permit decision for higher level review. NMFS, while continuing to object to the project, did not request elevation. On 26 May 1989, ASA(CW), based on recommendations from HQUSACE, granted the DOI and EPA elevation request. ASA(CW) granted the request and forwarded the action to HQUSACE for national policy level review of 404(b)(1) Guidelines issues concerning mitigation and the analysis of practicable alternatives. The elevation request was not based on insufficient interagency coordination.

The information in the following sections presents the results of the HQUSACE review of the complete administrative record of the Hartz Mountain permit application. Clarification of information contained in the record was obtained through meetings with the applicant and associated consultants, the District and NAD staff, the FWS and EPA.

In terms of environmental protection, the 404(b)(1) Guidelines (Guidelines) form an essential component of the Corps' 404 regulatory program. The Guidelines (40 CFR 230) are the substantive environmental criteria to be used in evaluating the impacts of discharges of dredged or fill material. In accordance with the Corps regulations (33 CFR 320 - 330), a 404 permit cannot be issued unless it complies with the Guidelines. HQUSACE's review of this case focused on the policy issues concerning compliance with the Guidelines.

II. PRACTICABLE ALTERNATIVES

A key provision of the Guidelines is the practicable alternative test which provides that "no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse

impact on the aquatic ecosystem" [40 CFR 230.10(a)]. In this respect, if a 404 discharge may reasonably be avoided, "it should be avoided."

In addition to the basic alternatives test, 230.10(a)(3) establishes a rebuttable presumption against discharges into "special aquatic sites" for non-water dependent activities. A non-water dependent activity does not require access or proximity to or siting within a special aquatic site to fulfill its "basic purpose." Practicable alternatives to non-water dependent activities are presumed to be available and to result in less environmental loss unless clearly demonstrated otherwise by the applicant. The Hartz Mountain project (housing) is clearly a non-water dependent activity. This fact is well documented in the District's decision documents and has not been contested by the applicant. Therefore, the burden of proving that no practicable alternative exists is the sole responsibility of Hartz Mountain, not the District or resource agencies.

A prerequisite to evaluating practicable alternatives is the establishment of the "basic purpose" of the proposed activity. It is the responsibility of the Corps districts to control this, as well as all other aspects of the Guidelines analysis. While the Corps should consider the applicant's views and information regarding the project purpose and existence of practicable alternatives, this must be undertaken without undue deference to the applicant's wishes. These general issues were discussed and guidance provided in the HQUSACE findings for the "Permit Elevation, Plantation Landing Resort, Inc." dated 21 April 1989, a copy of which has been provided to all Corps divisions and districts. Much of the legal and policy guidance in that document is generally applicable to this case, and need not be repeated herein.

In this case, Hartz has clearly stated that their project purpose was to construct 3,301 units of residential housing in the IR-2 area. In fact, a July 86 "planners report" submitted with the permit application stated that "a site geographically located outside the Meadowlands District would not fulfill the 'basic project purpose' of 401(b)(1) [sic] of the Permit program." The IR-2 site is an area designated by the Hackensack Meadowlands Development Commission's (HMDC) master plan as "Island Residential" housing. Hartz acquired ownership to 194 acres of the 238 acre site in 1979. Based on concerns of the District, Hartz ultimately modified the project purpose to expand the potential project area to New Jersey Housing Region 1 (Hudson, Passaic and Bergen Counties). However, Hartz asserts that its purpose remains the construction of a large scale (3,301 units) housing development. While it appears that the District made a conscious effort to view the project from a more basic purpose perspective, this was not the approach taken by Hartz in evaluating potential alternative sites [404(b)(1) evaluation page 5]. This was verified by Dr. Harvey

Moskowitz, Community Planner and consultant for the applicant, who conducted the analysis of alternative sites. This approach seriously flaws the validity of the alternatives analysis and is inconsistent with the Guidelines. Limiting project sites to those that can facilitate a 3,301 unit development may preclude the evaluation of otherwise practicable alternatives. Acceptance of this very restrictive alternatives analysis negates all attempts to otherwise more generically define basic project purpose. In this case, in the "Summary Discussion of the Availability of Practicable Alternatives" [404(b)(1) evaluation page 13] the District states that "There are no practicable alternative sites that are reasonably available to the applicant for the proposed construction activities within the Northeastern New Jersey Region which would meet the applicant's project purpose and the stated need for the project" (emphasis added).

The Guidelines alternatives analysis must use the "basic project purpose", which cannot be defined narrowly by the applicant to preclude the existence of practicable alternatives. On the other hand, the Corps has some discretion in defining the "basic project purpose" for each Section 404 permit application in a manner which seems reasonable and equitable for that particular case. It is recognized that this particular case may be unusual, because it involves unique issues of zoning and land use planning by the HMDC and the apparent scarcity of undeveloped land in the Region 1 area. However, federal concerns over the environment, health and/or safety will often result in decisions that are inconsistent with local land use approvals. In this respect, the Corps should not give undue deference to HMDC or any other zoning body.

At the request of the District, Hartz conducted a search for potential alternative sites in Region 1. Ultimately, 43 sites were identified and evaluated by Hartz's consultant, Dr. Moskowitz. Each site was evaluated based on a set of criteria developed by Hartz. The District reviewed the criteria and concluded that they were "appropriate for reviewing sites for practicability with regard to the Section 404(b)(1) Guidelines." While this approach may be an acceptable method for evaluating alternative sites, we are concerned that some of the criteria were biased to the extent that only sites that meet the applicant's purpose were considered. For example, alternative sites less than 50 acres were not considered practicable because they would not facilitate a 3,301 unit development and therefore "achieve the applicant's stated project goals" [404(b)(1) evaluation page 8]. On this subject the District states:

"Based on the applicants goal's for a profit, it must be presumed that the size of a potential alternative site is of primary importance. A smaller parcel of land could be considered a practicable alternative for a residential housing project although it could not accommodate a

project nearly the size that is the subject of the present permit application." [404(b)(1) evaluation page 7]

In this case the District's administrative record gives the appearance of having given too much deference to the applicant's narrowly defined project purpose. This may have very well resulted in the exclusion of otherwise practicable alternatives.

The District goes to great length to explain the criteria utilized by the applicant and the justification for each [404(b)(1) evaluation page 8]. However, no information is provided in the decision documents on the specific sites, the ratings they received, or why they failed as practicable alternatives. At a minimum, a table of the sites listing this information should have been included in the 404(b)(1) evaluation. In regard to the actual evaluation of the 43 potential sites, we observed at least a few discrepancies in the data submitted by the applicant. For example, two adjacent sites (4 and 5) were given different ratings on accessibility to public transportation. Of more significance, is the fact that the IR-2 site was not evaluated against the criteria used for the other sites. Our estimates indicate that the site may in fact not pass as a practicable alternative based on the applicant's own system for analyzing alternatives. Failing to evaluate the project site when using this type of evaluation system is inappropriate and indicates that the applicant has not rebutted the presumption against the discharge of fill material into special aquatic sites.

Throughout the decision documents the District mentions the need for housing in the Region and references New Jersey Council on Affordable Housing (COAH) information [Statement of Findings (SOF) page 14, 404(b)(1) evaluation page 11, Environmental Assessment (EA) page 2]. While the need for all types of housing in the Region may be very real, we are concerned that the administrative record does not clearly demonstrate the existence of such a need. The COAH information focuses on the need for low to moderate income housing and this portion of the housing need is not questioned. However, it appears that the District relied on the COAH data to substantiate the need for housing above the moderate income level. Admittedly the COAH information translates an actual need of 42,534 low/moderate units to an overall figure of 213,000 housing units. This is based on the number of market rate units that may be required to support the actual low/moderate housing needs. Use of this information to justify an overall housing need may not be appropriate. Further, reference to a COAH letter on page 11 of the 404(b)(1) evaluation is misleading if not inaccurate. The District states:

"The 27 September 1988 correspondence from the State of New Jersey's Council on Affordable Housing (COAH) substantiates the applicant's showing that no reasonably available

practicable alternative sites to the proposed development exist by focusing on the 'compelling need' for locating the housing in Secaucus at the Mill Creek site, at the densities mandated by the Hackensack Meadowlands Development Commission zoning regulations."

What the referenced COAH letter really states is that there is a need for 42,534 low to moderate income units and that it may take four market units per low/moderate unit to support such housing. In regard to the "compelling need" at the Mill Creek site (IR-2), the COAH letter states:

"The COAH supports the development of affordable housing units at the Mill Creek site as a meaningful step toward addressing the compelling need for such housing in Secaucus and Region 1." (emphasis added)

The proposed project will provide a maximum of 330 (10% of total) low to moderate income units at the IR-2 site. The administrative record and discussions with the applicant indicate that it is likely that only one half of the 330 units will actually be built at the IR-2 site. The decision documents consistently state that 10% to 20% of the project will be dedicated to low to moderate housing. This is clearly not the case and the record should reflect such. Further, the need for housing of any type and the zoning requirements of HMDC cannot override the Guideline's requirement to select the least damaging practicable alternative.

CONCLUSIONS:

1. For purposes of this case only, the basic project purpose should be defined as "construction of a large scale, high density housing project in the Region 1 area." That does not necessarily mean a project of 3,301 units in one contiguous location as proposed by Hartz. The District should determine the minimum feasible size, circumstances, etc., which characterize a viable large scale, high density housing project. The District may require the applicant to provide information that facilitates completion of this determination. Clearly Hartz has previously determined that a development of 2,748 units would be feasible. It may very well be that a smaller development (i.e., < 2,748 units) would also be viable. The permit decision documents should be corrected to reflect the project purpose noted above (i.e., references to satisfying the applicant's project purpose should be deleted).

2. Once the minimum feasible size, etc. has been determined in accordance with (1.) above, a revised alternative analysis should be completed by Hartz. The District must carefully evaluate the criteria used to compare alternative sites. The alternatives analysis must be objective and balanced, and not be used to provide a rationalization for the applicant's preferred result (i.e., that

no practicable alternative exists). The IR-2 site must be included in the alternatives evaluation and added to the administrative record.

3. The alternative site data should be made part of the decision documents. This should include a listing of all sites, their evaluation scores and a summary of the final determination of practicability.

4. Information on the need for housing must be accurately cited in the decision documents and additional information on the overall housing need (i.e., above moderate level) should be provided.

III. MITIGATION¹

As previously discussed, the Guidelines establish the substantive environmental criteria to be applied in the evaluation of potential impacts associated with discharges of dredged or fill material into waters of the United States. In addition to the "practicable alternative" test in 230.10(a), the Guidelines state that a discharge cannot be approved, except as provided under 404(b)(2), if it results in significant degradation of waters of the United States and, unless all appropriate and practicable steps have been taken to minimize potential adverse impacts on the aquatic ecosystem [230.10 (c) and (d)]. These form an important part of the current approach of requiring mitigation in the 404 regulatory program. Mitigation is also a required consideration under the Corps' Public Interest Review [33 CFR 320.4(r)].

As a general rule, once the least damaging practicable alternative has been selected, appropriate and practicable steps must be taken to mitigate the project impacts. Determining the amount and type of mitigation is often difficult at best. In particular, compensatory mitigation for wetlands loss engenders a considerable amount of controversy and discussion among regulatory and resource agencies and the development community. In order to improve consistency, Army and EPA are currently working on a 404 mitigation policy.

Pending the promulgation of the joint mitigation policy, the Corps should require mitigation measures which will provide compensation, to the maximum extent practicable, for all values and functions that are lost or adversely impacted as a result of

¹The discussion of mitigation that follows, and any subsequent requirements, have no bearing on the previous discussion and requirements concerning the availability of practicable alternatives.

a proposed development in waters of the United States. As with other permit specific Guidelines and public interest decisions, a determination of mitigation requirements will be made by the Corps. Such decisions should be made after appropriate consultation with Federal and state resource agencies. The Corps decision must be made in a manner that recognizes the ecological functions of special aquatic sites, in this case wetlands.

A prerequisite to developing a wetlands compensatory mitigation plan is the establishment of values and functions of the existing wetland system. Without the benefit of baseline information, the permit decision-maker cannot determine an appropriate mitigation level to find compliance with the Guidelines. As a matter of policy, the Corps should not make permit decisions before obtaining the necessary and appropriate information on the value of the specific resource that would be lost to a proposed discharge of dredged or fill material if the permit is granted. This information may be obtained from the applicant, in-house studies, technical assistance from experts at the Corps Waterways Experiment Station (WES) or universities and previously published reports to mention only a few sources. It is incumbent upon the Corps to review the data carefully to ensure that the information is scientifically sound and can be supported if challenged.

In the Hartz Mountain case an extensive mitigation "concept" was proposed by the applicant. The District relied heavily on the potential success of this concept in reaching a decision to issue the permit. The basic premise of the Hartz mitigation concept was that the existing wetland system was highly degraded and of very low value. In this regard, Hartz maintained that they could enhance low value wetlands (both on-site and at two off-site locations) to a point where they could compensate for the direct loss of 97.41 acres. This assumption is based on a presumed "successful" mitigation project currently under way by Hartz on another part of the IR-2 site. This 63 acre mitigation project was required as part of a 1983 Department of the Army Permit to fill 127 acres of wetlands for commercial and industrial development. To date, no comprehensive evaluations have been completed to substantiate the claims of success on this mitigation project in terms of overall wetland values. For the current project, Hartz determined, using the FWS Habitat Evaluation Procedure (HEP), that they would have to enhance 93.74 acres of wetland and create 22.12 acres of open water canals to compensate for the loss of 97.41 acres. In addition, Hartz proposed 8.84 acres of "raised islands" for upland habitat and 9.40 acres of wetlands preservation.

Throughout the District's review of this case there as been significant disagreement between Hartz and the resource agencies on the actual value of the *Phragmites* dominated wetlands within the project area. The applicant's HEP, which was modified several times, concluded that the area has "relatively low existing fish

and wildlife and ecological value" (emphasis added) (EA page 6). An Advanced Identification field team from the District, EPA, FWS, NMFS, New Jersey Department of Environmental Protection and HMDC conducted a analysis of the Hackensack area using the Corps Wetland Evaluation Technique (WET). According to the District, the "draft WET documents have shown that the general regions encompassing the proposed development site and mitigation areas have high value potential for fish and wildlife, as well as the potential for having moderate to high general ecological value ..." (emphasis added) (EA page 6). The District has indicated that the WET analysis was not specific to the project area and was more of a "windshield" survey. EPA and FWS requests for permit elevation were based, in part, on the lack of definitive data on the values of the project and mitigation sites. FWS continues to question the validity of the applicant's application of the HEP (a FWS methodology) process.

Based on the decision documents for this application, it appears that the District generally concurred with Hartz on the low wetland value of the project area. Their position was based on the HEP evaluation and other environmental data collected by the applicant. However, the addition of Special Conditions (A.) and (D.) seem to indicate that their support was somewhat tacit and that questions on the wetland values remained. Condition (A.) requires Hartz to perform a site specific WET using environmental data from other agencies and the HEP generated information. This information is to be used to "confirm that the proposed wetland mitigation values compensate for the aggregate value of the wetland functions lost to the filling activities..." Special Condition (D.) requires Hartz to undertake a comprehensive sampling and data collection program which includes the establishment of baseline information for the project area. While Hartz has provided biological, chemical and physical data in the form of various surveys and studies conducted over the years, an updated comprehensive scientific report on the existing conditions does not exist in the administrative record. From a policy perspective, we believe that a valid Guidelines determination cannot be made without the benefit of an appropriate assessment of the pre-project values of the impacted resource. This information is equally important in making the Corps public interest determination. Further, this assessment should be completed before a final permit decision is reached. The level and sophistication of information required will vary from application to application depending on the size and nature of the project. It is recognized that in a small number of cases (e.g., unauthorized fill), baseline information may not be readily obtainable and best professional judgement must prevail. However, the piecemeal approach of assessing current wetland values and the reliance on such information as an "April 1986 comprehensive, natural resources survey of the subject parcels and the Hackensack River" are causes for concern.

According to Hartz, completing the proposed mitigation would result in a 20% net increase in overall estuarine value in the project area. For purposes of the mitigation discussion the project area is defined as the 231.51 acre universe of the IR-2 site and the two off-site mitigation areas. The existing estuarine value of the project area was estimated at 38% of its potential. A 20% increase would result in a project area that functions at 46% of its potential estuarine value. When the 97.41 acres of project fill, 8.84 acres of "islands" and the 9.40 acres of preservation are removed from the project area², 115.86 acres remain for marsh enhancement and open water. In order to obtain their estimated 20% overall increase Hartz will have to enhance the 115.86 acres to 91% of their potential estuarine value. In this respect, we are concerned about Hartz's, or anyone's, ability to increase values to such a level. If the open water is subtracted, the remaining 93.74 acres of wetland would have to be enhanced to 113% of its potential estuarine value. Clearly, this would not be possible. In either case additional acreage may be required to achieve the 20% net increase in values required.

Another issue that is of concern is the inclusion of "fringe" wetlands and open water in the mitigation plan. Over 33 acres of the mitigation credit consist of a series of canals and adjacent narrow strips (fringe) of intertidal plantings among 3,301 housing units. The overall wetland value of this part of the mitigation should be documented. The HEP evaluation looked at this area as one 33.85 acre tract and not as one that was dissected by a large residential development. The applicant's main purpose for this part of the plan may very well be aesthetics.

An issue that was initially discussed in the HQUSACE permit elevation recommendations to ASA(CW), was the proposed issuance of the Hartz permit prior to receipt of a detailed mitigation plan. In this case, permit conditioning appears sufficient to ensure that a detailed plan will be submitted for District approval prior to the discharge of fill material. However, at a minimum, the permit plans should have provided enough information to accurately reflect the work proposed (e.g., typical cross sections, etc.).

CONCLUSIONS:

1. Hartz should be required to complete a comprehensive baseline study of the IR-2 site, off-site mitigation areas, and the previous 63 acre mitigation site before a final permit decision is made. The District, in consultation with FWS, EPA and NMFS will determine the scope of the study and the methods used. The final call on the study will be the District's.

²Correctly, these areas were not counted by the applicant or the District in determining the amount of marsh enhancement required.

2. The District, not Hartz, should complete a site specific WET evaluation before making a permit decision. We strongly encourage the District to utilize experts from WES to undertake this task. Funding for work of this nature has previously been provided to WES by HQUSACE and initial discussions have confirmed the availability of the appropriate WES staff.

3. The wetland replacement value of the fringe wetlands and open water at the IR-2 site should be reevaluated. Documentation of its value should be included in the record.

4. Once information is obtained from the studies noted in paragraphs one through three above, a determination of the value of the existing *Phragmites* marsh and, as appropriate, the amount of compensatory mitigation required to compensate for the lost resource should be completed. Based on those determinations, a final permit decision should be made.

5. After completion of the above, if a decision is made to issue the permit, Hartz should be required to submit more detailed permit plans. While we do not expect final drawings, basic information such as access between islands at the IR-2 site and typical pre and post project cross sections at all mitigation sites should be included.

IV. GENERAL CONCLUSIONS

A review of the voluminous administrative record reveals the extensive amount of effort on the part of the District to evaluate this application. Severely understaffed and working in a difficult geographic area, they should be commended for their overall accomplishments in the regulatory program.

From the guidance presented in this document, the general conclusion should be drawn that the Army Corps of Engineers is serious about protecting waters of the United States, including wetlands, from unnecessary and avoidable loss. The Corps districts should interpret and implement the Guidelines in a manner that recognizes this. Further, the Corps should inform developers that special aquatic sites are not preferred sites for development and that non-water dependent activities will generally be discouraged in accordance with the Guidelines. When unavoidable impacts do occur, the Corps will ensure that all appropriate and practicable action is required to mitigate such impacts. The mitigation must be properly planned with stringent permit conditions to ensure that it accomplishes stated objectives. Compliance monitoring by Corps districts must be an integral part of this process.

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Before Commissioners: Elizabeth Anne Moler, Chair;
Vicky A. Bailey, James J. Hoecker,
William L. Massey, and Donald F. Santa, Jr.

EcoEléctrica, L.P.)

Docket No. CP95-35-000

ORDER GRANTING NGA SECTION 3 AUTHORIZATION FOR THE
SITING, CONSTRUCTION, AND OPERATION OF LNG FACILITY

(Issued May 15, 1996)

On October 25, 1994, EcoEléctrica, L.P. (EcoEléctrica) filed an application, pursuant to section 3 of the Natural Gas Act (NGA) and Parts 153 and 380 of the Commission's regulations, for authorization of the construction and operation of proposed liquefied natural gas (LNG) facilities and a place of import in the Commonwealth of Puerto Rico (Commonwealth).

We will grant the requested section 3 authorization, subject to the safety and environmental conditions and mitigation measures specified in the appendix to this order.

BACKGROUND AND PROPOSAL

EcoEléctrica is a Bermuda limited partnership formed by affiliates of Enron Development Corporation and KENETECH Energy Systems, Inc.

EcoEléctrica proposes to construct and operate an LNG terminal at Guayanilla Bay, Peñuelas, about nine miles west of Ponce, Puerto Rico, to import LNG. The gas will be used to power a proposed 461 megawatt cogeneration plant, which will sell electricity to the Puerto Rico Electric Power Authority (Power Authority) and use steam to generate additional electricity and to meet the power requirements of a proposed desalination plant. EcoEléctrica notes that the government-created Power Authority supplies virtually all of the electric power consumed in Puerto Rico, that 98 percent of its existing generating capacity is provided by oil-fired units, and that the Power Authority has not added new generating capacity in nearly 20 years. EcoEléctrica states that in an effort to diversify its fuel sources, the Power Authority has elected to import natural gas as a cost effective means to meet anticipated future growth in energy demands in an environmentally acceptable manner. EcoEléctrica and the Power Authority executed a 25-year power purchase contract in March 1995.

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EcoEléctrica's proposed project includes both LNG and non-LNG-related facilities on a 36-acre site. However, the requested section 3 authorization pertains only to certain LNG facilities located on 25 of the site's 36 acres. These facilities consist of (1) a marine terminal with an 1800-foot pier for unloading LNG tankers; (2) two 1,000,000-barrel LNG storage tanks; (3) an LNG vaporization system; (4) various control systems; and (5) piping and other ancillary equipment.

On the remaining portion of the 36-acre site, EcoEléctrica proposes to construct (1) a 461 megawatt electric cogeneration facility that will use vaporized LNG as a fuel source for power generation; (2) a desalination facility capable of producing up to 4,000,000 gallons of fresh water per day; (3) other facilities necessary for the operation of the cogeneration facility, including a 2.3-mile, 230-kilovolt transmission line connecting the planned plant substation to an existing Power Authority substation and a gas line to serve the proposed cogeneration facility; and (4) a gas line to serve the Power Authority's existing Costa Sur Power Plant.

Upon completion, EcoEléctrica will import and store up to 2,000,000 barrels of LNG for use in the 461 megawatt cogeneration facility.

The total estimated cost to construct the EcoEléctrica project is \$600 million.

Construction of the cogeneration and desalination facilities would occur over a two-year period. Construction of the LNG facilities would begin after completion of construction of most of the cogeneration facilities and would occur over a 24- to 30-month period.

NOTICE AND INTERVENTIONS

Notice of EcoEléctrica's application was published in the Federal Register on February 2, 1995 (60 FR 6528). Pan National Gas Sales, Inc. (Pan National) filed a timely, unopposed motion to intervene ^{1/} and Algonquin Gas Transmission Company (Algonquin), Cabot LNG Corporation (Cabot), Total S.A. (Total) and Trunkline LNG Company (Trunkline) filed timely motions to intervene.

Cabot and Pan National comment on, but do not protest, the EcoEléctrica proposal.

^{1/} Timely, unopposed motions to intervene are granted by operation of Rule 214. 18 C.F.R. § 385.214 (1995).

Senator J. Bennett Johnston submitted a letter in support of EcoEléctrica's proposal.

EcoEléctrica's Objections to Motions to Intervene

EcoEléctrica opposes Algonquin's, Cabot's, Total's, and Trunkline's motions to intervene, and replies to the submitted comments.

Cabot claims that "[a]s the largest of only two importers of LNG into North America" it "has an abiding interest in the reliability and safety of the LNG importation industry as a whole and in the industry's continuing image reflecting the highest standards of reliability and safety." 2/ EcoEléctrica challenges Cabot's characterization of its reliability and safety interest in this proceeding as too tenuous to merit standing to intervene under Rule 214. 3/

EcoEléctrica goes on to point out that Cabot is the sole United States buyer from potential LNG sources in Nigeria and Trinidad, Cabot may thus be a competitor of EcoEléctrica's. EcoEléctrica asserts that "Cabot's negotiating position would be enhanced if it could prevent competing buyers of LNG from entering the market" and alleges that "Cabot appears to be attempting to maintain its concentrated market power in the Atlantic Basin by attempting to keep EcoEléctrica out of the LNG import business." 4/

In general, we are inclined to read broadly a party's stated rationale for seeking to intervene in a proceeding in order to assure that no relevant issues go unaddressed. Conditions relating to reliability and safety may establish precedent affecting Cabot. Further, EcoEléctrica admits that it may compete with Cabot. In view of the above potential for the outcome of this case to impact on Cabot, we conclude Cabot has an interest which may be directly affected by the outcome of this proceeding; therefore, Cabot may intervene pursuant to Rule 214.

2/ Cabot's Motion to Intervene, at 2 (February 17, 1995).

3/ Section 385.214(b)(2)(ii) of the Commission's regulations provides for party status where: The movant has or represents an interest which may be directly affected by the outcome of the proceeding, including any interest as a: (A) Consumer, (B) Customer, (C) Competitor, or (D) Security holder of a party.

4/ EcoEléctrica's Answer to Motions to Intervene, at 5 (March 6, 1995).

EcoEléctrica similarly asserts that Algonquin, Trunkline, and Total lack an interest that could be affected by the outcome in this proceeding, and argues these parties should not be permitted to intervene in this proceeding. We disagree. Algonquin and Trunkline have interests in LNG facilities in the United States and we find that the outcome in this proceeding has the potential to effect these LNG operations. Total is involved in a proposal to build, own, and operate a liquified petroleum gas-fired power generation project in Puerto Rico. EcoEléctrica's proposal involves gas supply and power generation in Puerto Rico, issues potentially affecting Total. We find that under Rule 214, Algonquin, Trunkline, and Total have demonstrated sufficient interests in this case to qualify as parties to this proceeding. Accordingly, the contested motions to intervene will be granted.

Cabot's Comments on the EcoEléctrica Proposal

In its motion to intervene, Cabot commented that EcoEléctrica's application neglects to identify its source of LNG supply, 5/ and submits that the Commission should not act until EcoEléctrica submits this information, as required by Commission regulations. 6/

Commission Response

We note that pursuant to NGA section 3 and Department of Energy (DOE) Delegation Order Nos. 0204-111 and 0204-127, DOE's Office of Fossil Energy (FE) has considered the need for and supply of LNG in this case, and has granted EcoEléctrica authority to import up to 130 Bcf of LNG per year for a 40-year term, from October 1, 1997, to December 31, 2037. 7/ DOE/FE will monitor the LNG supply contracts, import volumes, countries of origin, transporters, and price terms. Given the DOE/FE attention to the issue of gas supply, we find no reason to

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- 5/ EcoEléctrica states that possible LNG sources include Abu Dhabi, Algeria, Nigeria, Norway, Oman, Qatar, Trinidad, Venezuela, and Yemen.
- 6/ Sections 153.3 (d) and (f) and Section 153.4 (a), Exhibit E, of the Commission's regulations generally state that as part of an application to import natural gas, the applicant shall provide information showing: the location of the gas field(s) from where the gas will be imported and an estimate of remaining reserves; the name of the seller and producer of the gas to be imported and the rate to be paid; and, the contract(s) with the producer or seller of the gas to be imported.
- 7/ See DOE/FE Order No. 1042 (April 19, 1995).

require the information specified in sections 153.3 (d) and (f) and 153.4 (a), Exhibit E, of our regulations. Accordingly, we will waive the requirement that EcoEléctrica comply with those regulations.

Pan National's Comments on the EcoEléctrica Proposal

In its motion to intervene, Pan National states that according to information contained in EcoEléctrica's application, the proposed facilities will have capacity substantially in excess of the Power Authority's near-term need for electric generating capacity. Pan National questions whether EcoEléctrica intends to make any portion of this excess capacity available to other LNG suppliers or other potential gas users on a non-discriminatory, open access basis.

In addition, Pan National is unclear whether EcoEléctrica is seeking NGA section 7 authorization for the operation of its jurisdictional facilities or if the Commission intends to exercise such jurisdiction over the facilities. If the Commission elects not to assert section 7 jurisdiction over EcoEléctrica's proposed project, then Pan National urges the Commission to condition its section 3 authorization so that EcoEléctrica is required to operate its LNG import facilities on a non-discriminatory, open access basis in order to provide LNG terminal services to other potential importers of LNG to Puerto Rico.

EcoEléctrica's Answer

EcoEléctrica asserts that the Commission lacks the authority to impose open access requirements under either section 7 or as a condition under section 3. First, EcoEléctrica contends that section 7 does not apply to its facilities, since they will be used only to import LNG gas from outside the United States for consumption entirely within Puerto Rico; they will not be used to transport gas in interstate commerce. Second, EcoEléctrica argues that, as a consequence of the delegation of authority over gas imports and exports, and the modification to this authority occasioned by the Energy Policy Act of 1992, "there is no longer any authority under Section 3 for any agency to impose additional conditions on LNG import applications." 8/

Commission Response

We concur with EcoEléctrica's conclusion that there is no cause to impose a non-discrimination, open access requirement in this case. Our reasoning, although similar, is not identical.

8/ EcoEléctrica's Answer to Motions to Intervene, at 11 (March 6, 1995).

In considering EcoEléctrica's NGA section 3 application, we look at the siting of the import point and the construction and operation of the facilities used to implement the importation. 9/ The facilities at issue include the above described LNG tanks, vaporizers, and other ancillary equipment. Our section 3 deliberations do not encompass the related facilities, also described above, that EcoEléctrica proposes to construct at the site.

We do not regard EcoEléctrica's application as including a request for the equivalent of NGA section 7 authorization, and can find no rationale for conditioning our section 3 authorization to impose requirements based on our section 7 provisions. 10/

Pan National requests that we impose a non-discriminatory, open access service provision on EcoEléctrica. Under our section 7 certificate authorization, we require such a provision for service rendered by natural gas pipeline companies over facilities used to transport gas in interstate commerce. However, the proposed facilities under consideration in this section 3 proceeding will not be used to provide jurisdictional

9/ See Delegation Order No. 0204-112, 49 FR 6684 (February 22, 1984), providing the Commission the authority, with respect to imports and exports of natural gas, to approve or disapprove of the construction and operation of particular facilities and the site at which such facilities shall be located.

10/ In *Distrigas Corp. v. FPC*, 495 F.2d 1057, 1064 (D.C. Cir. 1974), cert. denied, 419 US 834 (1974), the court held that "[u]nder Section 3, the Commission's authority over imports of natural gas is at once plenary and elastic," and that to prevent gaps in jurisdiction the Commission has the discretion under section 3 "to impose on imports of natural gas the equivalent of Section 7 certification requirements." In addition to gas imports, the Commission has also had occasion to exercise jurisdiction -- under section 3 by analogy to section 7, but not pursuant to section 7 -- over gas exports. See, e.g., *Valero Transmission Company*, 27 FERC ¶ 61,151 (1984) and 30 FERC ¶ 61,035 (1985). See also *Yukon Pacific Corporation*, 36 FERC ¶ 61,216 at 61,758-59 (1987). Unlike EcoEléctrica, we do not view the Energy Policy Act of 1992 as precluding us from exercising our "plenary and elastic" authority under section 3 to impose section 7 certificate-like conditions under appropriate circumstances.

interstate transportation. 11/ Instead, the facilities will be used to engage in commerce between Puerto Rico and foreign nations. The Commission's jurisdiction under section 7 does not attach to such foreign commerce; our jurisdiction over foreign commerce is limited to the delegated authority under section 3. 12/ Further, EcoEléctrica intends to import LNG for its own supply, i.e., its facilities will not be employed to provide LNG services for others. Under these circumstances, we find no cause to consider imposing a non-discriminatory, open access condition under our section 3 authority over EcoEléctrica's operation of its LNG facility. In view of the above, we find Pan National's request that we mandate non-discriminatory open access to be inapplicable, and find no cause to impose such a provision.

DISCUSSION

Pursuant to section 3 of the NGA, and authority delegated by the Secretary of Energy, the siting, construction, and operation of EcoEléctrica's proposed facilities is subject to the jurisdiction of the Commission. An application under section 3 will be approved unless it "will not be consistent with the public interest."

We have reviewed the application and concur with EcoEléctrica's assertion that its proposal can assist in promoting the use of natural gas as an environmentally acceptable alternative to oil in meeting anticipated increases in electric demand. We find that EcoEléctrica's proposal is not inconsistent with the public interest, provided it adheres to the safety and environmental conditions and mitigation measures specified in the appendix to this order. Thus, we will grant EcoEléctrica's request for NGA section 3 authorization. 13/

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- 11/ EcoEléctrica avers that if it decides in the future to engage in interstate commerce in natural gas, "EcoEléctrica will make the appropriate filings at the Commission and Pan National will be free to raise its Section 7 arguments at that time."
- 12/ See, e.g., CMS Gas Transmission and Storage Company, 72 FERC ¶ 61,146 at 61,743-44 (1995).
- 13/ We note that in addition to the public interest requirements set forth in section 3 of the NGA, pursuant to Executive Order No. 10,485, 18 FR 5,397 (September 3, 1953), "the construction and maintenance at the borders of the United States of facilities for the exportation or importation of ... natural gas" requires a "Presidential Permit," whereby the Commission considers the public interest in conjunction with the Secretary of State's and Secretary of Defense's
- (continued...)

Environmental Review

In accordance with the provisions of the National Environmental Policy Act (NEPA) of 1969, 14/ the Commission and the Puerto Rico Planning Board (PRPB) prepared a final environmental impact statement/environmental impact statement (FEIS/EIS) to assess the environmental impacts of EcoEléctrica's proposed project. 15/

The Commission and the PRPB considered comments from interested parties, alternatives to the proposed project (including a "No Action Alternative") and potential impacts of the proposed project (including impacts on water quality, marine resources, threatened or endangered species, air quality, recreational facilities or visual resources, transportation, and cultural resources).

The FEIS/EIS process resulted in the development of specific mitigation measures, including certain additional investigations and studies. We conclude that EcoEléctrica's proposed project will be environmentally acceptable provided EcoEléctrica adheres to the mitigation measures specified in the appendix and specified by EcoEléctrica in its application, as supplemented.

13/ (...continued)

evaluation of foreign policy and national security concerns. However, this Executive Order does not apply to gas facilities on the border of the United States and international waters. See Yukon Pacific Corporation, 39 FERC ¶ 61,216 at 61,759 (1987) and Phillips Petroleum Company, 37 FPC 777 (1967). Hence, EcoEléctrica will not require a Presidential Permit for its gas facilities on the border of a self-governing commonwealth associated with the United States and international waters.

14/ 42 U.S.C. § 4321 et seq.

15/ The Commission is the lead Federal agency for the preparation of the FEIS in compliance with the NEPA requirements and the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 CFR §§ 1500-1508 (1995)). The PRPB, as a Commonwealth agency with authority over location approval and land use control, is required to consider the same potential environmental impacts within Puerto Rico under the Environmental Quality Board (EQB) regulations under Article 4(c) of Law No. 9. The joint FEIS/EIS gives both the Commission and the PRPB the information needed to comply with these regulations, and eliminates duplication of efforts as encouraged by section 1506.2 of the CEQ regulations.

Any Commonwealth or local permits issued with respect to the facilities subject to this Commission's jurisdiction must be consistent with the conditions of any Commission authorization of construction and operation of those facilities. This does not mean, however, that Commonwealth and local agencies, through application of Commonwealth or local laws, may prohibit or unreasonably delay the force and effect of the authorization issued by this Commission. 16/

At a hearing held on May 15, 1996, the Commission on its own motion received and made a part of the record in this proceeding all evidence, including the application, as supplemented, and exhibits thereto, submitted in support of the authorization sought herein, and upon consideration of the record, for the reasons stated above,

The Commission Orders:

(A) EcoEléctrica is issued NGA section 3 authorization for the siting, construction and operation of the LNG facilities described in the body of this order.

(B) The authorization granted in Ordering Paragraph (A) is subject to EcoEléctrica's compliance with the safety and environmental mitigation measures specified in the appendix to this order and in EcoEléctrica's application, as supplemented.

(C) EcoEléctrica is granted a waiver of sections 153.3 (d) and (f) and 153.4 (a), Exhibit E, as discussed herein.

(D) Algonquin's, Cabot's, Total's, and Trunkline's motions to intervene are granted.

By the Commission.

(S E A L)



Lois D. Cashell,
Secretary.

16/ See, e.g., Schneidewind v. ANR Pipeline Company, 485 U.S. 293 (1988); National Fuel Gas Supply v. Public Service Commission, 894 F.2d 571 (2d Cir. 1989); and Iroquois Gas Transmission System. L.P., et al., 52 FERC ¶ 61,091 (1990) and 59 FERC ¶ 61,094 (1992).

APPENDIX

Environmental Conditions
and Mitigating Measures

1. EcoEléctrica shall follow the construction procedures and mitigation measures described in its application, as supplemented, and identified in the FEIS/EIS, except as specifically modified by these conditions. EcoEléctrica must:
 - a. request any modification to these procedures, measures, or conditions in a filing with the Secretary of the Commission (Secretary);
 - b. justify each modification relative to site-specific conditions;
 - c. explain how that modification provides an equal or greater level of environmental protection than the original measure; and
 - d. receive approval in writing from the Director of the Office of Pipeline Regulation (OPR) **before using that modification.**
2. The Director of OPR has delegated authority to take whatever steps are necessary to insure protection of all environmental resources during the construction and operation of the project. This authority shall allow:
 - a. the modification of conditions of this Order; and
 - b. the design and implementation of any additional measures deemed necessary (including stop work authority) to assure continued compliance with the intent of the environmental conditions as well as the avoidance or mitigation of adverse environmental impact resulting from the project construction and operation.
3. **Prior to any construction**, EcoEléctrica shall file an affirmative statement with the Secretary, certified by a senior company official, that all company personnel, environmental inspectors, and contractor personnel will be informed of the environmental inspector's authority and have been or will be trained on the implementation of the environmental mitigation measures appropriate to their jobs before becoming involved with the construction and restoration activities.

4. The authorized facility locations shall be as shown in the FEIS/EIS, as supplemented by filed alignment sheets. **As soon as they are available, and before the start of construction,** EcoEléctrica shall file with the Secretary revised detailed maps and aerial photographs at a scale not smaller than 1:6,000 with station positions for all facilities and pipelines approved by this Order. All requests for modifications of environmental conditions of this Order or site-specific clearances must be written and must reference locations designated on these alignment maps/sheets.
5. EcoEléctrica shall file with the Secretary detailed alignment maps/sheets and aerial photographs at a scale not smaller than 1:6,000 identifying all staging areas, pipe storage yards, new access roads, and any other areas that would be used or disturbed and have not been previously identified in filings with the Secretary. This includes any alteration to facility locations filed with the Secretary. Approval of all areas must be explicitly requested in writing. All areas shall be clearly identified on the maps/sheets/aerial photographs. All areas must be approved in writing by the Director of OPR before construction in or near that area.

This requirement does not apply to minor field realignments per landowner needs and requirements which do not affect other landowners or sensitive environmental areas such as wetlands.

Examples of alterations requiring approval include all facility location changes resulting from:

- a. implementation of cultural resources mitigation measures;
 - b. implementation of endangered, threatened, or special concern species mitigation measures;
 - c. recommendations by the regulatory authorities of the Commonwealth of Puerto Rico (Commonwealth); and
 - d. agreements with individual landowners that affect other landowners or could affect sensitive environmental areas.
6. **Within 60 days of the acceptance of this authorization and before construction begins,** EcoEléctrica shall file an initial Implementation Plan with the Secretary for review and written approval by the Director of OPR describing how EcoEléctrica will implement each of the mitigation measures required by this Order. EcoEléctrica must

file revisions to the plan as schedules change. The plan shall identify:

- a. how EcoEléctrica will incorporate these requirements into contract bid documents, construction contracts (especially penalty clauses and specifications), and construction drawings so that the mitigation required at each site is clear to onsite construction and inspection personnel;
 - b. the number of environmental inspectors and how the company will ensure that sufficient personnel are available to implement the environmental mitigation;
 - c. company personnel, including environmental inspectors and contractors, who will receive copies of appropriate materials;
 - d. what training and instruction EcoEléctrica will give to all personnel involved with construction and restoration (initial and refresher training as the project progresses and personnel change), with the opportunity for OPR staff to participate in the training session(s);
 - e. the company personnel (if known) and specific portion of EcoEléctrica's organization having responsibility for compliance;
 - f. the procedures (including contract penalties) EcoEléctrica will follow if a noncompliance occurs; and
 - g. for each discrete facility, a Gantt or PERT chart (or similar project scheduling diagram) and dates for:
 - (1) the completion of all required surveys and reports;
 - (2) the mitigation training of onsite personnel;
 - (3) the start of construction; and
 - (4) the start and completion of restoration.
7. EcoEléctrica shall employ at least one environmental inspector. The environmental inspector(s) shall be:
- a. responsible for monitoring and ensuring compliance with all mitigative measures required by this Order and other grants, permits, certificates, or other authorizing documents;
 - b. responsible for evaluating the construction contractor's implementation of the environmental mitigation measures required in the contract (see condition 6 above) and any other authorizing document;

- c. empowered to order correction of acts that violate environmental conditions of this Order and any other authorizing document;
 - d. responsible for documenting compliance with the environmental conditions of this Order, as well as any environmental conditions/permit requirements imposed by other Federal, commonwealth, or local agencies; and
 - e. responsible for maintaining status reports.
8. EcoEléctrica shall file updated status reports with the Secretary and the PRPB on a biweekly basis until all construction-related activities, including restoration and initial permanent seeding, are complete. On request, status reports will also be provided to other Federal and Commonwealth agencies with permitting responsibilities. Status reports shall include:
- a. the current construction status of the project and major components, changes in facility design, work planned for the following reporting period, and any schedule changes for stream crossings or work in other environmentally sensitive areas;
 - b. a listing of all problems encountered and each instance of noncompliance observed by the environmental inspector(s) during the reporting period (both for conditions imposed by the Commission and any environmental conditions/permit requirements imposed by other Federal, Commonwealth, or local agencies;
 - c. corrective actions implemented in response to all instances of noncompliance, and their cost;
 - d. the effectiveness of all corrective actions implemented;
 - e. a description of landowner/resident complaints which may relate to compliance with the requirements of this Order, and the measures taken to satisfy their concerns; and
 - f. copies of any correspondence received by EcoEléctrica from other Federal, Commonwealth, or local permitting agencies concerning instances of noncompliance and EcoEléctrica's response.
9. EcoEléctrica must receive written authorization from the Director of OPR before commencing service from the LNG facilities. Such authorization will only be granted

following a determination that rehabilitation and restoration of the site is proceeding satisfactorily.

10. **Within 30 days of placing the authorized facilities in service**, EcoEléctrica shall file an affirmative statement with the Secretary, certified by a senior company official:
 - a. that the facilities have been constructed in compliance with all applicable conditions, and that the continuing activities will be consistent with all applicable conditions; or
 - b. identifying which of the conditions EcoEléctrica has complied with or will comply with. This statement shall also identify any areas along the right-of-way where compliance measures were not properly implemented, if not previously identified in filed status reports, and the reason for noncompliance.
11. EcoEléctrica shall commence construction on its LNG facilities within 3 years of the date of this Order, or file a motion to extend the deadline, with the specific reasons why additional time is necessary.
12. Prior to initiating construction, EcoEléctrica shall:
 - a. Provide copies of all soil, groundwater, and bottom sediment test studies and reports to the appropriate office of the Environmental Protection Agency (EPA) (Region II), with a description of the historical and intended use of the site;
 - b. File copies of the EPA's response, if any, with the Secretary;
 - c. File with the Secretary any additional tests, permits, or authorizations resulting from contact with the EPA;
 - d. File with the Secretary: (1) written concurrence from the EPA that the site has no Resource Conservation and Recovery Act (RCRA) hazardous wastes; or (2) a description of how EcoEléctrica's existing studies show, in a statistically valid manner, that the site has no RCRA hazardous wastes, using the EPA's regulations and guidelines discussed above. If EcoEléctrica is unable to provide either (1) or (2), it shall conduct additional soil, groundwater, and/or sediment testing sufficient to demonstrate that the site is free from RCRA hazardous wastes;
 - e. If the tests show that the site has RCRA hazardous wastes, file with the Secretary and EPA Region II a

description of how releases of hazardous constituents to the environment (including soil, sediment, and groundwater) will be addressed; and

- f. Receive approval in writing from the Director of OPR before commencing any construction at the site.
13. EcoEléctrica shall apply to the EPA for the necessary permit if it decides to dispose of hazardous wastes on site. Prior to construction, EcoEléctrica shall file with the Secretary the names and locations of the RCRA-permitted hazardous waste landfills/disposal companies it would use for off-site disposal.
14. EcoEléctrica shall comply with the provisions of all Federal, Commonwealth, and local laws applicable to the cleanup and disposal of any hazardous waste material, as defined by the pertinent and applicable law or regulation, including the filing of detailed implementation plans with the EPA, the Secretary, or other pertinent agencies.
15. EcoEléctrica shall submit all final seismic design plans to the Secretary for review and approval by the Director of OPR.
16. EcoEléctrica shall submit to the Secretary an analysis to demonstrate that failure of storage tanks on adjacent installations poses no hazard to the planned LNG facilities as a result of ground spreading and excessive settlements resulting from liquefaction of Layer 2.
17. As part of the tank foundation verification program, an appropriate number of standard penetration test borings shall be carried to Layer 5 after removal of the surcharge and before the installation of the stone columns. On the basis of these borings, the Director of OPR must approve a final decision of the penetration depth and spacing of the stone columns before they are constructed.
18. Tank settlement shall be monitored during the hydrostatic test. The plans for settlement monitoring during the hydrostatic test, as well as the results of the settlement observations during surcharging of the LNG tank foundations and during the hydrostatic test, shall be made available to the Secretary.
19. EcoEléctrica shall determine, and file with the Secretary for review and written approval by the Director of OPR, whether an additional row of stone columns under the outer slopes of the flood protection levees would be advantageous in order to avoid lateral spreading during earthquakes.

20. EcoEléctrica shall install a silt curtain around each piling extending from the water's surface to the bay bottom. In waters greater than 10 feet, the height of the silt curtains may be reduced, subject to the comments of the U.S. Fish and Wildlife Service (FWS), National Marine Fisheries Service (NMFS), EPA, and the Puerto Rico Department of Natural and Environmental Resources (DNER). However, at a minimum, silt curtains must extend 10 feet from the bottom of the bay towards the water surface.

The curtain shall be kept in place until the water quality within the curtain is similar to water quality control values. Each silt curtain shall be secured and completely enclosed to ensure that no manatees or sea turtles become entangled. In addition, silt curtains shall be inspected at least twice a day to ensure no manatees or sea turtles have become entrapped.

21. EcoEléctrica shall file with the Secretary a final mangrove mitigation plan in conjunction with FWS, NMFS, EPA, and DNER for the review and approval by the Director of OPR.
22. EcoEléctrica shall file with the Secretary a final seagrass mitigation plan in conjunction with FWS, NMFS, EPA, and DNER for the review and approval by the Director of OPR.
23. A designated manatee/sea turtle spotter shall be present on all work vessels. In addition, all work vessels and LNG vessels shall maintain a minimum 4-foot clearance between the vessel bottom and bay floor.
24. All construction vessels shall maintain a detailed log containing sightings, collisions, or injuries to manatees and sea turtles. This log shall be submitted to the FWS, DNER, and the Secretary following construction. In addition, a similar log must be maintained on all tug boats and LNG tankers during the life of the project. The manatee/sea turtle spotters shall maintain logs on the tugs from the time they leave the dock to meet with the LNG tanker until they return to dock. The manatee/sea turtle spotting activities on board the LNG tankers shall start when the tugs meet the tanker (3 to 5 miles off shore of the sea buoy) until the last tug leaves the tanker following unloading. This log shall be submitted on an annual basis to the FWS and DNER.
25. EcoEléctrica shall use a coarse wire screen (maximum 2 inch by 2 inch opening) over the discharge openings to prevent larger organisms such as manatees from entering the openings.

26. EcoEléctrica shall restrict steamblowing to the hours between 7 AM and 10 PM.
27. EcoEléctrica shall file with the Secretary and PRPB, farfield sound level data for the equipment for the power plant, and manufacturer's specifications for noise silencing equipment.
28. EcoEléctrica shall develop a traffic routing plan for all construction-related truck traffic during the construction phase of the project. This plan shall focus on truck usage of the PR-2/PR-385 eastbound onramp. The plan shall develop measures to reduce truck traffic at the PR-2/PR-385 intersection. The plan shall be designed to result in a level of service (LOS) of B at the intersection without decreasing LOS at other intersections by more than one level from existing conditions. The plan shall be reviewed and approved by the Director of OPR.
29. EcoEléctrica shall defer construction and use of its facilities and any staging, storage, or temporary work areas and any new or to-be improved access roads until:
 - a. EcoEléctrica files with the Secretary a revised unanticipated discovery plan for cultural resources, and the State Historic Preservation Officer's approval of the plan; and
 - b. the Director of OPR notifies EcoEléctrica in writing that it may proceed.

EcoEléctrica shall label all reports and plans identifying locations of cultural resources as "PRIVILEGED INFORMATION - DO NOT RELEASE."

30. An additional technical conference (or conferences) shall be held as the engineering design develops so that present areas of uncertainty may be more fully explored. These conferences shall be held prior to initiating construction at the site. At least one technical conference shall be held prior to initiation of construction after designs are finalized and major vendors (including LNG and other major storage tanks) have been selected and complete design details have been submitted to Commission staff. The applicant shall also provide design details to the Office of Pipeline Safety of the Department of Transportation and the U.S. Coast Guard Captain of the Port in Puerto Rico so that they may have the opportunity to participate in the technical conference(s) to assure compliance with their applicable regulations.

31. EcoEléctrica shall not commence construction without a written notice to proceed from the Director of OPR. Any major alterations to facility design shall be filed with the Secretary for review and written approval by the Director of OPR prior to initiation.
32. Onsite staff inspections shall be conducted with EcoEléctrica as significant milestones develop during the construction phase and prior to commencement of initial facility operation.
33. Following commencement of operation, the facility shall be subject to regular Commission staff technical reviews and site inspections on at least a biennial basis or more frequently as circumstances indicate. Prior to each Commission staff technical review and site inspection, the company shall respond to a specific data request including information relating to possible design and operating conditions that may have been imposed by other agencies or organizations, provision of up-to-date detailed piping and instrumentation diagrams reflecting facility modifications and provision of other pertinent information not included in the semi-annual reports described below.
34. EcoEléctrica shall submit to the Secretary semi-annual operational reports. The semi-annual reports shall provide changes in facility design and operating conditions, abnormal operating experiences, activities (liquefaction and LNG shipping schedules), and plant modifications including those proposed during the forthcoming 12-month period. Abnormalities shall include but not be limited to storage tank vibrations and/or vibrations in associated cryogenic plumbing, storage tank settlement, significant equipment and instrumentation malfunctions or failures, nonscheduled maintenance or repair (and reasons therefore), relative movement of the inner vessel, vapor or liquid releases, fires involving natural gas, refrigerants, and/or other sources, negative pressure (vacuum) within the LNG storage tanks, and higher than predicted boiloff rates. The reports shall be submitted within 45 days after each period ending December 31 and June 30. Included shall be a section entitled "Significant plant modifications proposed for the next 12 months (dates)." This section shall be included in the semi-annual operational reports to provide Commission staff with early notice of anticipated future construction and maintenance projects at the LNG terminal.
35. Significant nonscheduled events, including safety-related incidents (LNG or natural gas releases, fires, explosions, mechanical failures, unusual over-pressurization, major injuries, etc.) should be reported to Commission staff within 24 hours. In the event that an abnormality is of

sufficient magnitude to endanger the facility or operating personnel, notification should be made immediately. This notification practice should be incorporated into the LNG Plant Emergency Plan.

36. EcoEléctrica shall develop and document LNG storage tank inspection procedures (especially within the annular space between the tank outer shell and the concrete impoundment wall) to identify abnormalities, including cold spots on the outer shell, outer tank penetrations, etc. An annular space stairway (rather than a ladder) extending to ground level, permanent lighting of adequate intensity and periodic horizontal catwalks on the inside of the concrete impoundment should be provided for inspection purposes. One of the catwalks should be mounted on the inside of the concrete impoundment wall near the top. Inspection frequency should be defined.
37. EcoEléctrica shall conduct cryogenic safety re-evaluation of facility and design procedures to assure compliance with recommended practices, especially related to relief valve orientation and configuration, process valve closure verification, and structures adjacent or attached to the outer shell that may have adverse effect.
38. EcoEléctrica shall develop emergency procedures for responding to a major crack in the outer shell (including roof) of an LNG storage tank. Assure that the facility has necessary repair materials and equipment onsite. Emergency procedures (after appropriate Commission staff review) should be incorporated in facility operating and emergency manuals.
39. Each storage tank pressure relief valve should be reoriented and/or provided with closure to the elements (e.g., flapper valve or rain cap) to reduce intrusion of water into the valve mechanism. Use of a drain hole at the low point in discharge piping should be provided as appropriate.
40. EcoEléctrica shall install permanent seismic strong motion recording devices to record data on the actual response of the facility to strong seismic shaking at the following locations:
 - a. on one LNG tank foundation;
 - b. at or near the top of same LNG tank wall; and
 - c. at a freefield location on or near the site.
41. EcoEléctrica shall develop procedures to periodically (not less frequently than quarterly) conduct storage tank

foundation elevation surveys at multiple positions to monitor settling and to verify stability of the foundation system. Measurements should be made prior to and following hydrostatic testing and subsequent to any seismic event. EcoEléctrica shall explore and document the feasibility of instrumentation to continuously monitor storage tank foundation elevation. Any settlement in excess of that in the design should be investigated and reported to the Secretary.

42. EcoEléctrica shall provide a fire suppression system in the motor control center and switchgear areas.
43. Facility drawings, including piping and instrumentation diagrams, should be updated to reflect modifications and changes to the facility design; such drawings should be filed with the Secretary as they become available and/or with the semi-annual operational reports required in Mitigation Measure No. 34 above.
44. Operating and maintenance procedures/manuals, as well as emergency plans and safety procedures, should be filed with the Secretary.
45. EcoEléctrica shall coordinate emergency contingency plans and procedures (including evacuation) with Puerto Rico requirements and local officials consistent with DOT regulations.
46. In addition to complying with the DOT LNG Safety Regulations (49 CFR Part 193), the LNG facility must also comply with the requirements of the National Fire Protection Association (NFPA) guidelines contained in NFPA 59A-1996.
47. EcoEléctrica shall notify the Commission's environmental staff by telephone and/or facsimile of any environmental noncompliance identified by other Federal, Commonwealth, or local agencies on the same day that such agency notifies EcoEléctrica.



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PPT – A COMBINATION OF HDD AND MICROTUNNELLING TECHNIQUES
An Innovative Approach For Trenchless Pipeline Installation

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1. INTRODUCTION

The abbreviation **PPT** stands for "Push & Pull Technique". It is simply a combination of the techniques of both horizontal directional drilling (HDD) and microtunnelling. The purpose of this innovative trenchless technology is to be able to install pipelines under natural or artificial obstacles in difficult soil conditions where, if either of the two techniques were used in isolation, completion of the pipeline would not be viable.

The concept of combining HDD and microtunnelling techniques is not new and there have been several attempts to do so in the past. However, success in combining these two technologies has been elusive until now. The earlier attempts were unable to cope with the range of difficult soil conditions (gravels, cobbles and boulders) under real site conditions.

Herrenknecht AG of Germany, as part of its entrance into the HDD market, started serious design and development in 2001 based upon an earlier patent from 1998. The basic method described in the patent has been developed to suit the equipment available today.

2. METHOD STATEMENT

The PPT method can be described as a two stage process. The first stage is drilling the pilot hole whereas the second stage is a single pass reaming of the pilot hole to final diameter whilst the pipeline is simultaneously pulled into the borehole.

Pilot hole

The pilot hole phase of the PPT procedure is identical in every respect to a conventional HDD pilot hole. With the use of a standard HDD rig, the borehole is executed to the predetermined alignment from an entry point on the rig site to an exit point at the pipe site as shown in figure 1. The pilot hole for the PPT process can be drilled with a smaller cover than is usual with conventional HDD works because, the second stage of the process eliminates any potential for borehole collapse and subsequent associated surface settlements.

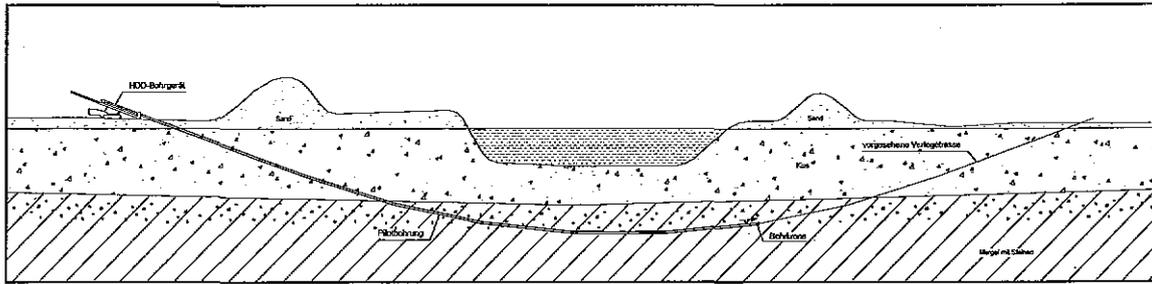


Fig. 1: Pilot hole (Principle Drawing).

Reaming and Pullback

Once the pilot drill has emerged at the exit point at the pipe site, the drill bit and the non-mags are dismantled from the drill string which is subsequently connected to the PPT machine, a modified AVN microtunneller with cutting wheel and conical stone crusher. As in any HDD process, the product pipe is placed on rollers taking due consideration of the elastic overbend at the exit point, a normal HDD procedure, and welded to the rear of the PPT machine.

The drill rig on the rig site rotates the drill string in the borehole, in turn rotating the cutting wheel of the PPT machine: The high pressure mud pumps on the drill site transfer the drilling fluid via the drillstring to jets in the cutting wheel and conical crusher chamber of the PPT machine. The action of the pull back of the drillstring by the HDD rig simultaneously advances the PPT machine and product pipe as shown in figure 2.

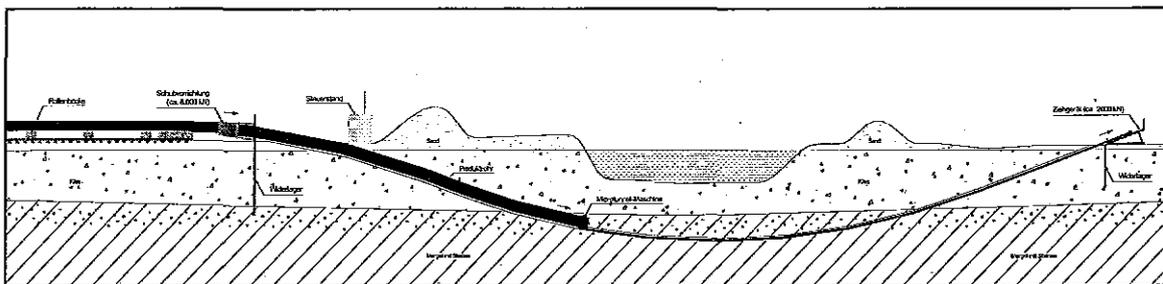


Fig. 2: Reaming and Pullback (Principle Drawing).

Subject to design of the PPT machine the combined cutting and crushing action can successfully excavate boulders up to approx 35% of the diameter of the cutting wheel. Whilst the small overcut between the diameter of the cutting wheel and the diameter of the product pipe, typically less than 100mm; eliminates the potential for borehole collapse, this can lead to higher pullforces, especially in gravels and cobbles. Thus the pulling capacity of the HDD rig must supply sufficient "weight-on-bit" to overcome the friction between the PPT machine and the surrounding soils. Thruster units at the pipe site provide additional force for the single pullback or reaming operation.

The thruster units are simply hydraulically operated clamping devices applied to the outside of the product pipe. Hydraulic cylinders, effectively pushing the product pipe from the pipe site into the borehole, move these clamping devices forward. The use of two thruster units interlocked by hydraulic cylinders to advance the product pipe provides a smooth and continuous push force from the pipe site.

As soon as the PPT machine arrives at the entry pit at the rig site, the drillstring and product pipe are disconnected to permit removal. The slurry lines within the product pipe used for removal of the excavated material are then removed, permitting this now completed section of the pipeline to be tied in to the connecting landlines.

3. DESIGN ASPECTS

The PPT method has been developed to take advantage of the two separate processes of HDD and microtunnelling without adopting the well known disadvantages of both processes.

The advantages of HDD are seen as the short installation time required for the construction of the pilot hole and the ability to prefabricate and test the entire pipe string prior to installation in the ground, essential for oil and gas pipeline applications. The principal disadvantages of HDD operations are that the process is not suitable for the installation of larger diameter pipelines as well as installation of pipelines in difficult soil conditions such as coarse gravels, cobbles and boulders.

Slurry microtunnelling techniques are perfectly suited to the difficult soil conditions as well as eliminating the potential for borehole collapse. The disadvantages of microtunnelling are the requirements for start and reception shafts as well as limitations in the lengths of pipeline that can be executed in a single drive.

In summary:

- Microtunnelling techniques permit operation in a wider range of soil conditions
- HDD techniques permit longer drive lengths
- Microtunnelling techniques enable larger diameter pipelines to be installed
- HDD techniques can easily achieve curved alignments

4. COMPONENTS OF THE PPT SYSTEM

There are three principal pieces of equipment necessary to be able to execute the works using PPT methods:

- HDD rig
- PPT machine
- Thrusters

Ancillary equipment such as high pressure pumps, mixing and recycling units for the drilling fluid are the same equipment as that normally used for HDD and microtunnelling operations.

The HDD rig itself does not require any adaptation or modification to be able to be used with the PPT method. However, the high torque requirement and high pullback load for the PPT method determines that a **Maxi or Mega** rig is necessary (pull force 2,000kN or higher). The high torque requirement (approx 90kNm) is necessary to be able to have effective power for the stone crusher behind the cutting wheel of the PPT machine.

Current expectations are that standard 6 5/8" high quality API drillpipe will be adequate for transfer of the combined loads of torque and pullback force from the HDD rig to the PPT machine.

The PPT machine itself is based upon the standard microtunneller design of Herrenknecht AG where nearly one thousand of such machines are in operation worldwide in all types of soil conditions (see figure 3).

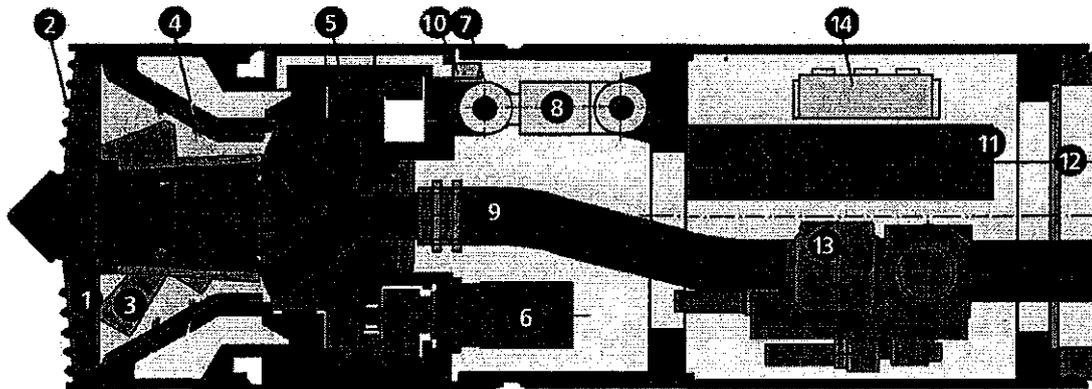


Fig. 3: Layout of a conventional Herrenknecht AVN-machine.

The only modifications necessary to the standard machine are for the connection of the drillpipe to the cutting wheel and the design of the flow channels and jets for the drilling fluid. The prototype PPT machine also included for axial movement of the cutting wheel in case there was any tendency to block or stall the crusher with large stones or other debris such as timber. In normal microtunnelling operations it is possible to free the stone crusher by rotating the cutting wheel in the opposite direction. However, this possibility does not exist when driving the cutting wheel with the drill string from the HDD rig as counter clockwise rotation would tend to unscrew the pipe joints.

The thruster unit is a completely new design that permits it to be used not only to apply push forces to the pipeline but also to pull back a pipe in the event of obstacles being encountered or other interruption to the normal process. The thruster units are completely independent from the HDD rig by having their own power pack and control station and so can also be used in conventional HDD operations to apply additional thrust to the pipeline. It is only necessary to install an adequate back anchor such as sheet piles to withstand the expected pull and / or push forces.

The principle of operation of the thruster units is shown in figure 4 where two units, each of 2,500kN force are operating in tandem. Assuming a pull force of at least 200tonne from the HDD rig, then a total force of 700tonne can be applied to the pipeline for the installation process.

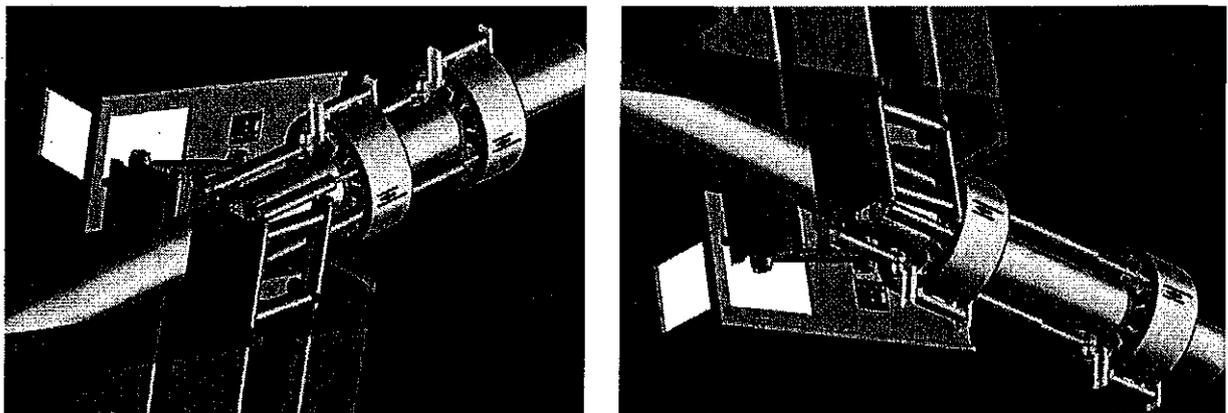


Fig. 4: Principle layout and working steps of the thruster unit.

The transmission of these forces, subject to pipe diameter, wall thickness and steel quality, is normally within the capacity of the pipeline but care must be exercised, where coatings on the outside diameter of the pipe are present. Early estimates indicate that the transmission of such forces is feasible using the clamps as dimensioned in figure 5.

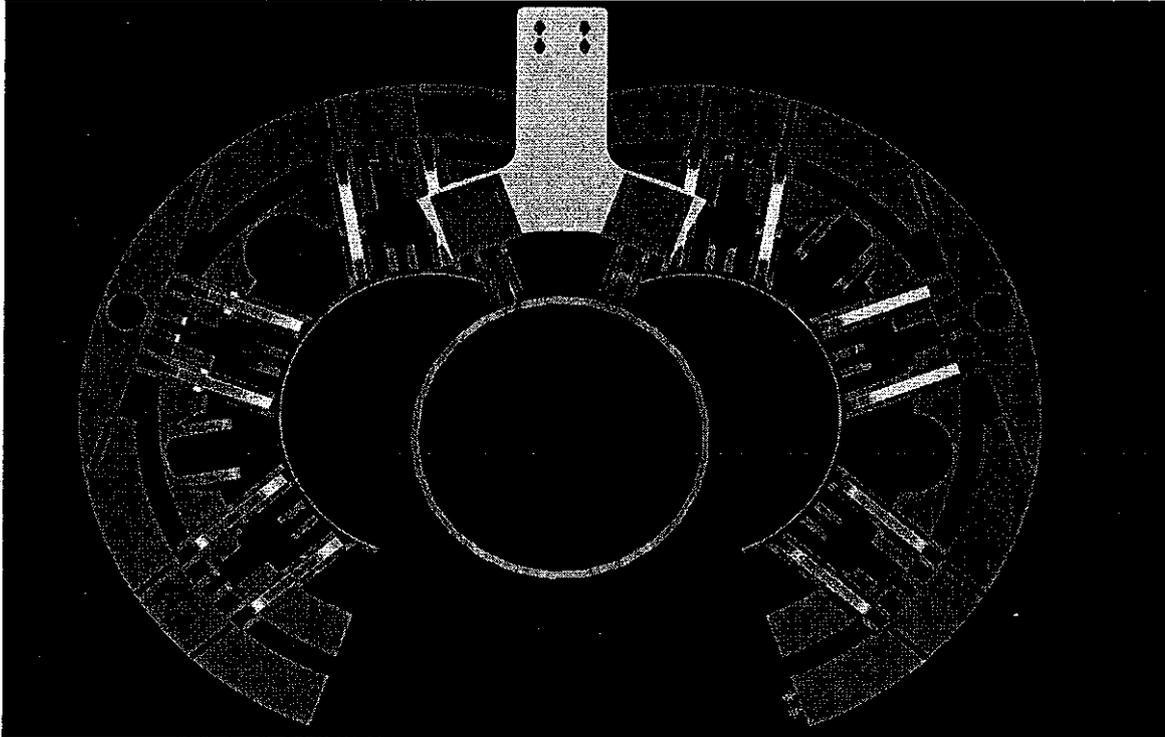


Fig. 5: Cross-section through thruster unit.

5. FIRST FIELD TRIALS OF PPT METHOD

The initial field trials were conducted at the works of Herrenknecht AG in Schwanau, Germany in 2003. The pilot hole was drilled in accordance with the basic data as listed below using normal steering tool techniques in combination with a TruTracker® coil.

- Entry angle approx. 5°
- Exit angle approx. 5°
- Minimum drilling radius approx. 600m
- Maximum cover approx. 3,0m

The soils encountered during the drilling consisted of a 0,5m thick layer of fill material with cobbles and boulders below which was a massive gravel layer, again with cobbles and boulders. The groundwater level was approx 2,0m below the surface.

The drilling was executed using a 4,000kN modular HDD rig (Herrenknecht HK-400M) with a maximum torque capacity of 120kNm. The drillstring was made up of 6 5/8" API drillpipe.

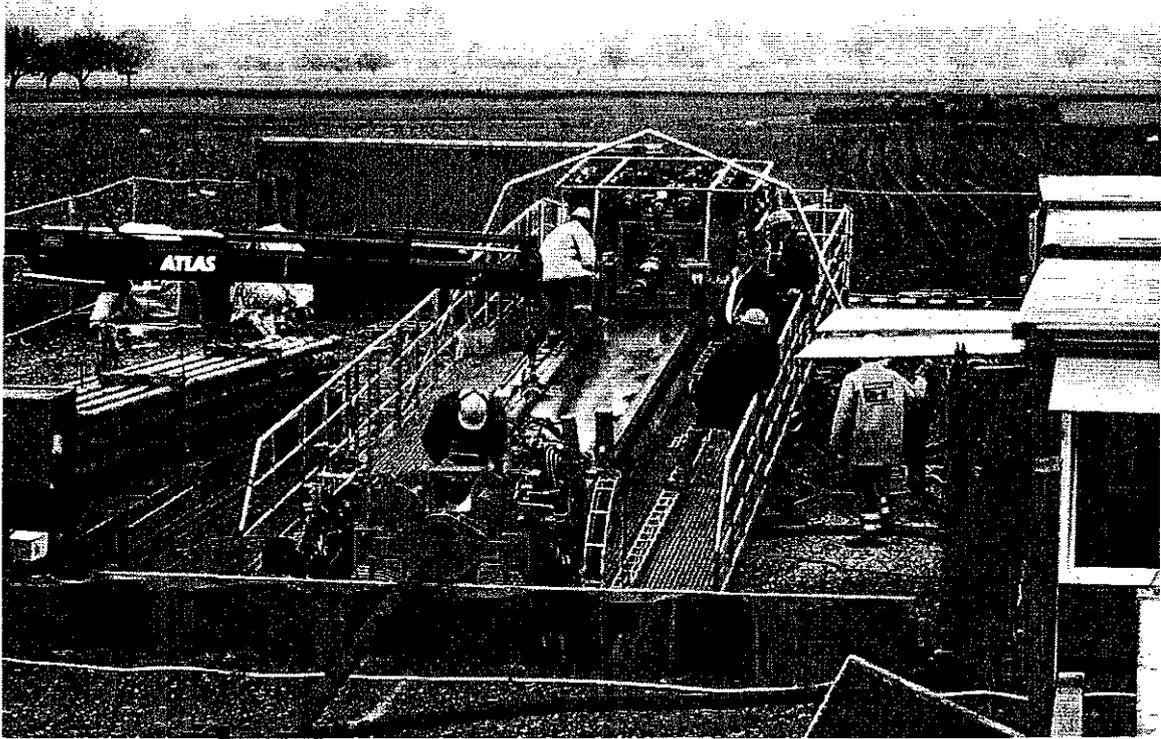


Fig. 6: HK400M drilling rig on the field test site in Schwanau.

Figure 8 shows the Herrenknecht built PPT machine being connected to the drillstring. The cutting wheel design was specifically to suit the expected gravels, cobbles and boulders with a stone crusher immediately behind the cutting wheel. The crusher is able to reduce the larger cobbles and boulders to a size able to be transported by the 150mm diameter slurry line through the 40" product pipe from the PPT machine to the surface (see figure 7).



Fig. 7: PPT-unit and 40"-product pipe on pipe rollers.



Fig. 8: PPT-machine being connected to the drillstring.

6. FIELD TEST RESULTS

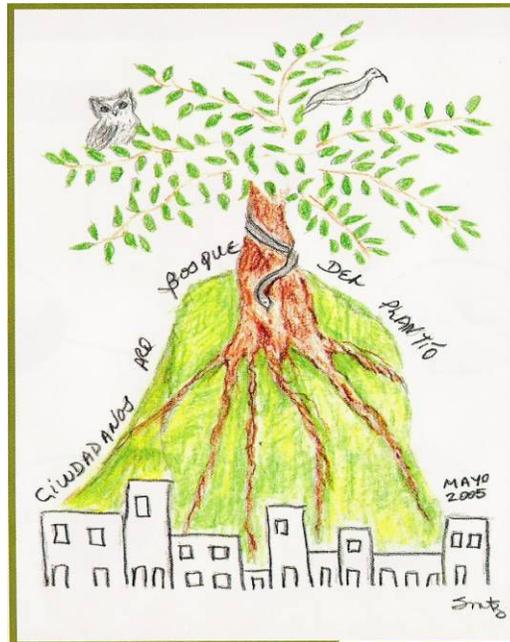
The PPT method proved capable of operating in the difficult soil conditions for which it was designed. Whilst drilling in the rounded, coarse gravels without groundwater (see figure 9) the pull force and torque necessary was considerably lower than that estimated in the design phase, thus providing a promising and encouraging result.

Nevertheless, problems occurred in the connection between the drillpipe and the PPT machine resulting in a shear failure virtually immediately the cutting wheel penetrated the borehole. This was remedied by both a stronger connection as well as improvement to the method of starting the borehole. The PPT machine is now guided into the ground for the first few meters by the use of a steel frame to maintain alignment.

The greatest difficulty encountered, in an area completely unexpected, was that of the slurry circuit to transport the cuttings from the crusher chamber to the recycling unit behind the product pipe. It was not possible to transport the cuttings only by the use of the high pressure pump as an energy source at the rig site. The returns did not flow as expected through the slurry line within the product pipe, instead escaping to the surface in front of the cutting wheel (break-outs).

Several options to overcome these difficulties are under investigation. The obvious solution would be to install a slurry pump behind the PPT machine in the product pipe. However, this is not considered to be a practical field solution on the basis that if pump failure or problems develop, then the whole process would have to be stopped. In addition, any pump maintenance during operation would not be possible. Alternative solutions are under investigation prior to the next field trials.

Conservation Analysis in the Municipality of Toa Baja, Puerto Rico



An Interactive Qualifying Project Report

By:

Ian Levesque

Brendan McLaughlin

Christina Mezzone

Alissa Paquette

May 3, 2006

Conservation Analysis in the Municipality of Toa Baja, Puerto Rico

An Interactive Qualifying Project Report
Submitted to the Faculty of
Worcester Polytechnic Institute
In partial fulfillment of the requirements for the
Degree of Bachelor of Science

Sponsoring Agency: Department of Natural and Environmental Resources

Submitted to:

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Project Co-advisor: Ann Garvin, WPI Professor

On-Site Liaison: Edgardo González, DNER Forest Service Director

On-Site Liaison: Wanda Crespo, los Ciudadanos pro Bosque del Plantío

Submitted by:

Ian Levesque

Brendan McLaughlin

Christina Mezzone

Alissa Paquette

Date: 3 May 2006

Abstract

In Puerto Rico, ongoing economic and population growth is causing widespread urbanization at the expense of valuable forest ecosystems. The community of el Plantío faced this issue when a cherished range of forested hills was threatened by local developers. We assessed the situation through interviews, explored the area to compile scientific arguments for preservation, and surveyed local educators regarding use of the area for educational purposes. Our findings will help the community justify re-zoning the hills as a protected area and suggest educational uses as an alternative to development. With the assistance of the Department of Natural and Environmental Resources, we used the example of el Plantío to adapt the USFS Wildland-Urban Interface Assessment to a Puerto Rican context.

Authorship

In the compilation of this report, each group member, Ian Levesque, Brendan McLaughlin, Christina Mezzone, and Alissa Paquette, has contributed his/her edits to our overall project and the chapters that follow. Listed below are the original authors of each section.

<i>Abstract</i>	Ian Levesque
<i>Authorship Page</i>	Christina Mezzone
<i>Acknowledgements</i>	Brendan McLaughlin
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Executive Summary

In Puerto Rico, as in many other parts of the world, ongoing economic and population growth is causing widespread urbanization. With approximately 4 million people inhabiting an island just over 3,500 square miles in size, careful land management is absolutely essential to prevent the destruction of Puerto Rico's valuable natural resources. While recent efforts have been made to produce a comprehensive national land-use plan that addresses the issues of deforestation and the destruction of valuable karst aquifers, historically much of this burden has fallen - and will continue to fall - upon the shoulders of motivated community groups such as Casa Pueblo in Adjuntas, los Ciudadanos Pro Bosque del San Patricio in San Patricio, and now los Ciudadanos pro Bosque del Plantío in Toa Baja.

When the range of karst mogotes - or small forested hills - surrounding the community of el Plantío, Toa Baja, was threatened by multiple local developers, a group of citizens from the community banded together to look into ways to first protect the area, and then put it to environmentally friendly uses. Inexperienced in dealing with the complex issues surrounding conservation efforts, they enlisted the help of the Department of Natural and Environmental Resources. Over the last few years, they have made significant progress. With Toa Baja presently drafting a new municipal land-use plan, los Ciudadanos pro Bosque del Plantío has a unique opportunity to have the mogotes re-zoned as protected areas, and potentially to realize their vision of the karst mogotes being used for educational purposes.

It is at this critical phase of the conservation process that our project group was called in by the Department of Natural and Environmental Resources to assist the community group in:

- Arguing for the preservation of the mogotes during the critical public planning board reviews in June and September of 2006, and

- Assessing the interest level of local school teachers and administrators towards various educational use ideas for the area.

Additionally, the Department of Natural and Environmental Resources asked us to document various aspects of the project for use in assessing the applicability of the U.S. Forest Service's Southern United States Wildland-Urban Interface Assessment to Puerto Rico.

To accomplish these tasks, we conducted a series of interviews and focus groups with el Plantío community members, relevant politicians from the Municipality of Toa Baja, members of the community associations of both neighboring Macún and el Plantío, prominent members of the Casa Pueblo community group, and schoolteachers involved with the Casa Pueblo educational program. We conducted a survey of local schoolteachers and administrators to determine their level of interest in several proposed educational use plans. We also worked with field researchers from the Department of Natural and Environmental Resources, hiking through the mogotes to catalog plant and animal species and the GPS locations of important geographic features. All this information was compiled and analyzed to provide los Ciudadanos pro Bosque del Plantío with strong arguments to use during the land-use hearings, and a better sense of what area educators would like to use in their lessons.

Our key findings from these investigations were that the el Plantío mogotes hold important environmental value due to the following:

- The presence of the endangered Palo de Rosa tree and other rare or endemic species of plants.
- The karst formation's value as a source of clean water – presently being used by several freshwater wells in the surrounding area.
- The karst formation's value in preventing flooding - as exemplified by the findings of the U.S. Geological Survey in 1983.

We also discovered that the current mayor's administration is in full support of the conservation of the mogotes, and should prove to be a valuable ally during the ratification of the new municipal land-use plan. If conservation of the area is achieved, local schools do have a strong interest in using the area for educational purposes. In particular, a local flora and fauna exhibit and hands-on experiments would be most useful as a supplement to existing environmental programs.

Using these findings, we were able to make several recommendations for the community group in el Plantío. First, we recommended that the community group attend the two upcoming planning board reviews and use our findings to defend the conservation of the mogotes. Secondly, the community group should combine educational materials from the U.S. Fish & Wildlife Service, the U.S. Forest Service, and the Department of Natural and Environmental Resources, with the local flora information included in this report to put together lesson plan ideas for area schools. Also, if the community group is able to gain enough support - both within el Plantío and in the surrounding communities - an educational center with hands-on experiments would both be useful to students and help increase awareness of local environmental issues. Long-term management of the area will require the assistance of the Department of Natural and Environmental Resources to encourage the continued growth of the Palo de Rosa and maintain the health of the entire ecosystem.

Based upon our experiences with los Ciudadanos pro Bosque del Plantío, we decided that the guidelines contained within the Wildland-Urban Interface Assessment - with several key modifications - better address the environmental issues facing Puerto Rico than existing programs. Our report will help strengthen the community's argument for preservation and provide the Department of Natural and Environmental Resources with a case-study to use in similar efforts across all of Puerto Rico

1.0 Introduction

Throughout the world, pressures including urban expansion, tourism, pollution, and deforestation are threatening ecosystems. During the twentieth century, approximately 40% of natural forest coverage was lost to agriculture, industrialization, and urbanization. Karst forests – which grow over a limestone base – are particularly sensitive to the effects of deforestation due to their unstable soil composition. Recently, communities near such valuable untouched land have been pressured to develop, making it difficult to preserve the land’s ecological diversity and natural functions. To combat these developmental pressures and preserve the environment, many community groups have adopted community-based natural resource management systems.

Puerto Rico has a particular need for community-based natural resource management systems to avoid overdevelopment and the destruction of natural ecosystems. Centered in the tropical environment of the Caribbean, Puerto Rico is home to many ecosystems that provide important natural functions. One such natural system is el Bosque del Plantío, a karst region located in the northern section of the island. El Bosque del Plantío presents a unique living environment for many Puerto Rican species and also acts as a natural water drainage system for the neighboring human settlements. These karst formations have remained undeveloped for much of the twentieth century, but modern economic interests now threaten both this forest and the rest of Toa Baja’s ecosystems.

The government organization responsible for the protection of such ecosystems in Puerto Rico is the Department of Natural and Environmental Resources (DNER). The DNER implements systems of management for the preservation of Puerto Rico’s public forests by working with local communities to effectively address the problem. Research conducted in nearby San Patricio, Puerto Rico, educated the DNER on the main issues involved in conserving an endangered area. Identifying the role of the ecosystems in relation to endemic plants and

animals, and developing a future use for the area were crucial steps to prevent development. The citizens of San Patricio showed that obtaining ownership rights to threatened land with the assistance of the DNER is an effective method to combat development attempts. In other areas of the world, the Nature Conservancy – a non-profit private organization focused on preserving natural ecosystems – developed other steps to protect habitats threatened by development. In East Kalimantan, Indonesia, the growing population’s dependence on natural resources is threatening its rainforests and mangroves. By targeting critical areas, the Conservancy works with local community groups, industries, and the government to develop reasonable incentives that inspire landowners to conserve property rather than develop it. In the Municipality of Toa Baja, Puerto Rico, concerned residents formed los Ciudadanos pro Bosque del Plantío, to help manage and protect the unique karst forest present in their community from being developed.

The main problem los Ciudadanos pro Bosque del Plantío faces is that the land is not yet protected from development and a coherent strategy to achieve its long-term protection has not yet been articulated. The community group along with the DNER would like to see the area used for recreational and educational purposes in the future. Presently, a legal injunction is preventing immediate development. However, once this hold expires, the community and DNER will struggle to prevent developers from entering the area and permanently altering the environment.

For our project, we worked with both the local community group and the DNER to address their individual needs. For the community group, we aimed to develop possible solutions to maintain el Bosque del Plantío and use it for future educational purposes. We strove to understand the acceptable uses for this forest by conducting personal interviews and completing on-site analyses. Using the information acquired during the course of the project, we intended to make environmental, educational, managerial, and economic recommendations to the community members regarding the area. In addition to supporting the conservation of el Bosque del Plantío,

we aimed to use our project to evaluate the US Forest Service's Wildland-Urban Interface Assessment for the DNER to use for conservation efforts in other parts of Puerto Rico.

2.0 Background

The effects of development and urban expansion have had major effects on the state of the environment throughout the world. While undisturbed land presents itself as a logical area for overcrowded societies to expand into, the consequences of deforestation can be devastating to the environment and detrimental to the well being of the people. Due to Puerto Rico's small size, many of its natural areas are being threatened by developers. In the Municipality of Toa Baja – the home of a karst tropical forest known as el Bosque del Plantío - developmental pressures have been growing and a conservation plan is desperately needed to prevent the destruction of its remaining forestland. This chapter discusses the functions of forests, their societal importance, and the reasoning behind conservation programs. It also describes the role that governments and communities have played in conservation efforts, and provides information regarding local Puerto Rican groups involved in various aspects of the protection process.

2.1 Importance of Tropical Forests

By the end of the twentieth century, forested land comprised nearly twenty-seven percent of land suitable for human settlement throughout the world. Such forested lands include the tropical rain forests of the Amazon, the coastal mangroves of Southeast Asia, the frozen wilderness of Canada, the dry woodlands of southern Africa, and much more (Roper, 1999, Introduction). Indeed, forests are present in diverse forms and provide many important benefits and uses to both humans and the rest of nature. However, throughout the twentieth century, a large portion of forested land was lost to the world due to human intervention. In fact, of the estimated 6000 million hectares of original forest prior to major human intervention, only about 3,500 million hectares remained worldwide as of 1997 (Roper, 1999, p.1). Of the remaining

forests, about 2,000 million hectares can be classified as tropical forests, which are usually found in the developing countries in tropical and sub-tropical regions.

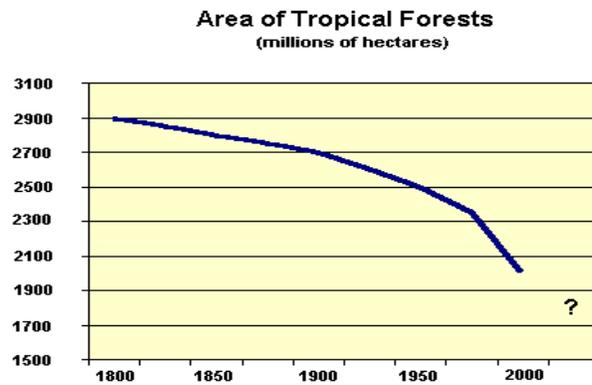


Figure 1: Tropical Forest Decline in the World (Roper, 1999, p.2)

Tropical forests have both environmental and socioeconomic importance. First of all, they are the natural habitat for nearly 70 percent of the world’s plants and animals. This accounts for nearly thirteen million species worldwide (Roper, 1999, p.2). The natural systems of these forests also affect the local and global climate – more specifically air quality and other pollution levels. By maintaining atmospheric humidity, carbon levels, and oxygen levels, the forests serve a vital role in supplying breathable air to humans and other inhabitants. Also, tropical forests are important for managing rainfall and appropriately hold excess water in a manner that is most effective for the environment. This is important in preventing erosion damage to ecosystems, which is often the cause of dangerous sinkholes and landslides. In other words, forests serve as natural watersheds that absorb excess rainfall to minimize flooding and encourage the growth of trees, which enhances soil stability and prevents erosion caused by excessive winds or other means (Roper, 1999, p.2). This function of the forest proves to be very valuable in areas such as Puerto Rico, which can receive up to 200 inches of rainfall annually (Rivera, 2006, Climate).

Perhaps just as importantly, the forests serve a very important socioeconomic role, as nearly 500 million people live around tropical forests worldwide. While the lumber industry

thrives in such areas producing nearly \$100 billion in products, forests also serve as valuable centers for local food supply, medicine, and natural fibers and resins (Roper, 1999, p.2). Despite their environmental and socioeconomic importance, tropical forests continue to be permanently lost in many areas of the world.

2.2 Causes of Deforestation

There are many explanations for the rapid rate of deforestation over the past century and its continuation today. Growing countries often depend on their extensive natural resources as means for economic development. In el Salvador, for example, an area with a similar tropical climate to Puerto Rico, nearly 50% of the forest coverage was destroyed since 1960 due to a rapidly growing agricultural industry. By 1991, only about 5% of the original tropical forest was undeveloped in el Salvador (Koop, 1997, p.2046). Such deforestation has had major negative environmental effects in the area. The country has soil erosion problems, is suffering from poor soil fertility, and has water pollution problems stemming from the destruction of natural watersheds. Such problems have caused nearly 75% of el Salvador's land to be degraded, and excess sediment runoff has further hindered already struggling hydroelectric energy production and irrigation systems. With a steady population growth rate of about 2% per year, el Salvador's demand for land for urbanization has made such deforestation nearly irreversible. El Salvador is a prime example of the dramatic impact of deforestation in developing tropical areas in the world.

The Food and Agriculture Organization of the United Nations reported in 1997 that from the period of 1980 to 1995 approximately 200 million hectares of land was deforested, at annual rates of up to 15.5 million hectares per year. Also, more land was lost to deforestation in Latin

America and the Caribbean than any other region – nearly 85 million hectares (Roper, 1999, p.3).

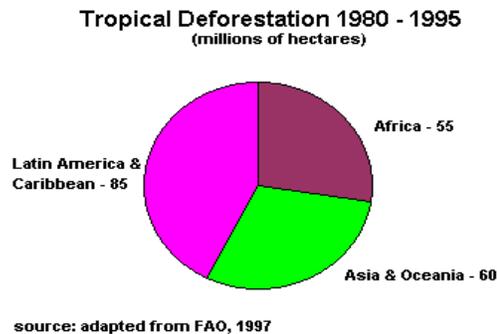


Figure 2: Tropical Deforestation by Location (Roper, 1999, p.3)

2.3 Karst Regions

The karst regions of Puerto Rico consist of only a small portion of the total tropical forests in the world but serve vital environmental functions. The growing threat presented by deforestation directly affects areas such as the karst regions of Puerto Rico and other tropical forests which hold environmental and cultural significance to their inhabitants.

2.3.1 Karst Regions Significance

Karst and pseudokarst regions are found all over the world, in places as diverse as the Waitomo region of New Zealand, the Ozark Plateau of Missouri, the Gunung Mulu National Park of Malaysia, the Apuseni Mountains in Romania, the Halong Bay in Vietnam, and of course the Karst forests of Puerto Rico (Karst, 2006, p.1). These regions vary greatly in topography and geographic placement, but all share some common characteristics. Karst regions are defined by large networks of underground drainages, formed through the erosive effects of rainwater, and are usually composed of limestone or dolomite, each of which is easily dissolved by mildly acidic rain (Karst, 2006, p.1). Pseudokarst is made up of basalt or granite, neither of which can be readily dissolved by rain. A third form of karst, known as thermokarst, is formed when

underground permafrost melts and drains away, leaving underground caves.

The caves found in karst regions are responsible for most of the karst's unique characteristics. Flooding is extremely unlikely in karst regions because rainwater drains very readily through the underground caves. Farming on a karst plain poses unique challenges because rainwater permeates the ground so quickly. If the region does not see frequent rainfall, the ground may dry out completely many times throughout the year. Sinkholes are also a common occurrence in karst regions. The continuous underground erosion creates large caves that occasionally become unstable and collapse, swallowing whatever or whoever is above them at the time. Without careful investigation of potential building sites, karst development can present a serious safety hazard. Karst groundwater can also be dangerous, because it is not filtered in the same way as traditional groundwater. It is entirely possible for pollution to travel extremely large distances underground. There have been many instances of karst sinkholes being used as landfills, without any regard for the environmental consequences.

Over time, karst sinkholes often coalesce into large depressions made up of the non-soluble remnants of prior erosion known as *poljen*. These areas are essentially large, flat sinkholes with walls as high as 100 meters (Karst, 2006, p. 1). Because they are made up of only non-soluble materials, *poljen* are stable and therefore readily developable. Soil from the valley walls surrounding *poljen* often flows downhill to cover the bottom of the depression (Rivera, 1998, p. 64). As such, *poljen* are often blanketed in nutrient-rich soil, which makes them particularly good for farming.

2.3.2 Karst Regions in Puerto Rico

Puerto Rico's karst region covers almost 20% of the island. Puerto Rico's karst is primarily limestone and dotted with mogotes (small limestone hills) and alluvial terraces (a form

of poljen characterized by frequent flooding). At the height of Puerto Rico's agricultural development, almost all alluvial terraces were used for farming as pastures, space for rotating crops, or coffee plantations (Rivera, 1998, p. 65). Many of these were eventually abandoned as the economy changed and are now covered in re-growth. Former coffee plantations had large numbers of shade trees planted and as such are now dominated by shade-favoring species, such as the short leafy *Guarea guidonia*, commonly known as *chuchupate* or *cedro macho* (Center for Tropical Forest Services, 2004, p.1). Abandoned pastures are now dominated by the highly aggressive *Spathodea campanulata*, or African Tulip Tree, a problematic species that can impede the growth of many other types of plants (Invasive Species Specialist Group, 2005, p.1).

Karst regions are important for a number of reasons. They are home to many kinds of wildlife, including at least twenty-two species of plants and fifteen species of animals that are legally designated as threatened or endangered (Belson, 1999, p.1). Limestone karst aquifers, such as the two found in northern Puerto Rico, are important sources of fresh water for inhabitants. These two karst aquifers, located within the Miocene limestone of the Aymamón and Aguada Formations and beneath the Oligocene limestone of the Cibao and Lares Formations, are saturated with water that takes over a decade to fully circulate, and as such, they are very sensitive to any form of pollution or development. Even small quantities of contaminants will build up to dangerous levels in a short time, leaving the water unsuitable for human use and harmful to plants and animals (Jones, 2003, p.132).

El Bosque del Plantío is one particular karst region located in the northern section of Puerto Rico, west of the capital city, San Juan. Surrounded by communities in the Municipality of Toa Baja, the area holds



Figure 3: Toa Baja Location (University of Texas, 2005)

environmental significance for nearby aquifers. The forest is home to a variety of flora and animal species and two protected endangered species - the Palo de Rosa (tree), and the Boa Puertorriquena (snake).



Figure 4: El Bosque del Plantío in Toa Baja (Los Ciudadanos pro Bosque del Plantío, 2005)

2.3.3 Puerto Rican Karst Aquifers

In Puerto Rico, karst regions are particularly important due to their function as aquifers, or clean fresh water supplies. All domestic, commercial, and industrial water is supplied by either surface water sources, such as lakes and rivers, or groundwater sources like karst aquifers. In Puerto Rico, over 25 percent of all water is supplied by groundwater sources (USDA, 2001, p.68) – a much higher portion than in the United States and other countries. This high dependence on groundwater makes careful management and conservation of aquifers essential.

The most important source of groundwater is the north coast limestone aquifer. This karst aquifer alone supplies 33 to 35 percent of all groundwater used in Puerto Rico. Every day over 20 million gallons flow northward through this aquifer from the mountainous center of

Puerto Rico towards the ocean (USDA, 2002, p.68). This course passes beneath many municipalities, including Toa Baja. This path provides convenient access to fresh water, but also ample opportunities for it to become polluted. The most effective conservation and management policies take into account the entire watershed, from headwaters to the ocean.

2.4 Deforestation in Puerto Rico

As described, karst regions are particularly sensitive to the effects of development. As a result of deforestation and urban expansion, both the karst ecosystems and their natural functions can be destroyed in just a short time. As Puerto Rico has developed into a powerful economy, it has endured many of the effects of deforestation, and the important ecosystems, including karst regions, are now being threatened.

Puerto Rico's economy has changed significantly from the early 20th century. In 1934, about 43 percent of the Gross National product was agriculturally based. Under the Puerto Rican policy, Operation Bootstrap, Puerto Rico began its change from an agrarian to an industrial economy. The shift began in the late 1940's, and by 1960 new factories were growing at a rate of five per week. Between 1945 and 1965 alone, 1,027 new manufacturing plants were constructed. Although Operation Bootstrap brought growth, there were disadvantages to industrialization including a decline in employment of 18.8%, and an increase in poverty due to the lack of jobs and low wages being offered. By 1979 the main companies in Puerto Rico were involved in petrochemicals, pharmaceuticals, and electronics (Johnson, 1980, pp.39-41). Specialized industries did not expand the job market for the general population, and the majority of people were forced to live in expanding poor urban communities.

Puerto Rico's major agricultural exports – coffee, sugar, and tobacco – have decreased by 13%, 87%, and 100% respectively since 1960 (Koop, 1997, p.2046). The karst regions of Puerto

Rico, which were primarily used as coffee plantations in the early to mid twentieth century, have since been abandoned and have recovered almost completely (Aide, 1997, p.64). Such areas have become very valuable natural ecosystems once again. In fact, due to the shift in its economy, Puerto Rico has actually experienced a rise in the amount of natural forest since 1960. By 1994, natural forest cover in Puerto Rico rose to 34% from the low of only 5% in the 1930s to 1950s (Thomlinson, 1999, pp.15-16). This level, however, has been noted as the “peak” of forest coverage in Puerto Rico. Panchromatic Satellite imagery data have shown that expanding urban and suburban centers have begun to encroach on forested land once again.

Figure 3. Distribution of urban areas in Puerto Rico in 1977 and 1994.

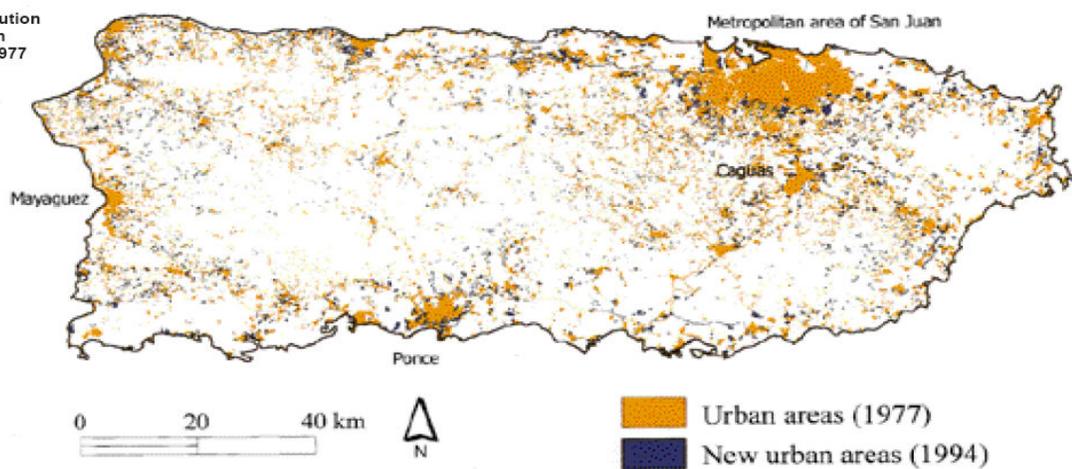


Figure 5: Urban Expansion Satellite Imagery (Aide, 2001, p. 51)

2.5 Urbanization and Its Results in Luquillo, Puerto Rico

During this time, populations shifted to major urban centers including the metropolitan areas of San Juan, Caguas, Ponce, and Mayaguez. Areas defined as urban covered about 11.3% of land in 1977 and have since increased to 14.4% of land in 1994, or a 27.4% increase in total urban areas (Aide, 2001, p.51). Population migration to the four major urban centers along with population growth has caused an increase in suburban development and population density.

Thus, areas that recovered over the years from the agriculture industry are once again becoming threatened by urban development and expansion.

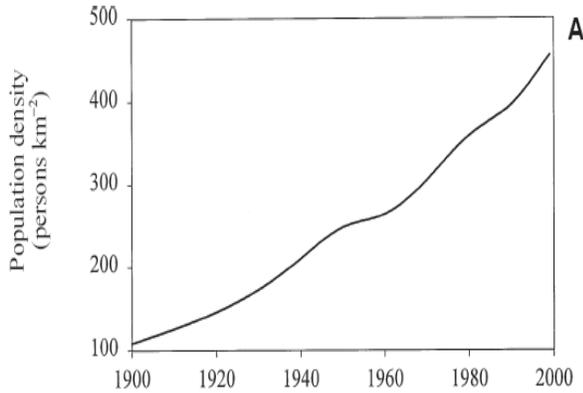


Figure 6: Population Growth in Puerto Rico (Aide, 2001, p. 50)

Table 1. Urban and nonurban areas (km ²) in Puerto Rico in 1977 and 1994, and the percent change of each class during the study period. Values in parentheses are the percent cover for each class on the island.		
Year	Urban	Nonurban
1977	984 (11.3)	7725 (88.7)
1994	1252 (14.4)	7457 (85.6)
% change	+ 27.4	- 3.5

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Figure 7: Urban/Nonurban Land Area (Aide, 2001, p. 51)

One example of the modern impact of deforestation can be seen through a study conducted at the Municipality of Luquillo, Puerto Rico. This expanding urban center in Northeast Puerto Rico has seen a shift from major agricultural development, and today supports thriving electronic and clothing manufacturers. Also, residential construction has increased to support the population migrating from nearby San Juan. The area has experienced a 218% population growth and a 2000% increase in the amount of land encompassed by urban settlements from 1936 to 1988 – mainly a result of expanding beyond the main town of Barrio Pueblo (Thomlinson, 1999, p.16). Luquillo is classified as subtropical moist and wet forests, areas which have ecosystems supporting a wide variety of plants and animals. As population growth has accelerated in recent years, natural land coverage has been negatively affected. The dense forest (over 80% canopy coverage) of Luquillo was most affected by the development of low and high density areas, according to a study carried out from 1988 to 1993. About 83% of the land that experienced a transformation to an urban environment was previously classified as dense forest.

The pattern of development in Luquillo is similar to areas around the world where natural resources are being exploited. The haphazard style of development – where urban areas grow in patches rather than planned growth – is known as “urban sprawl” (Robinson, 2005, pp.51-52). Roads and technology have made such expansion possible. In Luquillo, road density is among the highest in Puerto Rico. Road development, while connecting communities and enhancing urban growth, has major negative effects on the environment. Roads and the development alongside them fragment the natural ecosystems and habitats they pass through. After times of natural disaster, such as hurricanes, species are not able to move to less impacted areas to find food sources. This has been particularly devastating to native Puerto Rican species such as the Puerto Rican boa (*Epicrates inornatus*), which is now recognized as an endangered species.



Figure 8: Road Development (Roper, 1999, p. 5)

As populations are continuing to grow and people are developing a preference for low density urban areas, deforestation is once again becoming a major problem for urbanizing areas. In Puerto Rico, both governmental and local planning boards responded to this growth. The Puerto Rico Planning Board, for example, created a policy which advocates compact community development instead of the urban sprawl that destroys natural systems. In fact, the Planning Board placed zoning restrictions on environmentally important lands in Luquillo to minimize the effects of development. However, according to Koop (1997, pp.2053-2054), not all zoning laws

are being adhered to, and development is continuing at a pace that is not sustainable for sensitive environments.

While Luquillo consists of a more diverse ecosystem – both karst (semi-tropical moist forests) and wet tropical forests – than the karst region in Toa Baja, it is an important example to show the devastating effects of overdevelopment (Rivera, 1998, p.72). Uncontrolled urban sprawl effectively destroys natural ecosystems to an extent that they cannot recover.

With so many complex economic and political issues to work through, conservation efforts can be very difficult. Thankfully, much work has already been done in this area that our project and others can leverage. In particular, our project evaluated a model put together by the US Forest Service known as the “Wildland-Urban Interface Assessment” (Macie, 2002, p.1).

2.6 Wildland-Urban Interface

In 1998, after a series of Florida wildfires, the United States Department of Agriculture Forest Service developed the Wildland-Urban Interface Assessment to analyze the effects of urbanization, land use patterns, and management of the environment in thirteen southern states.



Figure 9: States of Interest for Wildland Urban Interface Assessment (Macie, 2002, p. 3)

This interface exists on several different levels according to the configuration of the land. Classic wildland-urban interface is defined by areas of urban sprawl, or areas where development approaches public and private wilderness (Macie, 2002, p.2). More specifically, the wildland-

urban intermix describes areas that are experiencing a transition from agriculture and forest uses to urban land uses. Typically these areas are a combination of urban and rural settlement, with the boundaries of urban development encroaching on the rural areas. Isolated wildland-urban interface consists of remote structures surrounded by large areas of untouched land – commonly in the form of summer homes or ranches and farms. As urban areas grow larger and closer together they create remnant forests surrounded by urban settlements, known as wildland-urban interface islands. These areas often lack species diversity and are not suitable for development due to topographical unsuitability (Macie, 2002, p.3).

The Wildland-Urban Interface Assessment was also established to address the sociopolitical issues present with development. Due to the different attitudes people have about the management of natural resources, conflicting values about natural land exist amongst opposing groups. For example, while some people may value maintaining an area with natural water resources, others may value its developmental potential. The interface also addresses the biological diversity of forested areas, and addresses possible changes in forest ecosystems and water quality that can result from increased urbanization. Lastly, for the southern United States, the interface was established to allow fire managers to identify and manage areas of development that are nearby areas prone to wildfire (Macie, 2002, p.5).

The main goals of the Forest Service’s Assessment were to examine factors causing change in the interface including land use planning, to explore their consequences on natural resources and forest management, and to identify research gaps and promote public awareness of interface issues.

2.6.1 Factors Driving Change in the Wildland-Urban Interface

As identified by the USDA, the main sources motivating change of the southern wildland-urban interface are population growth, social composition, shifts in the economy, rural land ownership, and individual lifestyles. The south is experiencing a net population rise of 6.3 people per 1,000-population per year – increasing the population by approximately 600,000 people per year (Macie, 2002, p.12). In addition, the levels of immigration and migration from other states to the south are greater than all other U.S. regions combined. This factor, along with a higher median age and life expectancy, affects forest ecosystems by increasing development of retirement communities and recreation facilities.

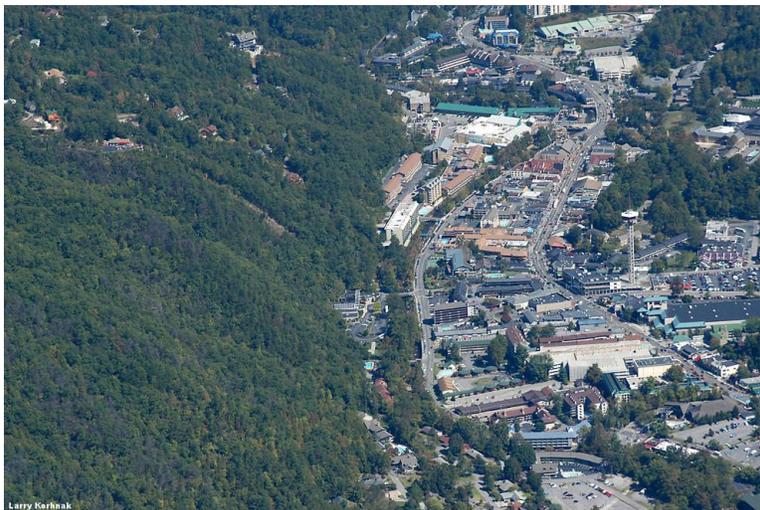


Figure 10: Example of Wildland-Urban Interface Area (Macie, 2006)

Consequently, between 1992 and 1997 nearly 16 million acres of rural land were converted to urban land uses. Over the next twenty years the urban and rural populations in the United States are expected to grow 18.8% and 12.4% respectively thus expanding the wildland-urban interface by increasing demands for development, timber harvesting, and recreation (Macie, 2002, pp.14-17). Also, the development of major interstate highways is contributing to the expansion of the interface, as rural areas are becoming more accessible to urban populations.

The changing economy in the south is another factor affecting change in the wildland-urban interface. Between 1975 and 1995, farming employment dropped by 7% while agricultural service industries, construction, and retail services all increased. This shift to a service economy is linked directly to urban expansion as the demand for shopping malls and manufacturing plants increase (Macie, 2002, p. 19). Also, the majority of southern rural land – approximately 432 million acres – is corporately and privately owned. The status of rural ownership is important to the land’s future and the advancement of the wildland-urban interface. Private ownership allows landowners to develop manufacturing and residential projects with greater ease resulting in greater fragmentation of the landscape. Also, private landowners are facing property damage from public uses, rising property taxes, and increasing pressure to transfer property rights to encroaching developers (Macie, 2002, p.22). These pressures have resulted in changing trends of forest management policy and preservation.



Figure 11: Developmental Pressure in Wildland-Urban Interface (Macie, 2006)

Another important factor affecting the change in the wildland-urban interface is the lifestyle of individuals within the interface. The knowledge gained by understanding the recreational activities and the choices people make helps to reveal the attitudes toward natural

resources and suggests appropriate programs for interface education and involvement. The most popular recreational activities in the south, such as walking for pleasure, outdoor family gatherings, visiting nature centers, and sightseeing, are each drivers for rural settlement and development patterns (Macie, 2002, p.24)

2.6.2 Land Use Policy and the Wildland-Urban Interface

The Federal Government has taken several steps to encourage management and stewardship of forested lands within the United States. For example, landowners of forested land are subject to a ten percent investment tax-credit and up to a \$10,000 annual tax write-off (up to 8 years) for reforestation expenses. Also, landowners who sell natural resources can recover their initial investment through tax deductions (Macie, 2002, p.43). However, tax deductions are not enough to effectively protect rural areas from being developed as the economic pressures are far greater than the government's incentive programs. The Wildland-Urban Interface Assessment notes the importance of identifying methods to reclaim abandoned urban areas and discourage the unnecessary development of untouched land. It recommends educational programs to alert residents in the interface area (including local officials and city councils) of the economic conditions that will result from urbanization and programs to encourage policymakers to create land-use policies that minimize the tax burdens of holding undeveloped land.

During focus group studies conducted in the southern United States, a majority of private landowners recognized the importance of environmental protection over property rights of individuals. The public is becoming more aware of the effects that individual landowners can have on the welfare of rural areas and communities despite zoning ordinances (Macie, 2002, p.60). Current zoning laws were not created with environmental protection in mind, but rather to protect private property values by restricting uses of land that decrease value or add cost to the

community. This system influences landowners to make decisions for their short term economic interest rather than for the good of the community. In comparison, the Wildland-Urban Interface Assessment provides recommendations that emphasize the long term significance of the environment. Geographical Information Systems (GIS) such as CITYgreen can be used to help map land-use plans that effectively integrate natural resources and development by projecting the impact of population growth. Also, policies such as the Purchase of developmental rights, Conservation Easements, and Land Trusts, limit developmental options (Macie, 2002, p.63). In order to find the most effective programs, the USDA recommends identifying the weaknesses in current land use policies and determining the public support and willingness to pay for land protection.

The Wildland-Urban Interface Assessment is a valuable resource for conservation and management techniques for urbanizing areas in the southern United States but also presents broad themes and lessons that can be applied to other areas of the world – such as Puerto Rico. By understanding these issues, environmental agencies will be able to more effectively communicate the environmental significance with community members, planners, and developers to promote conservation.

2.7 Government Regulations and Policies

In order to control the rate of development and conserve the natural ecosystems and functions of areas such as the Bosque del Plantío, it is necessary to create and implement management systems in coordination with governmental agencies and local communities. Governmental policies can have a large impact on the course of development and the impact development will have on the environment.

2.7.1 Puerto Rican Governmental Structure

Puerto Rico is a commonwealth of the United States and organizes its government in a similar structure to the United States. There are three main branches: The Legislative, Judicial, and Executive. The Governor heads the executive branch, and there are six offices that operate under him. Among those are the Planning Board, the Regulations and Permits Administration, and the Environmental Quality Board, each of which are vital to Puerto Rico's environmental status. With the Executive Reorganization Act of 1993, eight "umbrella" departments were created; one being the DNER. This government based organization considers proposals from communities in Puerto Rico in an effort to help them conserve land and natural resources within their communities (Business Registrar, 2006, p.1). For example, the community group from el Plantío obtained an injunction against an apartment complex construction to temporarily halt further development on the area. Also, a law presented by the Puerto Rican Senate, known as P. del S. 83, called for the protection of undeveloped parts of the Municipality of Toa Baja. (Puerto Rican Senate, 2005). The law protects all caves, wildlife and weather refuge, large rocks, hills, and other features of the community's karst region. With the cooperation of the community of el Plantío, the DNER has the ability to preserve and coordinate the management of the area, as well as designate the use of its natural resources. This law will be helpful in maintaining the area, but *non-autonomous municipalities* (as discussed below) have limited control over the development of their land (Puerto Rican Senate, 2005).

2.7.2 Municipality Power and the Puerto Rican Planning Board

Puerto Rico is organized into 78 municipalities, each of which is comprised of different communities, and has its own political standing and local flag (similar to individual states in America).

resources (Puerto Rican Senate, 1991). After the plan is reviewed by the Planning Board and the Governor, it is sent to the Permits and Regulations Administration for final approval.

However, municipalities must undergo many steps to gain autonomy and the powers associated with that status. Because of the complexity of the process, most municipalities remain non-autonomous and face further challenges when fighting for conservation (Business Registrar, 2006, p.1). For example, a municipality without autonomy might not have the power or funding to reclassify valuable land for conservation. The community group in el Plantío faces this issue because they lack a source of income with which to acquire land. As an alternative, the municipality could offer to trade land zoned for development for protected land. Another problem for non-autonomous municipalities is a lack of local environmental management expertise. In these cases, the DNER may be able to work with the community groups to establish management programs tailored to the area (Rebecca Rivera-Torres, Director of Toa Baja Planning Board, March 21, 2006, Personal Communication).

2.8 Community-Based Conservation

While government agencies and policies play a major role in the prevention of deforestation, the conservation process is more effective with community involvement. In Rincón, for example, community members met to discuss methods for protecting their environment in the future (Surfrider, 2006, p.1). Issues of land use planning and management, as well as economic development were discussed in response to the rapid growth of the local economy. A community development workshop was conducted with the hosting foundation, Surfrider, as well as members of the DNER. This workshop devised a system of management to protect community interests. With communities, such as Rincón, taking the initiative to focus on their environmental future, a precedent is being set that could easily spread throughout other

communities of Puerto Rico. However, local communities often lack clear systems of community management to regulate the extent of development, and thus quickly lose control of expansion. In order to most effectively conserve natural resources, a management system can be developed through local community organizations with the help of governmental policy and regulation.

2.8.1 Management Techniques

Community-based conservation incorporates the cooperation and involvement of community members and governmental agencies to aid them in the creation and implementation of future plans affecting their development. A community consists of a variety of people from different backgrounds, each with personal views, opinions, and agendas. Besides the individual households, the surrounding environment – forests, water, and animals – plays a key role in defining a community. This lays the foundation for community-based conservation that “the coexistence of people and nature...is its central precept” (Western, 1994, p.8). The main goal of community-based conservation is to utilize the connection between the local people and their surrounding ecosystem to benefit both nature and people.

Community-based management was developed to help protect natural resources in a manner that benefits society. Government bureaus and other organizations are continuously working to develop a system that prevents the environment from being overused and allows damaged ecosystems to recover. At times, community members are reluctant to trust governmental agencies when they propose regulatory policies for the community’s land. “Landowners traditionally react suspiciously to any (perceived or real) designs on their land by a government agency or a private organization. Such landowners may be more likely to take up a cause for conservation if the cause is place-based” (Babylon, 2003, p.7). To reduce tension, government agencies and private organizations often work with affected residents to include

them in the planning, implementation, and maintenance for a particular environmental project. This cooperation is important to the agencies as well because it allows them to understand the community viewpoint prior to executing a plan for a threatened area. “A cross-scale approach to conservation is necessary, addressing governance and ‘community’ at the various scales appropriate for the conservation problem in question” (Berkes, 2003, pp.635-636). Together, government and non-governmental organizations can realize the potential impacts of various proposals and evaluate which would offer the greatest social, environmental, and economic benefits for the area.

2.8.2 Effects of Community-Based Management

Evidently, community-based management systems are valuable to limit the effects of deforestation within diverse ecosystems across the world. This form of conservation can also bring long term economic benefits. For example, villagers from a community in Bengal benefited from community-based management by both regulating the local forestry industry, and developing a supplemental form of income to serve as an “economic incentive” by working with the government (see Appendix M). Governmental agencies commonly offer such incentive programs to communities involved in the conservation of an area. It is important that, “conservation organizations...illustrate that the achievement of a healthy environment often actually contributes to a robust economy” (Babylon, 2003, p.7). Effective conservation of land does not require the land to be completely closed for human usage, but limits the acceptable uses for the land. This allows people to still benefit from the land as a source of income, while maintaining the environment for future generations and allowing them to benefit as well. In addition to money raised by exploiting natural resources, communities can also raise income by using land for recreational and educational purposes.

The ties between the community and the government are another benefit of community-based conservation. The government and the community are able to work together to develop plans for an endangered area, each bringing forth different views and powers to the process. By working with the government, community groups know what is expected of them and the legal issues involved in the land. Meanwhile, the government can gain local expertise and input to improve their decision and evaluate its impact on the community (Western, 1994, p.330).

Although there are many positives to community-based conservation, there are some challenges associated with it. In areas that resist governmental intervention, sometimes it is difficult to initially establish community-based conservation programs without incentives and compensation.

Several case studies apparently assume that if a conservation activity is situated locally and involves local populations, then it is participatory. The presence of a national park or protected reserve administered by a central government entity almost inevitably means that participatory CBC will be highly constrained if not impossible and that strong monetary or other types of compensation will be required to offset losses in land or income (Western, 1994, p. 355).

People are not always eager to become involved in this type of conservation. Often local individuals concerned about their own finances view government and businesses as a threat to their personal welfare. Also, another problem may arise; namely, that the government may overlook the community as a whole. In past instances, the government considered only selected individuals who have expressed interest in preserving local threatened land, rather than the interests of the entire community. Without proper consideration of the attitudes of the entire community, some people may be overlooked and plans may be placed into action that do not reflect the area's interest (Babylon, 2003, p.8). Conflicting ideas for land usage between the government and community members is a major problem that often hinders progress of land conservation projects. (Western, 1994, p.429).

2.8.3 Community Efforts in Puerto Rico

There are several successful community-based preservation efforts in Puerto Rico. Their experiences helped us develop an effective preservation strategy and management plan for los Ciudadanos pro Bosque del Plantío to use.

2.8.3.1 Ciudadanos pro Bosque del San Patricio

Within Puerto Rico, community-based management has been used in order to increase protection for natural ecosystems. El Bosque del San Patricio is a forested area located near San Juan, in the northeast section of Puerto Rico. It is home to a variety of exotic animals and unique plants native to the area. After businesses expressed interest in developing the area for manufacturing purposes, los Ciudadanos pro Bosque San Patricio, a group of concerned community members, formed to protect the important natural habitat (Almeyda, 1998, Citizens pro San Patricio). The area now offers educational and recreational opportunities including a system of hiking trails and a park. They are currently developing a bird sanctuary to educate the community about the unique environment that surrounds them. The group has researched the native animals, plants, and the unique landscape to show its important role in the natural ecosystem. The group worked with the Department of Natural and Environmental Resources (DNER) to develop a law that allows them to co-manage the land, thus providing them with more control over acceptable uses for the area. The success of this group has served as a model for other communities in Puerto Rico, including the Municipality of Toa Baja in their fight to protect el Bosque del Plantío.

2.8.3.2 Casa Pueblo

Other important lessons can be learned from the experiences of the Casa Pueblo group. Casa Pueblo formed in response to a plan to begin open pit mining in the mountains of central Puerto Rico. This group faced tremendous opposition from both the governmental and commercial sectors and still managed to both stop the mining effort and turn the area into a useful resource for the community, providing educational benefits in addition to its natural value as a source of clean water.

Casa Pueblo's approach was radically different from all previous preservation efforts in Puerto Rico. They fought for a system of forest management that gave the responsibility for maintaining and utilizing the forest to the community instead of the government. This approach was difficult but ensured that the effort would faithfully serve the interests of the community. Casa Pueblo's experiences taught them the following lessons that are widely applicable (Gonzalez, 2006, p.27):

1. Focus on human development, such as quality of life issues and community self-reliance.
2. Highlight environmental services, like clean water, that the forest provides.
3. Concentrate on learning and personal growth.
4. Offer new economic opportunities.
5. Make it easy to become part of the process.
6. Prepare scrupulously, with academic and technical expertise.
7. Demonstrate public backing.
8. Have a trustworthy and effective governmental intermediary.
9. Give management agreements the time and flexibility to evolve.

10. Make effective use of limited resources, attracting volunteers by offering everyone an equal share in decision-making.

11. Continue to bring in new stakeholders to widen the circle of participation. These lessons will help other communities run successful preservation campaigns and management efforts of their own.



Figure 13: Casa Pueblo Community Group

2.8.3.3 Ciudadanos pro Bosque del Plantío

The Karst forest, el Bosque del Plantío, consists of privately owned lots throughout the seven communities of Toa Baja. After two landowners expressed interest in developing their lots nearby the community of el Plantío, residents formed los Ciudadanos pro Bosque del Plantío to combat this developmental pressure and protect the area's valuable environmental resources. The group approached the Planning Board of Toa Baja where they were assured the area would not be developed. After a new mayor took office, the appointed planning board granted the landowners the right to pursue their developmental projects. Through a legal hearing, an injunction was placed on the forest that ceased any development of the area for a maximum of eight years, during which time developmental alternatives could be presented to the Planning Board. Looking for sources of funding to possibly purchase the land and develop practical

alternative uses, the community group approached the Department of Natural and Environmental Resources. At a market price of nearly \$800,000 for one four acre lot of land, the direct purchase of the land is not feasible for the DNER. However, with the resources of the DNER, the community is looking for another alternative that will guarantee the conservation of the area.

Presently, the Municipality of Toa Baja is in the process of proposing a new land-use plan under which all land will be reclassified. Under the Municipality's proposed zoning plans, el Bosque del Plantío is classified as a protected area restricting all development. Also, as part of the central government's (Planning Board) zoning plan –

which is also under review – the forest is marked to be conserved. The support of the planning board is very important to help ensure protection into the future. The Municipality's plan is in the fifth and final stage for approval and is now subject to public hearings. These hearings, which will take place in June and September 2006, allow the public to voice support or criticism for the proposals in an effort to help finalize the land-use plans for Toa Baja. If able to preserve this area, the

community of el Plantío would like to maintain the area to educate local students about the unique flora,

species, and karst characteristics and the importance of preserving natural ecosystems.

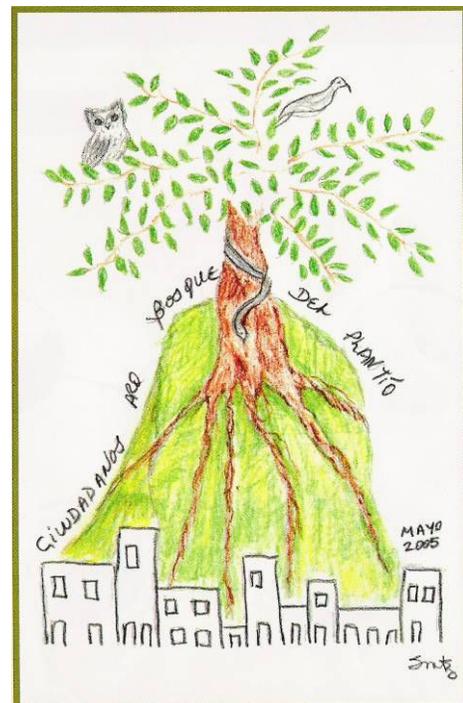


Figure 14: Los Ciudadanos pro Bosque del Plantío (Los Ciudadanos pro Bosque del Plantío, 2005)

3.0 Methodology

The main goals of our project were to detail environmental and educational reasons to conserve el Bosque del Plantío, and – using the area as a model – develop an effective series of steps based on the USDA’s Wildland-Urban Interface Assessment that other areas in Puerto Rico can use to prevent undesired development. In order to reach our goals, we met a series of objectives, including understanding the community members’ attitudes and goals for the area, identifying developmental pressures and environmental concerns, and evaluating the educational alternative uses for the area. This chapter outlines the methods used to achieve our specific objectives in order to reach our goals.

3.1 Identify Regional Plans, Goals, and Developmental Pressures

To identify the regional plans and goals for el Bosque del Plantío, as well as determine the developmental pressures the forest is facing, we held interviews with the community group from el Plantío and the Director of the Toa Baja Planning Board. These interviews revealed the attitudes of both the community group and the Planning Board towards the forest and its possible future uses.

3.1.1 Interview los Ciudadanos pro Bosque del Plantío

We interviewed los Ciudadanos pro Bosque del Plantío to understand why the group is working to conserve el Bosque del Plantío. We were also able to determine what previous work had been completed by the group regarding the forest, and acquire contacts within the Municipality. The interview was conducted informally to allow for greater personal communication, encourage involvement from the whole group, and allow for open-ended responses. The questions were asked in an unbiased manner, solely to learn about the community group’s history, the work they have been doing, and what they would like to see the area used for

if the forest is preserved. We also identified the developers that are currently interested in the area.

3.1.2 Interview Toa Baja Planning Board

We conducted a personal interview with Rebecca Rivera Torres, the Toa Baja Planning Board Director, to determine the status of the proposed zoning plan for Bosque del Plantío, and learn more about the roles the government and municipalities play in deciding land usage. Questions regarding the Municipality and the forest were asked in an unbiased manner, so that we could gauge the Director's true attitude towards the area. We acquired the proposed land-use plan for the Municipality of Toa Baja, and learned how it will affect el Bosque del Plantío if it is approved (See Appendix B).

3.1.3 Interview the Human Resources Director of Toa Baja

We met informally with Elías F. Sanchez-Sifonte, the Director of Human Resources in Toa Baja, both to show outside support for the agenda of los Ciudadanos pro Bosque del Plantío, and to determine whether or not the Mayor of the Municipality was in general agreement with the proposed land-use plan for Toa Baja. As a confidant and close partner with the Mayor, we decided that his answers would truthfully reflect the Mayor's attitude towards the Municipality as well. If the Municipal government agreed with the community group, their goals for the area would be much easier to achieve (See Appendix C).

3.2 Identify Environmental Concerns that Would Preclude Development

It was important to identify the major environmental concerns that that can be used as an argument against development. As described by Worcester Polytechnic Institute's professor Roger Gottlieb, a professor of environmental philosophy and an established author, (personal

communication, February 7, 2006), areas that hold an important environmental purpose are much more likely to be conserved than areas that cannot make a strong environmental claim (see Appendix O). To determine the functions el Bosque del Plantío serves, we reviewed previous academic research done on or in the forest, investigated the mogotes ourselves with the help of local experts, and analyzed the area's characteristics using GIS data from the Department of Natural and Environmental Resources.

3.2.1 Review Previous Academic Work

Graduate students from the University of Puerto Rico have completed research in the area to identify local endangered species and their role in the ecosystem. Also, some information regarding the connection of karst regions and natural aquifers was prepared during past studies of the area. Through our contact with Wanda Crespo, a graduate student working with los Ciudadanos pro Bosque del Plantío, we were able to obtain the results of the community group's investigations and use them to strengthen our own findings.

3.2.2 Field Research Species Identification

With the help of local community members and researchers from the DNER, we hiked through the mogotes to determine several important qualities of the land:

1. What are the characteristics of the terrain? Is it suitable for hiking, building, or neither?
2. What is the vegetation like? Is there fallen wood that could be used by the municipality?
3. What unique geographic attractions, such as caves, exist in the area and where?
4. What endangered species can we locate ourselves during a simple day-hike?

Throughout the hike we kept photographic documentation of our findings, logged species names in a notebook, and recorded GPS waypoints documenting both our path through the mogotes and the precise locations of important findings.

3.2.3 GIS Analysis for Karst Characteristics and Aquifers

With our field GPS data, we used GIS to analyze our findings. Using data collected by the Department of Natural and Environmental Resources and the US Geological Survey, we plotted our findings on aerial and topographical maps of the area to show the proximity of endangered species and unique geographical features to proposed and current developments.

While the ecosystems and specific endangered local species are a valuable argument for the conservation of the forest, it was also important to stress the environmental value the area offers to the community. This argument was made by comparing the location of the el Plantío mogotes to existing GIS maps of the aquifer networks in northern Puerto Rico and local fresh groundwater well locations. If we were able to demonstrate a link between el Bosque del Plantío and larger aquifer networks, this information would help defend the proposed zoning plan for the conservation of Bosque del Plantío.

3.3 Identify Educational Value to Community

Because the community group wanted to specifically maintain the mogotes as an educational center for the surrounding schools to visit, we investigated Casa Pueblo's successful environmental education program to use as a possible model for a similar program in Toa Baja. We also worked with local school administrators and teachers to evaluate feasible educational topics and determine their level of interest in using el Bosque del Plantío's resources for lessons and field trips.

3.3.1 Casa Pueblo's Community Value

In order to understand how forest education could be implemented in schools, our group conducted a personal interview with a teacher from the educational center of Casa Pueblo, an established and successful community-based land preservation group. Casa Pueblo has a collaborative program with fourth and fifth grade classes at the Adjuntas Middle School. We also interviewed the director of the Adjuntas Middle School, Elín Cintrón along with an English teacher, Lillian Nieves. Through these interviews, we determined the steps Casa Pueblo took to implement an educational program at that school. We documented some of the educational services and opportunities that Casa Pueblo provides to the students at the Adjuntas Middle School. We also asked questions about the attitude of the students and other teachers towards the program (See Appendix D). The success stories of Casa Pueblo are a helpful reference for making suggestions to the el Plantío community group for educational programs in their specific area.

3.3.2 Educator Interest Survey

After learning about the effect that Casa Pueblo had on their community and deciding to use their methods as an example for el Plantío, we needed to see if local educators incorporated information regarding el Bosque del Plantío or environmental issues into their lesson plans or had a future interest in doing so. We developed a survey for the teachers and administrators of schools within the Municipality that are close to el Plantío: Pajáros, Macún, and Candelaria (See Appendix E). We used this survey to find out what aspects of el Bosque del Plantío would be most applicable to the subjects taught at their schools.

The survey was conducted at six different schools - five at elementary schools, and one at a junior high school. At each of the six schools, questionnaires were given to the director,

science teachers, and social studies teachers. Our sampling frame included the fifth and sixth grade level teachers and directors at the elementary school and seventh grade at the junior high school because students at Casa Pueblo were most receptive at these age groups. A total of twenty-eight questionnaires were distributed to the six schools.

3.3.3 Educational Valuation Method

Within each questionnaire, respondents were given options that they would like to see incorporated into the el Plantío educational program. Each option consisted of a ranking system from 1 to 5 to allow the respondents to rank how interested they were in a particular topic. These ranking results were analyzed by comparing all possible educational options using the contingent rating system (Riera and Penin, 1997). Each option's ranking was totaled and compared to the best possible score of 90 (maximum of 5 points x number of respondents [18]). The option with the score closest to 90 was considered the best choice for the el Plantío educational program.

3.4 Application of the Wildland-Urban Interface Assessment

Working with Edgardo González of the Department of Natural and Environmental Resources, we evaluated the United States Department of Agriculture's Wildland-Urban Interface Assessment (WUI), to see ways that it could provide suitable conservation plans to communities in Puerto Rico. Using our work at el Plantío and research about other Puerto Rican communities as case studies, we modified the Wildland-Urban Interface to apply to the unique environmental and societal issues present in Puerto Rico. We identified sections of the plan that would be useful to implement in Puerto Rico and documented potential drawbacks and gaps that arose in the transition. The following topics were addressed:

- 1) Major themes and needs for the program

- 2) Population and demographic importance
- 3) Economic issues
- 4) Land-use policy
- 5) Urban and social influences on forests
- 6) Forest resource management and conservation

The differences between Puerto Rico's diverse ecosystem and the southern United States studied in the original WUI Assessment were considered to determine different management approaches. In addition, the differences in the laws and social attitude toward environmental conservation were also considered while modifying the Wildland-Urban Interface to become a useful model for the conservation of threatened land throughout Puerto Rico.

3.5 Summary and Impact of Methods

Through these methods, we developed project recommendations that effectively addressed our goals and objectives for both los Ciudadanos pro Bosque del Plantío and the Department of Natural and Environmental Resources. By evaluating the attitude of the regional inhabitants, particularly those of the community of el Plantío, identifying the developmental pressures and environmental concerns, and understanding the local regulations and policies we developed a solution that will help to conserve the forest for environmental and educational purposes to benefit future generations. Also, using our work as a case-study in the application of the Wildland-Urban Interface to Puerto Rico, the DNER will be able to provide guidelines and recommendations to other communities looking to protect natural resources from unwanted development.

4.0 Results and Analysis

The results presented in this section provide the Department of Natural and Environmental Resources and los Ciudadanos pro Bosque del Plantío with information to support the community group's conservation effort of el Bosque del Plantío and provide useful ideas for the forest's future. Through research, interviews, and technical analysis, we determined the different goals of the community group and developmental pressures facing el Bosque del Plantío, generated data to reflect the environmental issues that would preclude development, and surveyed educators to determine the value of the karst forest for educational purposes. In addition to our results for los Ciudadanos pro Bosque del Plantío, we evaluated the Department of Agriculture's Southern Wildland-Urban Interface Assessment to determine how the DNER could adapt it to Puerto Rico.

4.1 Goals for the use of el Bosque del Plantío

The regional goals for the use of el Bosque del Plantío were determined through a series of interviews. Group leaders of los Ciudadanos pro Bosque del Plantío, the director of the Toa Baja Planning Board, and the Municipality Human Resources Director provided us with their individual opinions. Through the interviews we gained multiple points of view on the mogotes of el Plantío and future uses for the forest.

4.1.1 Los Ciudadanos pro Bosque del Plantío

Los Ciudadanos pro Bosque del Plantío members want the mogotes surrounding their gated community to be fully conserved and protected for several reasons (See Appendix A). They expressed that the forest provides protection from dust and air pollution produced by neighboring industrial centers and helps regulate access to their community by outsiders. The group fought to cease all existing development that required the destruction of the mogotes and

is now fighting for the permanent protection of the land. This is important in order to maintain the biodiversity in the area, the habitats within the mogotes, and the overall appeal of the community of el Plantío. They would also like to renovate an existing abandoned house and offer it as an educational center for educators and schools to learn about the karst forests of the Municipality. Los Ciudadanos pro Bosque del Plantío want the ownership rights of the mogotes transferred from the private owner to either the community or an organization that can help manage and protect the area to benefit el Plantío and the surrounding communities. Currently, the el Plantío community group lacks a source of income and budget for purchasing and maintaining the area. They hope that through help from outside organizations, such as the DNER, they can obtain the funds needed to maintain the forest, and keep it from future development. For now, los Ciudadanos pro Bosque del Plantío members remain dedicated to fighting a hard battle in order to preserve the land.

4.1.2 Planning Board

The Municipality of Toa Baja Planning Board, headed by director Rebecca Rivera Torres, has proposed a land-use plan that designates the mogotes surrounding el Plantío as conservation areas, specifically called *tierra especial protegido* or specially protected land. However, the new zoning plan is still in progress – in the fifth and final stage of obtaining approval – and is subject to revision during public hearings in June and September 2006. If the plan is accepted and implemented, then no further commercial, residential, or industrial development will be allowed in the mogotes (See Appendix B). It would ensure that a permit for development will be prohibitively difficult if not outright impossible to obtain. The support of the Planning Board of Toa Baja is important to the conservation effort of los Ciudadanos pro

Bosque del Plantío, and if the new zoning plan is accepted and enforced, it will ensure the mogotes remain undeveloped.

4.1.3 Human Resources Director of the Municipality of Toa Baja

By interviewing Elias F. Sanchez-Sifonte, the Human Resources Director of Toa Baja, we learned about the Mayor of Toa Baja's stance on preserving the land of the Municipality, and what power the Municipality has in governing and owning land (See Appendix C). As a confidant of the Mayor of Toa Baja, Sr. Sanchez-Sifonte stated that one of the Mayor's main focuses is to protect the karst region. When he learned of the efforts of los Ciudadanos pro Bosque del Plantío, the Mayor took a stand alongside the community. Although for many years the Toa Baja area was neglected and there was over-development, the Municipal government has made efforts to preserve environmentally important lands in recent years. As an example, when the car dealership (see 4.2.2) began expansion – destroying sections of the mogotes in the process – the Mayor intervened and a cease and desist order was issued. The community group can take comfort in the fact that the Mayor presiding during the development of the land-use plan strongly supports the protection of the mogotes.

However, having the support of the Mayor does not mean that los Ciudadanos pro Bosque del Plantío will see the mogotes protected immediately. The government of the Municipality does not have the power to step in and claim ownership of the land. The 33 acres of mogotes surrounding el Plantío belong to a single private landowner. The Mayor and the Planning Board are currently negotiating with this private landowner to grant him ownership of lands designated for development in exchange for the environmentally important mogotes – a tactic that would help to ensure the immediate preservation of the forests while the land-use plan is under review, and place the land in safer hands for the future. The Municipality also stated that

it does not intend to retain possession of the land, as that could potentially place it in jeopardy during future administrations. The municipal government intends to entrust the land to a competent community-based conservation group.

The Director also stated that before the government would provide community groups, such as los Ciudadanos pro Bosque del Plantío, with the resources and tools for implementing and managing programs (such as educational centers or hiking trails), the full commitment and support of the community must be apparent to the Mayor. For now, both the Municipality government and los Ciudadanos pro Bosque del Plantío want the mogotes to be preserved in their current state, and the preservation effort is moving forward.

4.2 Developmental Pressures

It was important to establish the developmental pressures threatening the mogotes so we could offer feasible recommendations for the future maintenance and use of the area. By interviews with the community group, los Ciudadanos pro Bosque del Plantío, and through personal field work, we were able to establish three present threats: an apartment complex, car dealership, and a cell phone tower (Figure 15 – Larger version in Appendix F).



Figure 15 (Appendix F) Proposed Developments (DNER, 2006)

4.2.1 Apartments

A private owner of the 33 acres of the mogotes surrounding el Plantío has requested to construct between 57 – 67 apartments, a 100 car parking lot, swimming pool, and other facilities on a 1.5 acre lot. When asked to sell his land, he asked for a significantly larger amount than his

purchasing price (see Appendix B). The area he owns borders the mogotes, and any development would cause destruction of the land and important ecosystems. The development of the apartment complex would increase traffic through el Plantío and introduce a new demographic of residents, both of which the association members of el Plantío strongly oppose (see Appendix N).

4.2.2 Car Dealership

A car dealership located in Candelaria, on the opposite side of the mogotes and outside the gates of el Plantío, began excavating a significant portion of the mogotes to expand its capacity. The company destroyed more than their permit allowed, and they were forced to stop construction. This developed area upset community members of el Plantío because it has ruined that area's karst formation, and many trees and plants were disturbed in the process.

4.2.3 Cell Phone Tower

A cell phone tower exists on the side of the mogotes closer to Candelaria. There is an access road from a main street leading to the tower, and it is adjacent to the destruction of the mogotes from the car dealership. The community group recognizes the street as a future access point to the mogotes, especially if it becomes an educational area, but the construction of the tower disturbed the surrounding land similar to the car dealership development.

4.3 Environmental Findings

This section provides the data we collected to identify environmental concerns that would preclude development of el Bosque del Plantío. Our results indicated that there are sound scientific reasons to conserve the forest.

4.3.1 GIS Map of Area

During our hike to identify the plant species and geographic features in the mogotes of el Plantío, we took GPS readings to record the route we took through the mogotes and the locations of important landmarks. These data were combined with



Figure 16 (Appendix G): GIS Exploration Route and Fresh Water Wells Map (DNER, 2006)

satellite imagery from the DNER to form an overview map of Bosque del Plantío (Figure 16 / Appendix G). This map clearly depicts the location of the Palo de Rosa seedlings and adult tree, the largest cave-like formation, and the area cleared for a cell phone tower. The map also shows the location of seven fresh water wells in close proximity to the mogotes. These wells draw upon clean groundwater provided by the karst formations of which Bosque del Plantío is a part.

4.3.2 List of Species with Photos

After mapping the points of interest in the mogotes using GIS, a catalog was compiled with the various forms of vegetation seen on our hike within the mogotes (See Appendix H). This catalog included pictures and scientific information of the various plants found on the hike. The most important plants discovered were the Palo de Rosa and the Palo de Cruz. Palo de Rosa is an endangered species, while Palo de Cruz is endemic to Puerto Rico. There were also two rare species seen within the forest, specifically the Nigua and the Negra lora. Since we explored only this small section of the mogotes, there is a possibility that other endangered or threatened species remain to be discovered.

The catalog that we compiled contained only about a third of the actual species in the area. With the assistance of Victor Rodriguez, a research forester of the DNER, an expanded list of the plants that reside within this section of el Plantío mogotes was developed in order to give the community group information about the natural vegetation in the area (see Appendix I). All of this information can be used to help the community group of el Plantío make their case stronger by providing specific information to the planning board about the flora and fauna of the mogotes.

4.3.3 GIS Aquifer Map

The GPS location of Bosque del Plantío was also overlain with aquifer data from the United States Geological Survey to determine what type of aquifer it is (Figure 17 / Appendix J). As seen in the resulting aquifer map, Bosque del Plantío is classified as a “Fissured Aquifer (Including Karst and Volcanic Aquifers).”

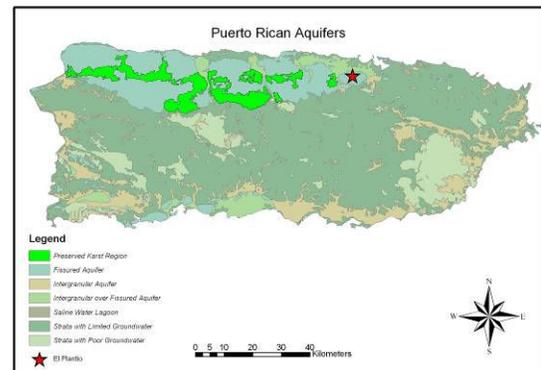


Figure 17 (Appendix J): Aquifers Map of Puerto Rico (with protected karst highlighted) (DNER, 2006)

Large areas of this same type of formation have already been designated as protected areas all across the northern coast of Puerto Rico (as seen in the map). This further affirms the value of this type of formation as a contributor to clean water.

4.3.4 Proximity Analysis

At the request of los Ciudadanos pro Bosque del Plantío, and with the help of the DNER, we performed a proximity analysis to determine the extent to which Bosque del Plantío contributes to clean air and water for communities outside el Plantío. During this process several additional maps were created to show changes in the land area of the Toa Baja mogotes over the

last thirty years and their relative location to industrial, residential, and commercial areas, and areas prone to (or protected from) flooding. In short, the proximity analysis showed that Bosque del Plantío is not large enough in land coverage area by itself to provide a benefit to Toa Baja as a whole. However, when combined with the larger karst mogotes found elsewhere in Toa Baja, the mogotes collectively provide a valuable service to Toa Baja by preventing flooding and contributing to cleaner air.

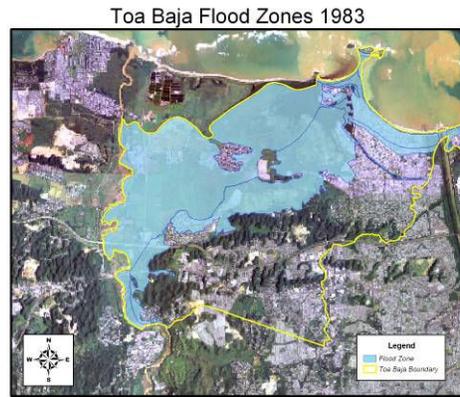


Figure 18 (Appendix K): Toa Baja Flood Zones (DNER, 2006)

The floodplains map shows a clear demarcation line between flood-prone and flood-safe areas running directly along the large range of mogotes (Figure 18 / Appendix K).

4.3.5 Developmental Suitability

Through a series of interviews and case studies, we determined the developmental suitability of karst regions – in particular the karst mogotes of el Bosque del Plantío. The karst belt of Puerto Rico has experienced many developmental problems due to its instability and porous characteristics. Sections of PR-10, a major highway that links Arecibo in the north and Ponce in the south, were developed over karst regions (Figure 19). Through a study of PR-10 we determined that developing karst regions is unreliable, dangerous, and much more expensive to maintain over a period of time than developing on stable ground. In a 1.7 mile stretch of highway construction through the Río Abajo State Forest, the



Figure 19: PR-10 Developmental problems (Puerto Rico Herald, 2004)

highway has experienced sudden collapses due to karst characteristics such as natural sinkholes and underground cavities of water. In fact, a biological assessment completed by the U.S. Department of Transportation revealed that thirteen sinkholes exist along the highway over this stretch (DOT, 1994, p.9). As a result, this stretch of the highway is constantly maintained and monitored to protect against a disastrous collapse that could harm civilians or close the highway. Due to the extra precautions and engineering efforts taken to maintain the highway, PR-10 is among the most expensive roadway projects in the history of Puerto Rico. The final segment, from Utuado to Adjuntas is expected to cost over \$100 million alone by its completion in 2007 (Puerto Rico Herald, 2004). This case study shows the inherent instability of karst regions and demonstrates the unsuitability of such regions for developmental purposes.

To determine the developmental suitability of el Bosque del Plantío, we conducted a series of interviews with the community groups from el Plantío and a neighboring village, Macún. The community group from el Plantío revealed that minimal flooding occurs within their community due to the surrounding karst's natural drainage system. To support their claim, we met with the community group from Macún, los Vecinos Unidos en pro de Macún. After the development of the PR-22 highway destroyed parts of the mogotes protecting Macún, the community experienced several negative environmental effects. Representatives from their community group mentioned that the highway contributes to an increase in temperature and flooding in sections of the community. Areas on the opposite side of the highway from Macún – former mogotes used by the community for farming and recreational purposes leveled for the highway construction – are now highly susceptible to flooding and not suitable for development. In comparison, there is little flooding in the other areas of Macún that are still protected by the karst forests of el Bosque del Plantío. These results show that el Bosque del Plantío serves an

important natural function to its neighboring communities and that the forest is not suitable for development.

4.4 Educational Benefit

In addition to serving important natural functions, el Bosque del Plantío can potentially offer educational and social benefits to surrounding communities. In order to identify the most feasible uses for the forest, we evaluated the efforts of Casa Pueblo in Adjuntas and surveyed local educators to determine what educational uses they would prefer.

4.4.1 Casa Pueblo as a Case Study

Casa Pueblo's educational program was designed to educate students about the importance of preserving their forested area and provided us with a model that could be adapted to help el Plantío become involved in schools within the Toa Baja area. First, Casa Pueblo worked with the University of Puerto Rico to develop an educational program for the neighboring Adjuntas elementary school. Once the curriculum was developed, members of Casa Pueblo presented their proposal to the director of the Adjuntas school. Their plan was to supply an additional classroom and teacher to work with 4th and 5th grade students on both managerial and scientific projects. These grade levels were selected because students at that age are typically open to trying new programs and are capable of being given some responsibility. The director reviewed the project and agreed to implement it into the Adjuntas curriculum. Since then, students involved with the Casa Pueblo program have improved in both leadership skills and grades.

The Casa Pueblo program provides the students with many activities to learn about the protected area and what it has to offer. Students tend to butterfly gardens, transplant trees, and learn about various management techniques to maintain the forested area. They also learn about

what services the forest provides, such as cleaner air and water. Field trips are made to both the forest and the University of Puerto Rico for students to work with the people of Casa Pueblo and professors in order to conduct experiments and collect data. When Casa Pueblo hosts awareness events, students act as tour guides and help describe exhibits. These types of programs were used as examples to give the people of el Plantío an idea of what types of activities they could offer at their site.

All people involved in the Adjuntas program had very positive attitudes about the opportunities it provides to the students. Different aspects of the Casa Pueblo class have even been incorporated into other subjects at the Adjuntas school. Many children participate more and take more interest in school since the inclusion of the Casa Pueblo program in their education. The community has been very happy to work with the people of Casa Pueblo and supports their children's involvement in the program. Newspaper articles are used to inform the people within the school district of upcoming activities and to inform the community about ways that they can participate. This type of information keeps the community actively involved in the program.

4.4.2 Survey Results

Replies were obtained from five out of the six schools in the el Bosque del Plantío area that we surveyed. We believe that the last school did not reply because there was no previous communication between the school and the el Plantío community group. The raw data that were collected can be found in Appendix L. These data were used to learn about what educational programs existed within the schools already and what future educational programs were of interest to the schools if el Plantío provided the schools with an educational center. We received eighteen responses (out of twenty-eight original questionnaires) from directors, teachers and (to

our surprise) students. Most of the teachers surveyed taught Science or Social Studies. Each individual's career length at their respective school ranged from three to thirty years. This broad response gave us many perspectives on the topic. An analysis of the data provided by the responses to the questionnaire found that in the opinion of the educators the average interest of students in the environment to be 3.9 on a scale of 1 to 5, with 5 being "very interested". This indicates that there is a significant interest in the environment among the students. At the same time, however, not many people were knowledgeable about the Los Ciudadanos pro Bosque del Plantío's work to protect el Bosque del Plantío.

After the educators were supplied with basic information about the area surrounding el Plantío and the efforts of the community group, there was a unanimous interest in learning more about the Bosque del Plantío preservation effort and about seeing a future educational center constructed in the area. One fourth-to-sixth grade Science teacher surveyed mentioned that there is already a student organization that he/she works with in developing environmental protection plans. This teacher stated that this issue is personally important, and thinks some of the alternatives we have identified would provide excellent opportunities for students.

A majority of the schools' teachers and administrators showed a significant interest in incorporating a type of educational program within their own schools about el Plantío and would like to work with other schools as well in the process. There has also been some previous work done between a few of the schools that surround el Plantío. From the questionnaires we determined that the area schools do not participate in educational programs with each other, but they already collaborate on sports competitions between the schools. Although there is no existing academic link between the schools, the existing cooperation for sports programs suggests that further collaborative efforts – such as an environmental program – may be possible.

Some environmental studies, spanning fourth through ninth grade levels, are already established within these schools. Teachers convey the importance of the environment through lectures, projects, movies, and experiments. While almost all students learn about the importance of the environment, a smaller number learn about ecosystems, environmental conservation, contamination of natural resources, and endangered species. The teachers mentioned that if a program were developed by el Plantío, they would be receptive to teaching the students about the endangered and endemic plant species of the area.

4.4.3 Valuation of Responses

Using the questionnaires collected, we compared each of the possible el Plantío educational options using the contingency ranking method. The total possible score for each option was 90. The total raw score for each option was summed and compared to the total possible score, then converted into percentage form. These percentages represent the absolute interest level for a particular option. The flora and fauna exhibit was shown to have the highest interest at 97.8%. All the other options – except the hiking trail – appeared to have approximately the same high level of interest (Figure 20).

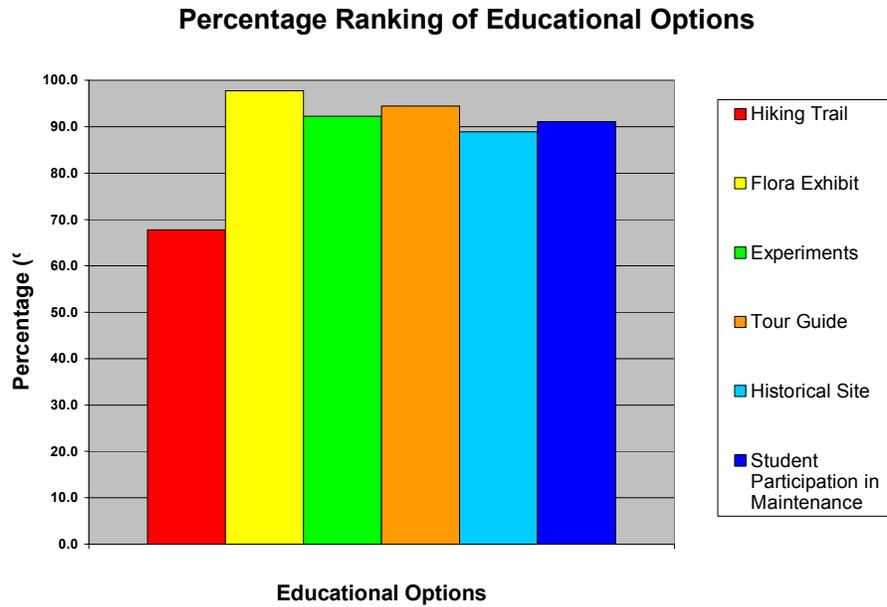


Figure 20: Percentage Ranking of Educational Options

In the percentage analysis, no solid conclusions about what activity was most favorable could be drawn. The hiking trail was the least favored option, although still holding about a two-thirds favorability rating, but no single activity was ranked significantly higher than the others. To gain a better sense of the respondents' opinions, we also compared the options to each other using a grouped chart (Figure 21). In this chart, each option's fives – or most interested – responses were counted and plotted. For comparison, other scores were included as well. This chart shows that the largest *number of people* were *most interested* in the flora and fauna exhibit. This distinguishes it as a clear choice for the first activity or facility to be implemented.

Comparison of Percentage Ranked for Education Options

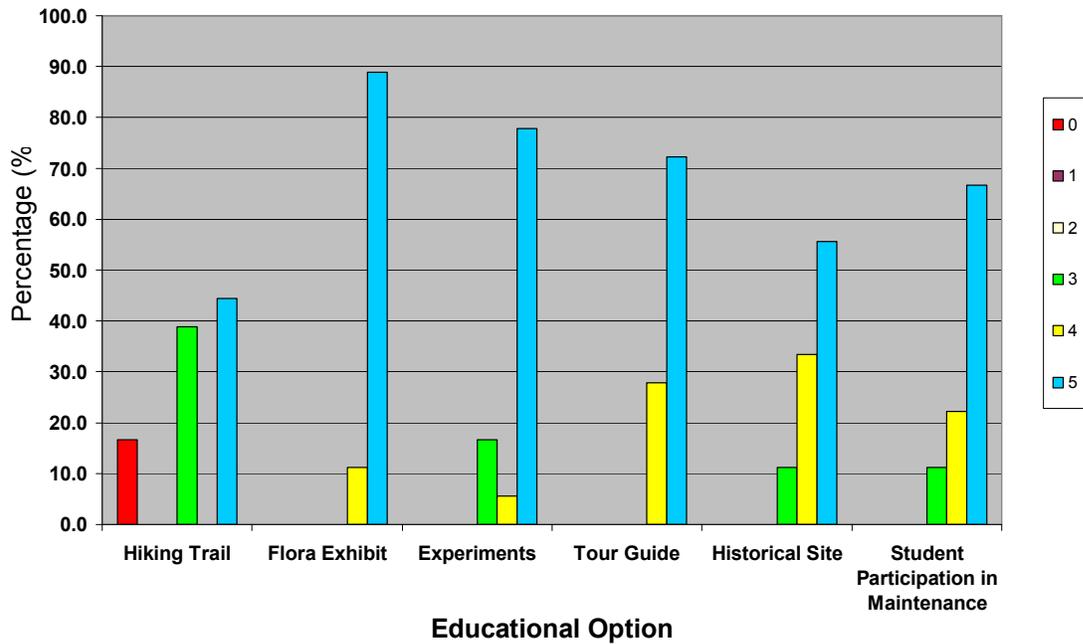


Figure 21: Comparison of Educational Options

Our last question simply asked for additional suggestions. One person suggested a virtual tour or video of what the mogotes had to offer (that would allow all visitors to see the area even if they are unable to hike into the mogotes). Another person suggested that we include information about the naval base near the mogotes. All of these data show the various interests that the schools have in different aspects and gives the community group ideas on what will draw educators to the area. It provides them with a starting point for ideas to incorporate within the educational center, with only more ideas to come in the future.

4.5 Wildland-Urban Interface Assessment

To provide the Department of Natural and Environmental Resources with a set of guidelines and recommendations for conserving forested areas threatened by development in Puerto Rico, we evaluated the U.S. Department of Agriculture’s Southern Wildland-Urban

Interface Assessment. We used information gathered from the conservation effort to preserve el Bosque del Plantío to support our analysis.

4.5.1 Application to Puerto Rico

We modified the Southern Wildland-Urban Interface Assessment to take into account the difference in social, economic, geographic and environmental backgrounds between the southern United States and Puerto Rico. In order to provide the DNER with the most effective guidelines to promote environmental conservation throughout the island, we considered the unique characteristics of Puerto Rico including its social and ecological diversity, legal issues, and available resources learned through our research regarding el Plantío. Also, we compared the assessment to the current forest conservation program of the Puerto Rico Forest Service. While the current program provides separate procedures for areas classified as either urban or rural, it does not effectively provide management tactics for the interface areas where forests overlap urban areas.

4.5.1.1 Major themes and needs for the program

The Wildland-Urban Interface Assessment developed four major themes relevant to the Southern United States. First, in order to successfully manage and conserve wildland-urban interface areas, one must realize that interface areas concern people. Secondly, public policy also plays a major role both in creating and solving problems. Third, interface problems are rarely one sided, but often are interdisciplinary and affect many different viewpoints. Lastly, the wildland-urban interface exists over different scales, and sometimes involves multiple landowners and jurisdictions.

Puerto Rico's wildland-urban interface areas are subject to very similar themes. Wildland-urban interface areas in Puerto Rico often border local communities that are

experiencing population and economic growth – such as the communities of Toa Baja surrounding el Bosque del Plantío, San Patricio, and Casa Pueblo. As a result, the population’s attitude toward the wildland-urban interface in Puerto Rico is still the underlying issue toward its conservation or expansion. Puerto Rican public policy is also an important factor in creating and solving problems, as in the United States. New policies – such as Land Use Plans – passed by municipalities are often the subject of controversy among many opposing groups. In Toa Baja, for example, a large portion of Candelaria’s population is focused on industrial development, while communities such as el Plantío, Pajaros, and Macún favor community conservation efforts.

The Wildland-Urban Interface Assessment also suggested major areas to research when addressing interface problems. One must understand the human influences – including public policies and management systems – and threats to ecosystems in wildland-urban interface areas. Also, the assessment stressed that understanding and communicating public attitudes is important to solve problems effectively. These research areas are just as important in Puerto Rico.

4.5.1.2 Population and demographic trends

The assessment identified population and demographic trends as an important factor affecting conservation and development efforts in the wildland-urban interface. Changes in the population level and demographics in the South have altered people’s attitudes and priorities toward land-use (Macie, 2002, p.153). Puerto Rico is currently experiencing similar population growth trends. Because of this, most of this section’s interpretations are still relevant, but the exact figures must be updated to reflect Puerto Rico’s population growth rates and changing demographics.

4.5.1.3 Economic issues

The Wildland-Urban Interface Assessment addressed the importance of economic trends in the south. The development of new industries was identified as a catalyst for urbanization and deforestation. Tax rates and incentives for landownership also affected the attitude toward conservation in the south. The personal objectives of landowners – whether they are interested in making profit or maintaining land – was identified as a driving force for the status of an interface area. By determining what factors lead to economic and urban expansion in the municipalities of Puerto Rico, management of wildland-urban interface areas can be more effective. In addition, Puerto Rico’s historic widespread deforestation to create agricultural land – and subsequent partial regrowth – should be taken into consideration.

4.5.1.4 Land-use policy

Public land-use policies were also identified as factors that affect natural resource management and conservation. In the Wildland-Urban Interface Assessment, federal, state, and local land use policies have effects on the amount of land available for development. While the Federal and State policies offer broad land-use provisions, the local governments use policies such as conservation easements, land trusts, transfer/purchase of development rights, or incentive zones to manage growth. Puerto Rico is also subject to a similar land-use policy structure and the United States Federal environmental regulations apply to U.S. territories in the same way that they apply to states. In addition, the Puerto Rican Central Planning Board creates land-use plans for the entire island by working with local municipalities’ land-use plans. The individual municipalities also have planning boards that act in similar ways to town governments’ boards in the US, and use similar management tactics. The programs used in Puerto Rico are not as extensive, as land trusts and conservation easements are rarely implemented. A stronger

emphasis on the usefulness of conservation easements and trusts is needed to determine how they can be more widely used in Puerto Rico.

Historically, Toa Baja was not autonomous and did not have the power to make its own zoning plans. Without the use of this relatively straightforward mechanism to control land use, and a lack of public awareness of environmental issues, almost nothing was done to preserve valuable land. However, now that Toa Baja is in the final stages of gaining autonomy and is drafting their own land-use plan, they are using their power to designate important areas as conservation zones. Better information on what non-autonomous municipalities can do to encourage conservation may have helped to move the preservation process along years ago.

4.5.1.5 Urban and social influences on forests

The Wildland-Urban Interface Assessment provides a list of ecosystem goods and services that are affected by urbanization. Such goods included food products, plants, animals, tourism, and recreation, among others. Some of the ecosystem services provided are the maintenance of hydrologic cycles, regulation of climate, the cleaning of water and air, and providing natural beauty and research opportunities. El Plantío and its neighboring communities are examples of areas that would be negatively affected by development. El Bosque del Plantío is a source of a wide variety of native plants and animals, and provides recreational uses to the surrounding communities. The forest's natural beauty is also aesthetically pleasing and highly valued by the neighboring communities of el Plantío, Pajaros, and Macún, and serves as a visual barrier to nearby industrial centers. In addition, the forest provides natural protection to el Plantío by preventing access to the community by non-residents.

Social influences, such as forest industry growth, political and regulatory influence, recreational activities, and community and landowner attitudes are also identified as causes of

forest reduction. While the forest industry is not as strong in Puerto Rico, as demonstrated in Toa Baja, political and regulatory influence along with community and landowner attitudes toward land usage are still major factors in conservation and development.

4.5.1.6 Forest management and conservation

Several different areas for managing forests experiencing change are discussed in the assessment including: water resources, traditional forest products, fire, recreation, and wildlife. The assessment recommends educational programs for environmental managers to provide them with more effective methods for harnessing natural resources while maintaining the environment. Similarly, they recommend programs to increase the general public's awareness about the effects an expanding urban area has on natural resources. In Puerto Rico, there is also a lack of public awareness about the importance of protecting the environment. In areas of Toa Baja, some of the natural functions of the karst regions were affected by development projects such as highways, factories, and housing development, causing poor air and water quality, and increased flooding. In addition, Puerto Rico lacks a defined watershed management policy. The absence of a clear water management strategy combined with increasing population density and land-use pressure has historically caused rampant watershed mismanagement in Puerto Rico. Casa Pueblo was able to use the importance of managing forests for clean water to raise awareness of broader environmental issues. Because of the historical success of this strategy in Puerto Rico, it deserves special mention in this section.

4.5.1.7 Wildland-Urban Interface Summary

Existing WUI Assessment Section	Southern United States	Puerto Rico (El Plantío, Toa Baja)
Population and Demographic Trends	<ul style="list-style-type: none"> • Growing populations cause conflicts over land usage 	<ul style="list-style-type: none"> • Similar to the United States • Limited land area causes conflicts
Economic Issues	<ul style="list-style-type: none"> • Economic conditions determine need for industrialization/development • Making profit vs. preserving land causes conflict of interest 	<ul style="list-style-type: none"> • Economic motives of Municipality and land owners need to be identified • El Plantío has a mix of industrial, residential and rural land areas.
Land-use Policy	<ul style="list-style-type: none"> • Policies should minimize conflict <ul style="list-style-type: none"> • Long time residents/ Newcomers • Public and private land management needs • Governmental roles in land-use: <ul style="list-style-type: none"> • Federal and State – determine available land • Local government – manage growth • Use of conservation easements and land trusts 	<ul style="list-style-type: none"> • Puerto Rico: Planning board land-use plan • Municipalities work on specific land-use plan • Needs more emphasis on easements and land trusts • Toa Baja land-use plan currently being reassessed.
Urban and Social Influences on Forests	<ul style="list-style-type: none"> • Logging Industry, recreational uses, and landowner attitudes affect rate of development • Urban and social influences threaten forest’s natural functions including: hydrologic cycles, regulation of climate, the cleaning of water and air, and natural beauty and research opportunities 	<ul style="list-style-type: none"> • El Plantío provides natural protection, natural beauty, recreational uses, habitat to plants and animals, and educational opportunities. • Threatened by expanding bordering industries.
Forest Management and Conservation	<ul style="list-style-type: none"> • Federal programs for forest education <ul style="list-style-type: none"> ▪ Educate environmental managers ▪ Educate general public 	<ul style="list-style-type: none"> • Community groups and government need co-management • More effective than federal efforts

4.6 Summary

Overall, through interviews, hikes, visits to surrounding and distant communities, GIS analyses, and a small survey, we have amassed scientific, social, and anecdotal information relevant to the efforts of los Ciudadanos pro Bosque del Plantío. In addition, this information provided us with the local experience necessary to evaluate the Wildland-Urban Interface in the context of Puerto Rico. Our results have indicated that there are sound scientific and social

reasons to preserve el Bosque del Plantío, and that the municipal government both agrees with the views of los Ciudadanos pro Bosque del Plantío and is uniquely poised to classify the forest as a protected area. Furthermore, local educators do in fact have an interest in using the area for educational purposes and have provided us with useful feedback regarding what they would like to see emphasized in any proposed educational use. With this information in hand, we are now able to provide conclusions and recommendations for future work.

5.0 Conclusions and Recommendations

Our conclusions and recommendations are divided into two separate sections: one detailing environmental recommendations for Los Ciudadanos pro Bosque del Plantío, and one outlining our Wildland-Urban Interface recommendations for the Department of Natural and Environmental Resources.

5.1 Community Recommendations

Using the information and results obtained through our work with Los Ciudadanos pro Bosque del Plantío we formed several conclusions and recommendations that will assist in the community group's effort to conserve Bosque del Plantío and maintain it in the future. This section contains our conclusions regarding the environmental significance of the forest, and recommendations for educational options, management strategies, and economic opportunities for the area.

5.1.1 Environmental Conclusions & Recommendations

The results of our investigations indicate that the area surrounding El Bosque del Plantío is environmentally valuable for several reasons, including: its value as an aquifer, the presence of the endangered Palo de Rosa, and the flood-preventative drainage characteristics of the karst. In the upcoming Land Use Plan hearings, the results section of this report and the associated appendices should be consulted to defend the proposed zoning plan from opposition. In particular, the Toa Baja Flood Plain Assessment (Appendix K) and the Map of Freshwater Wells (Appendix G) provide a strong practical argument for the conservation of the mogotes.

The proximity analysis did not show that Bosque del Plantío alone significantly affects the air quality of the surrounding area, however, the larger range of Toa Baja mogotes (of which

Bosque del Plantío is a part) indisputably provides a significant benefit to the municipality. Politically, it is wise to consider el Bosque del Plantío part of the larger range of mogotes.

The plant species catalog is not an authoritative assessment of the area because it covered only a limited area, but the confirmed presence of Palo de Rosa is an important consideration in future management of the area. The Department of Natural and Environmental Resources should be consulted regarding the proper care of the area immediately surrounding the Palo de Rosa seedlings, and department personnel should be brought in to thin the competing vegetation so that the seedlings have a better chance of long-term survival. The plant species catalog should also be useful in the development of educational materials or lesson plans. High-resolution versions of the vegetation photographs are included with this report and may be freely used for these purposes.

5.1.2 Educational Incorporation

Preserving the Bosque del Plantío is important for environmental reasons, but the area can also serve as an educational asset for local students. The forest – readily accessible to nearby schools – can provide historical, cultural and scientific information to enrich the students’ education. After conducting our questionnaires, we found that some environmental work has already been done with students from the fifth and sixth grades, but none of it was specific to el Bosque del Plantío or karst mogotes. The educators demonstrated an interest in using resources from el Bosque del Plantío – specifically a flora and fauna exhibit and hands-on experiments for students – in their environmental curriculum. Because of this, we recommend that an educational center be developed and operated by the people of el Plantío and surrounding communities. This center would provide students, educators, and residents the opportunity to learn about both the

forest ecosystems present within their municipality, and the processes required to conserve and maintain them.

The center could include the following:

- Photographs with detailed captions documenting local flora and fauna.
- An area where students can learn how to plant and care for unique local species, such as the Palo de Rosa.
- A virtual tour of the mogotes, in the form of a film that would allow visitors to see the vegetation of the forest without increasing foot traffic in the mogotes or disturbing endangered species. It would also allow any visitor – such as young children, the elderly, or the disabled – to see more of the area without hiking through the difficult terrain.
- A hands-on exhibit on karst regions that demonstrates their important characteristics. For example, a piece of porous karst rock could be included in the exhibit, with captions explaining the manner in which it prevents flooding and provides clean water.
- An exhibit documenting the steps los Ciudadanos pro Bosque del Plantío took to protect the forest, and the detrimental effects development would have had on the area. Casa Pueblo, for example, created a model of their mountain range with areas removed to show the negative effect mining would have had on the region.

However, the establishment of such a center would be difficult without first incorporating el Bosque del Plantío into environmental lessons in the classroom. Using existing lesson plans and ideas available from the US Fish and Wildlife Service, Casa Pueblo, and other organizations as a starting point, a number of classroom activities tailored to Bosque del Plantío could be developed. The DNER has copies of a number of these lesson plan collections in printed form.

We recommend that los Ciudadanos pro Bosque del Plantío contact the DNER for more information and to review the potential plans themselves.

5.1.3 Management Options

We formed three recommendations to help los Ciudadanos pro Bosque del Plantío effectively maintain the mogotes surrounding the community of el Plantío. They involve the government of Toa Baja, the Department of Natural and Environmental Resources, and the community group from Macún, respectively. If the community can demonstrate widespread support for a proposal, such as the establishment of an educational center, then the Toa Baja municipal government can provide some financial support for the project. The Toa Baja government expressed conditional interest in such a project, and therefore we encourage los Ciudadanos pro Bosque del Plantío to determine specifically what portion of surrounding communities would support their plans.

Secondly, the Department of Natural and Environmental Resources must have a role in the management of the Bosque del Plantío. During our hike through the mogotes we encountered a large number of Palo de Rosa seedlings located within thick undergrowth. The Department of Natural and Environmental Resources could help to carefully thin the undergrowth in the area to encourage the continued growth of the Palo de Rosa. Long term co-management with the DNER would be beneficial to maintain the species. Specifically, we recommend developing a Palo de Rosa recovery nursery. The DNER can provide resources needed to train members of the community as well as students from surrounding schools how to properly care for the species. A Palo de Rosa recovery nursery would allow el Plantío to gain recognition as a community that successfully protected an endangered species. This would be an accomplishment that the entire community and municipality could take pride in and could serve

as a symbol of their effort. The GIS files included with this report contain the GPS location of the endangered tree within the mogotes that the DNER will need to locate the species.

Finally, we encourage the community group in el Plantío involve the surrounding communities – to an even greater extent – in their efforts to conserve and maintain the forest. The forest is beneficial not only to el Plantío, but to the surrounding communities in Toa Baja as well. In Macún, los Vecinos Unidos en pro de Macún (a non-profit community organization that defends the interests of Macún) is also concerned about the future of the mogotes. They witnessed the consequences of deforestation when the PR-22 highway was constructed, and fear that flooding and similar problems would occur if the remaining mogotes were developed. Los Vecinos Unidos en pro de Macún expressed that they are very willing to work with other communities to support the preservation of the mogotes and promote alternative uses. Macún also shares a side of the forest with el Plantío, and by working together, there could be access to the mogotes for an educational center from a non-gated community, minimizing the security issues with which the community association of el Plantío is concerned. We recommend that los Ciudadanos pro Bosque del Plantío meet with Macún leaders in the near future to discuss possibilities for an educational center.

5.1.4 Economic Opportunities

Currently los Ciudadanos pro Bosque del Plantío are a non-funded organization, but there are options for raising funds for the construction of an educational center. The forest surrounding el Plantío contains a wide variety of beautiful plants, animals and scenic vistas. Using photography from our hike and additional pictures (particularly close-ups of flowers or seedlings, animal species, and views from the top of the mogotes), several calendars could be designed with a different local photograph for each month. We believe that a calendar would be

an appropriate and creative way to display the beauty of the mogotes and its wildlife. It could potentially draw more attention to the area, and provide a modest source of funding for los Ciudadanos pro Bosque del Plantío's efforts.

5.2 Wildland-Urban Interface

In addition to providing a strong argument for the conservation of el Bosque del Plantío in Toa Baja, we worked with the Department of Natural and Environmental Resources to address their particular needs. Through the data collected by working with the community of el Plantío and the case-studies of San Patricio and Casa Pueblo, we were able to analyze the United States Department of Agriculture's Southern Wildland-Urban Interface Assessment and determine its relevance to Puerto Rico. This section will present our conclusions and recommendations for ways to adapt the Assessment to Puerto Rico to allow it to be used in the future.

5.2.1 Implementing the Wildland-Urban Interface Assessment in Puerto Rico

After analyzing the Wildland-Urban Interface Assessment, we learned that much of the information provided is applicable to our case study of el Plantío and other areas of Puerto Rico. The population and demographic trends, economic issues, land-use policies, urban and social influences on wildland, and possible conservation management techniques must be addressed for each area being threatened by development. In the case of el Plantío in Toa Baja, these issues each played a major role in the conservation effort of the local community group. The wildland-urban interface conflict in el Plantío also identified gaps in the assessment that must be added to provide Puerto Rico with a management system that government agencies such as the DNER can use to help other communities conserve land in the future.

5.2.2 Other Needs for the Wildland-Urban Interface

While much of the Department of Agriculture's Assessment is applicable to Puerto Rico, there were several sections that need modification or additions. The ecological diversity of Puerto Rico is greater than the southern United States; therefore, it is important to recognize the sensitive environment when creating management policies and educational programs for the public. The interface assessment for the southern United States was initially established to provide methods to manage wildfire problems. In comparison, in Puerto Rico the focus of the wildland-urban interface rests on protecting the natural role and functions of the fragile and sensitive ecosystems.

Despite prior use of co-management systems between communities and governmental organizations to protect forested land, Puerto Rico's established co-management policy does not provide community groups with adequate information for the establishment of such systems. In Puerto Rico, community based management is an effective method of conservation that can decrease the strain placed on the resources of environmental agencies. The Wildland-Urban Interface Assessment should be adapted to emphasize the importance of co-management in Puerto Rico. We recommend that the Department of Natural Resource and the Environment expand community-based conservation efforts by educating the public about the steps needed to implement a co-management program and the possible benefits it brings. The DNER must establish relations with communities being threatened by development, determine possible goals/compromises for the use of the land, recommend the establishment of an official community group to head the efforts, and train community members in group communication and analysis. By working with el Plantío, we learned that within the community much confusion exists about the role municipalities have in implementing land-use plans and providing resources. To develop an effective management system, the community members must be

educated about the roles municipalities and the DNER hold for developing land-use strategies. The results from our contact with the municipal government of Toa Baja provide a basic overview of these roles. After this educational process is complete, community support for conservation efforts should increase and the DNER can train community members to properly manage their land with less government intervention.

Furthermore, the extremely fast regrowth rates experienced in abandoned areas of Puerto Rico places a special emphasis on the reclamation of cleared land. Abandoned areas in and around cities, including former military bases, can often be turned into valuable urban forests and serve the surrounding communities. This was not addressed in the Southern United States Wildland-Urban Interface Assessment and a section specific to Puerto Rico's tropical climate and plant species should be added.

Through our analysis of the Southern Wildland-Urban Interface Assessment, we recommend that the DNER reorganize its current forest management system to include the themes of the Wildland-Urban Interface. The important themes presented in the original assessment, in addition to our additional areas of recommendation specific to Puerto Rico, will provide the DNER with a comprehensive, organized conservation procedure for interface areas that were not addressed with the current rural and urban management systems.

5.3 Summary

By following these recommendations and consulting the supporting results sections of our report, the community group should be well equipped for the remaining land-use hearings. If everything continues as planned, the municipality will handle the transfer of land-ownership and the area will be protected. At that point, with the support of the rest of El Plantío and the communities surrounding the mogotes, preparations for a local educational program and/or

center can commence. Long-term management of the area can be accomplished through the negotiation of management agreements with the municipality of Toa Baja and the Department of Natural and Environmental Resources.

The Wildland-Urban Interface assessment already provides a good general overview of the issues involved in preserving interface areas and much of it applies to Puerto Rico. It establishes a more thorough procedure for managing interface areas that were not addressed by the current forest management procedures. With the addition of the sections previously discussed, it can serve as a valuable political tool and starting point for future conservation efforts.

5.4 Possible Future Interactive Qualifying Projects

Throughout the course of our project, we identified several important aspects that can be expanded into future projects including the following:

- A Palo de Rosa recovery nursery in the mogotes of Toa Baja would include research into the lifecycle of the species to allow for more effective transplanting and the continued growth of the endangered plant. The project would also assess the positive influence that the nursery would have on neighboring communities and the entire municipality, and would allow for community participation.
- An educational program could be incorporated into the school systems surrounding the mogotes of Toa Baja. This project could work to develop possible lesson plans to portray the significance of the unique ecosystems in the nearby karst forests. The lesson plans must be evaluated to include reference to local flora and fauna species present in the mogotes.
- Another project could be developed if there is support for the construction of an environmental educational center in Toa Baja. This project could include researching

more important characteristics of the karst forests, and designing exhibits to highlight them most effectively – including a possible virtual tour of the forest. This center can be used to educate the general public about the importance of the mogotes, and can also be incorporated into the lesson plans of local schools. An educational center will provide an important use for the forest to help ensure their survival into the future.

References

1. Aide, Mitchell T., and Rivera, Luis W. (1997). Forest Recovery in the karst region of Puerto Rico. *Forest Ecology and Management*, 108, 63-75. Retrieved February 1, 2006 from ScienceDirect database.
2. Aide, Mitchell T., and Thomlinson, John, R. (2001). Urban Expansion and the Loss of Prime Agricultural Lands in Puerto Rico. *Ambio*, 30(1). Retrieved February 1, 2006 from ScienceDirect database.
3. Almeyda, Javier R. (1998). Citizens Pro Forest San Patricio. Retrieved February 5, 2006, from <http://bosquesanpatricio.homestead.com>.
4. Babylon, R. (2003). *The Use of Community-Based Conservation in Natural Resource Management: Case Studies from The Nature Conservancy of Virginia*. Masters dissertation, Virginia Polytechnic Institute and State University, Blacksburg
5. Belson, C. (1999). Karst Waters Institute's Second Annual Top Ten List of Endangered Karst Ecosystems. *KWI Conduit*. 7 (1-2). Retrieved February 1, 2006, from <http://www.karstwaters.org/conduit/vol7no1/karst10.htm>
6. Berkes, F. (2004). Rethinking Community Based Conservation. *Conservation Biology*, 18(3), 621-630.
7. Bernard, H. Russell. (2006). *Research Methods in Anthropology. 4th Edition*. AltaMira Press. Oxford, UK.
8. Business Register. (2006). Government & municipalities. Retrieved Feb.10, 2006, from Business Register Web site: <http://www.busregister.com/prbusinfo/government.asp>
9. Center for Tropical Forest Services. (2006). *Trees of the Panama Canal Area*. Retrieved February 1, 2006 from the Smithsonian Tropical Research Institute. Website: <http://ctfs.si.edu/webatlas/english/guargu.html>
10. Carmona, J. (2004, September 2) Gridlock. *Puerto Rico Herald*. p. Carribean Business
11. Dávila-Casanova, Daniel. (2002). Centro de datos para la conservación de Puerto Rico. Retrieved Feb.10, 2006 from <http://www.natureserve.org/nhp/lacarb/pr/>
12. Department of Natural and Environmental Resources. (2003). Retrieved January 20, 2006, from Department of Natural and Environmental Resources Website: <http://www.gobierno.pr/drna>
13. Encyclopedia Britannica. (2006). Karst. Retrieved January 29, 2006, from Encyclopedia Britannica Online. <http://new.search.eb.com/eb/article-9044774>

14. Environmental Protection Agency. (2006). CEPD environmental justice plan. Retrieved Feb.10, 2006, from U.S. Environmental Protection Agency Web site:
<http://www.epa.gov/region02/cepd/ejplance.htm>
15. Gonzalez, M., Gonzalez, E., Deya, M. A., Diaz, T. D., & Geoghegan, T. (2006). *Bosque del Pueblo, Puerto Rico*. London: International Institute for Environment and Development.
16. Invasive Species Specialist Group (ISSG). (2003). Global Invasive Species Database: *Spathodea campanulata*. Retrieved February 1, 2006, from
<http://www.issg.org/database/species/ecology.asp?si=75&fr=1>
17. Johnson, R. A. (1980). *Puerto Rico: Commonwealth or colony?* New York: Praeger Publishing.
18. Jones, I., and Banner, J.(2003). Estimating recharge thresholds in tropical karst island aquifers: Barbados, Puerto Rico and Guam. *Journal of Hydrology*, 278(1-4), 131-143.
19. Junta de Planificación. (2003). Junta de planificación de Puerto Rico. Retrieved on Feb.10, 2006, from <http://www.jp.gobierno.pr/>
20. King, D., and Mazzotta, M., (2006). Ecosystem Valuation. Retrieved Feb. 7, 2006, from
<http://www.ecosystemvaluation.org/default.htm>
21. Koontz, T., and Korfmacher, K. (2000). Community collaboration in farmland preservation: how local advisory groups plan. Paper presented at the Association for Public Policy Analysis and Management Annual Research Conference, Seattle, OH.
22. Koop, G., & Tole, L. (1997). Measuring Differential Forest Outcomes: A Tale of Two Countries. *World Development*, 25(12), 2043-2056. Retrieved on February 1, 2006 from ScienceDirect database.
23. Land Trust Alliance. (2006). About Land Trusts. Retrieved February 18, 2006 from:
<http://lta.org/aboutlt/faq.shtml>
24. Los Ciudadanos Pro Bosque del Plantío. (2005). Los Ciudadanos Pro Bosque del Plantío. [Pamphlet].
25. Macie, Edward, & Hermansen, Annie (Eds). (2002, November). *Human Influence on Forest Ecosystems: The Southern Wildland-Urban Interface Assessment*. Asheville, North Carolina: U.S. Department of Agriculture Southern Research Station.
26. Mass Audubon. (2003). A Land Protection Strategy for Mass Audubon. Sent by Bob Wilbur, Mass Audubon's Director of Land Protection.
27. Puerto Rico Government. (1991) No. 81. An Act, Senate Substitutive to Substitutive H.B. 1296, Conference. Chapter XIII.

28. Puerto Rican Government. (1989) Tropical Forestry Initiative Act. H.R. 2065, 100th Cong.
29. Puerto Rican Government. (2005) P. del S. 803. Puerto Rican Senate, 15th Assembly.
30. Riera, P. and Penin, R. (1997) The Use of Contingent Ranking for Variations in Air Quality Valuation Due to Transportation Projects. Paper presented at the 25th European Transport Forum Annual Meeting, Brunel University, London.
31. Rivera, L. and Aide, M. (1998). Forest recovery in the karst region of Puerto Rico. *Forest Ecology and Management*, 108 (1-20), 63-75.
32. Rivera, M. (2006). *Welcome to Puerto Rico*. Retrieved February 1, 2006 from <http://welcome.topuertorico.org/geogra.shtml>
33. Robinson, Lin, and Newell, Joshua, P. (2005). Twenty-five years of sprawl in the Seattle region: growth management responses and implications for conservation. *Landscape and Urban Planning*, 71, 51-72. Retrieved February 1, 2006 from ScienceDirect database.
34. Roper, John, and Roberts, Ralph W. (1999). Deforestation: Tropical Forests in Decline. Retrieved January 28, 2006, from <http://www.rcfa-cfan.org/english/issues.12.html>
35. Surfrider. (2005). Community development workshop promotes public participation to shape Rincón's future. Retrieved Feb.10, 2006, from Salva Tres Palmas Web site: <http://www.surfrider.org/rincon/sustainable.asp>
36. Thomlinson, John, R., and Rivera, Lyaned. (1999, April). Suburban growth in Luquillo, Puerto Rico: Some Consequences of Development on Natural and Semi-natural systems. *Landscape and Urban Planning*, 49, 15-23. Retrieved February 1, 2006 from ScienceDirect database.
37. UCLA: National Center for History in the Schools. (1996). Era 6: The Development of the Industrial United States (1870-1900). Retrieved Jan. 29, 2006, from National Center for History in the Schools Web site: <http://nchs.ucla.edu/standards/era6-5-12.html>.
38. United States Department of Agriculture. (2001) *Puerto Rican Karst- A Vital Resource. Technical Report WO-65*, 68.
39. United States Department of Transportation. (1994). *Biological Assessment Relocation of PR-10. Technical Report*, 9.
40. University of Texas. (2005). Commonwealth of Puerto Rico Maps. *Perry-Castañeda Library Map Collection*. Retrieved April 1, 2006 from http://www.lib.utexas.edu/maps/puerto_rico.html .
41. Weaver, T. (2000). Changes in forestry policy, production, and the environment in northern Mexico: 1960-2000. *Journal of Political Ecology*, 7, 1-18.

42. Western, D., and Wright, M. (Eds.). (1994). *Natural Connections: Perspectives in Community-Based Conservation*. Washington, DC: Island Press.

Appendix A: Interview Summary – Los Ciudadanos pro Bosque del Plantío

On March 14, 2006, we visited el Plantío in the Municipality of Toa Baja. The interview was between our four team members, Edgardo González of the DNER, and eleven members of the community group. Wanda Crespo, our main contact within the community group, explained the goals of the group and the previous work that they have done prior to our arrival. She gave us a brief history of el Plantío community, stating that they were the first gated community in Puerto Rico. As a group they've made trips to the mogotes that surround them, and said they feel protected because the hills keep outsiders from entering the community. They provided us with a CD-ROM and printed copies of maps that showed the hydrology of the area and the location of the other communities. Wanda also explained the injunction that had been placed on an area where a private land owner hopes to build apartments. The proposed complex was for between 57-67 apartments, a 100 car parking lot, pool, and other facilities. The group was very opposed to this construction, and Wanda gave us a copy of the legal injunction, P. del S. 83. We were told that in the same area where there is proposed construction, they would like to see an educational center for schools to come and visit, to get children involved in their effort.

After hearing the community group's concerns and goals for the area, we were asked to explain what our thoughts on the project were, and what we have done so far. Ian explained to them our visions of the project, the research we have done, and what we would like to see happen in the area and with the project. The group responded, and again stressed their wants to have something educational come out of the project. Times were set up for us to visit the area, drive around to the other surrounding communities of Macún, Pajaros, and Candelaria, and to go on a hike through the mogotes.

Appendix B: Interview Summary – Toa Baja Planning Board

Questions:

- 1) Could you explain the current land use plan being considered for Toa Baja?
- 2) How solidified is the plan that is being worked on and how much is still up for debate?
- 3) How will this affect el Plantío and other surrounding communities?
- 4) How close is the process to being completed?
- 5) What happens once it is re-zoned as a protected area? We have heard after the zoning process is complete the municipality has eight years to possibly purchase the land, could you explain this situation?
- 6) What is the current zoning for the area and how much is protected?

Summary:

On March 22, 2006, we completed an interview with the Director of Planificación for the Municipality of Toa Baja, Rebecca Rivera Torres. The main goals of the interview were to discuss the current zoning laws for Toa Baja and to review the new re-zoning plans for the area.

Project Goals:

Brendan discussed the group's current plans for the project. He mentioned how currently we wanted to find out more information about the current land use plan along with the future plans for the area in order to help el Plantío use their area as a future educational center.

Re-Zoning Plan:

Mrs. Rivera-Torres explained that the area of Toa Baja was going through re-zoning. Currently, the area of the mogotes is not protected. She explained how three public hearings were going to happen over the course of the next few months in order to discuss the new plans for Toa Baja. The municipality has developed their own plan for the area to be reviewed by the central government. This plan designates the mogotes surrounding el Plantío as a protected area. She also explained how the central government has its own zoning plan for the area. This plan

actually includes more of the areas within Toa Baja to be protected as “green areas”. Specifically, the karst area of el Plantío is protected in both versions of the re-zoning plan. It is labeled as suelo rustico especialmente protegido. This will keep the land protected “forever”; however, she mentioned that in the past land-use plans have been changed when new government administrations take office. Since this area is protected in both plans, Mrs. Rivera-Torres stated that it is very unlikely that the area would be categorized differently after the public hearings and not be protected.

Current Landowners

Mrs. Rivera-Torres explained that the municipality is currently in conversation with the apartment developer. They were discussing the price for the land in order to possibly find a way to buy the property from the landowner. The municipality thought that the land would be approximately \$700,000, yet the land owner is asking for \$1 million. The central government is also working with other land owners in order to exchange their land for another area within Toa Baja that can be developed. This land interchange would allow the mogotes to also be protected and allow the land owners to still hold land elsewhere to develop.

Appendix C: Interview Summary – Human Resources Director of Toa Baja

Questions:

1. Are you familiar with the community group Los Ciudadanos Pro Bosque del Plantío and their efforts?
2. We have noticed that Toa Baja has beautiful mogotes and wetlands. Does Toa Baja pride itself on these?
3. We also noticed that there is a karst belt within Toa Baja. Does the natural topography of the Toa Baja attract people to the area?
4. We visited a municipal park that is being developed in Caguas. Has Toa Baja thought about developing a park for the area?
5. We have heard a lot of controversy about the land-use plan, both nationally and within the municipality of Toa Baja. What land-uses do you want to see emphasized in Toa Baja?
6. Mogotes and industrial areas co-exist within el Plantío. This causes a conflict of interest between preservation and industrialization. The community group would like to see the remaining mogotes used to educate students about the area's environmental history and culture. Would you support a land-use plan that preserves this area for educational use?

Summary:

On April 11, 2006, we hoped to meet with the Mayor of the Municipality of Toa Baja to learn more about municipal government, as well as what he thinks about the mogotes, and his view on the efforts of los Ciudadanos pro Bosque del Plantío. The Mayor was occupied at the time of the interview, so we met with a close colleague of his, the Director of Human Resources, Elías F. Sanchez-Sifonte. First, we questioned whether Toa Baja prides the natural beauty of the system of mogotes. Mr. Sanchez-Sifonte explained that for many years, the mogotes were neglected, areas were developed that shouldn't have been, and much of the land was overused. Since the Mayor took office, however, his main focus has been to protect the karstic region. He also said that the Mayor fought this issue before hand, when he was a Senator. In the past, saving the mogotes was not a main focus unless the communities that were close to the mogotes brought the matter to attention, such has el Plantío. The Mayor has gone public with his efforts, and issued a cease and desist on an area where a car dealership was clearing the mogotes. The

intervention of the Mayor shows his dedication to the community group's efforts, because they were worried about the mogotes, and he took their concerns into consideration.

The Director later went to explain how the area can be designated protected under the Autonomous Municipalities Act, and that after a master plan created by the Land Use Plan Committee is passed, it will not be simple to develop on an area. We were curious as to what resources the Municipality has, and Mr. Sanchez-Sifonte said that the Municipality expresses full commitment to work with communities. As for now, the focus is to save the mogotes from further damage, and any other work with community groups, etc. will be handled only if there is uniform support within the community.

We were also able to gain information regarding the ownership issues regarding the mogotes surrounding el Plantío. The Director disclosed that all 33 acres of land are owned by a single person, and the Municipality is in the process of trying to trade his land for land suitable for development. If the municipality succeeds on acquiring the land, they intend to give ownership rights to a trustworthy conservation-minded private organization to prevent future administrations from reclassifying the land for other purposes. The Director, the Mayor, and the Municipality of Toa Baja, as a whole would like to see the land be protected from further development to ensure that the mogotes remain untouched.

Appendix D: Interview Summary – Casa Pueblo

Questions:

1. How big is the Casa Pueblo School?
2. What grades are incorporated into the Casa Pueblo Program?
3. How did you come to work with the Casa Pueblo community group?
4. How did Casa Pueblo develop?
5. What are some of the activities that are done with the students?
6. How do the students find the program?
7. What subjects incorporate Casa Pueblo into their curriculum?

Summary:

On March 29, 2006, we visited Casa Pueblo in Ajuntas. During our visit we were able to speak to a teacher of a Casa Pueblo Class, a teacher within the Ajuntas school, and the Director of the school that works with Casa Pueblo. Each person was able to provide us with some information about the educational impact Casa Pueblo has had on the community.

Interview 1: Glady Diaz - Teacher of Casa Pueblo Class

The teacher of the fifth grade Casa Pueblo class, Glady Diaz, works directly with Casa Pueblo and was not hired by the school district. She explained to us the history of the educational system that Casa Pueblo has developed with the community's school. The program started as a pilot program with fourth grade students. Originally, professors from University of Puerto Rico Mayaguez and the Department of Natural Resources worked with people from Casa Pueblo to develop an educational plan for the students. This plan was then presented to the director of the school, Elín Cintrón, who approved to incorporate the importance of Casa Pueblo into the existing educational system. The current system has now been in use for two years with fourth and fifth graders. This program incorporates teaching the students about the history of Casa Pueblo along with management techniques of the area. The fourth graders usually focus more on the history and basic knowledge about the area while the fifth graders focus on learning

ways to manage and protect the area. The Casa Pueblo school consists of an auditorium, laboratory, class room and gallery for the students to use during their normal school hours. The students also take field trips to Bosque del Pueblo to collect scientific data as well as visit the University of Puerto Rico to work with professors.

The teacher then gave us a tour of the facilities, and noted that before she became a teacher within the program she worked for Casa Pueblo giving tours. She explained to us some of the hands-on activities the students can do while at school. One project the students work on is transplanting different varieties of plants. They are able to monitor the growth of these plants as well. They also get to participate in the growth of butterflies. They start watching the caterpillars grow and develop, care for the cocoons, and then once fully developed they transfer the butterflies to their butterfly garden, the newest attraction of Casa Pueblo. All of these attributes allow the students to become more active in school and expand their traditional education.

Interview 2: Elín Cintrón, Director of Adjuntas School

The director of the “Casa Pueblo” school gave us a better view of the process that took place between the community group and the school, which is adjacent to the main auditorium of Casa Pueblo. The director of Casa Pueblo approached Mr. Cintrón about the idea to incorporate the students in the preservation and management plan. He came with a full set of plans for the school director to review. The agreement was to be between Casa Pueblo and solely the collaborators of the school; the Central Government was to be in no way involved. Mr. Cintrón signed the contract with Casa Pueblo to show his full support and honor to collaborate with them. Through this program, he explained how the students have not only gained more knowledge about Casa Pueblo but how the program affects them on a much larger scale. The students involved in the program had higher grades in all of their classes and have increased their

leadership skills as well. The students find a joy and satisfaction from participating in the program and really look forward to attending the class. The parents of these students also participate and encourage the Casa Pueblo educational program. A newspaper is used to communicate the efforts of the students and Casa Pueblo as a whole, as well to make sure the community is aware of new activities Casa Pueblo can offer to them.

The director explained how this program is strictly between the community group of Casa Pueblo and the school. No government involvement was allowed. He explained how incorporating any legal aspects to the program would cause more problems. He is hoping to help Casa Pueblo expand their program to be able to accommodate the 326 students that attend the school. He would even like the Casa Pueblo program expand to other local schools as well.

Interview 3: Lillian Nieves, Social Studies and English Teacher

Mrs. Lillian Nieves gave us an “outsider” view on the Casa Pueblo program. She is teacher at the Adjuntas school and works with the students who are involved in the Casa Pueblo program. She feels that the Casa Pueblo program affects the students in a positive manner. She has seen more of the students participate in class and has seen their grades improve. She also said that the information from the Casa Pueblo class is often incorporated into the other classes the students are taking, such as Science and English. Often times, she will give the students a reading that relates to some information they have learned in the Casa Pueblo class. She appreciates the work of Casa Pueblo and encourages them to start to expand and incorporate more of the students into the program.

Appendix E: Educator Interest Questionnaire

Conservation Analysis of the Municipio de Toa Baja Educational Project Survey

*Hello, we are a student group from Massachusetts working on a project with the Department of Natural and Environmental Resources. We are conducting a survey to find out more information regarding the educational system of Puerto Rico and the schools interest in incorporating environmental education programs. If you could please take a few minutes to fill out this survey, it would be greatly appreciated. **All information will be kept confidential.*

Thanks.

*Ian Levesque
Brendan McLaughlin
Christina Mezzone
Alissa Paquette*

Personal Information

1. Are you a citizen of el Municipio de Toa Baja?

Yes

No

If yes, which community do you reside in?

2. What school are you affiliated with?

**3. Are you a Director or Teacher? (please circle one): Director
Teacher**

4. How long have you been a director/teacher?

5. What subject(s) and grade(s) do you teach?

6. On a scale of 1 – 5, (1- No Interest, 5- High Interest), how would you rate your students interest in science and the environment?

1 2 3 4 5

7. On a scale of 1-5, (1 – No Knowledge, 5- Most Knowledge), how much do you know about Los Ciudadanos Pro Bosque del Plantío and their effort to preserve the karst area?

1 2 3 4 5

Description of El Plantío



The forest that encompasses el Plantío contains karst forest formations that offer various functions to the area of Toa Baja. Karst forests are formed over a limestone base and have a composition similar to a coral reef structure that has risen and developed into mogotes. Also, the porous composition of karst acts as a natural water drainage system forming large caverns over

time. The unique characteristics of the area support a diverse ecosystem of plants and animals, including many endemic species and even the endangered Palo de Rosa tree.

Currently, the mogotes are in danger of being torn down and developed by private land owners. One of the communities, el Plantío, would be greatly affected by this development. Due to this threat, the Ciudadanos Pro Bosque del Plantío formed to help preserve this natural area to maintain the important natural resources, functions, and beauty it offers to neighboring communities. Their goal is to protect the forest and provide Toa Baja with an educational learning center. They hope to provide the students of the communities with an area where they can expand their scientific knowledge and learn about the importance of nature to society.

- 1. Now after reading about this information, would you be interested in learning more about the area and its environmental significance?**

Yes No

- 2. Are there any existing classes that incorporate information about environmental protection?**

Yes No

If Yes, please describe the lesson plan below:

If No, would you be interested in incorporating lessons on the environment into your classroom?

Yes No

- 3. Does your school coordinate programs with other schools in the area?**

Yes No

If Yes, please list schools and describe programs below:

If No, would you be interested in working with other schools?

Yes No

- 4. If an educational trail and center were provided to schools by this area, would it be of interest to you/your school?**

Yes No

5. Please rank the type of educational uses you would like to see incorporated into a future educational center of El Bosque del Plantío (1-No interest in incorporating into educational center, 5 –Very interested into incorporating into educational center)

Hiking Trail

1 2 3 4 5

Endangered Flora and Fauna Exhibit

1 2 3 4 5

Hands-On Experiments

1 2 3 4 5

Tour Guide

1 2 3 4 5

Historical Information Site

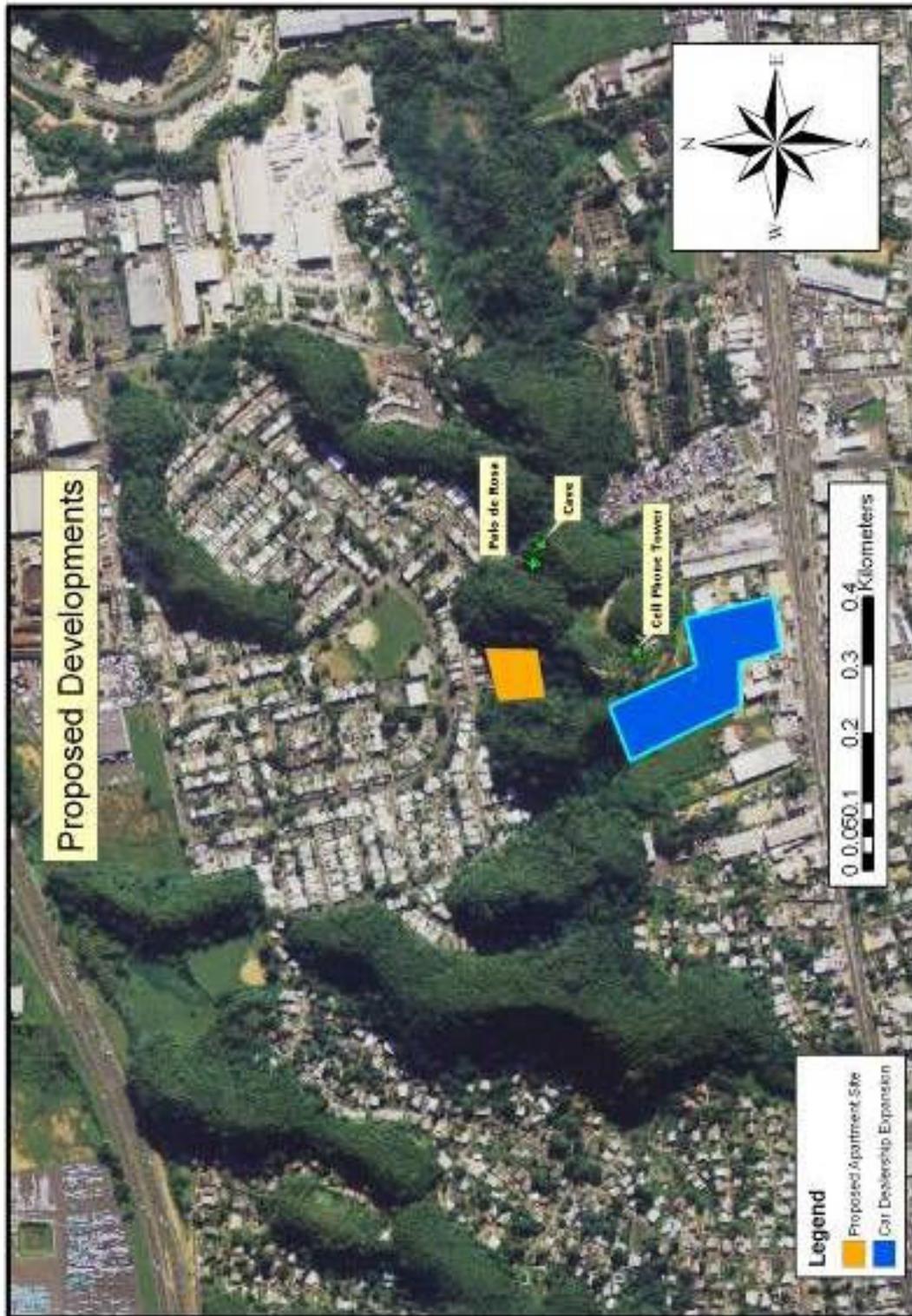
1 2 3 4 5

Student Participation in Maintenance of Section of Land

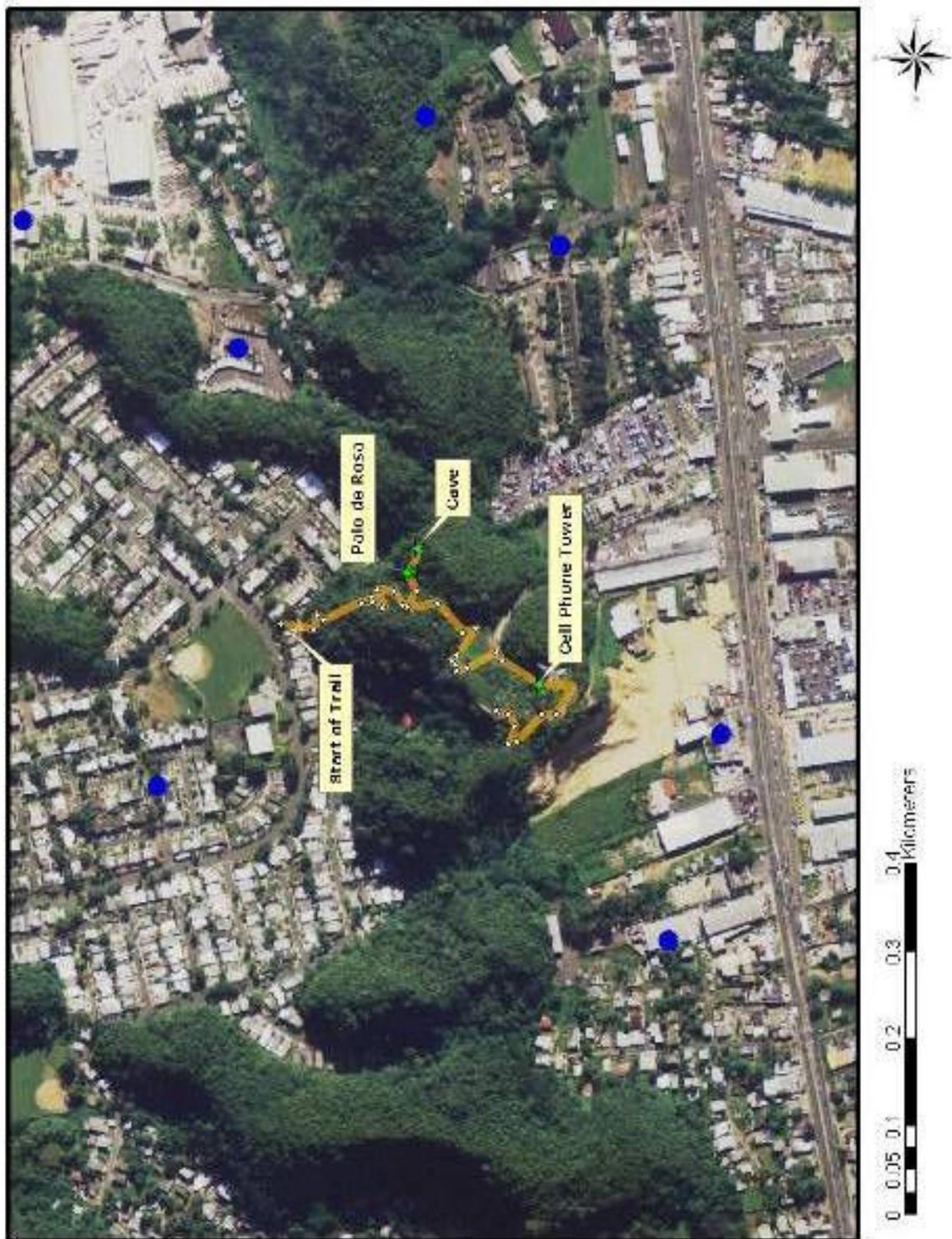
1 2 3 4 5

Please state other suggestions/ideas for the area in the space provided below:

Appendix F: Proposed Development Areas



Appendix G: GIS Exploration Route and Fresh Water Wells Map



Appendix H: Photographic Flora Catalog

	Family	Scientific Name	Common Name	Type of Growth	Rarity
	Adiantaceae	Adiantum	Maidenhair fern	Fern	Common
	Araceae	Philodendron giganteum	Bejuco de calabazón	Herbaceous climbing plant	Exotic/ Common in cultivation
	Bombaceae	Ceiba pentandra	Ceiba	Tree	Common

	Boraginaceae	Tournefortia filiflora	Nigua	Shrub	Rare/critical element/good for wildlife
	Celastraceae	Crossopetalum rhacoma	Maidenberry/ Coral	Shrub	Native/ Occasional
	Compositaceae	Emilia coccinea	Clavelito	Herbaceous Growth	Exotic //Common in open areas
	Compositae	Bidens alba	Margarita/ Shephard's needle	Herbaceous growth	Common
	Compositae	Eupatorium	Oreganillo	Shrub	Native

	Euphorbiaceae	Phyllanthus epiphyllanthus	Bayoneta/ Box-wood	Small Tree	Common in limestone
	Euphorbiaceae	Phyllanthus epiphyllanthus		Small Tree	Common in limestone
	Fabaceae	Rhynchosia reticulata	Frijolillo	Vine	Common

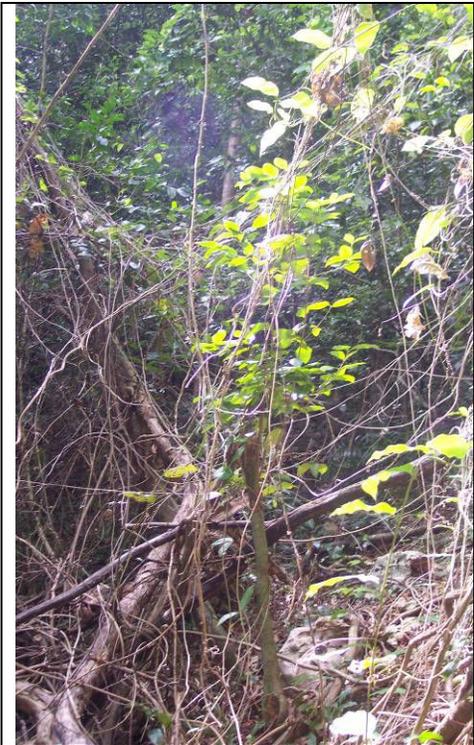
	Guttiferaceae	Rheedea portoricensis	Palo de Cruz	Tree	Endemic
	Guttiferaceae	Rheedea portoricensis	Palo de Cruz	Small Tree	Common/endemic to PR
	Guttiferaceae	Mammea Americana	Mamey apple	Large Tree	Common
	Guttiferaceae	Calophyllum calaba	Maria	Large Tree	Common

	Icacinaceae	Ottoschulzia rhodoxylon (seedling)	Palo de Rosa	Tree	Endangered species
	Icacinaceae	Ottoschulzia rhodoxylon	Palo de Rosa	Medium Tree	Endangered Species
	Leguminosae/ Caesalpinaceae	Hymenaea courbaril	Algarrobo/ West-Indian locust	Tree	Native/ Common
	Moraceae	Pseudolmedia spuria	Negra lora	Large Tree	Rare species in moist limestone hills
	Myrtaceae	Eugenia axilaris	White Stopper	Small Tree	Common in dry limestone and forest

	Orchidaceae	(seed capsule) Oececlades maculata	African Orchid	Orchid	Exotic/ Common
	Orchidaceae	Oececlades maculate	African Orchid	Orchid	Exotic/ Common
	Orchidaceae	Oececlades maculata	African Orchid	Orchid	Common

	Orchidaceae	<i>Vanilla poitaei</i>	Vanilla Orchid	Orchid	Common
	Polygonaceae	<i>Coccoloba diversifolia</i>	Uvilla	Tree	Native/ Common

	<p>Polygonaceae</p>	<p><i>Coccoloba diversifolia</i></p>	<p>Uvilla</p>	<p>Large Tree</p>	<p>Limestone</p>
	<p>Rubiaceae</p>	<p><i>Antirhea coriacea</i> (fruit)</p>	<p>Quina</p>	<p>Tree</p>	<p>Native</p>

	Rubiaceae	<i>Antirhea lucida</i>	Palo Iloron	Small Tree	Common in moist limestone forest
	Rutaceae	<i>Zanthoxylum martinicensis</i>	Espino Rubial	Tree	Common
	Sapotaceae	<i>Manilkara bidentata</i>	Ausubo	Tree	Common

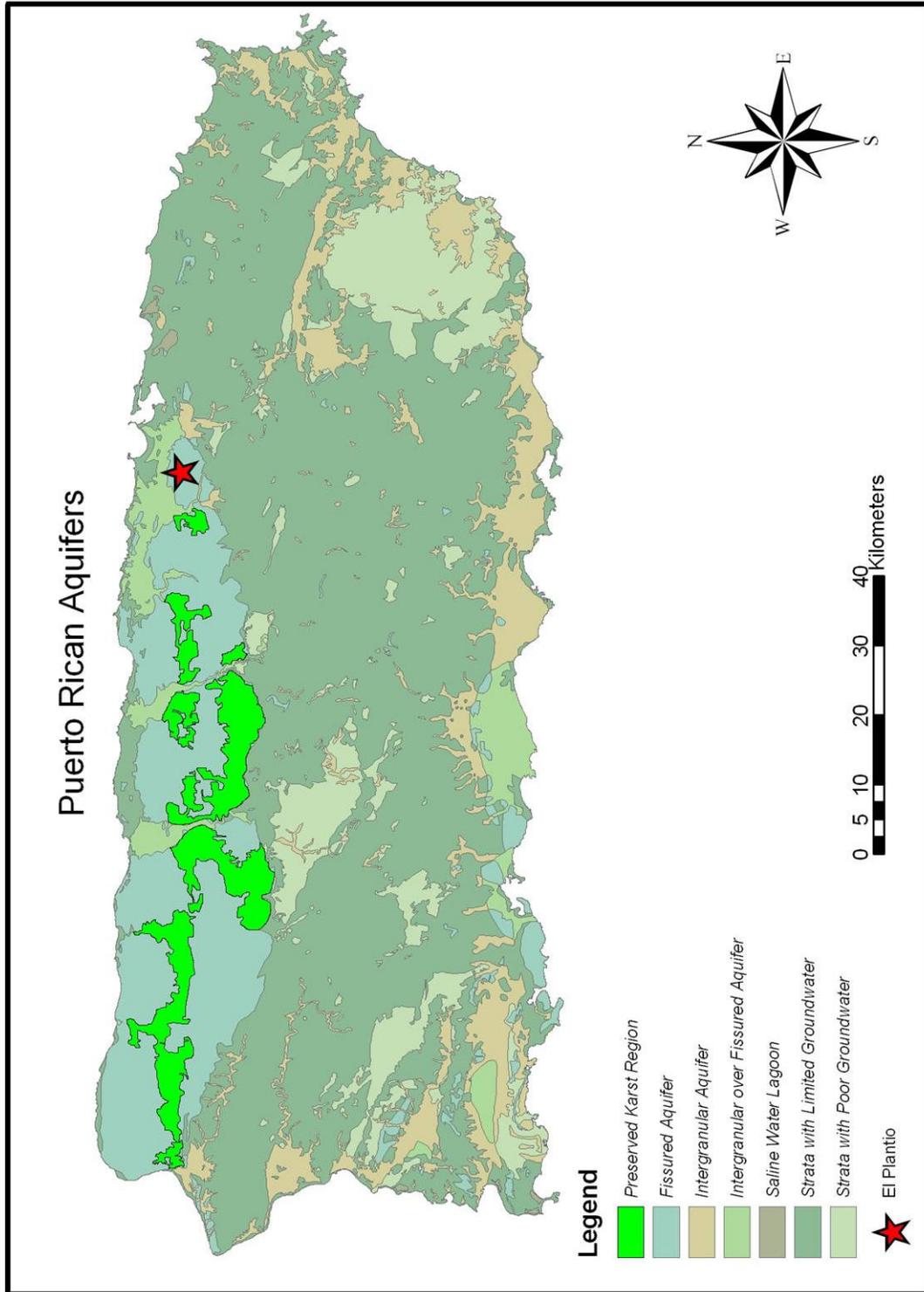
	Zamiaceae	Zamia amblyphyllidia	Marunguey	Cycad	Common to mogotes and limestone
	Zamiaceae Cone	Zamia amblyphyllidia	Maruguey	Cycad	Common in mogotes and limestone

Appendix I: Extended Flora Inventory

Flora de los Mogotes Circundante a la Comunidad del Plantío en Toa Baja				
Familia	Nombre Científico	Nombre Común	Habito	Estatus
Acanthaceae	Oplonia spinosa	Espinosa	Arbusto	Nativo Poco Común
Anacardiaceae	Comocladia glabra	Carrasco	Arbusto	Nativo Común
Araceae	Epipremnum pinnatum	Bejuco de Agua	Bejuco	Exótico Naturalizado
Araceae	Syngonium podophyllum	Malanga trepadora	Bejuco	Exótico Naturalizado
Araceae	Philodendrom giganteum		Rastrero/trepador	Nativo
Araceae	Anthurium creantum	Hoja de costado		Nativo
Araliaceae	Dendropanax arboreus	Palo de Pollo	Árbol	Nativo Común
Arecaceae	Roystonea borinquena	Palma Real	Árbol	Nativo Común
Asteraceae	Chromolaena odorata	Christmas bush	Arbusto	Nativo
Asteraceae	Pluchea carolinensis	Salvia	Arbusto	Nativo
Bignonaceae	Tabebuia heterophylla	Roble Nativo	Árbol	Nativo Común
Bombaceae	Ochroma pyramidale	Balsa	Árbol	Nativo Común
Boraginaceae	Tournefortia filiflora	Nigua	Arbusto	Nativo Poco Común
Bromeliaceae				
Bromeliaceae	Pitcarina angustifolia	Piña cortadora	Bromelia terrestre	Nativo
Bromeliaceae	Tillandsia recurvata	Nido de Gungulen	Bromelia epifita	Nativo
Bromeliaceae	Tillandsia polystachya	Piñon	Bromelia epifita	Nativo
Burseraceae	Bursera simaruba	Almacigo	Árbol	Nativo Común
Celastraceae	Maytenus elongata	Cuero de Sapo	Árbol	Endémico Raro
Celastraceae	Gyminda latifolia	Coscorroncito	Árbol	Nativo Común
Celastraceae	Crossopetalum rhacoma	Coral	Arbusto	Nativo Común
Combretaceae	Bucida buseras	Ucar	Árbol	Nativo
Compositaceae	Bidens Alba	Margarita	Herbácea	Común
Compositaceae	Emilia fosbergii	Clavelito colorado	Herbácea	Común
Euphorbiaceae	Gymnanthes lucida	Yaití	Árbol	Nativo Común
Euphorbiaceae	Phyllanthus epiphllanthus	Bayoneta	Arbusto	Nativo
Gesneriaceae	Gesneria pedunculosa	Árbol de Navidad	Árbol	Endémico Común
Guttiferaceae	Rheedia portoricensis	Palo de Cruz	Árbol	Endémico
Guttiferaceae	Calophyllum calaba	María	Árbol	Nativo Común
Guttiferaceae	Mammea americana	Mamey	Árbol	Nativo
Icacinaceae	Ottoschulzia rhodoxylon	Palo de Rosa	Árbol	En Peligro de Extinción
Laureaceae	Licaria parvifolia	Canelilla	Árbol	Nativo
Malvaceae	Urena lobata	Cadillo	Arbusto	Exótico
Meliaceae	Trichillia pallida	Caracolillo	Árbol	Nativo Común
Mimosoideae	Inga laurina	Guama	Árbol	Nativo Común
Moraceae	Ficus citirfolia	Jagüey blanco	Árbol	Nativo
Moraceae	Pseudolmedia spuria	Negra Lora	Árbol	Nativo Poco Común
Myrsinaceae	Ardisia obovata	Mameyuelo	Árbol	Nativo Común
Myrtaceae	Eugenia biflora	Pitanguera	Árbol	Nativo Común
Myrtaceae	Eugenia axillaris	Grajo	Árbol	Nativo
Myrtaceae	Eugenia monticola	Birijí	Árbol	Nativo
Nyctaginaceae	Guapira fragans	Corcho	Árbol	Nativo Común
Oleaceae	Linociera domingensis	Hueso blanco	Árbol	Nativo Común

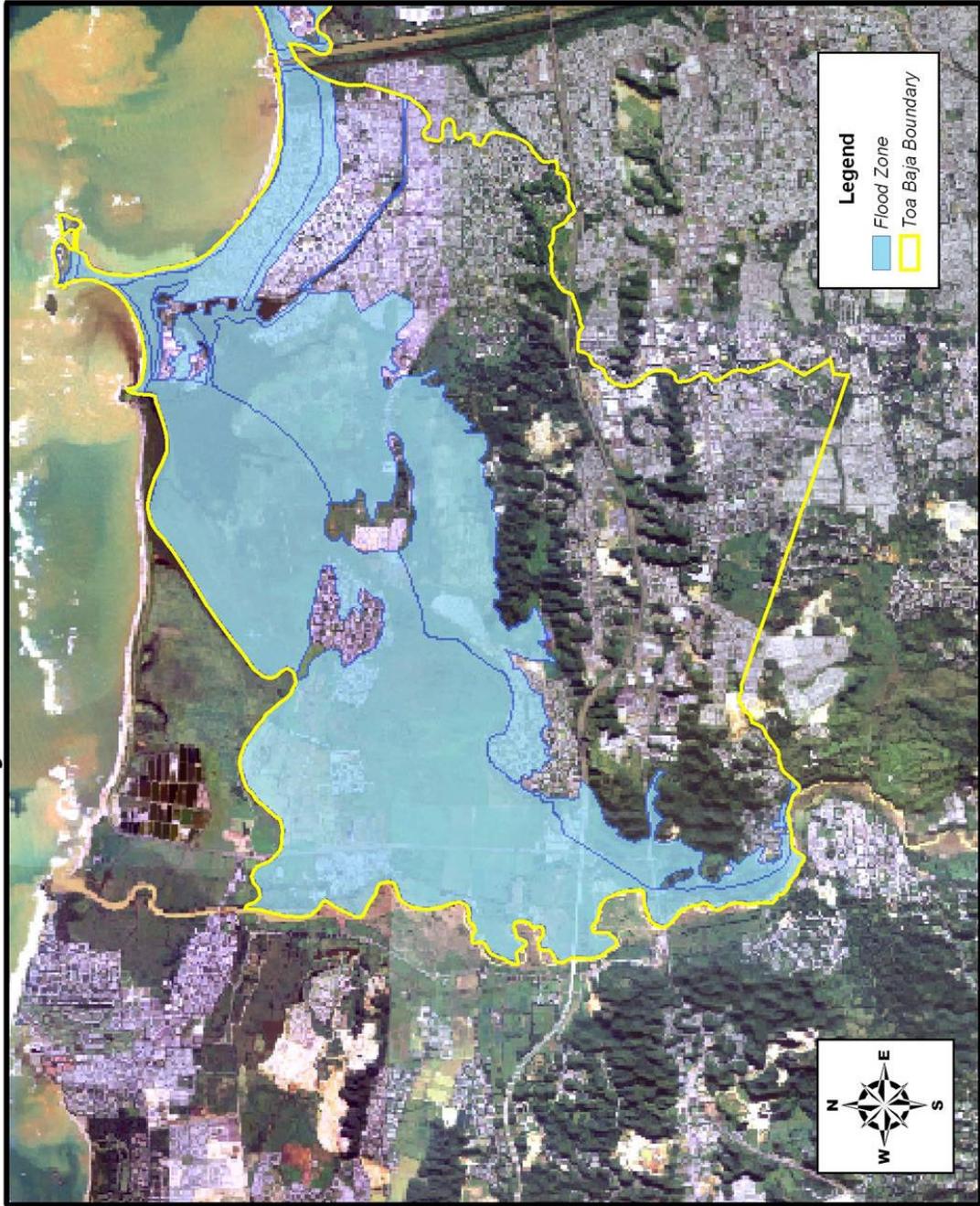
Orchidaceaea	Bletia patula	Flor de Pasma	Orquidia	Nativo
Orchidaceaea	Oceoclades maculata	Orquidia Africana	Orquidia	Exotico
Polygonanceaea	Coccoloba diversifolia	Uvilla	Árbol	Nativo Común
Rubiaceae	Chiococca alba	West Indian Snow Berries	Arbol	Nativo
Rubiaceae	Antirhea lucida	Palo Llorón	Árbol	Nativo
Rubiaceae	Guettarda ovalifolia	Cucubano	Árbol	Nativo Poco Común
Rubiaceae	Guettarda elliptica	Cucubano Liso	Árbol	Nativo Común
Rubiaceae	Antirhea coriacea	Quina	Árbol	Nativo Poco Común
Rubiaceae	Ixora ferrea	Cafeillo	Arbusto	Nativo
Rutaceae	Zanthoxylum martinicense	Espino Rubial	Árbol	Nativo Común
Sapotaceae	Sideroxylon foetidissimum	Tortugo Amarillo	Árbol Nativo	Nativo
Smilacaeae	Smilax domingensis	Bejuco de Membrillo	Bejuco	Nativo
Sterculiaceae	Melochia nodiflora	Malva Colorada	Arbusto	Nativo
Verbenaceae	Citharexylon fruticosum	Péndula	Árbol	Nativo Común
Zamiaceae	Zamia amblyphyllidia	Marungeuy	Cicada	Nativo Localmente Común

Appendix J: GIS Aquifer Map



Appendix K: Toa Baja Flood Plain Map

Toa Baja Flood Zones 1983



Appendix L: Raw Survey Result

Director/Teacher	Toa Baja	Area	School	Grade Level	Subject	Years	Student Interest in Environment	Knowledge of Community Group	Interest in Learning More about Area	Interest in Environmental Lessons	Interest in working with other Schools	Educational Trail and Center
D	N	Toa Alta	Antonia Saez Irizarry			3	3	3	Y	Y	N	Y
T	N		Antonia Saez Irizarry	5th - 6th	Science	7	3	2	Y	Y	Y	Y
T	N		Antonia Saez Irizarry	4th- 5th	Science	25	4	3	Y	Y	N	Y
T	N		Ernesto Juan Fonfrias		Social and Science	15	4	4	Y	Y	Y	Y
T	N		Ernesto Juan Fonfrias	4th-6th	Science	5	4	2	Y	Y	Y	Y
S	N		Ernesto Juan Fonfrias	3rd	Student		5	5	Y	Y	Y	Y
S	N	Companilla	Ernesto Juan Fonfrias	5th	Student		5	5	Y	Y	Y	Y
T	Y	Pajaros	Martin Garcia Giusti		Science	30	4	2	Y	Y	Y	Y
T	N	Bayamon	Martin Garcia Giusti		Social Studies	20	4	1	Y	Y	N	Y
T			Alinencia Valle Santana		Science and Social	6.5	4	1	Y	Y	Y	Y
T	Y	Levittown	Alinencia Valle Santana		Spanish, Social	15	2	1	Y	Y	Y	Y
D	Y	Candelaria	Alinencia Valle Santana			25	3	4	Y	N	Y	Y
T	Y	Levittown	Alinencia Valle Santana	4th	Social Studies	28	4	1	Y	Y	Y	Y
T	Y	Ingenio	Ernestina Bracero	5th	English	20	4	2	Y	Y	Y	Y
D	Y	Campanillas	Ernestina Bracero			14	5	4	Y	-	Y	Y
T	Y	Candelaria	Ernestina Bracero	6th	Social Studies	20	3	3	Y	Y	Y	Y
T	N		Ernestina Bracero		Science	13	5	1	Y	Y	Y	Y
T	N		Ernestina Bracero		Science	26	5	3	Y	Y	Y	Y

Topics	Number of People
Interest in Learning about Area	18
Interest in Environmental Lesson	18
Interest in working with Other Schools	16
Interest in Educational Center	18

Raw Survey Data – Educational Option Ranking

Director/Teacher	Hiking Trail	Flora Exhibit	Experiments	Tour Guide	Historical Site	Student Participation in Maintenance
D	5	5	5	5	5	5
T	5	5	5	5	5	5
T	0	4	3	4	5	3
T	3	5	5	5	4	5
T	3	5	5	5	4	5
S	5	5	5	5	5	5
S	5	5	5	5	5	5
T	5	5	4	5	4	5
T	3	4	3	4	4	5
T	0	5	5	5	3	4
T	5	5	5	5	5	5
D	3	5	3	5	5	4
T	0	5	5	5	5	5
T	3	5	5	4	4	4
D	5	5	5	5	5	5
T	5	5	5	5	5	5
T	3	5	5	4	3	4
T	3	5	5	4	4	3
Total Score	61	88	83	85	80	82
	0.677777778	0.977777778	0.922222222	0.944444444	0.888888889	0.911111111
Percentage	67.8	97.8	92.2	94.4	88.9	91.1

Percentage of People Who Rated Each Educational Option a Given Number						
Ranked Number	Trail (%)	Flora Exhibit (%)	Experiments (%)	Tour Guide (%)	Historical Site (%)	Student Participation in Maintenance (%)
0	16.7	0.0	0.0	0.0	0.0	0.0
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	38.9	0.0	16.7	0.0	11.1	11.1
4	0.0	11.1	5.6	27.8	33.3	22.2
5	44.4	88.9	77.8	72.2	55.6	66.7

Appendix M: Community-Based Management in Southwest Bengal

The success of community-based management can be demonstrated throughout the world. For example, Western (1994) describes the community-based conservation effort of the village of Chandana in Southwest Bengal. The village developed an environmental management system that protected their once abused forest and allowed them to benefit from its natural resources. After obtaining ownership rights to sections of the land in the 1970's, the inhabitants of the village started intensively logging the area, causing severe ecological problems. Suffering from a low household income, the villagers depended on the forest's logging industry as their main source of income and abused their rights. Over-logging destroyed the natural water systems causing land to dry up and become useless, and limited the water supply to the village. With this problem only growing, intervention was necessary before forest destruction became irreversible.

Forest Manager Jyoti Naik visited the village and warned the villagers if they kept abusing the forest, future generations would be left with no resources (Western, 1994, p. 58). After meeting as a community several times, the villagers developed a final plan that required each area of the forest to regulate and safeguard against over-logging through a community managed forest protection watch. The Chandana Forest protection Committee set up an informal warning system which reported any intruders to the area, thus effectively regulating the logging industry. As a result, there has been a positive long term economic impact on the community, and ecological systems have been able to recover. "In villages near Chandana, after five years of protection, more than 214 species of flora and fauna were present in the forest. Of these, 189 were utilized by local people" (Western, 1994, p.61). Although the members of the community suffered an initial decrease in income, in the long run they guaranteed financial stability. If the area had suffered complete destruction, the loss of the logging industry combined with the

negative environmental impacts would have left the community with no source of income.

Also, the Bengalese government gave the villagers rights to nearby rice-land farms to provide them with a supplemental source of income to ease the blow caused by the decrease in logging.

Overall, this system of community management greatly benefited both the population and the environment.

Appendix N: Interview Summary - Asociación Recreativa Residentes el Plantío Inc.

On April 19, 2006, we met with ARREPI, an association that works to maintain the safety of the community of el Plantío. We wanted to meet with them to learn of how many households there are in the community, as well as some of the things the group does for el Plantío. We were told that there are roughly 700 families, around 2,000 residents, within the gates of el Plantío, a number the Association does not want to see increased too greatly. Like the members of los Ciudadanos pro Bosque del Plantío, the Association members were against the construction of the apartment complex within their community, stating it would bring too many more inhabitants. As a group, the Association members developed services to protect the community and its residents, such as the 24 hour guarded access control entrance and street patrol. They stated that there is a low monthly maintenance fee of \$30 that the residents are asked to pay to upkeep these services, but their budget is small. The Association is headed by resident Lydia Gamancho, but no decisions can be made without the residents' cooperation and support.

It is clear that the Association wants to see the mogotes protected to maintain the security of their gated community, but implementing anything new would take full commitment and agreement from all of el Plantío's residents. This paralleled what we learned before with our interview at the Municipality, that working together will be the only way anything can happen within the mogotes that is aside from getting them protected.

Appendix O: Interview Summary – Professor Gottlieb

The main goal of this interview with Professor Gottlieb – conducted at WPI on February 7, 2006 – was to gain the knowledge of an experienced environmentalist in relation to our project needs. We entered the interview hoping to gain information about the most effective conservation methods and possible examples of such efforts. Also, we wanted to use Professor Gottlieb as a source for other contact information of local groups and agencies which could provide further detail on our project.

1) Important Methods of Conservation:

Professor Gottlieb discussed the most common methods for saving forested areas around the world:

- Does the area represent a cultural significance to a community or group?
- Does the area hold a specific environmental importance?
- Does the area have an educational purpose, or offer a possible educational use?
- Can the area be used for ecotourism purposes?
- Are there any traditional uses/resources for local communities such as food, plants, and other natural things?

If we can identify several of these possible uses for a threatened area, it is much easier to defend conservation over development.

2) Possible contacts and sources of information:

We began to discuss possible examples and contacts in the United States that we could contact for further information.

- Forest Service Employees for Environmental Ethics: Offers viewpoints on the importance of saving forests, and provides alternative uses that are ethical and useful for forest preservation.
- Northern Forest Alliance: Focused on New England, particularly Maine. Involved with methods of sustainable management.
- Forest Stewards Guild
- Nature Conservatory: This group often buys plots of land to keep developers away legally.

Professor Gottlieb noted that often local groups are powerless by themselves because they don't have the resources to make an impact at a wider level. Making connections with large governmental/professional organizations is important for local groups because it provides them with professional opinions and resources. Therefore, he felt it would be important for us to get this professional knowledge in addition to solely the community group.

Appendix P: Sponsor Background Information

Department of Natural and Environmental Resources

The Department of Natural and Environmental Resources (DNER) is part of the government of the Commonwealth of Puerto Rico. It plays an influential role in both the judicial and cultural activities of the island in order “to protect, to conserve and to administer the natural and environmental resources of the Country” (Department of Natural and Environmental Resources [DNER], 2003, Mission). It uses both promotion and administration to inform the people of Puerto Rico about the importance of their surroundings. It aims to help inhabitants of Puerto Rico to live in an environmentally conscious manner in order to create a happier and healthier environment.

The DNER is comprised of three sectors: direction, programming and administration. The most influential group is the programming sector. The Department relies on this group “to guarantee the development, planning, coordination, direction and supervision of the functions of the agency and the implementation of the public policy of development, protection and conservation of the natural, environmental and power resources.”(DNER, 2003, Structure) The programming sector of the DNER includes, among others, the Body of Watchmen of Natural Resources, Information and Education on Protection of the Atmosphere, and the Reforestation and the Administration and Conservation of Living Resources. The agency is responsible for dealing with wild life, forests, natural reserves, bodies of water, fishing, hunting, public properties, natural resources and the effects of development on each of these areas. It is in charge of creating laws and regulations that sustain the development of the natural resources of Puerto Rico.

The DNER is a key player in the development of the forest area within Toa Baja. This project deals with the fight to maintain the forest surrounded by the seven communities within the area. Particularly, the importance the DNER places on forestation along with their ability to create regulations to protect the area, greatly influences the project. By working with this agency, the project group will be able to obtain laws that have been established dealing with other forests within Puerto Rico as well as what laws they could implement if this area were not developed. The DNER feels that forests truly improve the quality of life for people while maintaining the wildlife and ecosystems that reside within it. They add character to the town, reduce contamination, act as a source of water absorption, reduce sunlight in order to save electricity, provide food and create a peaceful atmosphere for residents (DNER, 2003). With this in mind, it is very clear to see that the destruction of a community forest will greatly affect the DNER.

Los Ciudadanos pro Bosque del Plantío

Los Ciudadanos pro Bosque del Plantío consists of a group of concerned local citizens in the municipality of Toa Baja, the towns adjacent to the Bosque del Plantío. They formed in response to the increased pressure to develop the natural forest in the area. The group has organized itself to protect the land enclosed by the seven communities, and has established several goals for the future. The community group hopes to gain the right to co-manage the land with the government and other environmentally geared groups (*Los Ciudadanos*, 2005). Already, they have gained the cooperation and support of various groups, including the Department of Natural and Environmental Resources. With a focused group effort, they hope to

minimize commercial development in the area to protect the environment and well-being of the local communities.

Members of the municipality of Toa Baja have identified several problems that would arise if the Bosque del Plantío were to succumb to developers. The area offers educational opportunities for its citizens, is home to a variety of recognized endangered species, provides protection against flooding from storms, and holds other cultural significance, such as local flora and fauna. The group has identified several other functions of the forest, including controlling emission levels and toxic contamination, and regulating temperature. (*Los Ciudadanos*, 2005). Since these issues directly affect the citizens of the area, the community group has made it their mission to fight the developers in their quest for the land. The group intends to develop recreational and educational activities for the area, and also create a system of co-management between the community and the government.

Los Ciudadanos pro Bosque del Plantío is a privately funded, community based organization. Therefore, they have limited resources and need the support of government agencies such as the DNER for help in dealing with legal issues and costs. On May 26, 2005, the group officially registered with the State Department of Puerto Rico, to further broaden their outreach (*Los Ciudadanos*, 2005).

Los Ciudadanos pro Bosque del Plantío has grown as an organization over time. The group is now headed by an executive committee; offices including the Director, President, Vice President, Treasurer, Secretary, Sub-Secretary, and a Legal advisor. There are a total of thirteen active members on the main committee (*Los Ciudadanos*, 2005). The organization offers local knowledge and an understanding of the history of the Bosque del Plantío. It is trying to grow further with the help of the central and local government, private businesses, other communities, and scientific and educational institutions. There has already been a large response by Puerto

Rican citizens to the mission of Los Ciudadanos pro Bosque del Plantío. Groups who have offered support include the Ciudadanos del Karso, Sociedad Omitologica de Puerto Rico, Ciudadanos Pro Bosque San Patricio, Casa Pueblo – Adjuntas, Fundacion Luis Munoz Marin, Comunidades del barrio Candelaria, and the University of Puerto Rico. Research studies have been completed by the University of Puerto Rico dealing with developing systems of co-management and alternative uses for the area.

THIRTY-SIXTH ANNUAL REPORT
ON THE ELECTRIC PROPERTY
of the
PUERTO RICO ELECTRIC POWER AUTHORITY
SAN JUAN, PUERTO RICO

UNDER TERMS OF TRUST AGREEMENT

Dated as of January 1, 1974, as amended,

to

U.S. BANK TRUST NATIONAL ASSOCIATION

TRUSTEE

JUNE 2009



February 12, 2010

Puerto Rico Electric Power Authority,
San Juan, Puerto Rico 00936 and
U.S. Bank Trust National Association
New York, NY 10005, Trustee under the Trust
Agreement, Dated as of January 1, 1974, as amended

Gentlemen:

We submit herewith our Thirty-sixth Annual Report (for fiscal year 2009) as required of the Consulting Engineers, URS Corporation, under the terms of Section 706 of Article VII of the Trust Agreement governing the Puerto Rico Electric Power Authority's Power Revenue Bonds.

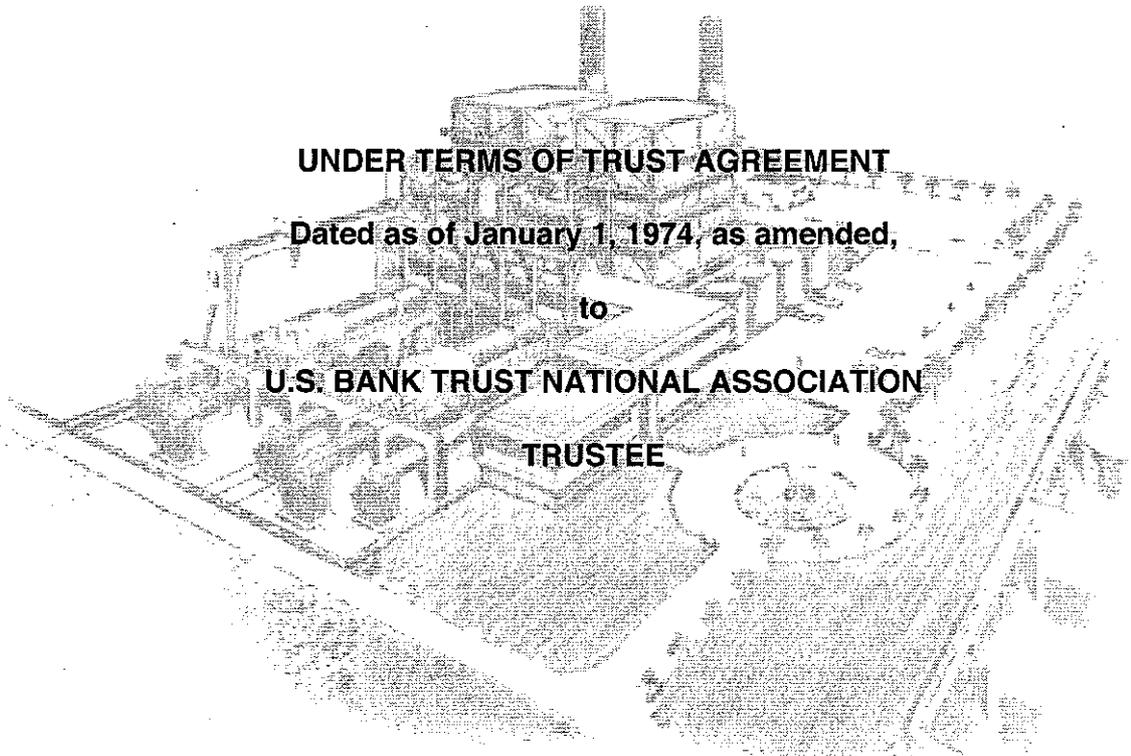
This report includes changes set forth in an Amendment to the Authority's 2009-2010 Budget of Current Expenses and Capital Expenditures. The Amended Budget significantly affects the Authority's financial status regarding Trust Agreement Requirements. The Amendment was prepared by the Authority in January 2010.

Very truly yours,

George W. Romano Jr.
Consulting Group Manager

GWR/gs

THIRTY-SIXTH ANNUAL REPORT
ON THE ELECTRIC PROPERTY
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U.S. BANK TRUST NATIONAL ASSOCIATION

TRUSTEE

JUNE 2009

URS

Washington Division

App-187



Washington Division

EXECUTIVE SUMMARY

This report is the 36th Annual Report by the Consulting Engineers to the Trustee of the 1974 Trust Agreement. The report is based on the Consulting Engineer's inspections, interviews and review of relevant data pertaining to the operation of the Puerto Rico Electric Power Authority electric System during the Authority's fiscal year 2009, ending June 30, 2009.

The Authority's economic performance in fiscal year 2009 was marked by decreasing energy sales in the three largest sectors as the recession in Puerto Rico deepened. Electric power sales in fiscal year 2009 fell 5.5% from the previous year, establishing the second consecutive year of decline. Fiscal year 2009 was the sixth consecutive year during which the rate of growth of the Authority's electric power sales was lower than the preceding year. The Authority's Current Forecast predicts the rate of decline in energy sales will steadily improve over the next three fiscal years, with modest positive growth forecasted for fiscal years 2013 and 2014.

The decline in sales coupled with lower fuel costs in fiscal year 2009 resulted in electric sales revenues that were 8.4% less than the previous year. Net Revenues, as defined by the Trust Agreement, were down 7.6% in the same time frame.

In January 2009 Ing. Miguel A. Cordero López was re-appointed as Executive Director of the Authority; he previously served as Executive Director from 1993 to 2000. Ing. Cordero is a professional electrical engineer with more than 30 years experience with the Authority. During his first tenure as Executive Director he initiated programs that reduced the Authority's dependence on fuel oil by 30%. In addition to his service with the Authority, Ing. Cordero has served in management positions in many public sector agencies and Authorities.

A net additional 600 MW of new capacity went into service during fiscal year 2009. The Authority added 464 MW at the San Juan Steam Plant with the new combined-cycle Units 5 & 6; completion of these units was the culmination of an extended effort which began with the contentious repowering project that stalled early in construction and its subsequent revival by new vendors and contractors. Secondly the Authority replaced four 21 MW combustion turbines at the Mayagüez plant with eight more efficient, aero-derivative combustion turbines totaling 220 MW. All the new combustion turbines placed in service in the past year are capable of firing natural gas as well as distillate oil, to support the Authority's plans for increased use of natural gas when it becomes available at the site.

The major fire damage at the Palo Seco Steam Plant in December 2006 removed 602 MW of generating capacity from the San Juan area load center and reduced the generation operating reserve capacity below margins that the Authority typically has maintained. At the end of fiscal year 2009 three of the Palo Seco units were in service, with Unit 3 scheduled to return in fiscal year 2010. The extended period when the Palo Seco Steam Plant was below full capacity caused the Authority to defer some scheduled maintenance on other steam plants. With the return of the Palo Seco units and the added capacity from San Juan Units 5 & 6, the Authority's schedule shows that for more than 50% of the days in fiscal years 2010 and 2011 one of the four largest steam units will be in scheduled maintenance, three of these are for major overhauls.

The Authority has identified losses of \$363.2 million that resulted from the fires at the Palo Seco Steam Plant. By the end of fiscal year 2009 the Authority's insurance carriers had reimbursed the Authority a total of \$301.3 million and another \$28.1 million was being negotiated.

Despite the extended outages of the Palo Seco units, the System continued to perform without major incidents, as the Authority redistributed its generation and that of the cogenerators; the transmission system operation was buttressed by the 230kV eastern loop that had gone into service in fiscal year 2006. In addition, there were no extraordinary events to challenge the system during fiscal year 2009.

In January 2010 the Authority prepared an amended 2009-2010 Annual Budget to address higher fuel costs than had been projected. The amended Annual Budget incorporated higher revenues resulting from the increased fuel costs and from an energy theft recovery initiative, lower projected operating expenses, and modifications to debt financing. The amended budget has aggressively targeted current expenses, less fuel and purchased power, with a 11% cut from the expenditures of the fiscal year 2009. In view of the significant revisions in the amended budget and their affect on the Authority's financial status regarding Trust Agreement requirements, the Consulting Engineers have incorporated the amended budget in the discussions and evaluations within the Financial section and Appendices of this Annual Report.

Expenditures on capital improvement program projects dropped 28.0%, or \$186.6 million, from fiscal year 2008 to 2009 as San Juan Units 5 & 6 and the combustion turbines at Mayagüez were completed. The Authority has developed a lean capital expenditure plan for the next five years, with plans to reduce capital expenditures another \$130 million in fiscal year 2010, a reduction of \$50 million in fiscal year 2011, no change in fiscal year 2012 and \$50 million per annum increases in fiscal years 2013 and 2014.

The Authority's fuel diversity program has been active for more than a decade, focusing on reducing its once almost complete dependence on fuel oil for generating power. A privately owned natural gas fired cogenerating plant has been in operation since 2000, followed two years later when a privately owned coal fired cogenerator went into service. During fiscal year 2009 these two plants produced 31% of the system power and demonstrated reliable operation. In fiscal year 2009 the Authority stopped work on a natural gas pipeline project to its 592 MW Aguirre Combined Cycle plant in response to community opposition. The Authority will turn over the unfinished project and material to the Aqueduct and Sewer Authority for construction of a water pipeline to benefit the island's southeast sector. At the end of fiscal year 2009 the Authority was in discussions with the Commonwealth to recover its project costs. The Authority still plans to expand natural gas utilization by pursuing high efficiency natural gas fired generation projects, including private project development. The current scope of the fuel diversity program encompasses more natural gas fired generation, renewables, and coal.

The Authority's total remittances to the Commonwealth for Contributions in Lieu of Taxes (CILT) and Other were \$181.4 million in fiscal year 2009, or 29% of the Authority's net revenues for the fiscal year, using the 1974 Trust Agreement accounting. The Authority's fiscal year 2009 CILT remittances were less than their obligations for that fiscal year, consequently the unpaid balance will be paid over the next three years. CILT remittances for fiscal year 2009 included installment payments on unpaid CILT obligations from fiscal years 2007 and 2008. At the end of fiscal year 2009, the outstanding unpaid CILT balance totaled \$97.9 million. In addition to CILT, which benefits the municipalities, the Authority also remitted \$42.1 million to the Commonwealth for certain subsidies during the fiscal year and \$8.9 million for the amortization of the outstanding line of credit used in the settlement of the municipalities lawsuit.

During fiscal year 2009 the Authority increased its lines of credit for interim financing to \$1,603.4 million from \$1,307.4 million in 2008. Three changes accounted for the \$296 million increase: a \$96 million line of credit was established for interim financing of capital improvement program projects; a \$225 million dollar fuel line of credit was increased to \$275 million; and the Authority initiated a \$150 mil-

lion line of credit with the Government Development Bank for covering collateral on its power revenue bonds that are based on interest basis swaps. At the end of fiscal year 2009, the Authority's outstanding debt on their lines of credit was \$90.4 million, or 7.3%, lower than the previous year. The Authority is evaluating paying down a portion of their interim financing debt with some of the proceeds of the next long term financing which is contemplated in the amended annual budget for fiscal year 2010.

The 1974 Trust Agreement obliges the Consulting Engineers to make specific assessments of the Authority's operations and make recommendations for funding of certain funds established under the Trust Agreement. These are discussed in depth in the report and summarized below:

The Consulting Engineers believes the Authority will receive sufficient revenues in fiscal year 2009 with the existing rates to cover current expenses, to make all required deposits in accordance with the 1974 Agreement's dictates and to exceed its 120% debt service coverage requirement. The debt service coverage was 145% in fiscal year 2009 and is forecasted to be 141% in fiscal year 2010 in accordance with the amended annual budget.

In the opinion of the Consulting Engineers, the properties of the System are in good repair and sound operating condition.

The Consulting Engineers reviewed and approved the Authority's Annual Budget of Current Expenses and Capital Expenditures for fiscal year 2010, which was adopted in June 2009. In addition, the Consulting Engineers has reviewed and approved the Authority's amended Annual Budget for 2010, which is scheduled to be adopted in February 2010. The budget for fiscal year 2010 includes the first year of the Authority's five year Capital Improvement Program. In fiscal year 2010 the Authority is projected to make no internally generated contributions to capital expenditures. In fiscal year 2009 the Authority's internal funding of capital expenditures was \$4.7 million or approximately 1% of total expenditures. The Consulting Engineers continues to recommend the Authority should pursue as aggressively as practicable an increase in the internal funding

During fiscal year 2007 the Consulting Engineers approved the use of the Reserve Maintenance Fund as an interim source of funds for the recovery of the Palo Seco Steam Plant, with the stipulation that any moneys withdrawn should be replenished using the proceeds from the Authority's insurance coverage within a reasonable timeframe. Net withdrawals during fiscal year 2008 were \$48.6 million, leaving the year-end balance of \$569,000. During fiscal year 2009 the Authority applied \$5 million to an inter-fund loan for the benefit of the Reserve Maintenance Fund. The Consulting Engineers recommends the Authority deposit \$5 million to the Reserve Maintenance Fund during fiscal year 2010.

At the end of fiscal year 2009, the Self-insurance Fund's balance was \$62.6 million. During fiscal year 2007 the Consulting Engineers approved the withdrawal of monies from the Selfinsurance Fund to cover uninsured losses associated with the Palo Seco Steam Plant fires. The Authority withdrew \$25.4 million from this fund and deposited \$5 million during fiscal year 2008; in fiscal year 2009 the Authority deposited \$10 million. Based on the current funding levels, the Consulting Engineers recommends the Authority deposit \$10 million to the Self-insurance Fund during fiscal year 2010.

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230 & 115 KV TRANSMISSION SYSTEM MAP

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INTRODUCTION

This is the Thirty-sixth Annual Report by the Puerto Rico Electric Power Authority's (Authority) Consulting Engineers, URS Washington Division (Consulting Engineers), filed to comply with the provisions of Section 706 of Article VII of the Trust Agreement, dated as of January 1, 1974, as amended and supplemented, between the Authority and U.S. Bank Trust National Association, the successor Trustee for the 1974 Trust Agreement.

Act No. 83 of the Legislature of Puerto Rico, approved May 2, 1941, as amended, reenacted and supplemented (the "Authority Act"), created the Authority a body corporate and politic constituting a public corporation and governmental instrumentality of the Commonwealth of Puerto Rico. Hereinafter, we will refer to Act No. 83 of the Legislature of Puerto Rico, approved May 2, 1941, as amended, reenacted and supplemented as the Authority Act.

With the release of the 1947 Trust Indenture on June 9, 1996, the 1974 Trust Agreement, dated as of January 1, 1974, as amended and supplemented, became the sole document governing all of the Authority's long-term financings, with the exception of minor subordinated interim debt. Throughout this report we will refer to the 1974 Trust Agreement, dated as of January 1, 1974, as amended and supplemented, as the 1974 Agreement.

Section 706 of the 1974 Agreement provides the following:

It shall be the duty of the Consulting Engineers to prepare and file with the Authority and with the Trustee on or before the 1st day of November in each year a report setting forth their recommendations as to any necessary or advisable revisions of rates and charges and such other advices and recommendations as they may deem desirable. After...the release of the 1947 Indenture, it shall be the duty of the Consulting Engineers to include in such report their recommendations as to the amount that should be deposited monthly during the ensuing fiscal year to the credit of the Reserve Maintenance Fund for the purposes set forth in Section 512 of this Agreement, deposited during the ensuing fiscal year to the credit of the Self-insurance Fund for the purposes set forth in Section 512A of this Agreement, if any, and deposited during the ensuing fiscal year to the credit of the

Capital Improvement Fund for the purposes set forth in Section 512B of this Agreement.

The Authority further covenants that the Consulting Engineers shall at all times have free access to all properties of the System and every part thereof for the purposes of inspection and examination, and that its books, records and accounts may be examined by the Consulting Engineers at all reasonable times.

This Annual Report is based, in part, upon our knowledge of the Authority's operations gained over the more than 60 years that we (Consulting Engineers and its antecedent companies) have been retained as Consulting Engineers. We were initially retained in accordance with the provisions of Section 704 of Article VII of the Authorizing Resolution, dated January 1, 1944, and subsequently in accordance with Section 704 of Article VII of the 1947 Trust Indenture from its inception until its release, a period of 53 years. We have also served as Consulting Engineers in accordance with Section 706 of Article VII of the 1974 Agreement since its inception.

Each year, in fulfilling our duties as Consulting Engineers, we visit and note the condition of all the steam production facilities a minimum of three times; all the remaining production facilities at least once each year; one-third of the more than 380 distribution substations and transmission centers; and a representative cross-section of all additional property owned and operated by the Authority. We regularly review the Authority's various reports and records, meet with the Authority's management and staff to discuss present operations and future plans, and perform a number of analyses relying primarily on data and information provided by the Authority. We also participate in all regular bond issue financings undertaken by the Authority by assisting in the preparation of the Official Statements, by providing several signed Engineers Certificates, and by participating in bond rating agency presentations.

SYSTEM DESCRIPTION

The Authority's System supplies virtually all of the electricity consumed in Puerto Rico and the smaller islands of Vieques and Culebra. The Authority generates approximately 70% of the electricity itself and purchases the remaining from two cogenerators, EcoEléctrica, L.P. located in the Municipality of Peñuelas and AES-PR located in the Municipality of Guayama. During fiscal year 2009, which ended on June 30, 2009, the System served more than 1,458,000 clients.

The Commonwealth of Puerto Rico is the easternmost of the islands comprising the Greater Antilles and is approximately 110 miles in length and 35 miles north to south. Central mountain ranges with peaks as high as 4,390 feet extend the length of the island from east to west. Coastal lowlands formed by the erosion of the central mountains extend inwards on the north coast for 8 to 12 miles and for 3 to 8 miles in the south. The northern coastal lowlands are humid while those on the south side of the island are semi-arid. The island's population density is high; approximately 70% of the island's 3.9 million inhabitants are concentrated in five urban areas—San Juan, Caguas, Arecibo, Ponce, and Mayagüez. Many of the remaining inhabitants populate the many small towns located in the remote mountainous interior. Taken together Puerto Rico's geography, climate, and the dispersion of its clients within the Commonwealth present the Authority with many challenges as it designs, builds, operates, and maintains its System. The Authority serves its clients in 26 districts through seven regional offices, each of which incorporates a technical office.

Puerto Rico is in the path of many of the tropical storms and hurricanes that cross the Greater Antilles during the hurricane season, which runs from June through November. The Authority's transmission and distribution systems, more than 90% of which are above ground, are particularly vulnerable to the high winds, torrential rains, and erosion that are associated with tropical storms and hurricanes. The last hurricane to drastically affect both the island's economy and the System, Hurricane Georges, struck the island on September 28, 1998.

An electric power system is made up of production, transmission, distribution, communication and ancillary facilities, not all of which are physically connected, operated as a single integrated whole. The flow of electricity within the system is maintained and controlled by a dispatch center. It is the

responsibility of the dispatch center's operators to match the real-time supply of electricity with the simultaneous demand for it. In order to carry out their responsibilities the System's dispatchers are authorized to buy power to complement the System's own generation and to economically dispatch it based on System requirements.

The Authority's primary dispatch center, which is under the direction of the Director of Generation, Transmission & Distribution, is located at Monacillos, approximately seven miles south of metropolitan San Juan. A Supervisory Control and Data Acquisition (SCADA) system, an integral part of the dispatch center's control system, has the ability to control total load flow on the island and can remotely control many of the Authority's substations and all of the large generating units. A secondary dispatch center is located in Ponce. Both centers are fully staffed during System emergencies, coordinating all restoration efforts.

The three major components of the System are the Production Plant, the Transmission system, and the Distribution system. They account for approximately 81% of the \$9.3 billion Plant-in-Service investment. Below is a brief description of each of these components.

The production plant's generating capacity, to the nearest megawatt, is 4,903 MW comprised of 2,892 MW of steam-electric capacity, 846 MW of combustion-turbine capacity, 1,056 MW of combined-cycle capacity, 100 MW of hydroelectric capacity, and 9 MW of diesel capacity. The 2,892 MW of steam-electric capacity consists of 14 units at four sites: Palo Seco—602 MW (four units) and San Juan—400 MW (four units), both on the north side of the island; Aguirre—900 MW (two units) and Costa Sur—990 MW (four units), both on the south side of the island. The reduction in the capacity and number of units at Costa Sur reflects the removal from service at the end of fiscal year 2008 of its Units 1 & 2 which had a combined capacity of 100 MW. The Authority's 1,056 MW of combined-cycle capacity is comprised of two units at the Aguirre complex with a capacity of 592 MW and two units located in the San Juan Station with a total capacity of 464 MW, which came into service during fiscal year 2009. The 846 MW of combustion-turbine capacity consists of 29 units at nine sites around the island, the three-unit 248 MW Cambalache Station being the largest. The 100 MW of hydroelectric capacity consists of 21 units at 11 sites around the island, the 25 MW Yauco No. 1 being the largest unit. The Authority has two

diesel generators each with 3 MW of capacity on standby reserve on the island of Vieques. On the island of Culebra four diesel generators having a combined capacity of 2 MW provide standby reserve. The Authority has mobile a diesel unit capable of generating 1 MW.

During fiscal year 2009 ten units came into initial service and four simple cycle combustion turbines were retired; these changes are reflected in the data above. The two largest new units were San Juan Units 5 & 6 combined cycle units, each having a design capacity of 232 MW. At Mayagüez four 21 MW combustion turbines were retired and removed from the site and replaced by eight aero-derivative simple cycle combustion turbines. The replacement combustion turbines increased the available capacity at the Mayagüez station from 84 MW to 220 MW.

The Authority's Sabana Llana battery energy storage system was designed to provide up to 20 MW for power factor correction and reserve capacity, however, the battery system has not been available for service since fiscal year 2006.

To supplement its own capacity, the Authority purchases power from two cogenerators under the terms and conditions of Power Purchase Agreements (PPAs). The Authority is in the ninth year of a 22-year PPA for 507 MW of gas-fired capacity from EcoEléctrica, L.P. The Authority is in the sixth year of a 25-year PPA for 454 MW of coal-fired capacity from AES-PR. The 961 MW of capacity provided by the cogenerators brings the total capacity available to the Authority to 5,864 MW. (See *Appendix VIII, System Capability*.)

The Authority's transmission system is an interconnected network of 230, 115, and 38 kV power lines that carry electrical power from the production plants to various distribution centers from where it is distributed to clients for consumption.

At the close of fiscal year 2009, the transmission system was comprised of 2,419 circuit miles of lines: 364 circuit miles of 230 kV lines, 691 circuit miles of 115 kV lines, and 1,364 circuit miles of 38 kV lines. Included in the transmission system totals are 24.7 miles of underground 115 kV cable, 59.8 miles of underground 38 kV cable and 54.7 miles of 38 kV submarine cable. The 30 transmission switchyards located at the power plants and the 48 transmission centers located throughout the System have a total transformer capacity of 18,423 MVA. The transmission system includes 68 sectionalizer facilities with automatic air-break switches to protect the transmission network.

As of June 30, 2009, the Authority's distribution system consisted of approximately 31,156 circuit miles of distribution lines (with operating voltages ranging from 4.16 to 13.2 kV) and 333 substations (with a total installed capacity of 4,840 MVA). The distribution system has 1,842 circuit miles of underground lines. There are 795 privately owned substations (with a total installed capacity of 3,168 MVA). The distribution system also includes approximately 1,458,000 client meters.

SYSTEM'S OPERATIONS

PRODUCTION PLANT

The Authority continues its commitment to an ongoing, long-term program to extend the life and to maintain the high level of availability of its production plant, i.e., generating units. The program consists of three components: formal operator training, comprehensive preventative maintenance, and design modification. The formal operator training part of the program emphasizes safety, operating efficiency, and equipment integrity. The comprehensive preventative maintenance part of the program requires the Authority to remove all major generating units from service for maintenance at regularly scheduled intervals to ensure their reliability. These intervals are referred to as "scheduled outages" in the text of this Annual Report. A residual life assessment of critical components is an integral part of the Authority's preventative maintenance practices.

The design modification part of the program represents the Authority's commitment to improve the operation of its generating units by installing redesigned, improved components, or by undertaking conversions. Examples of design modifications include original equipment manufacturer's, OEM, upgrades of the eight 50 MW combustion turbines and of their conversion to dual fuel firing capability, either natural gas or distillate. The control systems in the Authority's sixteen 21 MW combustion-turbines are being upgraded as part of a broader ongoing capital program. The Authority also converted all of its "forced draft" thermal plant boilers to "balanced draft" operation. These modifications allow the equipment to be operated at design or increased capacity with greater operational efficiency and reliability.

Among the Authority's current projects are those that aim to increase the efficiency of its steam turbines by improving the performance of the associated condenser. These projects have included: retubing condensers; replacing condenser vacuum equipment; replacing cooling water filtration systems, and improving condenser backwash capabilities. The Authority has installed continuous condenser cleaning systems on several units; these vendor owned continuous condenser cleaning systems are operated on a pay-for-performance basis. Turbine efficiency is also being improved through the installation of high efficiency seals, through turbine control upgrades, and through the installation of redesigned turbine blades.

We visit all the steam-electric production facilities a minimum of three times each year and all of the remaining production facilities at least once each year. We examine numerous operations reports and we regularly meet with the Authority's management and staff to discuss present operations and future plans.

In accordance with an agreement approved by the Secretary of the Puerto Rico Department of Labor, Puerto Rico's Jurisdictional Boiler Inspector has allowed the Authority to increase the interval between boiler certifications from 12 months, as normally required by Commonwealth law, to 18 months. At the end of fiscal year 2009 the Jurisdictional Boiler Inspector had certified all of the Authority's boilers within the previous 18 months.

MAINTENANCE

As is common in the electric utility industry, expenditures associated with some maintenance projects are capitalized rather than charged as a current maintenance expense. Occasionally the Authority installs capitalized components during a scheduled environmental outage. Significant production plant upgrades or design modifications are implemented during a major overhaul. The costs associated with these projects are capitalized and the replaced units of property are retired from service. Maintenance activities, routine and those performed during an outage, are charged against the plant's maintenance budget. During scheduled outages the Authority performs non-destructive testing (NDT) examinations of representative critical components to establish their condition and perform or schedule appropriate repair work. The scope of NDT examinations include boiler pressure parts, power piping, steam turbine components, electrical generators, transformers, and switchgear.

The Authority schedules their fourteen steam-electric generating units out of service for an environmental outage of two to four weeks duration at intervals of twelve to eighteen months. During an environmental outage the boiler and other components are cleaned to meet the requirements of the Air Compliance Preventative Maintenance Schedule contained in the Authority's Consent Decree with the Environmental Protection Agency (EPA). The Authority may keep a unit in service up to an eighteen-month limit subject to the unit's compliance with the emissions criteria in the Consent Decree. Frequently the Authority will advance the start of an environmental outage to ensure that adequate capacity is available during a period of high demand or to

avoid having several units out of service concurrently. The following paragraph describes some of the cleanings, inspections, and replacements that the Authority performs during an environmental outage.

At the start of an environmental outage slag is removed from the boiler and the water walls are cleaned. The superheater, reheater, air heater, and economizer areas are washed and inspected, as are the exhaust gas ducts and the stack. Air heater components; seals, baskets, casing, and sector plates are inspected and replaced as necessary. Ductwork is repaired. Hoppers are emptied and cleaned, expansion joints are inspected for corrosion and leakage. Fuel handling equipment is inspected, repaired, and recalibrated as necessary. The forced and induced draft fans and the gas recirculation fan are cleaned, noise and vibration levels monitored, adjustments made and repairs completed. Motors for fans and main boiler pumps are cleaned and inspected. Dampers are inspected and adjusted. The windbox, burners, combustion air instrumentation, combustion controls, and soot blowers are inspected and damaged or worn components are either repaired or replaced. Monitors for opacity, oxygen, and furnace pressure are cleaned, recalibrated, or as necessary replaced. Pumps, feedwater heaters, the deaerator, and associated valves are inspected. Lubricating oil systems are inspected. Power transformers are inspected and breakers tested and adjusted. If a pressurized part of the boiler has been replaced the boiler part will be pressure tested before the unit returns to service. Life extension inspections and NDT activities are completed on critical systems and components in preparation for future programmed outages.

In the discussions regarding the status of production units that follow, the narrative will note the duration of a unit's environmental outage and describe work completed during the outage, which is in addition to that routinely performed during an environmental outage.

Thirteen of the Authority's fourteen steam-electric generating units were in service during fiscal year 2009. Palo Seco Unit 3 was not in service as the restoration from damages incurred during the December 2006 station fire was continuing at the end of fiscal year 2009. Twelve of the 13 steam-electric generating units that were in service during fiscal year 2009 underwent an environmental outage during the fiscal year. Four of the environmental outages were completed while the unit underwent a programmed major overhaul. During fiscal year 2009 one of the 13 in-service steam-electric generat-

ing units was in service more than 18 months between environmental outages. The maintenance interval was extended because of System operational considerations caused primarily by the unavailability of the capacity from the two large Palo Seco units. The Authority notified the EPA of the need to keep the unit in service prior to the month in which it went beyond the Consent Decree's 18-month interval. The unit was operated in an environmentally compliant manner during the extended period.

With few exceptions the Authority sequences scheduled outages so that the large steam electric units are available for service from May through November, the months of maximum demand. This strategy seeks, to the extent possible, to maximize the availability of the System's capacity while maintaining compliance with the Consent Decree with the EPA.

Steam turbines are internally inspected every five-to-seven years. This work, which is typically scheduled for a period of three-to-five months duration, includes opening the high-, intermediate-, and/or low-pressure section of the steam turbine and disassembling, repairing, or replacing major components; the scope of work is more comprehensive than an "environmental outage". It is identified as a "major overhaul" in the descriptions of the status of production units that are discussed below. Occasionally the scope of work performed during a major overhaul will cause the schedule to be extended beyond the three-to-five months required to complete the turbine work. These events are detailed in the unit descriptions that follow.

The Authority's remaining production plant also includes both simple cycle and combined-cycle combustion-turbines, and a number of relatively small hydroelectric plants.

The Authority schedules maintenance on its 39 combustion-turbines (29 operated in simple cycle configuration and ten operated in combined-cycle configuration) based upon the number of "equivalent fired hours" of operation as specified in manufacturers' manuals. The equivalent fired hours concept takes into account the wear and tear associated with starting up the units as well as other operating factors that reduce the actual number of hours that units can be run between inspections. Eighteen of the Authority's simple cycle combustion-turbines are 21 MW Frame 5 machines, located at seven sites throughout the island. During the 1990's the Authority improved the performance of these combustion turbines by upgrading them to model "PA"

configuration. One of the benefits of the "PA" modernization is that the interval between certain inspections increased the equivalent fired hours as follows: fuel nozzles of these units are inspected every 1,125 equivalent fired hours or 2,250 equivalent fired hours for units with air atomization; combustion section inspections are conducted every 4,500 equivalent fired hours; and intermediate inspections are conducted every 9,000 equivalent fired hours. Compressor and power turbine sections are rebuilt during major overhauls, which are scheduled every 18,000 equivalent fired hours. Beginning in 2004 the Authority began a program to replace certain components in each of the 21 MW combustion turbines. The program included the replacement of the ratchet and torque converter thereby improving starting reliability, the installation of a universal fuel system, turbine modifications, an upgrade of the turbine control system, and new digital controls for the excitor. These upgrades have been completed on 13 of the 18 combustion turbines. The upgrades to the remaining combustion turbines are scheduled for completion in fiscal year 2012. Vibration analysis, lubricating oil analysis, and other diagnostic tests are performed monthly.

During fiscal year 2009 these units underwent programmed maintenance inspections and, as described in the *Other Combustion-Turbine Power* section of this report, underwent substantial upgrade to improve their efficiency and reliability

Eight new FT8 aero-derivative simple cycle combustion turbines went into service at the Authority's Mayagüez plant during fiscal year 2009. These eight combustion turbines comprise four units. The combustion turbines are connected in opposed pairs, between each pair is a 55 MW generator. The four units are capable of 220 MW; they replace the four 21 MW combustion turbines that were previously sited at the Mayagüez plant. The new units will be inspected and maintained at the following intervals:

"A" Inspection the sooner of every 1,000 hours or annually, during which borescope inspections are performed and preventative maintenance completed under the direction of a technical advisor.

"B" Inspection performed every 12,500 hours is a hot section inspection of the combustors, the power turbine sections and the seals and bearings. The unit is disassembled and shipped to a shop for the inspection.

"C" Inspection performed at 25,000 hours includes the inspection and refurbishment of the combustion turbine's intermediate case, the bearing compartments, pumps, in addition to the components inspected during a "B" inspection.

"D" Inspection performed at 50,000 hours entails the shop inspection of all sections of the combustion turbine and the refurbishment or replacement of worn components.

The three 82.5 MW Model GT 11N combustion-turbines power blocks at the Cambalache Combustion-Turbine Station are inspected and maintained in accordance with the schedule below:

Class "A" Inspection every 4,000 equivalent fired hours: the combustor, burners, and turbine blades are inspected; the duration of the inspection is approximately 6 days.

Class "B" Inspection every 8,000 equivalent fired hours: the instrumentation is recalibrated; the combustor, burners, and turbine blades are inspected; and the once-through steam generator (OTSG) is washed; the duration of the work is approximately 6 days.

Class "C" Inspection every 16,000 equivalent fired hours: the blades in the compressor section are replaced; the combustor is removed for inspection; the combustor liner is replaced; thermal tiles and holding rings are replaced; the turbine is opened; the first three rows of blades in the high-pressure section of the turbine are replaced; auxiliaries are inspected and repaired as necessary; the duration of the work is approximately 31 days. The removed combustor liner and turbine blades are refurbished for use during future outages.

The Authority completed the upgrade of the last of the Frame 7 combustion turbines at the Aguirre Combined Cycle Station to a modified Frame 7EA design during fiscal year 2007. The upgrade allowed the Authority to increase the number of equivalent fired hours a combustion turbine is in service between scheduled maintenance inspections to the hours cited below:

Combustion inspections during which burner nozzles, check valves, filters, and associated instrumentation are inspected are scheduled every 5,300 equivalent fired hours. Prior to the design upgrade combustion inspections were

performed at 4,000 equivalent fired hours intervals. Combustion outages take less than a week.

Hot-gas-path inspections, during which the liner, the first stage turbine blades, rotor bearings, burners, etc., are inspected, are scheduled approximately every 15,900 equivalent fired hours. The turbine inspection ports are opened; turbine blades are replaced as dictated by the degree of blade corrosion. A hot-gas-path inspection is typically completed over an eight-week period.

Major overhauls, during which the turbine and compressor are opened and blades in the first stage of the turbine are replaced, are scheduled after 31,800 equivalent fired hours. In addition, reduction gears and other turbine components and auxiliaries are inspected and repaired. Duct sections, baffles, the exhaust stack, the generator, and other electrical equipment are also inspected and repaired. Filter media in the air intake system are also replaced at this time. A major overhaul is typically completed over a sixteen-week period.

The steam turbines of the Aguirre combined-cycle plant are maintained in accordance with the same guidelines as those followed for the 16 steam-electric turbines.

During October 2008 the Authority's two 232 MW combined-cycle units, San Juan Units 5 & 6, went into commercial service. Each unit is comprised of a single combustion turbine with a capacity of 165 MW and a steam turbine with a capacity of 67 MW. The Authority has signed a long term service agreement, LTSA, with the combustion turbine vendor of approximately eight years duration during which the vendor will be responsible for the maintenance of the combustion turbine generator and the steam turbine generator. The Authority will be responsible for the maintenance of the combined-cycle plant's auxiliaries. Combustion turbine inspections will be performed on the basis of equivalent operating hours, EOH, as follows:

8,000 EOH—Modified Combustion Inspection fuel nozzles, combustor baskets, transition pieces, turbine blades in rows 1, 2, 3, and 4, and turbine vane and ring segments in rows 1 and 2 will be replaced. Inspections of the inlet, compressor, turbine, and exhaust sections of the combustion turbine are completed.

16,000 EOH—Combustion Inspection fuel nozzles, combustor baskets, transition pieces, turbine blades in rows 1, 2, 3, and 4, and turbine vane and ring segments in rows 1 and 2 will be inspected and replaced as necessary. Inspection of the inlet, compressor, turbine, and exhaust sections of the combustion turbine are performed.

24,000 EOH—Major Inspection of the Combustion Turbine is completed with inspection and replacement of blades in the compressor section and in the turbine section.

Steam Turbine Generator inspections will be performed on the following frequencies:

Steam Turbine Generator Valve Inspections will be performed every 18 months. The scope includes the cleaning, NDE, and adjustment of HP stop and control valves, reheat stop valves, and intercept valves.

Major Inspections of the Steam Turbine Generator are performed every 50,000 EOH.

The Authority has significantly reduced the duration of unscheduled outages of some of its large generating units by maintaining an inventory of critical spare components. On a long-term basis this practice has contributed to the improvement of both unit and System availability. Refer to the *Spare Components* section below for a listing of the major spare components.

The hydroelectric generating units are inspected on an annual basis and opened every five years.

Maintenance expenditures outlined below do not include the cost of the new capitalized units of property, and therefore they do not completely reflect the Authority's total cost of maintaining its fixed assets. As shown in *Appendix III, Detail of Operating and Maintenance Expenses*, maintenance expenditures for the production plant for fiscal year 2009 totaled \$117.3 million. Expenditures for fiscal years 2010 through 2014 have been projected to be \$122.5 million, \$114.9 million, \$114.7 million, \$114.4 million and \$114.2 million, respectively.

STATUS OF PRODUCTION UNITS

The statuses of the Authority's production units are described in the following sections based on their condition as of the week of June 30, 2009.

The table below provides a brief profile of each unit (capacity data, age, annual heat rate, and annual equivalent availability). The annualized heat rate is a measure of a unit's operating efficiency, which can be affected by its level of dispatch and other factors, such as capacity limitations caused by out of service equipment or sub-systems. Since heat rate is measured in terms of required fuel heating value input to produce one kilowatt of power, better performance is indicated by a lower heat rate.

Annual equivalent availability is defined as the percentage of time a generating unit was available, at its rated capacity, for service in a rolling 12-month

period. For this Annual Report, that period was the fiscal year ended June 30, 2009. The equivalent availability of the Authority-owned production plant for fiscal year 2009 was 71.4%. The two factors that weighed most heavily on the 2009 equivalent availability factor were continuing difficulties related to the return to service of the large Palo Seco steam units and the introduction of San Juan Units 5 & 6 which experienced routine and non-routine service interruptions during their first year of service. With those exceptions the Authority's large steam units continued their recent performance by maintaining good reliability levels and achieving a better heat rate during fiscal year 2009 than in the prior fiscal year.

A summary of annual performance data for each unit is presented on the table below:

AUTHORITY'S PRODUCTION PLANT SUMMARY PERFORMANCE FISCAL YEAR 2009

	RATED CAPACITY	AVAILABLE CAPACITY	INITIAL OPERATION	HEAT RATE	ANNUAL EQUIVALENT AVAILABILITY
STATION					
Aguirre Unit 1	450	450	1971	10,330	80%
Aguirre Unit 2	450	450	1971	10,186	93%
			Aguirre Station	10,284	87%
Costa Sur Unit 1 <i>Removed from service 4/30/08</i>	50		1957		
Costa Sur Unit 2 <i>Removed from service 4/30/08</i>	50		1958		
Costa Sur Unit 3	85	85	1960	11,745	66%
Costa Sur Unit 4	85	85	1962	12,007	80%
Costa Sur Unit 5	410	390	1969	10,664	80%
Costa Sur Unit 6	410	0	1972	10,644	88%
			Costa Sur Station	10,806	78%
Palo Seco Unit 1	85	85	1959	10,872	88%
Palo Seco Unit 2	85	85	1959	10,905	89%
Palo Seco Unit 3	216	0	1967		0%
Palo Seco Unit 4	216	120	1968	10,395	18%
			Palo Seco Station	10,819	31%
San Juan Unit 7	100	100	1964	11,248	75%
San Juan Unit 8	100	100	1964	11,469	88%
San Juan Unit 9	100	100	1966	11,444	88%
San Juan Unit 10	100	0	1965	11,639	32%
			San Juan Station	11,415	71%

AUTHORITY'S PRODUCTION PLANT SUMMARY PERFORMANCE FISCAL YEAR 2009 *continued*

	RATED CAPACITY	AVAILABLE CAPACITY	INITIAL OPERATION	HEAT RATE	ANNUAL EQUIVALENT AVAILABILITY
COMBINED-CYCLE UNITS					
Aguirre Combined Cycle Unit 1	296	202	1976		61%
Combustion Turbine 1-1	50	0		14,028	23%
Combustion Turbine 1-2	50	50		15,596	25%
Combustion Turbine 1-3	50	50		13,130	96%
Combustion Turbine 1-4	50	50		12,396	64%
Steam Turbine 1	96	52			80%
Aguirre Combined Cycle Unit 2	296	150	1975		63%
Combustion Turbine 2-1	50	50		12,897	94%
Combustion Turbine 2-2	50	50		13,114	97%
Combustion Turbine 2-3	50	50		12,915	92%
Combustion Turbine 2-4	50	0		13,188	17%
Steam Turbine 2	96	60			39%
			Aguirre Combined-Cycle Plant	11,568	62%
San Juan Unit 5	232	0	2009	8,394	31%
San Juan Unit 6	232	225	2009	7,951	58%
COMBUSTION TURBINES					
Cambalache CT Power Blocks					
CCTP 1	82.5	82.5	1997	11,884	94%
CCTP 2	82.5	82.5	1997	12,155	88%
CCTP 3	82.5	82.5	1998	11,980	89%
			Cambalache CTs	11,995	90%
Frame 5 GT Power Blocks					
9 Blocks of 2 GT's	378	336	1971 - 1973	14,411	85%
Mayagüez					
GT 1	55	27.5	2009	10,206	90%
GT 2	55	55	2009	10,097	98%
GT 3	55	55	2009		98%
GT 4	55	55	2009		97%
				ANNUAL SERVICE FACTOR	ANNUAL EQUIVALENT AVAILABILITY
HYDRO					
Total for 21 Hydro Units	100	78.6	1929 - 1953	23%	92%
DIESEL GENERATORS					
Total for 7 DG sets	9	9	1980 - 2006	0.70%	99%

Steam-Electric Production Plant

Total Generating Capacity 2,892 MW

The generating units within a steam-electric generating station are identified by acronyms in the following manner: Unit No. 1 in the Aguirre Steam Plant is introduced as ASP Unit No. 1; Unit No. 3 at Costa Sur Steam Plant is CSSP Unit No. 3, and so on. The narratives on the generating units in this section present information by paragraph in the following sequence:

The first paragraph provides historical and annualized operational data and summarizes the types and number of outages the unit experienced during the fiscal year. In this paragraph and in the following paragraphs turbine sections are identified in the following manner: high-pressure (HP), intermediate-pressure (IP), and low-pressure (LP).

The second paragraph describes the number and types of scheduled outages (major overhaul, environmental outage, or maintenance outage) the unit experienced during the fiscal year. The work performed during maintenance outages is described if the outage was longer than 24 hours. However, if a unit was scheduled out of service repeatedly for the same reason, the cause of the maintenance outages and their resolution will be noted regardless of the brevity of the outage.

The third paragraph describes the number of times and the duration of forced outages and unit limitations the unit experienced during the fiscal year. The cause of the outage or limitation and the action(s) taken to return the unit to full service is described when the forced outage or limitation was of more than 24 hours duration. Repeated outages or limitations attributed to the same cause are noted, despite being of less than 24 hours duration. The Authority tracks unit limitations as "equivalent outage hours" (EOH), which are a measure of the hours the unit's output was restricted below full capacity; for example, operating for 24 hours while the unit output is limited to 50% is equivalent to 12 hours of outage for the unit at full capacity.

The fourth paragraph notes the scheduled outages that are planned for fiscal year 2010 or beyond along with equipment and system replacements and upgrades that are included in the Capital Improvement Program. Capital expenditures for station services that impact a number of the station's units are described in the station's Unit 1 narrative.

The date of the most recent and the scheduled start of the unit's next major overhaul are noted.

Aguirre Steam Plant

ASP Unit No. 1 was on line, capable of full output. The unit's reliability was impacted by a number of events during the fiscal year. Aguirre Unit 1 returned to service on completion of a six-week extended environmental outage in December 2008. In addition to that outage the unit was scheduled from service five times for maintenance; these maintenance outages kept the unit from service for ten days. This unit was forced from service on five occasions; these events kept it from service for approximately nine days. During the year the unit accrued a total of 248 equivalent outage hours. At the end of the fiscal year this unit had generated an average of 322.8 MW and had a gross capacity factor of 59.6%. Unit 1 was in service 7,280 hours during the fiscal year.

The Authority scheduled Unit 1 from service in early November at the start of a 43-day extended scope environmental outage. In addition to the work completed during routine environmental outages the Authority also reconditioned the LP turbines, replaced 448 dissimilar metal welds in the superheater, installed inspection viewing ports on switchgear, replaced a shaft on a forced draft fan, adjusted the servos, and chemically cleaned the condenser. Two maintenance outages within a ten day period were needed to repair boiler tube leaks, these repairs were completed within seven days and the unit returned to service early in October. A leak at a turbine bearing was repaired during a five day scheduled outage in January. In March a two day maintenance outage was needed for the repair of boiler tube leaks and in late March the Authority repaired an oil leak in a normal station service transformer (NSST).

Forced outages kept the unit from available status for approximately ten days during fiscal year 2009. The failure of excitor brushes caused the unit to trip twice. Following one of these trips tubes in the superheater area broke, their repair was completed over the following three days. An electrical problem at a forced draft, FD, fan forced the unit out of service in October. In November the Authority replaced parts of the turbine drive boiler feedwater pump and the repaired broken boiler tubes during a forced outage. The unit's output was limited for the equivalent of ten days of generation at its rated capacity of 450 MW. Eight of the equivalent outage days accrued

while the Authority completed weld repairs to the shaft of one of the unit's two FD fans.

Unit 1 is scheduled to begin a major overhaul in January 2010. During the major overhaul waterwall sections will be replaced as will the windbox and boiler corners. A section of the superheater will be replaced. The condenser will be cleaned, the HP/IP turbine rotor will be replaced and the HP casing repaired. The generator and turbine drive boiler feed pump (BFP) will be cleaned and inspected. A motor on the start-up BFP will be replaced. Preventative maintenance will be performed on electric motors and transformers. Relays will be tested and reset. During fiscal year 2009 the Authority upgraded the fire detection and suppression systems at the station. When the last phase of the upgrade is completed in August 2009 the following systems will be operational: a foam system in the tank farm area, a water spray system will protect boiler corners, air heaters, lube oil tanks, turbine bearings and couplings, an FM 200 system will protect personnel and equipment from fire in enclosed spaces like the DCS room, the excitor room, servers and communication rooms and the control room. Other capital expenditures were dedicated to the refurbishment of critical equipment and to the replacements that will be installed during the overhaul described above.

Both Aguirre units are capable of regulating frequency between 230 and 430 MW. The Aguirre Steam Plant had the lowest net heat rate and the lowest percent of auxiliary energy consumption of the four largest steam electric generating stations.

ASP Unit No. 2 was on line capable of full output. During fiscal year 2009 the unit's availability was impacted by a number of planned and unplanned events, the sum of which kept it from available status for a total of 26 days. This unit was in service more hours, 8,159, during the fiscal year than any of the Authority's other steam electric units. Eight scheduled maintenance outages kept the unit from available status for 21 days. The unit was forced from service six times, these forced outages kept it from available status for a total of six days. During fiscal year 2009 Unit 2 generated an average of 326.7 MW, achieved a capacity factor of 74.2%, and was capable of regulating frequency.

Unit 2 completed an environmental outage late in fiscal year 2008 and was not scheduled for an environmental outage during fiscal year 2009. The Authority repaired boiler tube leaks during four maintenance outages, these repairs accounted for

seven of the 21 days that the unit was unavailable while undergoing maintenance. During October the Authority scheduled the unit from service for approximately four days during which the air heaters were cleaned and repaired and the boiler back pass washed. Feedwater heaters were repaired during two maintenance outages; together these outages accounted for six of the maintenance outage days. Late in the fiscal year the unit was scheduled from service twice for maintenance. The main power transformer was inspected, and the transformer oil replaced during a four-day maintenance outage from which the unit returned to service in early June. During the last of the maintenance outages the Authority repaired a flow control valve.

The unit was forced from service six times, only two of the forced outages kept the unit from available status for as long as 24 hours. Quickly corrected problems with the turbine drive for boiler feedwater pump caused two of the forced outages. Two other times the unit was forced from service but returned in less than 12 hours. In August an operator error tripped the unit; when the unit tripped several superheater welds failed, their repair kept the unit from service for two-days. In March the unit was forced from service by leaks in the superheater area and by oil leaks at several turbine bearings. Repairs were completed and the unit returned to service three days later. Three times during the fiscal year the unit's output was reduced by a forced de-rating. The capacity limitations imposed during the three periods totaled less than two equivalent outage days. The unit's output was limited to 300 MW while boiler water chemistry was adjusted. The unit's output was limited on two occasions while its air heaters were cleaned.

Unit 2 is scheduled to begin an extended scope environmental outage in November 2009. The timing of the outage is in compliance with the Authority's Consent Decree with the EPA. In addition to the routine cleanings, inspections, and replacements that comprise an environmental outage the Authority will also replace the LP turbine. In May 2005 the unit returned to service on completion of a major overhaul. It is scheduled for another major overhaul in fiscal year 2012. The scope will include the replacement of the HP/IP turbines, the reconditioning of the turbine control valves, the inspection of the generator stator and the replacement of the generator rotor with a rotor being manufactured in Switzerland. Boiler sections will be replaced, the main steam and hot reheat lines will undergo non

destructive examination and repairs will be made as necessary, electrical equipment, transformers, relays, switchgear will be inspected, repaired and reset. The scope of the overhaul will be further defined during fiscal year 2010.

Costa Sur Steam Plant

CSSP Unit No. 1 and CSSP Unit No. 2 (both nominally 50 MW) these two units, which entered service in the 1950s, were taken out of service in fiscal year 2004, more than four years ago. During fiscal year 2008 the Authority's stopped reporting on the availability of these two units. During fiscal year 2009 the Authority initiated the process of obtaining the approvals needed to solicit bids for the decommissioning of these units.

CSSP Unit No. 3 (nominal 85 MW) was unavailable for service while undergoing repairs; it was scheduled to return to available status early in fiscal year 2010. During fiscal year 2009 this unit was scheduled from service three times, once for a programmed environmental outage and twice for maintenance outages. Scheduled outages kept the unit from service for 42 days. The unit was forced from service five times, these outages kept it from service for 77 days during the fiscal year. The unit's output was limited for the equivalent of five outage days and it was placed in reserve shutdown four times. Unit 3 generated an average of 64.5 MW, had a gross capacity factor of 41%, and it was in service 4,682 hours during fiscal year 2009.

In August the unit began an environmental outage with an extended scope from which it returned to service 40 days later in early October. During the outage the Authority replaced 200 condenser tubes, installed an upgrade to the burner management system, replaced twelve scanners, burner isolation valves, and replaced two low pressure feedwater heaters. Following the outage the unit was scheduled from service for the repair of boiler tube leaks. These repairs were completed and the unit returned to service in less than two days. The other maintenance outage kept the unit from service for less than five hours. The unit was placed in reserve shutdown four times for a total of 52 days during the fiscal year.

While the unit was forced from service five times, only three of the outages were of more than one day's duration. The first was a two-day outage needed to repair boiler tubes; the second forced outage was caused by the failure of generator bushings and current transformers. The unit returned to avail-

able status in mid-March, 32 days after being forced out. In mid-May the failure of a generator bushing forced the unit from service for a second time. The unit had not returned to available status at the end of the fiscal year 2009. Concurrent with the repair of the generator and the replacement of current transformers the Authority planned to complete the cleanings, inspections, and replacements that comprise an environmental outage. This would enable them to comply with the Consent Decree requirement without taking the unit from service a second time during fiscal year 2010. The unit's output was limited numerous times during the fiscal year while its condenser was being cleaned. A typical cleaning would limit the unit the equivalent of three operating hours. In January the unit was limited for 33 equivalent outage hours while pump repairs were completed. In March the unit's output was limited for one day while one of its two boiler feedwater pumps was repaired.

Unit 3 returned to available status on completion of its most recent major overhaul in January 2004 and is scheduled to begin its next major overhaul during fiscal year 2012. The capital improvement program includes a multi-year project to refurbish the tank farm dikes and the replacement of fuel oil piping from the tank farm to the station. The installation of an upgrade to the fire detection and suppression systems was in progress. The upgrade included a deluge system for the main power transformers and a CO₂ system for the breaker and switchgear rooms in the station both are scheduled for commissioning during fiscal year 2010. The burner management system upgrade installed in this unit will also be installed in Unit 4 during fiscal year 2010; this work is budgeted in the capital improvement program.

CSSP Unit No. 4 (nominal 85 MW) was on line, capable of full output and capable of regulating frequency. The Authority scheduled the unit from service three times during fiscal year 2009. These scheduled outages, one environmental and two maintenance outages kept the unit from available status for 38 days. Five forced outages kept the unit from service for 29 days while repairs were completed. The unit's output was limited the equivalent of seven operating days and the unit was put into reserve shutdown for a total of 77 days during the fiscal year. Unit 4 generated an average of 64 MW, had a gross capacity factor of 45%, and it was in service 5,229 hours during fiscal year 2009.

Unit 4 began a 33-day environmental outage in late August. During the outage the Authority replaced

several of the unit's low pressure heaters and repaired the excitation system. Later in the fiscal year the unit was scheduled from service for maintenance twice, initially in April for slightly more than one day for the repair of waterwall leaks and in May for almost four days for repairs to the economizer section. The unit was placed in reserve shut-down four times for a total of 77 days during the fiscal year.

Four of the five forced outages that took this unit from service were the result of tube failures in various sections of the boiler. Approximately 12 days were spent completing repairs in the economizer section and 17 days were spent, during two other forced outages, repairing boiler waterwall tube leaks. The cause of the fifth forced outage was quickly repaired allowing the unit to return to service in a few hours. The unit's output was partially down rated several times, together these down ratings equaled eight equivalent operating days. Five of these equivalent days accrued while repairs were being made to one of the unit's boiler feedwater pumps. The remainder accrued while condensers were being cleaned.

Unit 4 is scheduled to begin an environmental outage in November 2009 during which the Authority will install the upgrade to the burner management system. Unit 4 returned to service on completion of a major overhaul in February 2007 and is scheduled to undergo a major overhaul in 2014.

CSSP Unit No. 5 (nominal 410 MW) was online while limited to 390 MW due to high temperature differential at the air preheater. The Authority scheduled this unit from service eight times during the fiscal year. The unit was unavailable for 62 days during the year as it completed two scheduled environmental outages and six maintenance outages. Three forced outages kept the unit from service for an additional nine days. The unit's output was limited a number of times during the fiscal year. These limitations were the equivalent of approximately three outage days. Unit 5 generated an average of 298.7 MW, had a gross capacity factor of 59%, and was in service 7,064 hours during fiscal year 2009.

The unit returned to service at the end of a 39 day environmental outage with an extended scope on the last day of July. In addition to the routine work performed during an environmental outage the Authority also replaced the motors on both boiler feedwater pumps, inspected and repaired turbine control valves, cleaned and repaired air heaters,

installed temporary restraints on the main steam line, inspected station transformers, and cleaned the condenser. In May Unit 5 was scheduled out for an environmental outage from which it returned to available status in 19 days. Four of the six maintenance outages, each approximately two days in duration, were scheduled for the repair of tube leaks in waterwalls. During March the Authority scheduled a four day maintenance outage during which the condenser was cleaned, the opacity monitors were replaced, and minor repairs made to the boiler's corners.

During September the failure and repair of tubes in the fuel heater forced the unit from service for six days. The repair of boiler tube leaks were completed during a three day forced outage in January. The unit tripped from service following the loss of power to the burner management system; power was restored and the unit returned to service in less than one day. The partial equivalent day outage limitations at different times during the fiscal year accrued while repairs were completed on a circulating water pump, air heaters, a check valve, and on fans.

The unit returned from a major overhaul in July 2002 and is scheduled to undergo a major overhaul in fiscal year 2011. The major expenditures for equipment are budgeted in the capital improvement program. During the overhaul the Authority will replace feedwater heaters, retube the condenser, replace waterwall panels and boiler corners, replace the HP/IP rotor and refurbish the LP turbine rotor, rewind the generator stator, repair the main steam line, and replace the auxiliary cooling tower. High efficiency seals will be installed in the turbine during the overhaul. Switchgear will be replaced and the unit's main distributed control system (DCS) will be upgraded, a Mark VI control system will be installed and LP heater No. 3 will be retubed.

CSSP Unit No. 6 (nominal 410 MW) was unavailable for service having just begun a major overhaul. The unit was scheduled from service one other time and that was for a Consent Decree mandated environmental outage. Other outages included two forced outages that kept the unit from available status for eight days; the equivalent of five outage days accrued while the unit was limited for a number of different reasons. This unit experienced a number of partial down ratings and several forced down ratings and accrued five and a half equivalent outage days. Unit 6 generated an average of 313 MW, had a gross capacity factor of 68%, and during fiscal year 2009 it was in service 7,816 hours.

During a two-week environmental outage in October the Authority performed NDT of critical lines and equipment in preparation for the start of a major overhaul in June 2009. The Authority also installed temporary restraints on the main steam line control valve chest, which is scheduled for major modification during the unit's overhaul. The unit returned from its most recent major overhaul in June 2000. In mid-June 2009 the unit came out of service at the start of a major overhaul which is scheduled for completion in October 2009. The combined budget allocations for the major overhaul of Costa Sur Unit 6 constitute the largest of the projects funded for Costa Sur in fiscal year 2010. The scope of the overhaul includes asbestos abatement, the replacement of waterwall sections, the installation of new burners, the replacement of several feedwater heaters, the retubing of the condenser, the replacement of the HP/IP and LP turbine rotors, the installation of high efficiency seals in the HP/IP turbine, the rewinding of the generator stator, the modification of the main steam line and the supports thereon. The DCS will be upgraded, switchgear replaced, relief valves tested and recalibrated, the auxiliary cooling tower replaced, turbine control and stop valves cleaned, inspected and repaired as necessary. Mechanical equipment and electrical motors will be inspected; transformers will be inspected and tested. Air heaters will be refurbished with new baskets and seals.

The first of the two forced outages was a two-day outage in November during which the Authority repaired tube leaks in the reheat section and the second, during January 2009, was a six day outage for the repair of tube leaks in the boiler. Problems with the boiler's burners and with low condenser vacuum were the two principal reasons that this unit accrued a total of five equivalent outage days during fiscal year 2009.

Palo Seco Steam Plant

PSSP Unit No. 1 (nominal 85 MW) was on line and capable of full output. During fiscal year 2009 this unit was scheduled from service five times, once for a program outage of 21 days duration and four times for maintenance. Unscheduled forced outages took the unit from service seven times. Forced outages kept the unit from available status for the equivalent of five days. The unit's output was limited for less than the equivalent of one day. The unit was in service for a total of 7,763 hours during the fiscal year; it generated an average of 73.8 MW while in service and had a gross capacity factor of 77% for fiscal year 2009.

From mid-July into early August the Authority scheduled this unit from service to rebalance its turbine rotor and to perform other incidental repair and replacement work. Unit 1 was also scheduled from service twice during August for maintenance. These outages combined to keep the unit from available status for five days, initially for valve repairs and then for the repair of boiler tubes. In September the unit was scheduled out for approximately two days for turbine rebalancing and additional boiler repairs. In March the repair of hydrogen leaks in the generator cooling system were completed during an eight day maintenance outage.

During the second half of the fiscal year the unit was forced from service three times by condenser tube leaks. The unit lost a total of approximately three days while the Authority identified the leaking tubes and plugged them. The boiler tripped due to low water level twice and returned to service in a few hours each time. The unit was forced from service in February when the loss of a circulating water pump caused degradation of the condenser vacuum; the pump was repaired and the unit returned to available status in less than a day. The fifth forced outage caused the unit to be out of service for only a few hours. The 16 equivalent outage hours that this unit recorded were accrued while the unit was turned down for condenser repairs and cleanings.

The following describes modifications to facility systems, and capital improvements that were not unit specific: the four Palo Seco units have been connected to the 115 kV GIS substation, the installation of the FM 200 fire suppression system was completed and the Authority implemented a program of thermographic inspection of switchgear and other major electrical equipment. The installation of a foam system to extinguish fires in the tank farm area and the construction of a deluge system to protect the main power transformers was continuing at the end of the fiscal year. During fiscal year 2010 the power supply to the station's fire pumps will be revamped so that energy needed to power the fire suppression equipment is provided from a source other than a unit within Palo Seco Station. During fiscal year 2009 Fire Department Inspectors inspected the station, equipment, and reviewed training records of station personnel. Unit 1 returned to available status in April 2008 on completion of a major rebuild following a December 2006 fire event. It will undergo an environmental outage during fiscal year 2010.

PSSP Unit No. 2 (nominal 85 MW) was online and capable of full output at the end of the fiscal year. Unit 2 was scheduled from service three times, twice for programmed outages and once for maintenance. This unit was unavailable for service a total of 38 days while scheduled work was completed. The unit was forced from service four times and returned to available status in a matter of hours after each incident. There were four events that led to an accrual of 67 equivalent outage hours during the fiscal year. The unit was in service for a total of 7,849 hours during the fiscal year; the most of any of the station's units. It generated an average of 73.4 MW while in service and had a gross capacity factor of 77% for fiscal year 2009.

The unit returned to available status on completion of a 31 day environmental outage in December. In addition to the routine cleanings, inspections, replacements, and adjustments that are completed during an environmental outage the unit was connected to the 115 kV GIS substation that was completed early in the fiscal year. During May the repair of hydrogen leaks in the generator cooling system accounted for the balance of the fiscal year's scheduled outage hours.

Each of the four forced outages reported during the fiscal year was caused by a failure in a different part of the unit. The repair of a leaking condenser tube forced the unit from service for 12 hours, the longest period that this unit was unavailable due to a forced outage during the fiscal year. Equivalent outage hours totaling approximately three days accrued while the Authority cleaned the unit's condenser. Following heavy rain storms, mud precipitates from the water passing through the condenser, coating tubes and causing condenser vacuum to degrade. On several occasions the unit was limited while the Authority found and plugged leaking condenser tubes.

Unit 2 is scheduled to begin a major overhaul late in fiscal year 2010. During the overhaul the Authority will replace boiler sections, replace the HP/IP turbine rotor, replace the existing seals in the HP/IP sections with high efficiency seals that will increase the turbines efficiency, the LP turbine will be reconditioned, and the condenser will be retubed. The generator's rotor will be rewound. This work will keep the unit from available status for approximately four months. In 2002 this unit returned to available status on completion of its previous major overhaul. **App-209**

PSSP Unit No. 3 (nominal 216 MW) was forced from service by a fire on December 30 2006; its repair was continuing at the end of fiscal year 2009. Unit 3 had been scheduled to begin a major overhaul in February 2007. After evaluating the extent of the damage sustained by each of the of the Palo Seco units during the fires the Authority determined that this unit would be the last of the four units to return to service. The work originally planned for completion during the overhaul was incorporated into the repair schedule. At the start of fiscal year 2009 the restoration of this unit was 60% complete; it was scheduled to return to service early in calendar year 2009. The completion of work in the turbine generator area was on the critical path setting the unit's return to service. At the start of the fiscal year the HP/IP turbine rotor and the generator rotor were in mainland shops being refurbished; the replacement LP turbine rotor was in protected storage at the station; and boiler work was continuing. In addition work was continuing on control valves, instrumentation and control wiring, and on the distributed control system and the burner management system. The completion date slipped due to the late return of turbine generator components to Puerto Rico and subsequently the correction of turbine seal problems. In mid-March the Authority accepted the unit and continued instrument calibration, the chemical cleaning of the boiler, the completion of work on the polishing system, and the commissioning of switchgear. During the last month of the fiscal year the Authority continued to correct turbine vibration problems and to repair leaks in the generators hydrogen cooling system. On completion of these repairs this unit was expected to return to available status early in fiscal year 2010. The Authority has scheduled Unit 3 for a major overhaul in fiscal year 2016.

PSSP Unit No. 4 (nominal 216 MW) was in service with its output limited to 120 MW due to problems regulating the pressure in the boiler. This unit returned to available status during the second week of January on completion of repairs following the December 2006 station fires. Concurrent with the replacements and repairs made necessary by the fire the Authority also overhauled critical equipment and installed system upgrades. Following its initial return to available status in January, the unit was available for service only 64 days through the end of fiscal year 2009. All but three of the outage days that followed the return to service in January accrued as the result of forced outages. The unit was in service for a total of 1,533 hours during the fiscal year; it generated an average of 162.5 MW while

in service and had a gross capacity factor of 13% for fiscal year 2009.

During this unit's restoration its boiler waterwall sections, the boiler bottom, and burners were replaced, switchgear and load centers were replaced, the HP and IP turbine rotors were refurbished in a mainland shop, the LP turbine rotors were refurbished at the station. High efficiency seals were installed in the turbine. The generator was inspected, its rotor was sent to a shop to be rewedged. A new burner management system and new control systems for the boiler and the turbine generator were installed. Cable tray and control wiring was replaced, critical steam lines were inspected and repaired as necessary. Motors, fans, transformers, condenser valves, and pumps were cleaned, inspected, and maintained prior to the unit returning to available status in January. In May the unit was scheduled from service for the repair of boiler tube leaks. That maintenance outage was the only scheduled outage for the unit during fiscal year 2009; the repairs were completed in less than three days.

One day after its January return to service the unit was forced out for 27 days while its lube oil system was repaired and work was completed on its polishers. The day after returning from that outage it was forced out by leaks in the hot reheat section of the boiler. Following a second forced outage caused by tube failures in the hot reheat section the Authority replaced 256 dissimilar metal welds in that section. Concurrent with those replacements the Authority relined and refurbished the lube oil tank to prevent contamination of the unit's lubricating oil. The unit returned to service at the end of March and continued in service until experiencing three brief, partial day forced outages in mid-April. After several trips caused by high turbine vibration the Authority replaced the thrust bearing and returned the unit to available status within eight days. During May the unit was forced from service six times, only one of these outages lasted more than one day; during that outage boiler tubes were repaired. In June the unit was forced from service twice but returned to available status within hours each time.

Unit 4 is scheduled for an environmental outage in January 2010.

San Juan Steam Plant

Units 1, 2, 3, & 4 have been retired from service for more than three decades.

SJSP Unit 5 (nominal 232 MW) is a combined cycle unit comprised of a combustion turbine with a design capacity of 165 MW and a steam turbine with a design capacity of 67 MW. This unit was connected to the System on October 20, 2008. The Authority accepted the unit on October 22, 2009. Following acceptance the unit was available for service 1,924 hours and in service 1,294 during fiscal year 2009. When in service its combustion turbine generated an average of 142.6 MW. For fiscal year 2009 the combustion turbine achieved a gross capacity factor of 17.1%. Similar performance data were recorded for the unit's steam turbine, 1,793 available hours, 1,148 service hours, an average generation of 46.6 MW and a gross capacity factor of 13.0%.

Unit 5 was in service 544 hours during November, the first full month following its acceptance; this total represents almost half of the service hours this unit would accrue during fiscal year 2009. Over the balance of the fiscal year the unit was scheduled from service for maintenance five times and forced from service seven times. The seventh forced outage occurred in mid-March when a blade in the LP section of the steam turbine failed causing damage to condenser tubes. The unit was designed without a steam bypass system that would allow the operation of the combustion turbine when the steam turbine was unavailable for service. The loss of the steam turbine effectively also forced the combustion turbine from service. At the end of fiscal year the Authority had repaired the steam turbine condenser and had scheduled the completion of steam turbine repairs for mid-September. It was evaluating steam turbine modifications that would enable the combustion turbine to be placed in service before steam turbine repairs were completed.

The Authority has a long term multi-year service agreement with the combustion turbine vendor, Mitsubishi, to perform the inspections of the combustion turbine generators and the steam turbine generators that comprise San Juan Units 5 & 6. The Authority is responsible for the inspection and maintenance of auxiliary equipment in these units. A discussion of the frequency of the contracted inspections and their scope is found in the *Maintenance* section above.

SJSP Unit 6 (nominal 232 MW) is a combined cycle unit comprised of a combustion turbine with a design capacity of 165 MW and a steam turbine with a design capacity of 67 MW. On June 30, 2009 the unit was in service, regulating frequency, and capable of generating 225 MW. This unit was connected

to the System on October 20, 2008. The Authority accepted the unit on October 22, 2009. Following acceptance the unit was available for service 3,759 hours and in service 3,674 during fiscal year 2009. When in service its combustion turbine generated an average of 145.2 MW. For fiscal year 2009 the combustion turbine achieved a gross capacity factor of 54.0%. Similar performance data were recorded for the unit's steam turbine, 3,350 available hours, 3,260 service hours, an average generation of 49.1 MW and a gross capacity factor of 42.4%.

During fiscal year 2009 Unit 6 was scheduled from service five times, once for a modified combustion inspection and four times for maintenance. These scheduled outages kept the unit from available status for 56 days. The unit's initial combustion inspection was completed in 39 days, following the return to service it was scheduled from service twice for the replacement of compressor section filters. The unit was scheduled out for four days in February for maintenance during which miscellaneous repairs and adjustments were made in preparation for a performance test. The Authority replaced instrumentation during a one-day maintenance outage in May. The unit was unavailable for service a total of 29 days as a result of the more than 15 forced outage events that the unit experienced during eight months of the fiscal year that followed its acceptance by the Authority. The unit's output was limited an additional 18 equivalent days by miscellaneous problems with the steam turbine that made it unavailable for service. Many of the outages occurred during the months immediately following its commercial operation. Seventy percent of the service hours that this unit accrued during the fiscal year occurred during the last four months of the fiscal year.

SJSP Unit 7 (nominal 100 MW) was online capable of full output and capable of regulating frequency from 70 MW to 90 MW. The Authority was overhauling this unit at the start of the fiscal year. Following its return to available status in early August it was scheduled from service six additional times for maintenance, these outages kept the unit from available status for a total of 15 days. Forced outages, 14 in all, kept Unit 7 from available status for 43 days during the fiscal year. Equipment failure limited the unit's output for less than two equivalent outage days. During the 6,536 hours that Unit 7 was in service it generated an average of 82.3 MW and had a gross capacity factor of 61%.

This unit began a major overhaul in December of fiscal year 2008 and returned to available status in August. During the overhaul the condenser was cleaned and inspected; defective tubes were replaced or plugged. Waterwall sections on three sides of the boiler were replaced; sections of the FD air duct were replaced. The HP/IP turbines were refurbished in a mainland shop. The generator was opened, cleaned, and inspected. Both boiler feed water pumps were replaced and a new superheater section was installed. Welds on the main steam, hot and cold reheat lines and on the deaerator underwent non-destructive testing and repair as necessary. Electrical switch gear breakers were replaced. The boiler control system was upgraded. Both air preheaters were replaced. The overhaul was scheduled for completion in five months, however, delays in the completion of the refurbishment of the HP/IP turbine rotor, air preheater rotor alignment issues, and the reassignment of personnel to outages on larger units combined to add several months to the overhaul's schedule. Following its return to service it was scheduled out for two days for the removal of the strainers installed during the overhaul to protect the lead and intercept valves. In December it was scheduled out for nine days for the repair of a valve in service to a high pressure heater. During a scheduled maintenance outage in January the Authority repaired an oil leak at a servo-actuator. During a three day maintenance outage in February the Authority replaced condenser strainer components. It was scheduled from service in April for a condenser cleaning and during May for two days while waterwall leaks were repaired.

Two forced outages accounted for 40 of the 43 days that this unit was unavailable after being forced from service. The first of these was a 26 day outage in August that occurred as the unit was being returned to service following its overhaul. During the outage the Authority repaired the normal station service transformer (NSST) buss and repaired generator seal leaks. At the end of October the unit was forced from service following the failure of a circulating water pump; the pump was replaced allowing the unit to return to available status in mid-November. The electrical or mechanical failures that caused the dozen other forced outages were fixed quickly enabling the unit to return to available status each time in less than eight hours. The repair of a boiler feed water pump limited the units output for slightly more than one equivalent outage day.

The capital projects budgeted for San Juan Station will focus on the refurbishment and replacement equipment and on the upgrades of systems that will be installed during the overhaul of the other San Juan units. The Authority has awarded a contract for the design and installation of an upgrade to the station's fire suppression system that will provide protection for transformers and turbine generators, completion is scheduled during fiscal year 2010. The Authority began construction of a 115 kV gas-insulated switchgear (GIS) substation in fiscal year 2009. The GIS substation will be part of the 115 kV underground loop in the San Juan area; completion of the substation is scheduled for fiscal year 2011. The Authority installed a line to carry wastewater from the station to a water treatment plant. Unit 7 is scheduled for an environmental outage during fiscal year 2010.

SJSP Unit 8 (nominal 100 MW) was online and capable of full output. Seven scheduled outages kept this unit from available status for 38 days during the fiscal year. Six of the outages were for maintenance and the other was an environmental outage required by the Consent Decree with the EPA. Ten forced outages kept Unit 8 from service for a total of almost five days. The unit was put into reserve shutdown for approximately seven days. During the 7,583 hours that Unit 8 was in service it generated an average of 86.4 MW and had a gross capacity factor of 75%, the highest capacity factor achieved by the San Juan units and the second highest of the Authority's steam-electric generating units.

During a 30 day environmental outage the Authority also repaired the generator's hydrogen cooler, repaired air in leakage at the condenser, repaired flue gas duct leaks and completed non-destructive examination of the deaerator and main steam and hot reheat lines in preparation for the unit's major overhaul in fiscal year 2010. The unit returned to available status in late September. During a two day maintenance outage in November the Authority cleaned the condenser and made a number of other minor repairs. In March a servo-valve was replaced during a three day maintenance outage. During April the Authority cleaned the unit's condenser and repaired tube leaks and returned the unit to available status in less than two days. The unit was scheduled from service for two days in June while the Authority replaced nine of the boiler's burners.

The need to repair condenser seals and to plug leaking condenser tubes accounted for two of the ten forced outages slightly more than two of the forced

outage days. The balance of the forced outages was very brief and the Authority returned the unit to available status in a matter of hours. Two of the forced outages were caused by electrical problems at the NSST. The causes of the other forced outages were each unique and following their repair or adjustment did not recur during the fiscal year.

Unit 8 returned to available status on completion of a major overhaul in September 2002. It is scheduled to begin a major overhaul during fiscal year 2010. During the overhaul the Authority will refurbish all turbine sections, clean and repair turbine control valves, and inspect the generator, rewind the generator rotor. They will replace sections of the exhaust gas duct, rebuild the air preheaters, replace the primary and secondary superheat and reheat sections. The condenser will be retubed and boiler waterwall sections will be replaced. Auxiliary equipment, transformers, motors, and switchgear will be inspected and replaced or repaired as necessary. The overhaul is scheduled over a five month period.

SJSP Unit No. 9 (nominal 100 MW) was online capable of full output and of regulating frequency from 70 MW to 90 MW. In addition to the ten days that the Authority put this unit into reserve shutdown it was also unavailable for service an additional 39 days while undergoing scheduled inspections and repairs. One of the scheduled outages was an environmental outage; the other six were maintenance activities. In addition the unit was forced from service five times; the forced outages kept it from available status an additional three days. The unit was in service 7,520 hours during fiscal year 2009; its average generation of 85.3 MW produced a gross capacity factor of 73%.

The Consent Decree mandated environmental outage was completed in 26 days; during the outage the Authority also repaired the unit's two air preheaters, repaired a boiler feedwater pump, repaired leaks in the generator's cooling system, and cleaned the unit's condenser. The unit returned to available status in mid-April. In early July the Authority repaired a boiler feedwater pump during a six day maintenance outage. In August repairs to tubes in the superheater and waterwalls were completed during a two day scheduled outage. The unit was scheduled out for several more days in October while the Authority cleaned the condenser and completed other repairs. Repairs made during the three other maintenance outages were completed on waterwall tubes, a turbine inlet valve, and on a deaerator steam line.

Approximately half of the forced outage hours this unit accrued during the fiscal year followed a failure in the secondary superheater that was repaired in less than two days. Three of the other forced outages were caused by a faulty low boiler level alarm and the last of the forced outages was a turbine protection trip during March from which the unit returned to available status in a fraction of a day. This unit was placed in reserve shutdown at the beginning of January for ten days. There were no equivalent outage hours accrued by this unit during fiscal year 2009.

In August 2003 this unit returned to service on completion of its last major overhaul. Its next programmed overhaul is scheduled to begin during the first half of fiscal year 2011. During fiscal year 2010 procurements budgeted in the capital improvement fund will be made in preparation for the unit's overhaul. During the overhaul the generator's stator will be rewound, the HP/IP and LP turbine sections will be refurbished. A superheater section and waterwall sections and a low pressure feedwater heater will be replaced. Transformers and electrical equipment will be inspected and repaired as necessary.

SJSP Unit No. 10 (nominal 100 MW) began a major overhaul in early February, it is scheduled to return to available status in August. Before beginning the overhaul the Authority had scheduled the unit from service four times. Eight outage days accrued during these four maintenance outages. The unit was forced from service seven times and accrued a total of 66 forced outage days while the Authority completed repairs following the outages. The unit accrued 750 equivalent outage hours during the fiscal year and was placed in reserve shutdown for a total of 70 days. The unit was in service 1,874 hours during fiscal year 2009; its average generation of 85.8MW produced a gross capacity factor of 18%.

The scope of the overhaul includes retubing the condenser, refurbishing all turbine sections and the installation of high efficiency seals and a vortex system in the turbine, control valves will be cleaned and adjusted, the generator will be cleaned and inspected. Waterwall sections, the superheat and reheat sections are being replaced. New burners are being installed and air preheater baskets replaced. Both boiler feedwater pumps are being replaced and a new condensate tank installed. The Authority will clean, inspect, and repair auxiliary equipment, transformers, motors and switchgear. Cable tray is being replaced. The schedule has been extended in part due to the reassignment of San Juan maintenance

personnel to outages on larger units elsewhere in the System. During July the Authority scheduled the unit from service for the first of the four maintenance outages, it returned to available status on completion of repairs to the secondary superheat section. Two maintenance outages were dedicated to condenser cleaning and repairs. These outages accounted for six of the eight days that the unit was unavailable while maintenance was performed.

The longest forced outage kept the unit from available status for 36 days for repairs following an LP turbine blade failure. The unit was forced from service for 24 days while condenser tubes were plugged and other repairs were completed. Earlier in the fiscal year the unit was forced from service for two days while repairs to the unit's excitor and condenser were completed. Condenser section failures forced the unit from service three additional times during fiscal year 2009. The unit was limited for the equivalent of 31 outage days while the Authority completed condenser repairs and cleanings with the unit in service. The Authority placed Unit 10 in reserve shutdown twice during the fiscal year for a total of 70 days.

Unit 10 had been in service almost eight years before the start of the major overhaul in progress at the end of the fiscal year. The budgeted capital projects for this unit are described in the scope of the major overhaul described above.

Combined-Cycle Plant

Total Generating Capacity 1,056 MW

The combined-cycle units installed at San Juan Units 5 & 6 added 464 MW capacity to the System. The status of these units is discussed with the other San Juan units above.

Aguirre Combined-Cycle Plant

The combined-cycle plant is comprised of two units. Each unit consists of four combustion-turbines (CTs), each rated at 50 MW, with individual heat recovery steam generators (HRSGs), i.e., boilers, powering a single 96 MW steam turbine-generator (ST). This configuration yields a unit capacity of 296 MW and a total plant capacity of 592 MW. These units are primarily used as cycling units. For fiscal year 2009 the Aguirre Combined Cycle plant recorded a net capacity factor of 8.7% while generating 2.1% of the System's net generation. The station's net generation for fiscal year 2009 was only 26.4% of its net generation during fiscal year 2008.

In the following discussion the CTs and steam turbine-generators at this plant are identified by Unit and number and with respect to CTs by order within the unit, i.e. the second CT in Unit No. 1 is numbered CT 1-2 and the steam turbine-generator in Unit 2 is identified as ST-2.

At the end of the fiscal year, both of the station's steam turbine-generators and six of the eight CTs were available for service. During fiscal year 2009 the Authority completed a major overhaul of ST-2. Its previous overhaul was completed in February 2001. The Authority has scheduled the overhaul of ST-1 during fiscal year 2011. During fiscal year 2009 there were two significant conditions—leaking exhaust dampers and high cooling water temperatures—that limited the capacity of both steam turbine-generators.

A large part of the limitation was attributed to the inability of the CTs, when operated in combined cycle service, to supply steam at the steam turbine-generator's design conditions. The hot exhaust gases leaving the turbine pass through an exhaust duct in which there is a diverter or damper. This damper, much like a gate, directs the hot exhaust gases to atmosphere if the unit is being operated in simple cycle mode. When operating in combined cycle mode the damper is repositioned to divert the CT's hot exhaust gases to the HRSG where the steam is generated that drives the unit's steam turbine-generator. The original dampers, when positioned for combined cycle service, did not seal well enough to prevent the leakage of some of the hot gases to atmosphere. These exhaust gas losses limited the HRSG's ability to generate steam at design pressure for delivery to the steam turbine-generator causing the steam turbine's generation to be less than design. As part of the capital improvement program the Authority is replacing the dampers in the eight CTs. The replacement diverters are of a different design and have been installed in five of the CTs that are available for service. They have demonstrated better sealing ability and have improved the steam generating capacity of the HRSGs. At the end of fiscal year 2009 replacement diverters were being installed in CT 1-1 and CT 2-4 both of which are scheduled to return to available status in fiscal year 2010. When CT 1-1 and 2-4 return to available status all eight of the CTs will have the capability of being fired by either distillate or natural gas. The Authority has scheduled the installation of a replacement diverter in CT 2-2 in fiscal year 2010; CT 2-2 is the last of the eight CTs to have the replacement diverter installed

and marks the completion of a replacement program that began in fiscal year 2004.

In addition to the losses attributed to poorly sealing diverters, the two steam turbine-generators are also limited by inefficient condensing operations. The high temperature of the cooling water in the closed loop cooling system is a major factor limiting the efficiency of the condensers.

At the end of fiscal year 2009 the Authority had completed the upgrade of the combustion system on all eight of the station's CTs. The upgrade brings the CTs to a modified Frame 7EA design, which gives the CT the capability of operating at a higher combustion temperature, thereby improving its efficiency. Additionally the fired hours between combustion inspections, formerly required every 4,000 equivalent fired hours (EFH), is increased 32.5% to every 5,300 EFH. This increase in EFH is likely to increase the interval between combustion inspections by six or more months. The replacement of the air inlet filter houses and filter media is being performed concurrent with the CT's upgrade. The 7EA upgrade, the replacement of inlet air filter houses, the replacement of HRSG soot blowers, the replacement of diverters, and auxiliary equipment were budgeted in the capital improvement program. An upgrade of the DCS has been completed in both units. Other capital projects include the purchase of condenser tubes for installation during the overhaul of ST-1 in fiscal year 2011, the continuation of the multi-year soot blower replacement project, the replacement of motor operated valves, and the purchase of components for the overhaul of ST-1, the replacement of an overhead crane, and scheduled combustion turbine inspections.

ACCP Unit No. 1 was available for service and capable of generating 202 MW. One of this unit's four combustion turbines, CT 1-1, was unavailable for service. While the CT was undergoing a major inspection no steam was being produced in its HRSG. The loss of that steam, coupled with poor condenser vacuum and cooling tower limitations, lowered the steam turbine generator's capacity to 52 MW.

CT 1-1 was unavailable for service while undergoing a major inspection which was in its eighth month at the end of the fiscal year. The inspection began in November; this CT is scheduled to return to available status during the first quarter of fiscal year 2010. During the inspection its generator rotor was rewound, its exhaust diverter was replaced, a new filter house installed, exhaust ducting repaired and

dual fuel capability installed. The Authority scheduled CT 1-1 from service seven times for maintenance for a total of 51 hours during the fiscal year. The longest of the maintenance outages was 15 hours the amount of time the Authority needed to repair an exhaust gas leak. Another exhaust gas leak was repaired during an 8-hour maintenance outage in October. The compressor section was washed during several brief maintenance outages. This CT was forced from service on July 14 by a ground fault in its generator rotor. The rotor was replaced and the CT returned to available status 44 days later. CT 1-1 was forced from service five additional times for a total of less than 22 forced outage hours. Twice the CT was forced out by electrical problems with the generator leading to the replacement of the terminal block and a relay. During fiscal year 2009 CT 1-1 was in service 876 hours or 43.3% of the 2,022 hours it was available.

CT 1-2 was available for service and capable of generating 50 MW. It began a major inspection in mid-January following the failure of a stationary blade in the 2nd row of the compressor section. The turbine rotor and generator rotor were refurbished in mainland shops. The refurbishment of the turbine rotor was completed early in fiscal year 2009 and the rotor was installed in CT 1-4 which had experienced a similar compressor section blade failure late in fiscal year 2008. The refurbished rotor from CT 1-4 was subsequently installed in CT 1-2. By switching rotors CT 1-4 was able to return to available status sooner than otherwise would have been possible and the switch did not delay the return of CT 1-2 to available status. A new exhaust diverter and filter house were installed; the exhaust plenum was modified during the inspection. The package giving the CT the capability of burning natural gas was installed prior to the CT's return to available status in March 2009. The start of the major inspection was delayed for two months and accounts in part for the extended period that this CT was unavailable for service. A week after its return the Authority inspected the fuel bypass valve during a nine-hour maintenance outage. The CT was forced from service three times for a total of 58 forced outage hours. Continuing problems with the fuel bypass valve, ultimately leading to its replacement, were the cause of two of these forced outages and accounted for 49 of the forced outage hours. During fiscal year 2009 the unit was in service 66 hours, or 3% of the hours that it was available for service.

CT 1-3 was available for service and capable of generating 50 MW. CT 1-3 was scheduled from service for a 10-day combustion inspection in December. On eight occasions the Authority scheduled this CT from service for maintenance; these outages kept it from available status for fewer than three days. Two maintenance outages were scheduled for the repair of oil leaks in the accessory box. The repairs were quickly completed and the CT returned to available status in less than one day. The CT was forced from service four times, the longest of which was the result of a System event, following the replacement of a damaged control card the CT returned to available status in less than ten hours. During fiscal year 2009 the unit was in service 2,638 hours, or 31.2% of the hours that it was available for service.

CT 1-4 was available for service and capable of generating 50 MW. This CT was forced from service in June 2008 by the failure of a stationary blade in its compressor section. Four months prior to the blade failure the CT had undergone an inspection of its hot gas path during which blades were inspected and some replaced. The blade that failed in June had been in service fewer than 25,000 hours. The compressor section rotor was shipped to a mainland shop for repair; compressor section blades of a different manufacturer with a different coating were installed. While the mainland repairs were in progress the Authority installed the refurbished compressor rotor from CT 1-2 in CT 1-4. Following reassembly, CT 1-4 returned to available status at the end of October. The CT was forced from service for six days during April by a failure at the feed to the CT's normal transformer. Maintenance outages were scheduled four times during the fiscal year none of the four kept the CT from available status for as much as ten hours and no two of the scheduled maintenance outages were for the inspection or repair of the same equipment. During fiscal year 2009 CT 1-4 was in service 383 hours or 6.7% of the 5,659 hours it was available.

ST-1 was available for service and in economy shutdown on June 30, 2009. Its output was limited to 52 MW, due to the conditions noted above. It is scheduled for a major inspection during fiscal year 2011. During fiscal year 2009 the Authority scheduled ST-1 from service for maintenance in early February following a failure in the unit's condenser cooling water piping. The repair of the cooling water line was completed in early April and ST-1 returned to available status. Earlier in the fiscal year the steam turbine generator had been scheduled from service for

maintenance three other times for a total of almost five days. Repairs to the unit's main power transformer (MPT) accounted for four of the maintenance outage days. There were two forced outages during the fiscal year, in October a failure in the cooling tower's motor control center, MCC, transformer forced the unit out for one day and while repairs to that transformer were being completed the steam turbine generator accrued almost all of the nine equivalent outage days that it accrued during the fiscal year. In fiscal year 2009 the unit was in service 2,509 hours, or 42% of its available hours.

ACCP Unit No. 2 was available for service and capable of generating 210 MW. Three of the unit's four CTs, each capable of generating 50 MW, were available at the end of the fiscal year. The unit's steam turbine-generator was available for service and capable of generating 60 MW. Its output was limited as the Authority was performing a major inspection of one of the unit's four CTs.

CT 2-1 was available for service and capable of generating at design capacity. During November the Authority completed a combustion inspection of CT 2-1 and returned it to available status in nine days. The combustion inspection was the first for programmed inspection of this CT following its return to available status on completion of a major inspection in March 2007, twenty months previously. The CT was scheduled from service for maintenance five times, these scheduled outages kept the CT from available status for a total of almost seven-days. In January the CT was scheduled from service for preventative maintenance of the MPT for CT 2-1 & 2-2. During May the Authority scheduled the CT from service for two days while they repaired a control module. The three other maintenance outages were each less than 12 hours in duration and were scheduled to address different maintenance issues. The forced outage following a trip to protect the MPT servicing CT 2-3 & CT 2-4 was the only forced outage for this CT during the fiscal year. CT 2-1 was in service 1,625 hours or 19.5% of the hours it was available for service during the fiscal year 2009.

CT 2-2 was available for service and capable of generating at design capacity. CT 2-2 returned to service on completion of the installation of the dual fuel package in May 2008. There were no scheduled inspections for this CT during fiscal year 2009. During the first half of fiscal year 2010 it is scheduled to come out of available status for three months for the installation of a new exhaust diverter, a new air intake filter house, and for the refurbishment of

the exhaust gas plenum. CT 2-2 is the last of the eight CTs to have these components installed. During fiscal year 2009 this CT was scheduled from available status for a total of eight days. In January the CT was scheduled from service for three days as preventative maintenance to its MPT was completed. During May the Authority scheduled the CT from service for three days for the repair of a control module. The six other maintenance outages were each less than 12 hours in duration and were scheduled to address different maintenance issues. The CT was forced from service once when a relay protecting the MPT tripped, the relay was reset and the CT returned to available status within two-hours. CT 2-2 was in service 1,087 hours during the fiscal year or 12.7% of the 8,572 hours that it was available during fiscal year 2009.

CT 2-3 was available for service and capable of generating 50 MW. During July it returned to available status on completion of a major inspection during which a new exhaust diverter, a replacement filter house, exhaust duct refurbishments, and an overhaul of the combustion turbine were completed. The refurbishment of the generator's rotor in a mainland shop extended the outage into fiscal year 2009. The Authority also installed the components giving the CT dual fuel firing capability. Following its return it was scheduled out for maintenance ten times; two of these outages kept the CT from available status for more than a day, the inspections and repairs made in each of the other maintenance outages were completed in less than 12 hours enabling the CT to quickly return to available status. In October the unit was unavailable for five days while the Authority replaced a compressor. The repair of a control module kept this CT and the other CTs in Unit 2 from service for two days during May. The CT was forced from service nine-times. In September the breaker protecting the MPT for CT 2-3 & 2-4 failed. The breaker was replaced. After the completion of inspections and tests of the MPT and protective devices, the CT returned to available status. The causes of the remaining forced outages were quickly resolved; none kept the CT from available status for as long as ten hours. CT 2-3 was in service 1,229 hours, which was 15% of its available hours.

CT 2-4 was unavailable for service at the end of fiscal year 2009 while undergoing a major inspection. This CT was scheduled from service for a major inspection during the first week of September. It is scheduled to return to available status early in fiscal year 2010. During fiscal year 2009 this CT did not

accrue any maintenance or forced outage hours. The blades in this CT's compressor section had not failed but were manufactured and coated to the same specification as those that had failed in CT 1-1 and CT 1-4. Rather than risk the failure of a blade with the CT in service the Authority decided to replace the compressor section blades during the major inspection blade. During the outage the Authority overhauled the combustion turbine; the turbine rotor and compressor rotor were sent to mainland shops for refurbishment. After starting the inspection the Authority suspended work on CT 2-4 for three months in order to focus on the completion of major inspections on CT 1-1 and CT 1-4. In April work resumed on CT 2-4 as the Authority completed the replacement of the exhaust diverter, the filter house, and of repairs to the exhaust gas plenum. The installation of the components providing dual fuel firing capability is scheduled for completion during the first quarter of fiscal year 2010. CT 2-4 was in service 719 hours, which was 47.2% of its available hours during fiscal year 2009.

ST-2 was available for service and capable of generating 60 MW. ST-2 began a major inspection in April 2008 from which it was scheduled to return in late August. During the inspection the generator rotor and the turbine's HP and LP rotor were sent to the mainland for cleaning, inspection and refurbishment. Replacement blades were installed in the HP and LP turbines, journals and bearings were machined and the rotor balanced. New bearings and generator casing seals were manufactured. Condenser tubes were hydroblasted; a vacuum pump was replaced; work on the main cooling tower and other mechanical components was completed. ST-2 returned to available status at the end of October. Three weeks after returning to available status ST-2 was forced from service by a failure in a condenser cooling water piping. Before returning the steam turbine generator to service in late February the Authority replaced 90' of the large diameter concrete protected fiber reinforced pipe. The unit was scheduled from service for four days in May while the Authority replaced a unit control module and completed repairs to electrical equipment in the switchyard. ST-2 was in service 250 hours, which was 7.3% of its available hours during fiscal year 2009.

Combustion-Turbine Power

Total Generating Capacity 846 MW

Cambalache Combustion-Turbine Power Blocks

These units were designed to provide rapid response spinning reserve, which helps to ensure System stability in the event of the unanticipated loss of a large generating unit and thereby improve the reliability of service to the Authority's clients. To provide this reserve the Authority typically dispatches at least one of the units at 60% of capacity. Following the loss of the Palo Seco Steam Plant's generation the Authority typically dispatched two of the Cambalache units in base load and held the third in ready reserve. During fiscal year 2009 all three CTs had high availability factors, however, the high cost of distillate fuel, the additional lower cost steam generating capacity made available with the return to service of the Palo Seco units, and the reduced demand on the System, all combined to limit the service hours for each of the CTs during the past fiscal year. The plant's air permit allows 780 unit starts per year, the equivalent of five starts per unit per week. During fiscal year 2009 there were 301 unit starts.

During fiscal year 2008 the Authority decided to defer the conversion of the Cambalache plant to combined cycle. The Authority withdrew the application for a PSD and other permits that had been submitted to regulatory authorities for the combined cycle conversion. The proposal to upgrade the combustion turbines from model GT11N1 to GT11NM technology will be reevaluated during fiscal year 2010. The upgrade will increase the power output of each CT by approximately 16 MW and will necessitate the reissuance of certain environmental permits.

During fiscal year 2009 Authority personnel completed planned inspections on each of the combustion-turbines. The Authority has entered into a technical services contract with the station's original equipment supplier that remains in effect through 2011. It obligates the supplier to provide a technical advisor on a full-time basis at the station and to provide the replacement parts needed in the hot gas path during class C inspections of the combustion turbine. Refer to the *Maintenance* section for a description of the scope of a class C inspection. The Authority's employees are responsible for the installation of the replacement parts. The service agreement also covers the provision of additional technical assistance as required for scheduled maintenance.

Since initial operation each of the Cambalache units has experienced at least one compressor section blade failure. Blade failure analyses concluded that the corrosive effects of airborne contaminants caused the failures. The Authority has taken steps to reduce the intake of airborne contaminants into the compressor section and they implemented a program of online compressor section washings performed on each shift and off line compressor section washings performed at two-week intervals. Additionally the original equipment manufacturer, OEM, tested a number of different sacrificial coatings to determine which coating would provide up to 100,000 hours of protective service to the blade. Following analysis the OEM, recommended a blade coating which has since been applied to the blades in the first ten rows of the compressor section. The coated replacement blades are installed on a rotor in the OEM's mainland shop and shipped to Puerto Rico for installation during a class C inspection. The last of the three CTs to receive a rotor with coated blades did so during a class C inspection early in fiscal year 2009. All compressor section cleanings are now done with the unit off line.

The station's air permit established the maximum firing rate of distillate fuel oil at 104 gallons per minute (gpm) per unit. Adherence to this fuel oil consumption rate impacts the capacity of these units. The amount of the limitation is subject to ambient air temperature. Higher air temperatures decrease a unit's power output while cooler temperatures, only rarely experienced in Puerto Rico, increase power output.

The work described in this paragraph was budgeted in the CIP and completed during fiscal year 2009. The Authority performed a class C inspection of unit 3 and the installation of a replacement once through steam generators (OTSG) in the CT. The replacement of the OTSGs will improve the CTs response to load changes. During fiscal year 2009 the Authority completed the installation of a new turbine generator control system, P-400, with its installation during Unit 3's class C inspection. The P-400 control system is capable of controlling the demineralized water plant and balance of plant (BOP) systems. During fiscal year 2009 the Authority purchased replacement tube bundles for the station's air fan heat exchangers. The tube bundles will be installed during upcoming scheduled inspections. The upgrade of the fire detection and suppression system in the administration building and control room was in progress at the end of the fiscal year.

Please refer to the *Maintenance* section above for a full description of what constitutes a class "A", "B", and "C" inspection referred to in this section.

CCTP Unit No. 1 was available for service and capable of generating 82.5 MW on June 30, 2009. During fiscal year 2009 the unit was scheduled out of service six times for a total of 16 days; one of these outages was for a class B inspection and the other five were maintenance outages. There were also ten forced outages, which kept the unit from available status for a total of almost four days.

During October the Authority completed a six-day class B inspection of this unit. In December the unit was scheduled from service for eight days while insulators on the line transmitting power from the transformer to the switchyard were replaced. During the other maintenance outages the Authority sealed a gas leak at a turbine flange, washed the compressor section, and scheduled the unit out twice for the repair of a pressure switch on the main power transformer. These last two repairs were completed in less than 12 hours.

On three occasions the unit was forced from service by gas leaks at a turbine flange. Each time the Authority was able to reseal the flange and return the unit to available status in less than one day. Electrical trips accounted for three forced outages during September. The three repairs that followed were completed in a total of less than two days. During June the unit was forced from service by a leak in the lube oil system. The failures that caused the two other forced outages were repaired in less than five hours and the unit returned to available status.

For the second consecutive year Unit 1 had the best heat rate of the three Cambalache units. This CT's next class A inspection is scheduled for December 2009 and its next class C inspection is scheduled during fiscal year 2011. For fiscal year 2009 this CT had an availability factor of 94%. Unit 1 had 105 starts, was in service 2,183 hours, generated an average of 63.7 MW, and had a gross capacity factor of 19% for the fiscal year.

CCTP Unit No. 2 was available for service and capable of full output on June 30, 2009. During fiscal year 2009 the unit was scheduled out of service seven times for a total of nine days: once for a scheduled inspection and six times for maintenance. There were two forced outages, which kept the unit from available status for a total of 37 days.

The scheduled inspection, a class A inspection, was completed in two days during July. Three maintenance outages were scheduled in the first half of the fiscal year, these maintenance outages kept the unit from available status for slightly more than one day. Two of the outages were for the repair of a fuel valve, during the third the Authority repaired a pump. In April the unit was unavailable for service for approximately three days while a fuel oil leak was corrected. The Authority scheduled the CT from available status twice during June, each time the maintenance was completed in less than two days. The Authority performed maintenance on the unit's opacity monitors and completed inspection and repair of the lube oil system during the second of the outages.

This model combustion turbine has five stages in the turbine section. In September a third stage blade failed, damaging the blades and vanes in stages three, four, and five. The damaged sections of the turbine were replaced and the CT returned to available status 37 days after being forced out. The blade that failed had been in service approximately 4,000 hours. The OEM conducted an initial analysis of the failed blade and found no evidence of foreign object damage. The report concluded that the failure was the result of the unit being cycled. The Authority disputed this finding. At the end of the fiscal year the OEM had reimbursed the Authority for part of the cost of the repair. The Authority is pursuing additional payment from the OEM. In January the CT was forced from service for several hours by a fault in the 230 kV line to the switchyard.

Unit 2 is scheduled for a class B inspection early in fiscal year 2010. It returned from a class C inspection in November 2007. For fiscal year 2009 this CT had an availability factor of 88%; it had 92 starts, and was in service for 1,678 hours. It generated an average of 63.5 MW when in service. Unit 2 had a gross capacity factor of 15% for the fiscal year.

CCTP Unit No. 3 was available for service and capable of full output on June 30, 2009. During fiscal year 2009 the unit was scheduled out of service eight times for a total of approximately 49 days: twice for planned outages and six times for maintenance outages. There were six very brief forced outages, which kept the unit from available status for a total of less than 24 hours.

The CT returned to available status on completion of a 43-day programmed class C inspection in mid August. In addition to the normal scope of **APP-219** a class C inspection the Authority replaced the OTSG

and installed the P-400 control system, the P-400 had previously been installed in the other two units. The air filtering system was replaced with a static filtering system installed in an air intake house designed with rain hoods and a mist eliminator. The compressor was washed with the unit off line during November and returned to available status the same day. Routine maintenance, completed in less than 24 hours was performed during four of the maintenance outages. An inspection of the continuous emission monitoring system, CEMS, was made in June and kept the unit from available status for less than three hours. The only maintenance outage that kept the unit from available status for more than 24 hours involved the repair of the unit's static frequency converter. The unit returned to available status 36 hours following the start of the maintenance outage.

The unit was forced from service six times and accrued a total of 23 forced outage hours as a result of these events. The causes of forced outages, four during June, were each different and each was quickly remedied.

Unit 3 is scheduled for a class A inspection early in August 2009. For all of fiscal year 2009 this CT had an availability factor of 87%; had 104 starts, and was in service for 1,248 hours. It generated an average of 68.4 MW when in service. Unit 3 had a gross capacity factor of 12% for the fiscal year.

Other Combustion-Turbine Power

The Authority has nine Combustion-Turbine Power Blocks, each with two simple cycle machines. In the discussion that follows, combustion turbine and gas turbine as synonymous and they will be identified as GT, in accordance with the Authority's convention. The eighteen gas turbine units are located at seven sites and have an aggregate capacity of 378 MW; the GTs went into service between 1971 and 1973. They are distillate-fired Frame 5 gas turbines, each capable of generating 21 MW. During fiscal year 2009 the Authority also brought eight new combustion turbines into service at Mayagüez. These aero-derivative units provide the Authority 220 MW of capacity at Mayagüez and a System total of 598 MW of simple cycle combustion turbines. For fiscal year 2009 the GTs had a combined equivalent availability of 88%. The net generation of the GTs during fiscal year 2009 was 31% of the prior fiscal year's net generation with the decline due to the return to service of several of the Palo Seco steam electric generating units, the relatively high cost of distillate fuel, and lower system demand. During fiscal year 2009, the

eight combustion turbines at Mayagüez accounted for 26% of the net generation of all GTs. Their generation was almost matched by the six GTs at Palo Seco; combined these two GT sites accounted for more than half of the gas turbine's generation during the fiscal year. Twenty-two of these units were available for service at the end of the fiscal year.

The Authority continues its program of replacing the fire suppression systems at each of its GT sites with CO₂ systems. The CO₂ systems provide fire suppression capability in each of the GT's compartments. At the end of fiscal year 2009 these systems had been installed at Palo Seco, Costa Sur, Aguirre, and Jobos GT sites. The combustion turbines at Mayagüez are protected by a similar system. The Authority will complete the installation CO₂ fire suppression at the three remaining GT sites in fiscal year 2011. Engineers in this division have been trained to perform thermographic inspections of electrical systems and do so at regular intervals.

The eight aero-derivative gas turbines that entered service during fiscal year 2009 are capable of generating 220 MW. These units replace four of the Frame 5 GTs that went into service at Mayagüez in 1972. The new units have a heat rate approximately 30% lower than the average heat rate of the older Frame 5 GTs.

Scheduled inspections were performed on 11 of the Authority's 22 GTs during the fiscal year. The service hours of many of the gas turbines were lower during fiscal year 2009 than during fiscal year 2008. As the GTs accrued fewer service hours the months between scheduled inspections increased. The following paragraphs describe what was completed during several of the more extensive inspections conducted during the fiscal year. Also discussed is the status of gas turbines that were not available for service at the end of the fiscal year.

Yabucoa's GT 1-1 returned to service in August on completion of a major inspection of six months duration. During the inspection the Authority replaced the turbine compressor section and the generator's rotor. A Mark VI control system and a universal fuel system were installed. The ratchet and torque converter and clutch were replaced as was the exhaust plenum. The air inlet house was refurbished. Compartment doors were replaced and the unit was painted before returning to available status.

Daguao GT 1-1 was unavailable and undergoing an intermediate inspection from November until June. During the inspection the Authority installed a Mark

VI control system and replaced the ratchet, torque converter, and clutch. The site's diesel motor was inspected and routine maintenance completed. The generator was opened, the rotor removed cleaned and inspected. The excitor was inspected and the voltage regulator was replaced. Combustors were inspected; before returning to service the unit was painted.

Jobos GT 1-2 was scheduled to return to service in August on completion of a major inspection that began in late March 2009. Before returning to service the generator rotor will be replaced, the stator cleaned and inspected, and a Mark VI turbine control system will be installed. The voltage regulator will be replaced as will the ratchet and torque converter. A universal fuel system will be installed and the starter motor will be rebuilt.

With the connection of Palo Seco 3-1 & 3-2 to the 115 kV GIS substation, all three of the Palo Seco GT power blocks were connected to the newly constructed substation.

At the end of fiscal year 2009 two of the Mayagüez units were unavailable as particulate had been found in the lubricating oil. The units came out of service in late June and their return was pending at the end of the fiscal year. Jobos 1-1 was also unavailable after being forced from service in early June. The Authority was replacing switchgear and had scheduled its return to available status during the first week of fiscal year 2010.

Hydro Production Plant

Total Generating Capacity 100 MW

The Authority has 21 hydroelectric generating units at eleven locations. They have an aggregate capacity of 100 MW. The Authority reported that for fiscal year 2009 the hydroelectric generating units had an aggregate equivalent availability of 92%, generated 170,331 MWh or 39% more than they generated during the previous fiscal year and had an annualized service factor of 23%. On June 30, 2009 the hydroelectric system was capable of generating 79 MW. The status of the units that were unavailable or limited on that date is described below. Briefly, at the end of fiscal year 2009 two units, each at a different location were unavailable for service. During fiscal year 2010 the Authority will begin a three year program of upgrading the fire suppression systems at hydroelectric stations. During fiscal year 2010 the Authority is scheduled to award a contract for the installation of fire suppression systems at the Dos Bocas Station. Specifications and bid packages will

be prepared for the supply and installation of fire suppression systems for the Rio Blanco, Toro Negro, Garzas and Yauco hydroelectric units during fiscal years 2011 and 2012. Other multi-year capital projects include the replacement of control systems, breakers, and the replacement of the penstock valve at Garzas. More than 13,000 hours were expended during the fiscal year completing scheduled inspections and maintenance on the 21 units during the fiscal year. A representative description of the repairs and replacements completed following scheduled and unscheduled outages follows:

Yauco 2-1 was in testing on June 30, 2009 following completion of repairs to its commutator. The 4.5 MW unit was forced from service in mid-December; the date for its return to available status was extended several times. Yauco 1 with a design capability of 25 MW is the Authority's largest hydroelectric unit; its output was limited throughout the fiscal year, however, due to damage to its nozzles, other mechanical components, and reduced water flow due to obstructions in its tunnels. The replacement of nozzles and other components will be a part of the unit's overhaul. Before the overhaul can begin the Authority must complete a bypass piping system that would enable water to flow around the station to consumers in the valley below Yauco 1. The Authority plans to complete the installation of the bypass system during fiscal year 2010. On June 30, 2009 Yauco 1 was capable of generating 12 MW.

The 3.6 MW of capacity at Caonillas Unit 2-1 continues to be unavailable due to the sedimentation in Lake Vivi. The unit has not been available since September 1998 when Hurricane Georges struck Puerto Rico.

There are five generators in the two Toro Negro hydroelectric stations; they have a combined capacity of 10.5 MW. Unit 2-1 with a 2 MW capacity was unavailable for service for three months while breakers were changed and the generator repaired.

Garzas Unit 2-1 with 5 MW of capacity was unavailable for service from mid October until mid December while control cables were replaced and for four months starting in February while penstock repairs were completed. Units 1-1 and 1-2 were forced from service for penstock repairs during May 2009.

Dos Bocas Unit 1-3 with 5.0 MW of capacity returned to available status on completion of a two month-long scheduled inspection during which the Authority replaced the unit's excitation system and completed other repairs.

Diesel Generators

The diesel generators installed by the Authority on the islands of Vieques and Culebra provide backup power in the event of interruption of the power delivered by submarine cables to these islands. At the end of the fiscal year the seven diesel generators were available for service. During fiscal year 2009 the four diesel generators on Culebra, with a combined capacity of approximately 2.0 MW, generated 67 MWh. These four diesel generators were in service a total of 319 hours. On Vieques the Authority's two 3 MW diesel generators and single 1 MW diesel generator were in service a total of 121 hours during the fiscal year and generated a total of 120 MWh.

FUELS

Since March 2007 the Authority has been burning a residual fuel oil with a sulfur content not exceeding 0.5% by weight in all of its large steam electric generating stations. In that month the large steam electric generating stations at Aguirre and Costa Sur went from burning a fuel with 0.75% sulfur content to a residual fuel oil not exceeding 0.5% sulfur by weight. Four years earlier in compliance with an agreement with the EPA the Authority began burning this residual fuel oil with low sulfur content at its steam electric generating stations at San Juan and Palo Seco on the north coast of Puerto Rico. Following the switch to the low sulfur fuel, the two stations on the south side of the island discontinued the use of fuel additives. Also all new contracts for the purchase of the distillate fuel oil that is burned in the Authority's simple and combined cycle units will specify that the sulfur content not exceed 0.05% by weight, to realize better pricing and supply options.

The Authority's current practice for fuel procurement has been to solicit bids for the supply of fuel on the basis of a one-year contract with the option of extending the contract for an additional year. Extension of the contract for the option year is discretionary for either party to the contract. If one party elects not to exercise the option year provision that party must notify the other party to the contract four months prior to the end of the first year. This provides either party the time to pursue contracts elsewhere. The Authority's experience is that the parties agree to extend the contract through the option year approximately 80% of the time.

In January 2009 the Authority awarded a contract for the supply of the residual fuel oil for the Aguirre Steam Plant. In February 2009 the Authority took delivery of residual fuel oil per this contract. The

second year, an option year, if exercised would extend this supply contract through January 2011. At the end of the fiscal year the Authority had requested bids for the supply of residual fuel oil for the Costa Sur Steam Plant. The contract was scheduled for award during July 2009. The residual fuel for Palo Seco and San Juan Steam Plants is supplied per a single contract that was awarded in April 2008. This contract was extended through its option year; it will be put out for rebid in March 2010.

The Authority's contract for the supply of distillate fuel oil for the San Juan Units 5 & 6 was awarded in February 2009. This contract, if extended through an option year would terminate in fiscal year 2011. The San Juan units burn a distillate with sulfur content of not more than 0.05% by weight.

The contract for the supply of distillate for the Cambalache units has been extended through the June 2009. The distillate supplied under the expiring contract contained not more than 0.15% sulfur by weight. The supply contract being bid at the end of fiscal year 2009 specified a distillate with a sulfur content not exceeding 0.05% by weight. This contract would also cover the supply of distillate for the units at the Aguirre Combined Cycle Plant.

The contract the Authority awarded in May 2008 for the supply of distillate with sulfur content not to exceed 0.05% has been extended through April 2010. This distillate will be burned in the Authority's eighteen Frame 5 combustion turbines each having a 21 MW capacity and in the four 55 MW aero-derivative simple cycle combustion turbine units which entered service at Mayagüez during fiscal year 2009. The 55 MW aero-derivative units replace four Frame 5 combustion turbines that were taken out of service at the end of fiscal year 2008.

BATTERY ENERGY STORAGE SYSTEM

The 20 MW Battery Energy Storage System, BESS, at Sabana Llana was commissioned in August 2004. The plant consists of two units designated 1A and 1B. More than 3,000 batteries powered each unit. The plant was designed to provide ready reserve capacity in response to a System disturbance and power factor correction when needed. Early in fiscal year 2006 one of the units was forced from service by a fire. Following the fire the Authority determined there were a number of design issues that would prevent the batteries from providing safe and reliable service. The Brazilian manufacturer of the batteries disputes the Authority's position and has been unwilling to replace the batteries. The

Authority and the manufacturer have been unable to reach a settlement. The Authority has filed suit; at the end of fiscal year 2009 the case continued in the discovery stage.

SPARE COMPONENTS

To reduce the unscheduled outages of various units, the Authority has purchased a number of critical spare components (see the following list). Using such spare components during an emergency outage can greatly expedite the unit's return to service. Once the damaged component is repaired, it becomes the spare. This practice has significantly reduced the downtime of some of the Authority's large units thereby helping to maintain both unit and System availability. The following is a list of major spare components:

- HP/IP and LP turbine rotors for Aguirre Unit Nos. 1 & 2
- HP/IP and LP turbine rotors for Costa Sur Unit Nos. 5 & 6
- Motors for FD, ID, & GRF for Costa Sur Units Nos. 5 & 6 and Aguirre Unit Nos. 1 & 2
- Power transformer adaptable to Costa Sur Units Nos. 5 & 6 and Aguirre Unit Nos. 1 & 2
- Emergency station service transformer for Aguirre Steam Station
- Generator rotor for Aguirre Unit Nos. 1 & 2
- LP turbine rotor for Palo Seco Unit Nos. 3 & 4
- Generator rotor for Palo Seco Unit Nos. 1 & 2
- Power transformer for Palo Seco Unit Nos. 3 & 4
- CT generator for the Aguirre Combined-Cycle Plant
- CT turbine rotor for the Aguirre Combined-Cycle Plant
- Power transformer for Aguirre Combined Cycle Station
- Two generator rotors for the 21 gas turbines
- Compressor rotor assembly for a 21 MW gas turbine
- Service transformer for San Juan Station Units
- Replacement motors for all large pumps
- Replacement rotors for FD, ID, & GRF fans
- Large pumps and vacuum equipment for combined cycle & steam-electric units
- Burners, soot blowers, air heater components for steam-electric units

PRODUCTION PLANT CAPITAL EXPENDITURES

Production plant capital expenditures in millions of dollars are forecasted to be \$128.0, \$104.0, \$90.3, \$115.0, and \$161.5 in fiscal years 2010 through 2014 respectively. Actual production capital expenditures in fiscal year 2009 amounted to \$246.6 million as shown in *Appendix VI, Capital Expenditures*. Details by Budget Item Number for fiscal years 2010 through 2014 are shown in *Appendix X, Details of Capital Improvement Program*.

ENVIRONMENTAL

The Environmental Protection and Quality Assurance Division is responsible for assisting the Authority's operating Directorates to comply with all applicable Federal and Commonwealth environmental laws and regulations. The Environmental Protection Division's responsibilities include the development of comprehensive programs to achieve the Authority's environmental performance goals. They have primary responsibility for obtaining the permits required to add Authority owned capacity to the System or to modify existing capacity. These responsibilities include defining the measures necessary to remain in compliance with new regulatory requirements and responding to alleged instances of noncompliance cited by federal or local environmental agencies.

During fiscal year 2009 the Authority performed environmental protection or environmental remediation projects at each of its major generating stations. Environmental projects were budgeted at \$11.9 million and actual 2009 expenditures totaled slightly more at \$12.2 million. The Authority's five-year Capital Improvement Program (CIP) for fiscal year 2010 through 2014 identifies environmental projects valued at \$78.9 million. During fiscal year 2010 these projects are budgeted at \$10.3 million.

In February 1992 the EPA conducted a multimedia inspection of the Authority's four steam electric power plants (Aguirre, Costa Sur, Palo Seco, and San Juan) and the Monacillos Transmission Center. In December 1992, the EPA identified several instances of noncompliance related to air emissions, water discharges, and to the Spill Prevention Control and Countermeasure (SPCC) compliance program at the Authority's four major steam electric generating stations and at the Monacillos Transmission Center. These findings led in March 1999 to an agreement between the agencies of the federal government and the Authority, which became the basis for the court

approved Consent Decree which is still in effect, although subsequently revised and amended. The Authority agreed that starting in March 2003 the residual fuel oil burned in the steam electric generating stations at Palo Seco and San Juan on the north coast of the island would have a sulfur content not exceeding 0.5% by weight. Since March 2007 the Authority has been burning a fuel oil with a sulfur content not exceeding 0.5% by weight at its south coast steam electric generating stations at Aguirre and Costa Sur. For more discussion on this refer to the *Fuels* section of *System's Operations*. During fiscal year 2007 the Authority completed projects to reduce NOx emissions at steam electric generating stations at Palo Seco, Aguirre, and Costa Sur. As a condition of receiving certain permits the units at San Juan Station had previously been modified to reduce NOx emissions. The Authority and the EPA monitor compliance with the lower NOx emissions requirements.

The Authority has selected environmental consultants to assist them on air emission compliance strategies and projects, as well as compliance issues arising under sections 316 (a) & (b) of the Clean Water Act. The largest of the multi-year environmental projects budgeted in the CIP are related to the Clean Water Act's Section 316 and entail the refurbishment of the cooling water intake system at the Costa Sur steam electric generating station and the rerouting of that station's cooling water, thermal effluent, discharge system. Work associated with these two projects is budgeted through fiscal year 2014 at \$8 million and \$37.5 million respectively. The Authority prepared a Detailed Engineering and Environmental Review (DEER) of several options for reducing the temperature of Costa Sur's thermal effluent. Following review the EPA approved a plan for an offshore submerged discharge of the station's thermal effluent. Additional impact studies are being prepared for submission to the US Corps of Engineers. Construction of the replacement thermal effluent discharge system at the Costa Sur Steam Plant will continue beyond fiscal year 2014 and is estimated to cost approximately \$60 million.

To comply with the Puerto Rico Environmental Quality Board's Underground Injection Control regulations the Authority has completed the closure of septic systems at steam electric generating stations at Aguirre, San Juan, and Palo Seco. Sanitary systems at these stations have been connected to the Puerto Rico Aqueduct and Sewer Authority's treatment systems. During fiscal year 2010 the Authority will

complete the tie-ins to the sanitary sewer systems at the Costa Sur Steam Plant. Costa Sur is the last of the major stations at which septic system tie-ins remain to be completed. Remediation of closed septic systems will continue during fiscal year 2010.

The Authority maintains an asbestos abatement program through which it is reducing exposures to asbestos containing materials through encapsulation and removal.

In 2003 the EPA approved the Authority's plan to achieve compliance with the Spill Prevention Control and Countermeasures (SPCC), provisions of the Oil Pollution Control Act of 1990. Through fiscal year 2012 the Authority has budgeted \$8.8 million for the inspection, testing, and repair of fuel oil tanks, the refurbishment of tank dikes and the installation of secondary containment around fuel oil tanks; these projects have been ongoing since 2004 at electric generating stations. This budget allocates funds for contamination control projects at the Authority's hydroelectric and combustion turbine plants and for the replacement of a distillate line to the Palo Seco generating station. More than half of the Authority's substations contain quantities of oil in transformers and other electrical equipment that trigger the inspections and control measures mandated by these standards. The Authority has budgeted \$5.1 million through fiscal year 2012 for SPCC compliance projects at substations and transmission centers. The Authority will meet with the EPA during fiscal year 2010 to discuss the schedule for the completion of Facility Response Plans (FRP), and for the inspection and modification of these facilities.

As of March 2009 the Authority reported achieving compliance in excess of 99% with its in-stack opacity requirements and with its Air Quality Compliance Program and also achieving the same high level of compliance with Clean Water Act regulations. At the end of fiscal year 2009 none of the Authority's generating stations was on probation with the EPA.

COGENERATORS

The Authority has entered into long-term Power Purchase Agreements (PPAs) with the owners of two cogeneration plants in Puerto Rico. These plants, one fueled by natural gas (vaporized LNG) and the other by coal, bring fuel diversity to the island's generation mix. The Authority's PPAs with the cogenerators establish the method for calculating the cost of the fuel component of the cogenerators' energy charge for a twelve-month period at the start of each

calendar year. The plants incorporate emission control technologies enabling them to comply with stringent environmental standards; both plants are highly efficient. The Authority controls the dispatch of the cogenerators' power. During fiscal year 2009 the cogenerators accounted for 30.6% of the System's net generation. During fiscal year 2008 the cogenerators had generated 31.8% of the System's net generation. (For further discussion of these power producers see the *Capacity Planning* section.)

The Authority is treating its purchased power costs as an operating expense in its various financial schedules and it is recovering them from its clients utilizing a purchased power charge similar to its fuel charge. As previously noted, both of these charges are combined and appear on the client's bill as the adjustment charge. The Authority's purchased power costs, as shown in *Appendix III, Detail of Operating and Maintenance Expenses*, for fiscal year 2009 totaled \$671.8 million; in fiscal year 2008 the total was \$661.1 million. For fiscal years 2010 through 2014 the Authority projects purchased power costs in millions of dollars to be, \$711.7, \$716.0, \$734.8, \$755.9, and \$727.6, respectively.

In the following narratives a scheduled outage will be noted regardless of duration and unscheduled outages or limitations of a unit's output of one or more days duration will be noted. Also an event that removed more than one of a plant's units from the system is noted below regardless of duration.

EcoEléctrica, L.P.

On March 21, 2000, the Authority began buying 507 MW of power from EcoEléctrica, L.P. in accordance with a 22-year PPA. The plant consists of two combustion-turbines (CTs) each with a heat recovery steam generator (HRSG), i.e., boiler, combining to power a single steam turbine-generator, STG. Each of the CTs is capable of generating 167 MW; the steam turbine-generator is capable of generating 173 MW. The plant's waste heat is used in a desalinization plant capable of producing 2 million gallons of fresh water a day. The water is for its own use and for sale to the Puerto Rico Aqueduct and Sewer Authority. The EcoEléctrica, L.P. complex also includes an LNG unloading dock, an LNG storage tank, an LNG vaporizer, and associated facilities.

For fiscal year 2009 EcoEléctrica achieved an equivalent availability of 89.6%, significantly below the equivalent availability of 93.9% achieved during fiscal year 2008, but only slightly below the fiscal year 2009 target of 90%. Due to the number and exten-

sive scope of the maintenance inspections scheduled for the EcoEléctrica units during fiscal year 2009 the Authority lowered the target equivalent availability from 93% to 90% for the current fiscal year. A provision allowing for this reduction is contained in the PPA. The plant had a capacity factor of 75.9% while generating 9.8% less energy in fiscal year 2009 than in the prior fiscal year. Each of the plant's three units was in service and capable of full output on June 30, 2009. CT 1 was unavailable for service a total of 42 days during the fiscal year, the major inspection of the combustion turbine-generator that began in February accounted for 36 of the 42 days. This CT was forced from service for repairs seven times during the fiscal year. Two of these one-day outages were for the repair of a turbine bearing and the third was for the installation of blinds to isolate the CT from the steam turbine-generator. High turbine vibration in CT 1 forced from it from service for a day and a half during April. In January an operator error led to a boiler feed pump being shutdown, tripping the unit and causing the Authority to shed load. Service was restored to affected clients within 15 minutes.

CT 2 was unavailable for service for 25 days during fiscal year 2009. In January the CT was scheduled from service for a 12-day combustion inspection that was extended an additional ten days for the replacement of blades in the turbine and compressor section. Shortly after returning to available status CT 2 was scheduled from service for maintenance and returned to available status two days later. CT 2 was forced from service twice during the fiscal year and returned to service in less than four hours after each trip. CT 2 was generating 270 MW when the second of these trips occurred forcing the Authority to shed load. The Authority was able to restore service to affected clients within 25 minutes; EcoEléctrica returned the unit to available status in less than two hours.

EcoEléctrica's steam turbine-generator capacity was limited during the 67 days during fiscal year 2009 that one of CTs with which it was combined was unavailable for service. When a CT tripped so too did the STG. Additionally the STG was scheduled from service for 29 days for a major inspection. During the inspection blades in the HP and IP sections of the turbine were replaced. Turbine seals were replaced. The generator was cleaned and inspected, and nozzles were sandblasted. The STG returned to available status in early March. The STG was forced from service three times, once following the failure of a system controlling the handling

LNG, another time during April by the loss of the instrument air system, and the third time by a malfunction in a relay protecting the generator. When this last event occurred the Authority shed load but returned power to all of the affected clients within 18 minutes. The STG returned to available status after each of these trips in less than one day.

The Authority had forecast that EcoEléctrica would generate 14.4% of the System's energy during fiscal year 2009. For fiscal year 2009 EcoEléctrica provided 15.1% of the System's energy. The Authority forecasts that EcoEléctrica, L.P. will generate 15.8% of the energy sold by the Authority during fiscal year 2010.

AES-PR

AES-PR's coal-fired steam-electric cogeneration station began commercial operation in November 2002. The owners of the facility have entered into a PPA with the Authority to provide 454 MW of power for a period of 25 years. The station is comprised of two circulating fluidized bed steam generators employing clean coal burning technology and two steam turbine-generators each capable of generating 227 MW. During fiscal year 2009 AES-PR accounted for 15.7% of the energy sold by the Authority. Although this was more than the 14.6% of the System's net generation that the Authority had forecast that AES-PR would provide, its net generation during fiscal year 2009 was 7.5% less than in fiscal year 2008. For the remaining years of the PPA's term, the plant has a target equivalent availability of 90%, a target it has achieved in prior years. During fiscal year 2009 AES completed major overhauls of both units and achieved an equivalent availability of 88.2%. The plant realized a capacity factor of 82.7%. Three times during the first half of fiscal year 2009 the station's capacity was limited as coal fuel became too wet to maintain the stations capacity. While limitations due to heavy rains lasted six days they accrued less than two equivalent outage days for the station.

Unit 1- at the end of fiscal year 2009 this unit was online and capable of generating 227 MW. During fiscal year 2009 there were two scheduled and three forced outages. These outages kept the unit from available status for a total of 55 days, additionally the unit's capacity was limited on six occasions, however, the limitations were relatively small and brief, totaling less than one equivalent outage day. In November the unit came out of service for 15 days while scheduled maintenance was performed. In late June Unit 1 returned to service on completion of a

tor's collector plates were replaced, boiler and refractory repairs were completed. In September a component within the UPS failed and the unit tripped while generating 254 MW; the trip caused the Authority to shed load. Power was restored to affected clients within six minutes and the unit returned to service six hours later. In April tube failures in the fluidized bed heat exchanger (FBHE) forced the unit from service. Fifteen tubes in the FBHE were repaired and the unit returned to service approximately nine days later. In May the unit was again forced from service while broken tubes in a finishing heat exchanger were repaired during a five-day outage.

Unit 2 – was in service and capable of generating 227 MW on June 30, 2009. The unit was undergoing a scheduled outage for the overhaul of the unit at the start of the fiscal year. It returned to available status in mid-July on completion of its only scheduled outage. The unit was unavailable for service for 39 days in fiscal year 2009; 35 of these days were caused by eight forced outages. The Authority had to shed load at the onset of three of the eight forced outages. The longest that any of Authority's clients were without service following one of these trips was nine minutes. The unit's output was limited three times, each time for a different reason; the sum of the equivalent outage hours associated with these limitations was less than one day.

During the major overhaul from which the unit returned to service early in fiscal year 2009 AES-PR completed the replacement of the collector plates in the unit's precipitator, cleaned and inspected the boiler, repaired refractory, completed maintenance on electrical equipment, mechanical components, and fuel and ash handling and conveying systems. The unit was forced from service for five days during November for the repair of broken tubes in the FBHE. In February the unit was forced from service by opacity issues. During the outage the ID fans control system was reset and a malfunctioning turbine valve was cleaned and repaired. These repairs kept Unit 2 from available status for eight days. During an eight-day forced outage in March, seventeen tubes in a high-pressure feedwater heat exchanger were repaired. In mid-April the unit tripped from service following the failure of the fluidizing air blower. The unit tripped following the failure of the ash control valve forcing the Authority to shed load. The unit returned to service approximately 35 hours later following completion of repairs. The three other forced outages were caused by failures **App-226**.

instruments that monitored the secondary air fan and the generator; replacements were installed and each time the unit returned to service in three or fewer hours.

TRANSMISSION AND DISTRIBUTION SYSTEMS

The Authority's transmission and distribution systems is comprised of an island-wide network of power lines, switchyards, substations and electrical equipment that carry the electrical power from the production plants to serve the Authority's clients.

On an annual basis the Consulting Engineer's personnel visit and note the condition of approximately one-third of the Authority's 333 distribution substations and 45 transmission centers (TCs). In order to observe a representative sample, we select substations from among the 78 municipalities in the 26 districts served by the Authority. The scope of the inspections include a representative portion of the Authority's 230/115 kV transmission lines.

TRANSMISSION

The Authority's transmission system consists of high voltage power lines, switchyards and electrical equipment that carry the electrical power from the production plants to the dispersed substations, both the Authority's and privately owned substations, which serve the System load. The backbone of the transmission system is the 230/115 kV network that moves bulk power. The balance of the transmission system is the 38 kV lines and equipment that serve the whole island and also provide the submarine service to the islands of Vieques and Culebra. For reference when reading this section, a map of the Authority's 230 kV and 115 kV transmission systems precedes the *Appendices*. The map shows the existing transmission system with the planned modifications to the systems through fiscal year 2014.

230 kV System

The existing 230 kV system is comprised of 364 circuit miles of transmission lines that encircle and sectionalize the island. The 230 kV system has two north-south corridors which divide the system into three principal loops—the western loop, the central loop and the eastern loop. Each north-south transmission line originates at a major production facility in the south and carries power to the load centers in the north.

The central loop has been in operation for many years. It was the first 230 kV transmission line to tie

the generating plants located on the island's south coast to the load concentrated in the San Juan metropolitan area via the Aguas Buenas TC south of the city. A parallel 230 kV line in the center of the island connects the Costa Sur and EcoEléctrica production units in the south with the Manatí TC located between San Juan and the Cambalache combustion turbine station on the north coast. The central loop is joined by east-west transmission lines connecting the Costa Sur units with the Aguirre plants in the south and a line on the north side of the island connecting Manatí to Aguas Buenas via Bayamón.

The western loop connects the Costa Sur and EcoEléctrica production units in the south with the Mayagüez switchyard and production units, on the west coast of the island, and from there to the northern cities of Aguadilla, Hatillo, and Arecibo. The western loop was completed in fiscal year 2002 following the construction of the segment connecting Mayagüez and the Cambalache TC. The loop increased the transmission system's capacity and reliability and improved the quality of electric service in the north-western municipalities.

The most recent expansion to the transmission system was the eastern loop that went into service during fiscal year 2006. The eastern loop was installed to support the load growth in the northeastern area of the island, complete the encirclement of the island by the 230 kV system, and improve the transmission system reliability and capacity by increasing the available transmission lines to move electrical power from the complex of generating plants in the south to major load centers in the north. The eastern loop runs from the large power production units in the southern plain at the Aguirre units in Salinas and the AES plant in Guayama to the eastern part of the island through Yabucoa and Río Blanco and terminating in Sabana Llana, southeast of the San Juan metropolitan area. Large sections of the new 230 kV eastern transmission line run along existing 115 kV rights-of-way. The project required the relocation of 16 miles of existing 115 kV lines between Río Blanco and Quebrada Negrito. The scope of the eastern loop project also included the expansion of the 230 kV facilities at the Sabana Llana and Yabucoa TCs.

The Authority is presently installing two new projects to expand the 230 kV transmission system. These projects will improve the capacity and reliability of the transmission system, particularly in moving power from the generating plants in the south to the load centers in the north and enhancing voltage stability at the load centers. During most of

fiscal year 2009 the Authority imposed operational constraints on the transmission system because all the Palo Seco units and the new San Juan Units 5 & 6 were not in full and reliable operation. Consequently new work adjacent to critical existing lines was deferred or rescheduled to periods of low demand, however, some work along new rights of way proceeded.

The first priority 230 kV transmission line project for the Authority will connect the Costa Sur Steam Plant and the EcoEléctrica, L.P. Cogeneration Plant, both of which are on the south side of the island, with the Cambalache combustion-turbine station near Arecibo, which is on the north side of the island. The total length of the line will be 38 miles, however, more than half of its length consists of upgrading existing 115 kV line to 230 kV, which will accelerate the construction schedule of the 230 kV line. The 115 kV line will be subsequently reestablished, as discussed below. The Authority plans to complete the 230 kV project in four years, beginning in fiscal year 2010. The Authority's current CIP shows spending on this project in the fiscal years of 2010 through 2013 will be \$3.2 million, \$8 million, \$8 million, and \$6 million, respectively. Presently, the line is scheduled for completion in fiscal year 2013.

The second priority 230 kV transmission line project is a new 50 mile long line being constructed between the Costa Sur Steam Plant in Guayanilla and the Aguas Buenas TC, located near the San Juan urban area load center. Construction of the line began in fiscal year 2003 and is scheduled to be completed in fiscal year 2015 at an estimated cost of \$99 million. The expenditures for this project during fiscal year 2009 were \$19.0 million, bringing the project to approximately 60% completion. Expenditures are estimated to be \$8 million in fiscal year 2010, plus an additional \$20.5 million through fiscal year 2014.

During fiscal year 2009 the Authority continued engineering and procurement for a new 230/115 kV transmission center in Ponce; construction is scheduled to start in fiscal year 2010. The project is forecasted to cost \$6.0 million and has a target completion during fiscal year 2011. The new 450 MVA transmission center will be located in an existing 115/38 kV transmission center along the high capacity transmission line corridor east of the Costa Sur production units; this location will enhance the reliability and operational flexibility in the high voltage system for moving bulk power from the large generating units on the south side of the island. The

Authority plans to start work on the next new 230/115 kV transmission center in Mora, located in the northwest portion of the island, during fiscal year 2014.

115 kV System

The 115 kV system is comprised of 691 circuit miles of transmission lines that encircle and cross the interior of the island. The 115 kV system was the first high voltage transmission system put into operation on the island to improve the efficiency and reliability of the distribution of bulk power. The 115 kV lines and substations serve all the major load centers on the island. Many of the 115 kV transmission line corridors were subsequently used as rights of way for the 230 kV system lines as that system grew.

In its plans for the long term expansion and improvements to the 115 kV system, the Authority has prioritized a number of new and rehabilitation projects for 115 kV transmission lines, transmission centers and other components of the system. Given the scope, complexity, and cost of these projects, their execution typically spans many years between initial work and placement into service.

In fiscal year 2009 the Authority completed construction of a new \$18.4 million 115 kV line project that provides an inter-connection between the transmission center at Juncos, which is presently fed from Humacao TC to its south, and the existing transmission line to its north that connects transmission centers at Rio Blanco and Monacillos. The Authority plans to start construction on two new 115 kV lines in fiscal year 2012. The first line is scheduled for completion in fiscal year 2014 and will feed the new, planned 115/38 kV Bairoa TC, north of Caguas. The next new line is scheduled for completion in fiscal year 2016 and will provide a second feed to the Hato Tejas 115/38 kV TC that is under construction; the line will run from the Palo Seco plants to the Hato Tejas TC in Bayamón.

The Authority's two priority projects for 115 kV transmission line work in fiscal year 2010 involve improvements to existing transmission lines. During fiscal years 2010 and 2011 the Authority has budgeted \$18 million to upgrade an existing 115 kV transmission line between Caguas and Cayey to support the operation of the new transmission center under construction at Las Cruces, which is discussed below. The second project is the replacement of an existing 115 kV line between the Costa Sur plant and the Dos Boscas TC, located south of

tion of the new 230 kV line discussed above, which is located along most of the same right of way. The replacement 115 kV line will be located in the existing right of way, but will have greater capacity; this project is scheduled to be in operation in fiscal year 2016.

In addition to the GIS substation in construction in the 115 kV San Juan urban loop discussed below, the Authority currently has identified eight priority projects associated with new or expansions to existing 115/38 kV transmission centers. The Authority has four projects for the construction of new 115/38 kV transmission centers and four projects to expand the capacity of existing transmission centers. Each of these transmission centers is close to an area of high or growing load, where it is necessary to reinforce the 38 kV system capacity and reliability by providing for additional operational contingencies in supporting the 38 kV system in those areas.

In fiscal year 2008 work began on a new 115/38 kV transmission center to be located in Hato Tejas, in the region of Bayamón. Work on the second new transmission center began late in fiscal year 2009. This transmission center will be in Las Cruces, located in Cidra south of Caguas. Both projects are targeted for completion in fiscal year 2011. The third new transmission center will be in Venezuela, near Rio Piedras in San Juan. The project work is scheduled to start in fiscal year 2011 and be completed in fiscal year 2014. The fourth new transmission center project will be in Bairoa, part of Caguas. This project is scheduled to start in fiscal year 2012 and be completed in fiscal year 2014. All four projects are rated at 150 MVA.

The Authority is presently working on two projects to increase the capacity of existing 115/38 kV transmission centers by extending the switchyard and installing a second 150 MVA transformer. These projects are at the Victoria TC, in Aguadilla, and the Canovanas TC, in the Carolina region; both are scheduled for operation in fiscal year 2010.

Concurrent with the new 450 MVA 230/115 kV Ponce TC project discussed above, the Authority will expand the capacity of the existing 115/38 kV Ponce TC by 150 MVA; construction is scheduled to start in fiscal year 2010 and be completed the following year. In fiscal year 2012 the Authority plans to begin installation of a second 150 MVA transformer at its Maunabo TC near the southeast corner of the island; completion is scheduled for the following year.

To protect the integrity of the transmission system in the San Juan urban area during and following extreme weather events, the Authority is installing four new 115 kV substations and a 30-mile underground loop of 115 kV transmission cables that will link the major components of its System in the metropolitan area. As shown on the 115 kV underground system map, the system can be fed through any of the four existing transmission centers and two steam plants which are interconnected by the new transmission loop. The principal function of the underground cable is to provide a robust measure of redundancy so that the Authority will be able to maintain continuity of service in San Juan's central business district, perhaps at partial load, in the event overhead lines are lost during a hurricane or other disaster. In addition, the cable will be available for back up service to the Authority's existing overhead transmission lines under normal circumstances. The scope of this project was prompted by the devastation caused by Hurricane Georges in fiscal year 1999. The Federal Emergency Management Agency (FEMA) reimbursed the Authority a total of \$73 million of the project's cost of \$195.8 million for the underground cable and ductbank scope of work.

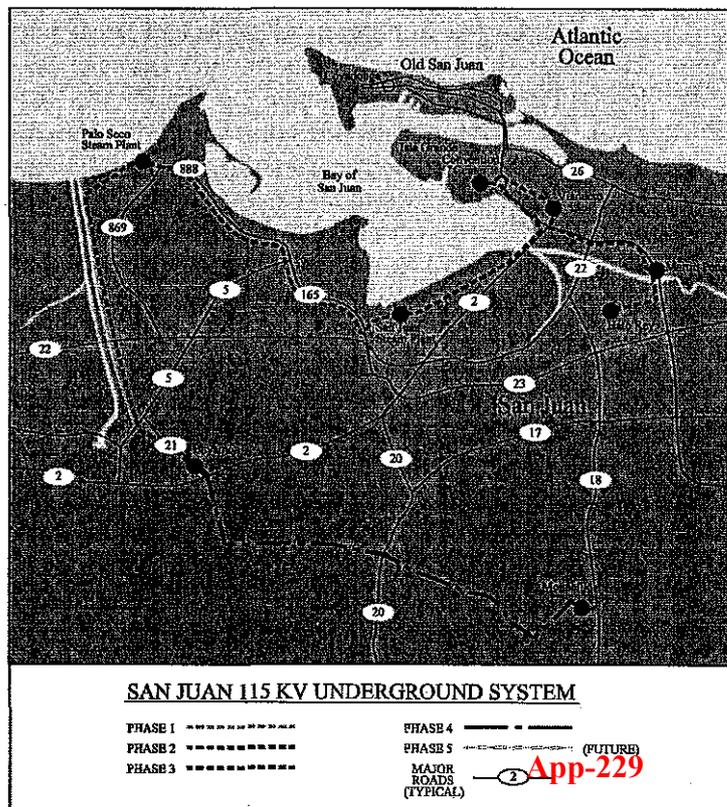
The 115 kV underground work was installed in four major phases between fiscal years 2002 and 2008. All the underground 115 kV cable was fabricated

using cross-linked polyethylene (XLPE) cable. While the XLPE cable was more expensive than cable insulated by oil or other chemical compounds it eliminated the possibility of environmental contamination if such compounds were to leak into the surrounding terrain.

The Authority incorporated provisions in the completed work for a future extension of the 115 kV underground system from the Isla Grande substation to the Covadonga substation in Old San Juan. This underground cable could provide increased load flow under normal and emergency conditions to the government buildings located in the Old San Juan area. The Covadonga 38 kV gas insulated switchgear distribution substation was constructed in a dedicated building that includes space for future 115kV equipment fed by an under ground duct bank.

The 115 kV underground system includes four new substations incorporating gas-insulated switchgear (GIS), providing for compact and enclosed substations. The first two new substations at Isla Grande and Martín Peña have been in service since fiscal year 2008. These substations were designed to support existing and anticipated load growth in their respective areas. The third and fourth substations are located at the San Juan and Palo Seco Steam Plants. These GIS switchyards will replace the old, existing switchyards that have been in operation since the plants went online in the late 1950's and 1960's. In conjunction with the 115 kV underground cable project, a new GIS switchyard will be constructed at each site for the terminations of the new 115 kV cable.

The new San Juan Steam Plant GIS switchyard has been designed to accommodate 850 MW, the existing units as well as the additional capacity of Units 5 and 6, which were placed in operation during fiscal year 2009. The switchyard GIS equipment has been purchased for this project and delivered to the island, but the original substation construction design was found to be too expensive. The Authority subsequently revised the scope of the San Juan Steam Plant GIS project to reduce the project cost. The revised project is budgeted at \$62.5 million. Construction began in the third quarter of fiscal year 2009, with operation targeted for fiscal year 2013. In order to support initial operation of the new Units 5 and 6, the Authority installed a new, compact switchyard dedicated for Units 5 & 6; this switchyard is electrically tied into



the existing overhead 115 kV and 38 kV transmission systems.

The Palo Seco Steam Plant 115 kV GIS substation project completed construction in fiscal year 2009 at a cost of \$65.7 million. Construction for this project began in fiscal year 2006, but subsequently the schedule for initial operation was revised to support the return to service of Palo Seco Units 3 & 4. The Palo Seco steam plant units suffered extensive damage to the electrical and control system during two fires in December 2006, and were already scheduled for major overhaul work. In view of the large scope of electrical work involved with the restoration of the Palo Seco units and the congested site, the Authority chose to realign construction work on the GIS project to coordinate with the repair and restoration work being performed on the steam plant units at the station. Operation of the GIS substation project coincided with the return to service of Palo Seco Unit 4 during fiscal year 2009, with Unit 3 scheduled shortly thereafter. Palo Seco Units 1 & 2 returned to service during fiscal year 2008 using a new 38 kV GIS substation adjacent to the new 115 kV GIS substation.

38 kV System

More than half of the Authority's transmission system circuit miles operate at 38 kV, which is considered its "sub-transmission" level. While most of the sub-transmission system is near load centers, it is also the primary transmission system to some of the island's most inaccessible interior regions.

The 38 kV system feeds two thirds of the Authority's distribution substation capacity and almost all of the private substations on the island. Given that the 38 kV system is an essential component in the Authority's transmission network, for many years the Authority has been pursuing a system wide rehabilitation program to upgrade the reliability and capacity of the 38 kV system. In addition, the Authority continues to invest in new 38 kV system lines, switchyards and expansions.

The scope of the rehabilitation work includes replacing old conductors with new, replacing aging wooden poles with steel poles and upgrading the system for forecasted local load growth. In some areas, certain sections of the rehabilitated 38 kV lines have been installed along new rights of way to facilitate the present work as well as future maintenance.

In fiscal year 2009 the Authority expended \$17.0 million on 26 projects of 38 kV rehabilitation work; the five largest projects constituted approximately 70% of the total expenditures. These projects are located throughout the island and reflect the extent of the 38 kV system. The Authority has budgeted \$21.3 million and plans to work on 40 rehabilitation projects in the 38 kV system during fiscal year 2010. The largest project in 2010, however, accounts for approximately one-quarter of the fiscal year's 38 kV rehabilitation budget. This project involves upgrading the 38 kV lines in the north-western area of the island that are served by the Victoria TC, which increased its transformer capacity and the new additional generation at the Mayagüez plant.

The Authority expended \$1.8 million during fiscal year 2009 on new aerial 38 kV lines, which is similar to the budget for fiscal year 2010 for these expansions. There were 14 active projects during fiscal year 2009; the Authority's budget has funds for seven projects in fiscal year 2010.

The 38 kV system also includes more than 50 miles of underground cable in mostly urban areas. In response to civic and business leaders requests, the Authority is expanding the scope of the underground cable in urban and industrial areas. During fiscal year 2009 the Authority expended \$1.6 million on new and expansion underground 38 kV projects. The largest underground project in fiscal year 2009 was the new underground line between two key substations in the Guaynabo district, in San Juan. The underground line connecting the Caparra and Cachete sectionalizers in Guaynabo is the highest priority underground 38 kV line and is scheduled to be completed in fiscal year 2011 at a total cost of \$7.6 million. Work continued during fiscal year 2009 on an underground line from the Sabana Llana TC feeding an existing substation located approximately two miles away in the urban area of Carolina; the project is scheduled for completion in fiscal year 2010. The third project is the underground feeders in the new Parque Tecnológico Las Américas (Technology Park of America) southwest of Arecibo; approximately one half of the cost of the 38 kV work is being underwritten by the public and private project developers. The Authority plans on expending \$7.0 million on this project during the coming fiscal year and an additional \$3.0 million in the following two fiscal years.

The submarine cables feeding the islands of Vieques and Culebra are part of the 38 kV system. Recent severe erosion of the beach on Vieques where the

submarine cable makes landfall has forced the Authority to extend the cable and relocate the termination structure. This is a priority project for the Authority that is budgeted at \$1.5 million and is scheduled for completion in fiscal year 2010.

During fiscal year 2009 the Authority expended \$2.0 million on continuing work on a new 38 kV GIS substation at the Parque Tecnológico Las Américas. As discussed above the substation will support a new industrial complex now under development. The Authority has budgeted \$3.7 million to complete this project in fiscal year 2010.

In fiscal year 2009 the Authority expended \$1.3 and \$1.6 million respectively on two new, ongoing 38 kV sectionalizer projects. The first sectionalizer is in Aguadilla and the second is part of the expansion of the substation at Factor, discussed below. Both are scheduled for completion in fiscal year 2010.

Transmission Plant Capital Improvements

The transmission plant funding forecasts in the Authority's current CIP address a wide range of improvements covering the entire transmission system. Transmission capital expenditures in fiscal year 2009 amounted to \$91.5 million. The Authority is planning to spend \$117.2 million on capital improvements to its transmission system in fiscal year 2010: \$79.8 million for expansion projects and \$37.4 million for rehabilitation projects. The Authority plans to spend \$469.1 million on its transmission system over the next five fiscal years. Details of these expenditures are discussed in the *Capital Improvement Program* section and are itemized in *Appendix X, Details of Capital Improvement Program* and summarized in *Appendix VI, Capital Expenditures*.

DISTRIBUTION

The Distribution System is the final link between the Authority's production plants and Transmission System and its clients, with the exception of the small number of commercial and industrial clients who purchase power at the transmission level. The Distribution System includes Authority owned substations that reduce the power from transmission voltage to the level at which it is locally distributed. The lines, poles, transformers, and appurtenances of the Authority's distribution system are installed along both city streets and country roads as well as along the Authority's rights-of-way. Service drops from the distribution lines and meters complete the connection to clients' premises.

Selected 13.2 kV Projects

The Authority has a long-standing program in place to upgrade its primary distribution level to 13.2 kV. The higher voltage is a cost effective method that enables the existing conductors to carry more load, while updating older distribution equipment such as transformers, switches, capacitors and reclosers. In addition, operating at 13.2 kV reduces line losses and allows for longer circuits runs, thereby providing more flexibility in making system interconnections.

The Authority makes on-going investments in new distribution substations to support new and increasing load, such as in areas with increasing residential construction, and to improve system performance. The Authority has standardized on two sizes of permanent substations based on the transmission system supply voltage. This standardization expedites the engineering, procurement, and construction cycle, increases flexibility in potentially utilizing equipment as spares, and provides a cost effective installed capacity margin for load growth. In situations where the Authority needs additional substation capacity on an interim basis or with short lead times, the Authority installs temporary substations that are standardized unitized metal clad equipment, which can be relocated as required.

During fiscal year 2009 the Authority placed into service a new 13.2 kV substation at Mora in Isabela. Work continued on a second new 13.2 kV substation at Factor in Arecibo which is scheduled to be completed early in fiscal year 2010; the scope of work includes a new 38 kV sectionalizer which will be placed in service concurrently with the substation. The Authority plans to begin work on four new permanent 13.2 kV distribution substations in fiscal year 2010. The first project is a new substation at Yabucoa in the Caguas region that is scheduled for completion in fiscal year 2011. The following year the Authority plans to complete the new substations at Rio Bayamón II and Hato Tejas both in the Bayamón region and Santa Isabel in the Ponce region. In fiscal year 2013 the Authority plans to complete one new substation, with three more scheduled for completion in fiscal year 2014. The total amount budgeted for the construction of these substations is \$37.4 million for the five years through fiscal year 2014.

In addition to expansions and new distribution substations, during fiscal year 2010 the Authority plans to replace the transformer in the Buen Pastor substa-

tion in the San Juan region to increase the capacity from 22.4 MVA to 44 MVA.

The Authority owns 18 portable distribution substations that enable them to perform substation maintenance with minimal or no interruption of service, to speed recovery after a substation failure, and for enhanced operation during line clearance constraints. The portable equipment ranges in size from 1.5 MVA to 45 MVA at 38 kV and 115 kV, and includes two capacitor banks at 38 kV 18 MVAR.

In compliance with a settlement with the municipality of Ponce, the Authority is improving the distribution system in the historic district of Ponce. The project involves upgrading the existing overhead 4.16 kV system to a 13.2 kV underground distribution system. The underground work in the historic district is being coordinated with the telephone company and the water and sewer utility who are also concurrently relocating buried utilities in the same district. The scope of the entire project will be executed in four sequential phases to minimize disruptions to the neighborhoods and local traffic. The first phase of the work was completed and placed in service in fiscal year 2007 at a total cost of \$21.1 million, of which \$12 million was born by the Authority. The second phase of the work is budgeted at \$18 million, with \$10 million being the responsibility of the Authority. This phase began work in fiscal year 2008 and completion is scheduled in fiscal year 2010. Design for the third phase began last fiscal year, construction is scheduled to start early in fiscal year 2010, with completion in fiscal year 2012. Work on the fourth phase is targeted to begin following completion of the third; the final phase is targeted for completion in fiscal year 2012. The total cost for all the work is estimated to be \$56 million, with the Authority's portion costing approximately \$33 million.

Distribution Plant Capital Improvements

The Authority's capital expenditures on the distribution system amounted to \$105.0 million in fiscal year 2009. The Authority is planning to spend \$75.3 million on capital improvements for its distribution system in fiscal year 2010: \$17.0 million for expansion projects, \$58.3 million for rehabilitation projects and other distribution expenses, such as remote automated meters, line transformers, breakers, sectionalizers, and reclosers. The remote automated client meters discussed below have been a long term capital commitment by the Authority and they account for 19% of the Distribution CIP budget for

fiscal year 2010. The Authority plans to spend \$397 million on its distribution system capital improvements over the next five fiscal years.

AUTOMATED SYSTEMS

The Authority uses an integrated computerized system that provides information management tools to improve the effectiveness and efficiency of its operation and maintenance of the transmission and distribution systems. The Authority's data management system integrates a Work Management System, a Geographic Information System and an Outage Management System into an Integrated Resource Management System that is known by its Spanish acronym of AIRe (Administración Integrada de Recursos).

The AIRe system is structured to maintain its databases as well as interface with existing computerized systems in other Authority divisions such as finance, human resources, and payroll. Some of the benefits of the AIRe system are: improved client service; reduced O&M expenses; improved emergency response; better planning; improved and consistent engineering/design and estimating practices; archived maintenance records; and, real-time system status reporting.

To develop and implement the AIRe system the Authority worked with leading suppliers of asset management system software. The expenditures on the contract for the lead software development were \$30.2 million through initial installation. Since then the Authority has established maintenance contracts with the firms involved in the AIRe system to provide continuity and upgrades. The total cost of the maintenance contracts has averaged less than \$1 million per year.

The Work Management System (WMS) component of the AIRe system has been in service in all of the Authority's districts since 2001. During fiscal year 2009 the Authority began implementing a major upgrade to the software system, scheduled to be completed in two years. Concurrently the WMS will include the integration of the GIS, discussed below. The WMS tracks the progress of all construction and maintenance work from start to completion in real time. The functions of the system include estimating, engineering, scheduling, required approvals, the generation of bills of material of approved equipment in accordance with Authority standard designs, and the accumulation of labor and material costs for each project. Engineers using mobile laptop computers with Authority design standards can start local project work in the field. When the proj-

ect is completed the system provides for incorporating any differences between the design and as-built installation and updates both the Authority's existing inventories and its Continuing Property Record (CPR), which is a detailed list of the Authority's Plant-in-Service.

The Geographical Information System (GIS) component of the AIRe system is a comprehensive geospatial model of the entire transmission and distribution systems including an inventory of all components. The GIS database is designed to interface with the WMS and the Outage Management System, as well as providing an engineering tool for modifications, new work and circuit analyses. Completing the GIS was a major task since the Global Positioning System (GPS) coordinates of every pole on the island had to be plotted and all the associated equipment physically inventoried. The Authority has recently expanded the scope of the GIS to include validating the location of client meters to improve the precision of the Outage Management System discussed below. The Authority estimates the client meter validation activity will be completed in fiscal year 2011. The GPS coordinate data are utilized with a one-meter resolution satellite map database of the entire Commonwealth that was developed by a Puerto Rican interagency governmental group.

The Outage Management System (OMS) component of the AIRe system has been in island-wide operation since the end of fiscal year 2008. The OMS is designed to improve the Authority's recovery efforts following a hurricane or tropical storm by generating: a damage assessment report based on data received from various system transponders and the Customer Information System; a complete inventory of equipment needing replacement; maps of all areas affected by the outage(s); and, an up-to-the-minute report of the System's status. When the restoration work is underway, the AIRe system monitors and records all of the labor and material costs. The installation of replaced equipment will then be used to update the Authority's CPR.

In conjunction with the OMS system the Authority expanded the use of an Automatic Vehicle Location (AVL) system to approximately 120 repair vehicles during the past fiscal year. The AVL system is capable of providing the real-time location of any Authority vehicle fitted with the GPS receiver and communication link to the Authority's local dispatch center. Vehicle location information has been useful for the local dispatch in reducing travel time to

problems and routing assistance to work crews if required. The AVL also enhances the safety of the crews by providing their location whenever it may be needed, such as during wide area power restoration work. The initial experience with the AVL system has been favorable and the Authority is evaluating deployment in all emergency vehicles.

In addition to the AIRe system, in fiscal year 2000 the Authority began the island-wide installation of an Automated Meter Reading (AMR) system. When it is fully installed, the AMR will enable the Authority to remotely status all residential client meters, in addition to all other clients served at 13.2 kV and below. The target cost for the AMR system is approximately \$200 million for the initial installation at all designated clients. The program consists of installing new design digital meters for all new clients as well as actively replacing old and defective meters. As of June 30, 2009, automated meters had been installed in approximately 90 percent of the target total of more than 1.4 million meters. The AMR system digital meters are significantly more accurate than the analog meters they replaced. The system being installed utilizes a proprietary technology, which communicates between meters and remote controllers by superimposing a frequency modulated signal on the Authority's existing distribution lines between the client meter and the Authority's substation. Because it uses the electric power wires, this technology's performance is not impaired by the island's varied terrain.

Communication between the AMR system central processor and the individual installed meters is through dedicated transformers and communication equipment installed in the substation serving the associated client's meter. The processed signals from the AMR substation equipment are routed to the central processor via the Authority's existing fiberoptic or microwave systems. The project calls for the installation of AMR communication equipment at all the Authority's substations throughout the island by the end of fiscal year 2011. As of the end of fiscal year 2009, the Authority had installed this AMR equipment at more than 94% of its substations.

The Authority's early experience with the AMR meters exposed weaknesses in the meter's resistance to tampering. In response the Authority toughened its meter specifications and began thermally spot sealing the digital meter's plastic case to deter tampering, or at the very least leave evidence of tampering if the meter were inspected. In addition, the Authority formed a multi-discipline technical group

to identify features to enhance the tamper resistance of the AMR meters. Although the Authority now buys meters with the most robust anti-tampering specifications commercially available, even the newest meters have proven susceptible to tampering with powerful magnets. In the second half of fiscal year 2009 the Authority significantly increased its theft detection and prevention program. Amongst other detection techniques, the program utilizes the comparison of local/temporary meters on the distribution lines versus the aggregate of the individual served meters, a comparison of a client's present electricity usage versus historical data, and a toll free hot line for anonymous reporting of suspect electricity theft. Based on experience in fiscal year 2009, the Authority anticipates the theft recovery program will generate considerable additional revenues and help deter further theft. As discussed in the *Legal Affairs* section the Authority has established legally binding administrative processes to recover contested billings for theft from responsible clients.

Although they are not among the AMR system features now being installed, the AMR has the capacity to incorporate at a later date the ability for the Authority to simultaneously monitor and control the performance of key components of its distribution system. By controlling such devices from a central location, the Authority would be able to enhance its capability to control load flow, manage restoration of service from an outage, and improve operational power factor. If added, this type of control could reduce operating costs, improve client satisfaction, and facilitate Demand-Side Management & Energy Conservation (DSM & EC) programs by allowing the utility to control its clients' energy use. The AMR system can also be expanded to provide real time electrical power consumption data to support analyses of operational performance and time based pricing structures that may be evaluated in the future.

Now that the Authority has completed the installation of the Work Management System in each district and implemented the interface with the Customer Information System, Customer Services operators can now switch between their billing system and the Work Management System while speaking with clients. During emergencies, all the commercial offices located across the island are integrated into the Work Management System, allowing trouble orders to be immediately generated electronically.

The implementation of these automated systems has allowed the Authority to consolidate many of its Customer Service centers. The new consolidated

offices improve operational efficiency and are a way to improve client satisfaction since the new service centers are staffed 24 hours a day seven days a week.

MAINTENANCE

The Authority generally maintains its transmission and distribution equipment using a time-based system. In some cases the maintenance intervals have been modified to meet the challenging tropical environment or relevant operating experience. As an example of routine periodic inspections, the Authority performs infrared inspections of all substations and switchyards twice a year. The infrared inspections are used to identify "hotspots" which are faulty connections that are overheating and are likely candidates for failure. In addition to performing electrical and mechanical testing, the equipment is painted on a periodic basis to help prevent corrosion.

The Authority's inspection and maintenance program for high voltage electrical equipment is based on the criticality of the equipment's service, with the scope and frequency of the inspections and maintenance guided by the manufacturer's standard recommendations. Main power and transmission transformers are inspected on a two year cycle, while substation transformers follow a four year interval. The Authority takes oil samples annually from all high voltage transformers in an effort to identify internal deterioration before it leads to failure. The Authority's oil analysis program relies on a recognized industry consultant's recommendations, coupled with its own operating and maintenance experience, to perform more frequent monitoring or eventually repair. As many major transformers approach their design service life this program has become increasingly important in maintaining the system operating reliability.

The inspection and testing frequency for other high voltage equipment in the maintenance program include: gas circuit breakers—six years; oil circuit and vacuum circuit breakers—four years; and protective relays—no more than three years for calibration and testing, with relays protecting major equipment such as transmission transformers tested more frequently based on when the equipment is out of service.

Recently the Authority's transmission towers have been subject to sporadic vandalism and the theft of aluminum structural bracing members for their scrap metal value. On one occasion removal of these components precipitated a transmission tower collapse, transmission line damage and subsequent loss of service in the surrounding area. While police

apprehended the thieves involved in the tower collapse, the Authority has increased inspections of all transmission towers using both the helicopter patrols and inspections from the ground. Any deficiencies identified in these inspections are repaired on a priority basis.

Transmission system maintenance expenses, shown in *Appendix III, Detail of Operating Expenses*, totaled \$33.0 million in fiscal year 2009. For fiscal years 2010 through 2014 the Authority has forecasted expenditures in millions of dollars of \$34.5, \$30.9, \$30.9, \$30.8, and \$30.7, respectively. Among these expenditures are funding for tower maintenance, tree trimming, insulator replacement, helicopter patrolling of transmission lines, and right of way management. The costs associated with the transmission system portion of substation maintenance are also included in these budgeted expenditures.

Distribution system maintenance expenses, also shown in *Appendix III, Detail of Operating Expenses*, totaled \$67.3 million in fiscal year 2009. The budget for fiscal year 2010 includes \$70.3 million for distribution system maintenance expense. For fiscal years 2011 through 2014 the Authority has forecasted expenditures in millions of dollars of \$66.3, \$66.1, \$66.0, and \$65.9, respectively. These expenditures include distribution system related expenditures similar to those described under transmission system maintenance expenses.

The Consulting Engineers believe the planned expenditures for maintaining the Transmission and Distribution Systems are adequate.

TRANSMISSION AND DISTRIBUTION SYSTEMS RELIABILITY

The principal guideline in the operation of a utility electric system is to continuously balance the real time demand for electricity (the load) and the simultaneous production of power while maintaining regulation of the system's voltage and frequency. The electric system is designed to meet this requirement across a wide range of operating conditions, which include loss of an operating transmission line or other key system component. Analyses of these design conditions establish the required redundancies in the system and operating criteria. Consistent with industry practice, the Authority has designed the entire transmission system to maintain continuous operation with at least one contingency event (loss of an operating component) and two contingencies for critical lines that move power from the central production plants.

Reliability Indices

Reliability standards have been in place within the North American electric utility industry for many decades. Following recent wide spread power losses in America, such as the Northeast blackout in August 2003, the electric power industry and its regulators have reaffirmed the importance of reliable service to support the balance of the economy. This was reinforced in the Energy Policy Act of 2005, which called for mandatory reliability standards for the interstate bulk power systems. The Authority's experience is consistent with the industry in that while the notorious blackouts are caused by the transmission systems, most interruptions to client service are caused by problems in the local distribution system.

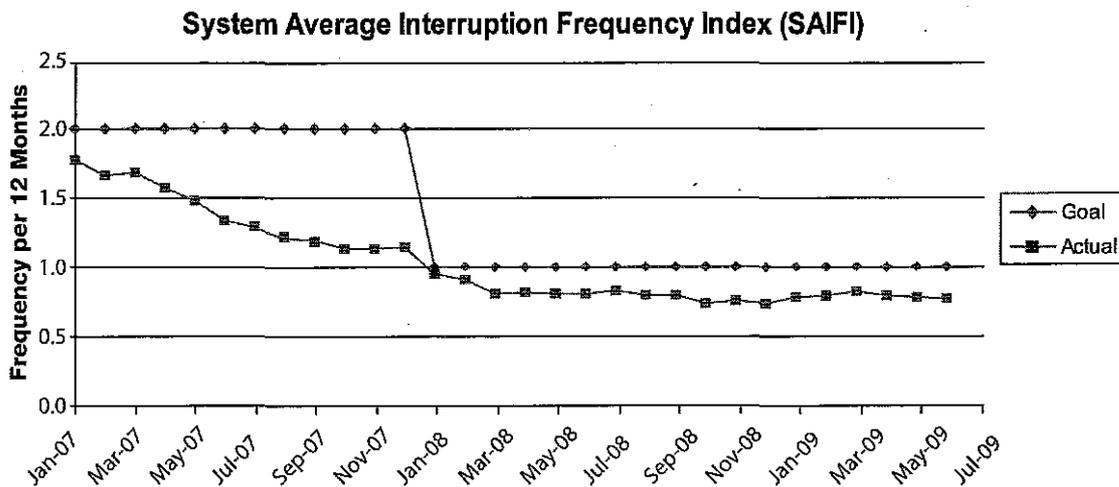
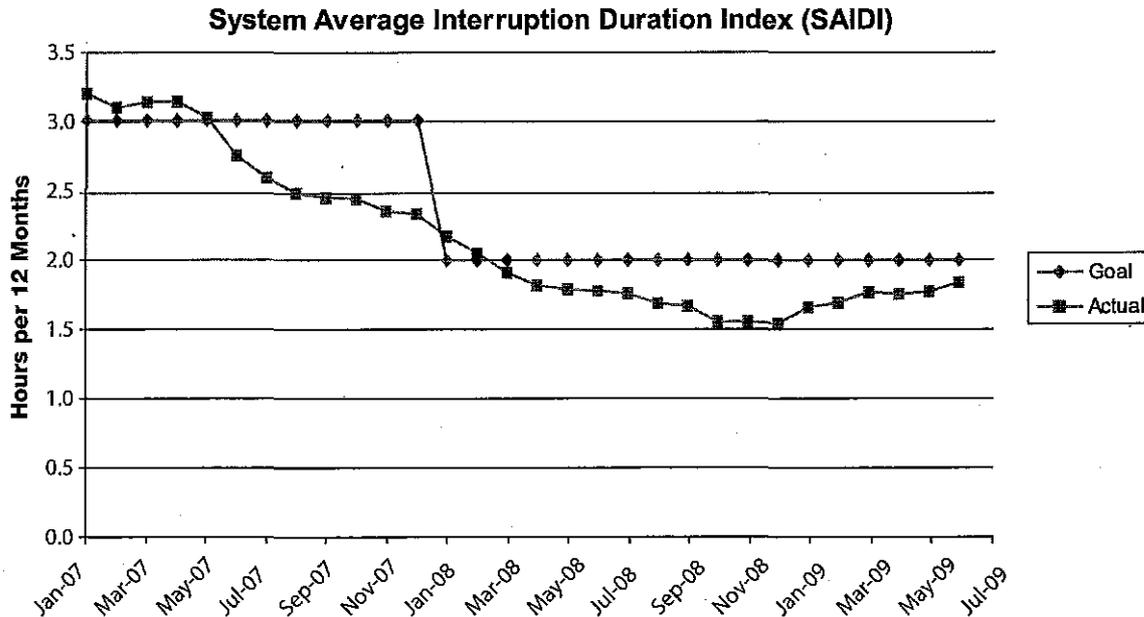
Two industry criteria generally accepted for measuring an electric system's reliability of service to its clients are the following:

System Average Interruption Duration Index (SAIDI) – The average duration of sustained service interruptions per client occurring during the preceding twelve-month period. It is the average time a typical client was without power over a rolling twelve-month period. The average is determined by dividing the sum of the durations of all sustained client interruptions by the total number of clients served. The Authority reports its SAIDI duration statistics in hours.

System Average Interruption Frequency Index (SAIFI) – The average frequency of sustained interruptions per client occurring during the preceding twelve-month period. It is calculated by dividing the total number of sustained client interruptions by the total number of clients served.

SAIDI and SAIFI indices take into account only sustained outages; they do not reflect momentary interruptions or voltage irregularities, which can affect sensitive electronic equipment. For both SAIDI and SAIFI, lower index values indicate better client service, i.e. shorter and fewer service interruptions.

Throughout the electric power industry the general procedure for calculating reliability indices has been implemented by most utilities with their own specific adjustments to reflect their service conditions. The Authority's SAIDI and SAIFI data include only outages longer than fifteen (15) minutes and exclude major events, such as the effects of tropical storms/hurricanes and disruptions from multiple contingencies.



The graphs above show the Authority's SAIDI and SAIFI data over the 30 month period ending on June 30, 2009 to provide some perspective on the short term trend of these indices. Starting in January 2007 and again in January 2008, the Authority lowered its goals for both SAIDI and SAIFI to reflect the Authority's objectives in continuing to improve client service. The SAIDI goal for calendar year 2007 was 40% less than previously, while the SAIFI goal was one-third less than previously. The SAIDI goal for calendar year 2008 was lowered an additional 33% and the concurrent SAIFI goal was cut in half. These new performance targets coincided with the Authority's reinvigorated tree trimming and vegetation control programs that specifically address a major cause of service interruptions. The scope of the Authority's program includes both transmission and distribution lines, as well as public education of

appropriate plantings located under overhead power lines. The Authority had previously lowered its reliability goals in January 2002.

The Authority's current SAIDI and SAIFI goals are only 40% and 33%, respectively, of what they were in calendar year 2006. These lower goals are more challenging to achieve and maintain, consequently the margin between the goals and actual performance has shrunk.

The average total duration of a client's sustained interruptions during the past fiscal year, as shown above in the Authority's 12-month rolling average of SAIDI, was consistently below the Authority's current goals and tended to remain in a relatively narrow range. This past fiscal year, however, may have marked the end of a nearly steady decrease in SAIDI statistics over the preceding six years during which the average interruption duration dropped by two-thirds.

During fiscal year 2009 the twelve-month rolling average of the number of sustained outages per client was stable and below the Authority's SAIFI goals for the year. In the eight years following fiscal year 2001, the frequency of service interruptions measured by SAIFI statistics peaked in the second quarter of fiscal year 2005. The SAIFI values in the past fiscal year were approximately one-fourth those in fiscal year 2005. Similar to the SAIDI statistics discussed above, fiscal year 2009 may have marked the end of the almost constant decrease in the frequency of interruption over the last four years.

As the Authority reduces the outages caused by trees and vegetation, one key to further improving the Authority's reliability performance will be the identification of the cause of service interruptions. The potential integration of the Customer Information System, AIRe and Automated Meter Reading systems may allow more detailed analysis of reliability data. In addition, it would be possible to acquire data on an individual client's actual experience rather than relying on composite averages.

GENERAL FACILITIES

The budget for capital improvements for the General Plant encompasses General Land and Buildings and Equipment. The budget for General Plant capital improvements during fiscal year 2009 amounted to \$71.0 million; actual expenditures during the past fiscal year were \$37.5 million. The largest reductions in capital expenditures during fiscal year 2009, compared to the budget, were in expenditures for land and rights of way, information technology equipment and systems for client services and other miscellaneous equipment. As shown on *Appendix X Details of Capital Improvement Program*, the expenditures for General Plant for fiscal years 2010 through 2014 are forecasted to be \$24.2 million, \$35.2 million, \$44.0 million, \$59.6 million, and \$45.5 million, respectively.

The extensions and improvements planned for fiscal year 2010 include \$7.8 million for General Land and Buildings. Expenditures within this category are for the acquisition of transmission rights of way, land for planned expansions, improvements to the Authority's warehouses, workshops, offices, buildings, and grounds. The budgets for new technical buildings and warehouses in the Capital Improvement Program have been deferred until fiscal years 2012 and 2013 respectively.

The total expenditures for Equipment in fiscal year 2009 were \$15.2 million, in comparison to a budget

of \$26.4 million. For fiscal year 2010 the total Equipment budget is \$16.4 million; this is comprised of four budget subgroups, as follows: The Computer Equipment budget for fiscal year 2010 is \$5.4 million—\$3.1 million is allocated to the Customer Service systems and \$1.2 million for improvements to the fiberoptic system. The Transportation Equipment budget is for repairs or improvements to the Authority's aircraft and purchase and replacement of the Authority's vehicles; the budget for fiscal year 2010 is \$6.6 million. The Communication Equipment budget is \$970,000 for fiscal year 2010. The last Equipment subgroup is Other Equipment, which has a budget of \$3.5 million for fiscal year 2010. The scope of this subgroup spans a wide range of equipment including specialized power quality monitoring equipment, vehicle repairs tools, small construction tools and miscellaneous tools used for the installation of distribution lines.

CONDITION OF THE SYSTEM'S PROPERTIES

The Consulting Engineers visited and noted the condition of each of the Authority's steam-electric generating facilities three or more times during fiscal year 2009 and also visited the other production facilities at least once during the fiscal year. In addition, we also visited and noted the condition of approximately one-third of the Authority's more than three hundred and seventy transmission centers and distribution substations. In the course of these visits we observed other property in the production, transmission, distribution, and general plant functional groups.

In conjunction with our field activities, we have reviewed various maintenance reports of the Authority, specific maintenance activities, and the planned actions for the next fiscal year. We have also reviewed reports submitted by manufacturers' representatives.

In the opinion of the Consulting Engineers, the properties of the System are in good repair and sound operating condition. The Consulting Engineer notes that Palo Seco Steam Plant Units 1 & 2 returned to service in fiscal year 2008 following a serious fire in December 2006. Palo Seco Unit 4 returned to service during fiscal year 2009, however it developed performance issues following its return to service and its output was limited at the end of fiscal year 2009. Unit 3 was scheduled to return to service early in fiscal year 2010.

CURRENT FORECAST

During the last third of every fiscal year the Authority develops a forecast entitled *Presupuesto de Ingresos* (Revenue Budget) that contains detailed short-to-intermediate-term projections of energy sales revenues, number of clients, fuel prices based on Energy Information Agency (EIA) projections; the forecast also includes long-term generation and long-term peak demand. This annual report references the Authority's forecast dated April 2009 as the "Current Forecast." The remainder of this section will describe the results of these forecasts and the methodologies used in their preparation.

The preparation of the Current Forecast is timed so that its projections may be used to develop short-term (1-2 years), intermediate-term (3-5 years) and long-term projections (6 years and beyond) of various financial and operational parameters. The short-term financial projection is used for the Authority's Annual Budget of Current Expenses (Annual Budget) for the ensuing fiscal year that begins on July 1st. The intermediate-term revenue projection is utilized to establish the Authority's needs for capital improvements and the projected sales revenues, which are used to evaluate its ability to meet the necessary covenants of its Trust Agreement regarding forecast revenue to projected debt coverage. The long-term projection of peak demand and available capacity through 2030 is used to plan for the addition of generating capacity in the future. (See *Capacity Planning*.)

Since the Current Forecast was prepared before the end of the fiscal year, it was based on actual kWh sales from July 2008 through February 2009. Energy sales for the balance of fiscal year 2009 were estimated by service class based on extrapolations of kWh sales for the three-year period of 2006 to 2008 and year-to-date data in fiscal year 2009. Generation requirements are derived from sales projections, adjusted to reflect system operating losses. The forecast methodology reduces data to a daily basis to allow adjustment for leap years.

The short-term and intermediate-term forecasts project estimated sales, revenues, number of clients, generation, and maximum demand on a monthly basis for the remainder of fiscal year 2009 and for all of fiscal year 2010 and on an annual basis thereafter through fiscal year 2014. Projections of fuel costs are also provided through fiscal year 2014. The long-range forecast projects annual generation (in GWh) and peak demand (in MW) is projected through fiscal year 2030.

The projected revenues in the Current Forecast are derived from the forecast energy sales by classification using existing base rates and the appropriate adjustment charges for the cost of purchased power and fuel. The revenue projections also take into account the residential subsidies but do not include the industrial and hotel subsidies. The Authority's forecasted revenues and payment obligations are discussed in the *Financial* section.

In the preparation of the Current Forecast the Authority typically reviews analyses of the Puerto Rico economy that are prepared each year by three independent economic consultants. The three consultants are Econometrica, Inc. (ECO); the Inter-American University – IHS Global Insight (IAU-GI); and the Commonwealth of Puerto Rico's Planning Board (Planning Board). The Authority uses the economic indicators projected by these economic consultants in these analyses in the preparation of its Current Forecast. In view of the uncertainties in the economic forecasts, the Authority generally uses the least optimistic five-year intermediate term energy sales projections for financial planning purposes and the most expansive projections for long-range capacity and operational planning. This year, however, the Authority selected the Planning Board projections because they were the least expansive for the budget year 2009-10 and effectively match the least expensive projections for the following two fiscal years. (See *Econometric Factors* section below.)

For the last two decades the short-term energy sales projections in the Authority's Current Forecasts have typically been conservatively close to actual performance; these were during a period of almost continuous electric sales growth only interrupted by the impact of hurricanes. Since fiscal year 2006, however, short-term consumption forecasts have understated the actual decline in consumption. To improve the accuracy of their projections, last year the Authority revised the modeling of residential and industrial class consumption to reflect the clients' sensitivity to the price of electricity.

Although the least expansive forecast was used to project the electric energy consumption in each of service class for fiscal year 2009, electric sales were actually 5.5% less than the previous year, compared to a projected decline of 1.3%. Additional discussion of fiscal year 2009 performance can be found in the *Short-to-Intermediate Term Energy Sales Forecast* section.

ECONOMY OF PUERTO RICO

Since the present depressed state of the economy of Puerto Rico is unprecedented in recent decades, economic forecasting for the island is currently difficult and more uncertain. The demand for electric energy in Puerto Rico has historically tracked the island's evolving economy and its attendant economic development. Puerto Rico's economy has evolved from primarily an agriculture economy in the early 1900s to one dominated by manufacturing in the 1940s through the 1970s and, finally, moving to a mixed economy largely comprised of the manufacturing and service sectors over the past three decades.

The Planning Board is the official Commonwealth agency that collects and reports the principal macroeconomic indicators utilized in the Current Forecast, which are the Gross Domestic Product (GDP), and the Gross National Product (GNP), of the Puerto Rico economy. The Planning Board's macroeconomic indicators depicted in the Current Forecast for fiscal year 2006 and 2007 were revised and fiscal year 2008 is preliminary. As measured by the GNP the Puerto Rican economy was robust in the three fiscal years ending in 2005, subsequently the economy grew marginally by 0.5% in fiscal year 2006 and contracted by 1.9% in fiscal year 2007 and 2.5% in fiscal year 2008. The Planning Board's preliminary estimate for the GNP is that it contracted by 3.4% during fiscal year 2009. For fiscal year 2010 the Planning Board initially projected a contraction

in the GNP of 2.0%, however, with the implementation of the Federal Economic Stimulus Plan and economic measures, such as the Employment Reduction Plan and the Economic Stimulus Plan, to be implemented by the Commonwealth Government of Puerto Rico, the Planning Board revised its projection that the GNP would grow marginally by 0.1% in fiscal year 2010, 0.9% in 2011 and 1.0% in 2012. The chart below reflects the earlier Planning Board projections that were utilized in the Current Forecast.

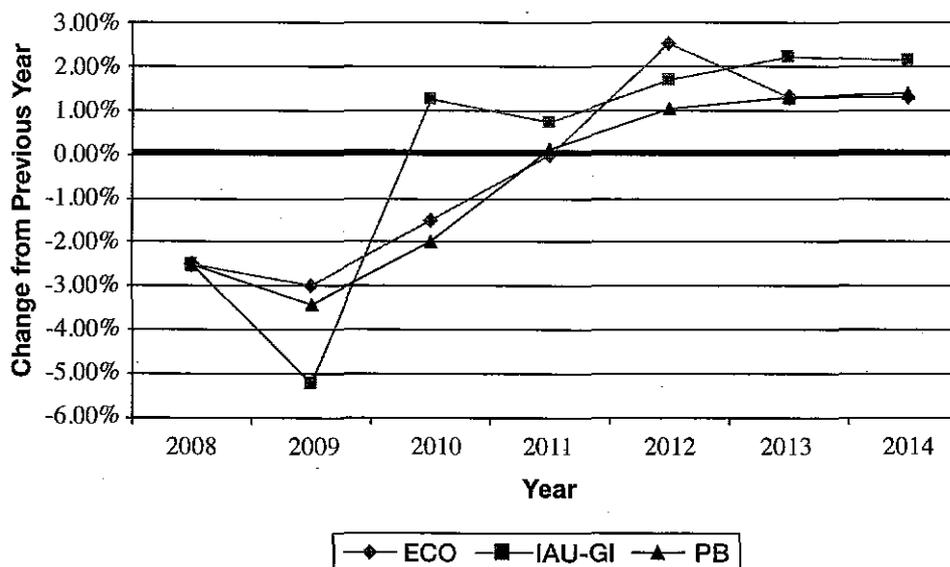
The following chart shows the projections of the Gross National Product for Puerto Rico by the Authority's three economic consultants for fiscal years 2009 through 2014.

ECONOMETRIC FACTORS

The Current Forecast is based on econometric models, which attempt to correlate the future consumption of electricity with recent consumption data, industrial class power costs and selected economic indicators. This year, as in most years, the Authority used three economic consultants to provide forecasts of these macroeconomic indicators. As mentioned earlier, the three consultants were Econometrica, Inc. (ECO); the Inter-American University-Global Insight (IAU-GI); and the Commonwealth of Puerto Rico's Planning Board (Planning Board).

To establish the sales forecasts in the Current Forecast for the base fiscal year of 2009, the

Projections of Gross National Product



Authority's model used actual data through February 2009 and estimated data for the balance of the fiscal year based on correlations with year-to-date data and extrapolation of data from the prior three years.

The projected energy sales by client classification data were developed using historical data since 1983 and selected economic indicators to March 2009. These macroeconomic indicators are:

- Gross Domestic Product (GDP), used in part to forecast residential and commercial kWh sales.
- Gross National Product (GNP) used as a factor in forecasting industrial kWh sales.

In developing the Current Forecast the Authority uniformly employs the economic indicators from each economic consultant. The resulting power sales over the five-year intermediate term forecast period are summarized below (CAGR is the compound annual growth rate):

PROJECTIONS OF TOTAL GWH SALES

Fiscal Year	ECO	Percent Change	IAU-GI	Percent Change	Planning Board	Percent Change
2008	19,601.6		19,601.6		19,601.6	
2009	18,574.3	-5.24%	18,574.3	-5.24%	18,574.3	-5.24%
2010	18,087.2	-2.62%	18,115.1	-2.47%	17,929.0	-3.47%
2011	17,729.2	-1.98%	17,938.8	-0.97%	17,739.2	-1.06%
2012	17,612.7	-0.66%	17,908.7	-0.17%	17,667.1	-0.41%
2013	17,468.3	-0.82%	18,036.1	0.71%	17,700.5	0.19%
2014	17,314.1	-0.88%	18,279.7	1.35%	17,826.8	0.71%
5-year CAGR		-1.40%		-0.32%		-0.81%

Generally the Authority would have used the ECO projections in its Current Forecast since these produced the lowest growth rate, negative 1.40%, in total energy sales over the future five year period 2010-2014. This year, however, the Planning Board's forecast was used because it was least expansive in total energy sales for the 2010 budget year with negative 3.47%. In addition, the sales projections based on the Planning Board were within 0.05% and 0.3% of projections based on ECO for fiscal years 2011 and 2012 respectively.

For reference, the Planning Board used the following assumptions while developing its economic forecast dated April 2009 over the forecast period:

The U.S. Economy

1. Contraction of the U.S. economy of -1.4% in 2009 and a marginal growth rate of 0.5% in 2010.
2. The average price of petroleum in fiscal year 2009 was \$65.33 per barrel and \$47.25 per barrel in 2010.
3. A reduction of 43.3% and 14.4% in interest rates for fiscal years 2009 and 2010 respectively.

The Puerto Rico Economy

An additional \$385 million in Federal transfers for 2010.

CONSUMPTION OF ELECTRICITY

Over the twenty years from the mid-1980's through 2006, the annualized rate of growth in the consumption of electricity in Puerto Rico was generally greater than that of the U.S. mainland. Interruptions in this pattern were principally caused by major weather events. The event with the greatest impact occurred in 1998 when Hurricane Georges devastated the island, causing severe damage to the Authority's system and a dramatic, short-term curtailment in power sales. By fiscal year 2000, however, the annual growth rate in the Authority's energy sales rebounded back to a robust 6.8%. The growth rates for energy sales in fiscal years 2001, 2002, and 2003, were moderate at 3.2%, 2.2% and 4.0% respectively. For fiscal years 2004 through 2007 the decline in the annualized growth rate for energy sales continued with marginal growth rates of 1.9%, 1.2%, 0.6% and 0.3%, respectively. For fiscal years 2008 and 2009 energy sales declined sharply resulting with negative growth rates of 5.2% and 5.5%, respectively.

The five-year power sales projection in the Current Forecast shows continued annual declines of 3.5%, 1.1%, 0.4%, for fiscal years 2010 through 2012, respectively and incremental positive growth of 0.2% and 0.7% in fiscal years 2013 and 2014, respectively. As shown on the comparative chart below, Electric Retail Sales-All Sectors US & PR, the rate of growth in electric sales have gradually decreased over the past five years in Puerto Rico as it has on the U.S. mainland. Looking forward, energy sales in Puerto Rico are projected to rebound and reach positive growth in fiscal years 2013 and 2014. U.S. energy sales dropped 5.2% in calendar year 2008, are forecast to contract for a second consecutive year in 2009

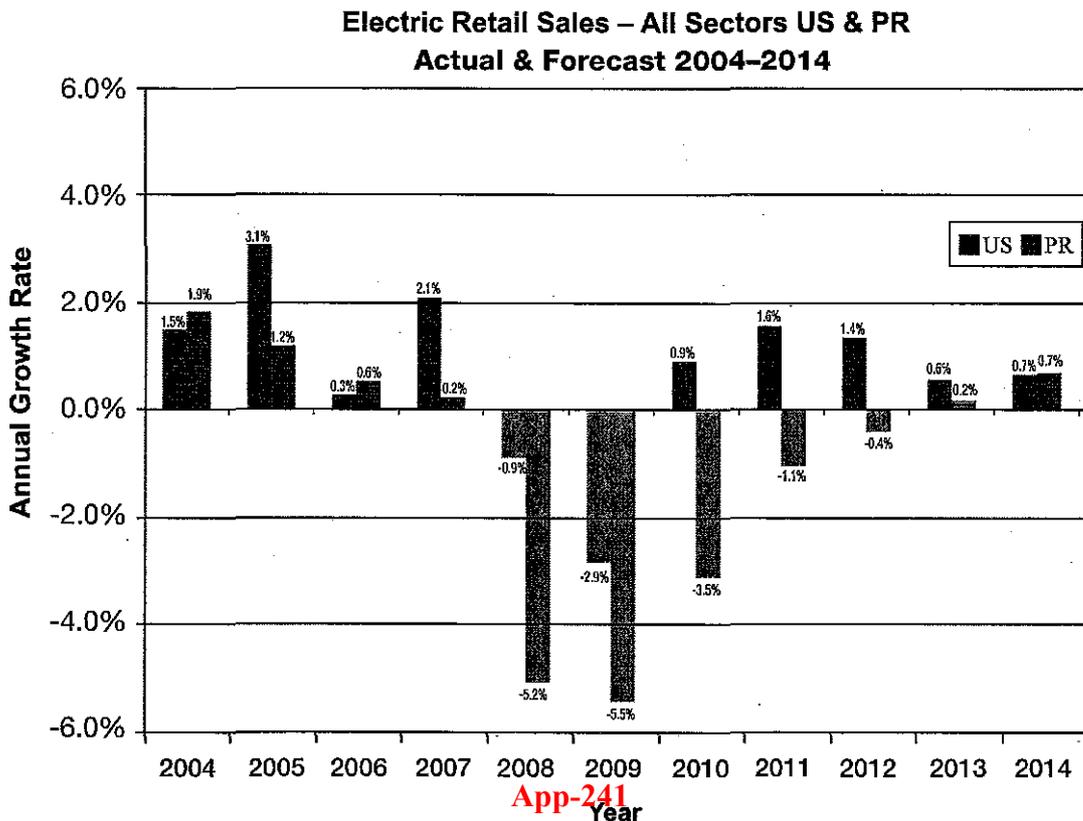
and then grow marginally in the calendar years 2011-2014. The data for the U.S. are derived from two EIA sources. The first EIA source is the Short-Term Energy Outlook, which is published on a monthly basis and is therefore current, was referenced for the historic data and the forecast for the calendar years 2009 and 2010. The EIA's Annual Energy Outlook was the source for the forecast data in calendar years 2010 through 2014. Data for 2010 were taken from the August 2009 Short-Term Energy Outlook, which reflected scaled back energy sales projections in comparison to the projections for 2011 and later, which were taken from the Annual Energy Outlook prepared in December 2008.

DEMAND AND ENERGY FORECAST

GENERATION FORECAST

The total net generation for fiscal year 2009, including purchased power and hydro-power, was 21,763 GWh, which was a 5.4% decline from the amount generated in the previous year. Over the five-year period from fiscal year 2004 through 2009, the compound annual growth rate (CAGR) in net generation was negative 1.1%. The Current Forecast of electric generation over the next five fiscal years, through 2014, has a CAGR of negative 0.8%. The long-term generation forecast for the next ten years through fiscal year 2024 project small but steady annual increases with a CAGR of 0.7% in that ten year period.

The Current Forecast develops generation data using the gross generation of the Authority's plants plus the amount of purchased power, which is the net output of the two cogenerators. As discussed above the generation projection in the Current Forecast was based on actual generation data through February 2009, preliminary generation data for March, and a projection for the balance of the fiscal year. The annual



generation for fiscal year 2009 in the Current Forecast predicted a decline of 5.4% compared to 2008, which closely matched the observed decline in net generation for the same period. The annual generation for the forecast period was determined utilizing a system efficiency that was the System's 12-month system average to February 2009, based on the sales and generation data methodology in the Current Forecast.

PEAK DEMAND FORECAST

Consistent with the Authority's conservative approach to expansion of generation capacity the Current Forecast used the projections of IAU-GI for the development of the peak demand forecast because it was the most expansive of the three economic consultants forecasts.

For the third consecutive year the System did not reach a new peak demand. The current historic system peak of 3,685 MW was established in September 2005, in fiscal year 2006. From fiscal years 2004 to 2009 the five-year CAGR in actual peak demand contracted by 0.9%. The peak demand for fiscal year 2009 was 3,351 MW which was 5.5% less than the peak demand reached during fiscal year 2008 and 9.1% less than the historic system peak demand.

The Current Forecast utilized a system load factor of 78.19% to project peak demand for the duration of the generation forecast to fiscal year 2030. The system load factor is the ratio of the average demand in kilowatts supplied during a designated period, in this case the 12 months through February 2009, to the peak or maximum demand also measured in kilowatts.

The most expansive model in the Current Forecast predicts that the 3,685 MW peak demand established during fiscal year 2006 will not be exceeded over the twenty-one year duration of the forecast. The forecast peak demand projects a 0.6% contraction in the CAGR during the five-year period from fiscal year 2009 through 2014 and 0.1% over the ten years from fiscal year 2009 through 2019. For comparison, the 2008 peak demand forecast showed a 0.9% CAGR for the five-year period through fiscal year 2013 and 0.8% for the ten-year period through fiscal year 2018.

Since 1993 the Authority has included explicit recognition of the potential effects of its DSM & EC programs in its peak demand forecasts. These programs are discussed below.

The *Peak Demand Forecast Comparison* graph below shows the degree in which the peak demand forecast has changed over the last several years.

DEMAND-SIDE MANAGEMENT AND ENERGY CONSERVATION PROGRAMS

Electric utilities offer programs to encourage clients to modify their levels and patterns of electric consumption. The implementation of such programs, known collectively as Demand-Side Management & Energy Conservation (DSM & EC), achieve two objectives; energy efficiency and load management. DSM initiatives such as load management programs are designed to achieve load shifting from peak hours to non-peak periods. Energy efficiency measures reduce the energy consumption of end-use devices and systems by promoting high-efficiency equipment and energy-efficient building design. Successful DSM & EC programs promote energy efficiency and achieve cost-effectiveness for utilities and clients thereby delaying the need for new capacity. DSM & EC programs help to conserve fossil fuel resources, reduce air pollution, and lower a utility's need for capital and its carrying costs.

As part of its Load Management Program the Authority promotes: Time-of-Use (TOU) rates to improve or smooth out its load curve; the purchase of energy-efficient motors and air conditioners; and the use of more efficient lighting. TOU rates offer economic incentives to Industrial and Commercial clients who modify their patterns of energy consumption, i.e., adding load to off peak hours and reducing load during peak hours. (For more information on TOU rates see the *Rates* section.) The Authority, with a limited staff, also offers clients advice on power factor improvement that benefits both the client and the Authority.

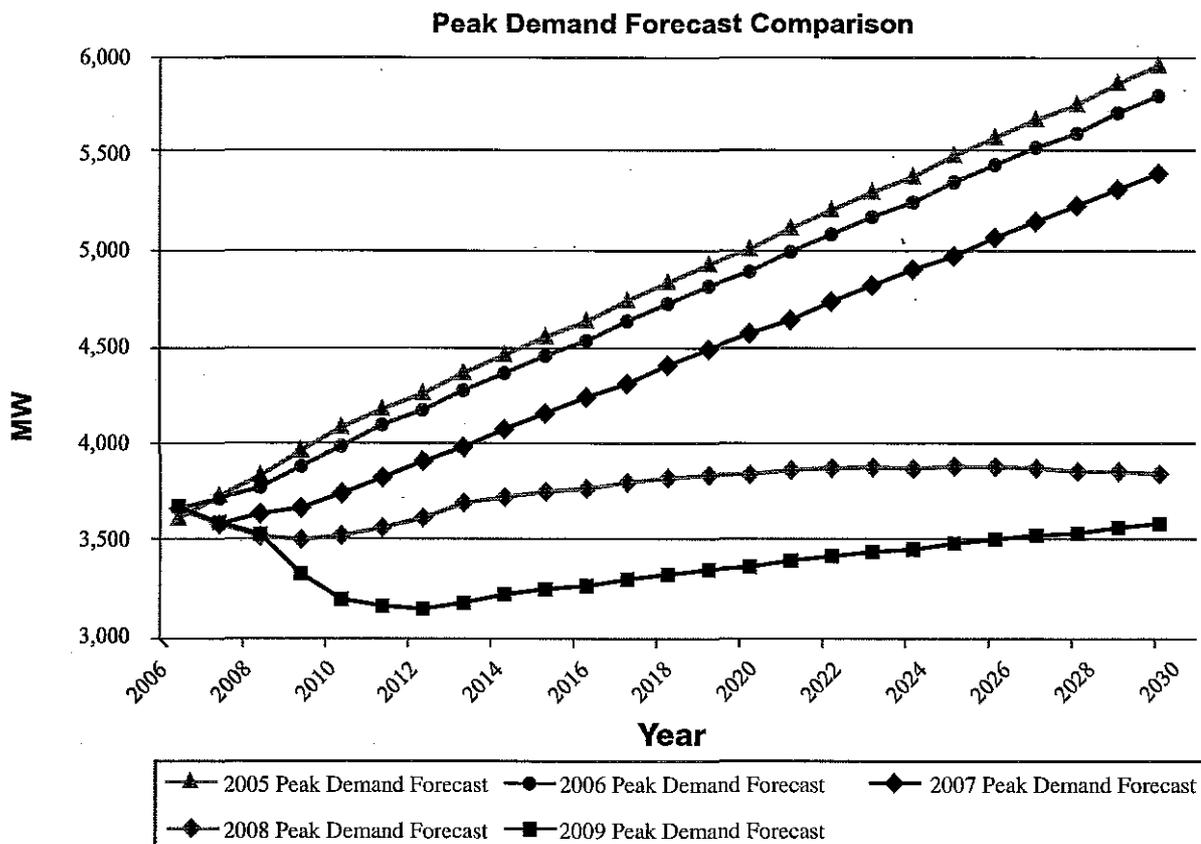
As part of its energy conservation program, the Commonwealth government promoted in September 2008 an energy efficiency program that offered a \$5 discount coupon for the purchase of four or more compact fluorescent light bulbs. The coupons were inserted into approximately 1.3 million residential electric bills during the monthly billing cycle starting on September 8, 2008 and were valid until the end of the calendar year. The Department of Consumer Affairs froze the price of the light bulbs as of August 15, 2008. The coupons could be redeemed at many authorized retailers through out the island. The estimated cost of this program was \$6.6 million.

The Authority, as it has for the past several years, projects that the savings from its DSM & EC program will lower peak demand by 1 MW per year. Its load reduction program might be even greater if the

optional energy management system (EMS) component were added to the automated meter reading system that is being installed throughout the system. Employing the EMS would allow the Authority to control clients' equipment, such as air conditioners, for periods when load management is desirable. The Authority continues to analyze the potential for load control among its small commercial clients.

CAPACITY PLANNING

The Authority periodically updates its Capacity Expansion Plan (CEP) as part of its efforts to ensure its ability to meet expected long term electric load growth, to provide reliable, cost-effective electric service to its clients, and to reduce its dependence on fuel oil. The CEP is updated using system-planning software that is widely accepted throughout the electric utility industry. The software employs multiple factors to determine the least cost system operation and expansion over the forecast period. Amongst other inputs, the computer simulation accounts for the unique cost and operational attributes of each existing and potential new production unit in the System. In addition, the model reflects that the Authority has no neighboring utilities with which to interconnect, that each of its large units supply a relatively high percent of the system load and that its load is fairly constant throughout the year. These last three characteristics significantly increase the reserve generating capacity



that the Authority must maintain in order to be able to provide reliable service to its clients.

The Consulting Engineers regularly reviews the Authority's capacity planning and believes that the Authority's Capacity Expansion Plan discussed in this section provides a reasonable basis for its capacity planning at this time.

OVERVIEW

AVAILABILITY

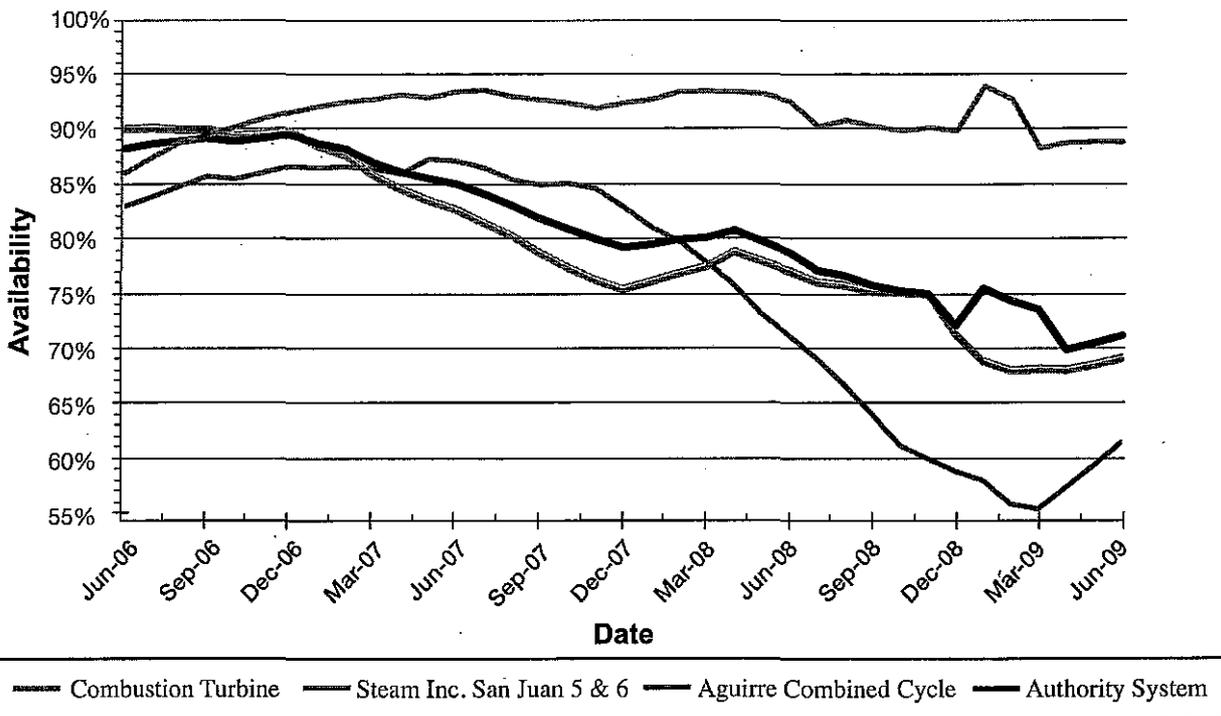
The Authority has directed considerable resources over almost two decades towards improving the availability of its electric production plant. With these significant capital expenditures, the Authority has been able to extend the life of its generating facilities, reduce the need for extended scheduled outages, and lower the frequency of forced outages, thereby increasing the percentage of time its generating units are available for service. During the last decade the Authority's total System annual production plant availability increased from being consistently in the range of 80% up to 2003, to more than 84% by the end of calendar year 2005, and as high as 88% in December 2006.

On December 29 and 30, 2006, the Palo Seco Steam Plant was forced out of service as the result of two separate fires. The extended loss of the 602 MW

steam plant from the island's load center severely tested electric production plant reserve capacity and the transmission system ability to move large quantities of power from the large generating units in the south to the load centers on the northern side of the island. Total system availability dropped from 88% just prior to the fires to 71% at the close of the fiscal year 2009. Restoration of the first two units at Palo Seco placed 170 MW back into the System; Unit 2 returned to service in November 2007 and Unit 1 returned in April 2008. The two larger 216 MW units required extensive overhaul with Unit 4 returning to service in March 2009, and Unit 3 scheduled for return in the first quarter of fiscal year 2010. The Authority anticipates recovery to previously demonstrated high levels of availability by fiscal year 2013, following completion of the scheduled major overhauls of certain larger steam units. As discussed in the *System's Operations* section some of these major overhauls were deferred pending restoration of the Palo Seco Steam Plant units.

The Authority's overall production plant equivalent availability for the three-year period ending June 30, 2009 is shown with performance by the three major kinds of generation—steam, combustion turbine, and combined cycle.

**Authority's Electric Production Plant Equivalent Availability
(12-Month Rolling Average)**



NEW CAPACITY

During fiscal year 2009 the Authority accepted for commercial operation two combined cycle units at the San Juan Steam Plant and eight combustion turbines at the Mayagüez facility.

The San Juan project, San Juan Units 5 & 6 went commercial in October 2008, and adds 464 MW of efficient combined-cycle capacity to the Authority's System. The addition is comprised of two combined-cycle units each consisting of one combustion-turbine rated at 165 MW with a heat recovery steam generator (HRSG) feeding a single 67 MW steam turbine-generator. The new combined cycle units are currently the most efficient of the Authority's production units.

The Mayagüez combustion turbine project replaced four older less efficient 21 MW combustion turbines with eight 27.5 MW dual fuel aero-derivative combustion turbines making four 55 MW units; each unit is comprised of two combustion turbines driving one generator. The first two units started operation in the third quarter of fiscal year 2009, operation of the last two units was accepted in the fourth quarter of the past fiscal year. The replacement combustion turbines incorporate newer technology that significantly improves the overall efficiency of the facility and adds 136 MW of new capacity.

Both the San Juan and Mayagüez units will initially operate on distillate fuel, with the provision for switching to natural gas when gas becomes available at the facility.

PURCHASED POWER

In parallel with the internal program to improve production plant performance, the Authority entered into long-term purchased power agreements with the owners of two privately owned and operated cogeneration facilities. These new plants were selected to aid the Authority in providing for electric load growth, reduce the island's dependence on fuel oil, and continue to improve the System reliability.

In accordance with a 22-year power purchase agreement (PPA) that commenced on March 21, 2000, the Authority began purchasing 507 MW of power produced by EcoEléctrica, L.P.'s gas-fired combined-cycle cogeneration facility. The PPA outlines capacity and energy charges to be paid by the Authority based on the performance and electrical output of the facility. A principal condition of the agreement is a progressive reduction in the monthly capacity charge, paid by the Authority, subject to the facility meeting

a minimum 93% availability on a 12-month rolling average. EcoEléctrica's target availability for fiscal year 2009 was reduced to 90% because of scheduled maintenance work; the actual availability was 89.6% for the period. The target availability during fiscal year 2010 will return to 93%.

The Authority has also entered into an agreement with AES-PR to purchase 454 MW of power from its coal-fired steam-electric plant. The plant, which consists of two identical fluidized-bed boilers and two steam turbines, uses clean-burning coal technology. The facility commenced commercial operation on November 29, 2002. The 25-year PPA with AES-PR is similar to EcoEléctrica, L.P.'s. The minimum guaranteed availability for AES-PR is 90%, slightly lower than EcoEléctrica, L.P.'s, but typical of coal-fired electric generating plants. Actual availability for the 12 months ended June 30, 2009 was 88.2%.

These PPAs have allowed the Authority to reduce its dependency on fuel oil, mitigate the economic risk of its electric system operation, and to schedule the retirement of some of its older, less efficient generating units. For further discussion on EcoEléctrica and AES-PR, refer to the *Cogenerators* in the *System's Operations* section.

Prior to the Authority purchasing power from the cogenerators, nearly 99% of the energy sold by the Authority was produced by its oil-fired units. During the current period of depressed energy sales, it is estimated that up to 37% of the Authority's annual energy sales could be derived from fuels other than oil, when both the EcoEléctrica, L.P. and AES-PR plants are operating at base load. In fiscal year 2009 actual cogenerator generation was 30.6% of the system total. Subject to dispatch and actual availability, the combined generation of EcoEléctrica, L.P. and AES-PR is forecasted to be 31.8% of the total System generation in fiscal year 2010.

Other benefits of the cogeneration contracts include fixing the cost of fuel used to generate electricity for each year of the contract at the beginning of such year. Annually, the fuel portion of the energy charge per kWh is set based on actual fuel-related energy charges for the preceding year, adjusted using inflation and other indices. The fixed nature of the fuel cost reduces short-term variations in the Authority's energy costs by bringing purchased power costs out of step with price changes in other components of the Authority's fuel mix. The fixed fuel costs also affords the Authority the opportunity to better dispatch its electric production plant.

FUTURE CAPACITY PLANNING

The Authority's current capacity expansion plan is based on the Authority's most recent Current Forecast dated April 2009. As discussed in the *Demand and Energy Forecast* section, the Current Forecast shows declining peak demand through fiscal year 2013 with only modest annual increases afterwards. The previous system peak of 3,685 MW, established in fiscal year 2006, is not currently forecasted to be exceeded until beyond the horizon of the Authority's capacity planning.

The reduction in forecasted peak demand allows the Authority to focus on reducing and stabilizing future electric power costs by decreasing its dependence on oil while improving the overall efficiency of its electric production plant. The first step in this process is to expand the use of natural gas for electric generation by utilizing it in modern efficient generating units. The price structure of LNG also tends to provide stable electric energy prices in comparison to oil. The Authority plans to initially utilize the excess storage capacity at the existing LNG facility located in Guayanilla at the EcoEléctrica cogeneration plant.

The first project to use the available gas at EcoEléctrica was intended to be the two existing 296 MW combined cycle units at the Aguirre plant, which were converted to dual fuel capability. The pipeline project from Guayanilla to Aguirre was canceled in April 2009, however, in response to community opposition to the pipeline.

The Authority is currently evaluating the utilization of the surplus gas storage at EcoEléctrica for a new combined cycle facility to be located at the Costa Sur Steam Plant. The combination of modern combined cycle efficiencies and the reduction in equivalent gas pricing over distillate could provide electric energy

savings of more than 35% over any of the Authority's existing oil-fired generating units based on current forecasts of fuel pricing.

The Authority's strategic plan is to expand the use of gas for electric generation across the island. As gas becomes available, the next candidate for gas firing will be the San Juan Units 5 & 6, which have dual firing capability and are currently the most efficient Authority owned generating units.

To further reduce its dependence on oil, the Authority is studying the construction of a new coal-fired plant at a former refinery in Guayama, on the island's southeast coast. The Authority is also studying the possible conversion of one or more of its steam generating units to coal firing. The conversion would require the construction of a new boiler to maintain steam cycle capacity and efficiency.

As stated above, the gas and coal fueled projects described are not required for load growth, and as such, are not presently included in the Capacity Expansion Plan while the Authority considers the economics of ownership and long term power purchase agreements.

The first six years of the current CEP are excerpted in the Capacity Expansion Plan table. Details of existing generating capacity of the System and the anticipated changes through fiscal year 2014 are shown in *Appendix VIII, System Capability*.

ALTERNATIVE ENERGY SOURCES

The Authority's policy is to review all valid proposals submitted by developers for power projects on the island. The basic economic criterion used to evaluate these proposals is that the cost of the power must be at or below the Authority's avoided cost for that power, which is the cost the Authority would incur if it were to build and operate the new capacity itself.

CAPACITY EXPANSION PLAN

(In MW)

Fiscal Year Ending	Peak Demand ¹	DSM Savings	Peak Demand Less DSM	System Capacity End of Year	Installed New Capacity	Retirements	Reserve Margin	Reserve Margin%
2009	3,351	0	3,351	5,864	684	84	2,513	75%
2010	3,224	1	3,223	5,864	0	0	2,641	82%
2011	3,192	2	3,190	5,864	0	0	2,674	84%
2012	3,178	3	3,175	5,864	0	0	2,689	85%
2013	3,210	4	3,206	5,864	0	0	2,573	80%
2014	3,253	5	3,248	5,864	0	85	2,531	78%

¹ 2009 Actual; 2010-2014 Based on IAU-GI projections in the Current Forecast dated April 2009.

At the end of fiscal year 2009 there were no firm alternative energy sources in the Authority's CEP because of uncertain project viability and timing.

To promote the use of renewable resources for the production of electric energy and further expand its energy diversification, the Authority created two subsidiaries to facilitate its participation in alternative power projects. The first wholly owned subsidiary is PREPA Oil & Gas, which was established to provide a mechanism for the Authority to participate in gas infrastructure projects or arranging fuel supplies for private power generators. The other new subsidiary is PREPA Renewables. This subsidiary was formed for the Authority to assist in funding renewable energy projects or to establish a joint venture with developers of renewable energy projects. Both subsidiaries currently hold no assets.

The Authority has entered into Power Purchase Agreements (PPA) with developers to purchase electric energy from three different wind energy projects and a waste-to-energy project. The wind projects, while not yet permitted, are 39 MW, 40 MW and 50 MW each. The largest 50 MW farm is to be located in Guayanilla on the southern side of the island.

The PPA with the waste-to-energy project is for 50 MW. This project is still in the permitting stage. Discussions related to a second waste-to-energy project continued during the past fiscal year, with no conclusion. While these facilities could help solve the waste disposal problems on the island, these projects have historically been uneconomic on the island and none are presently in operation.

To encourage more efficient and renewable on-site generation technologies such as photovoltaic panels, the Commonwealth legislature enacted the Economic Incentives Act in 2008 that sets out the basis under which the Authority would buy the excess power self-generated by a client. The scope of the Economic Incentives Act is discussed the *Financial* section. At this time the energy from distributed generation sources are not included in the CEP.

FUEL MIX

For information on the types of fuel used in the Authority's various generating units see the *Fuels* section under *System's Operations*.

The Authority purchases all its fuel oil under one-year contracts that include an option for a second year. These contracts are structured to reflect physical clearing prices, and avoid speculation in the market. In addition, the pricing structures of the two

cogenerators are based in part on annual indices to provide stable pricing for purchased power. These strategies, however, do not isolate the Authority from changes in energy costs that have been occurring over the last few years; all production related fuel expenses are currently recovered through the fuel component of the adjustment charge.

The total projected use of each type of fuel is based on generation required to meet the demand forecasts developed in the Current Forecast. The Authority utilizes an economic dispatch simulation of all generating sources in the System to determine the lowest cost generation plan. The dispatch simulation takes into account the heat rate, operational characteristics and fuel costs specifically for each plant. As discussed in the *Current Forecast* section, this information was developed for the remaining months of fiscal year 2009 and summarized annually for the five-year intermediate-term forecast. The actual annual results of generation, fuel use and costs for fiscal year 2009 and those forecasted over the five-year period are presented in *Appendix IV, Annual Generation, Fuel Consumption, and Fuel Costs for Thermal Stations*.

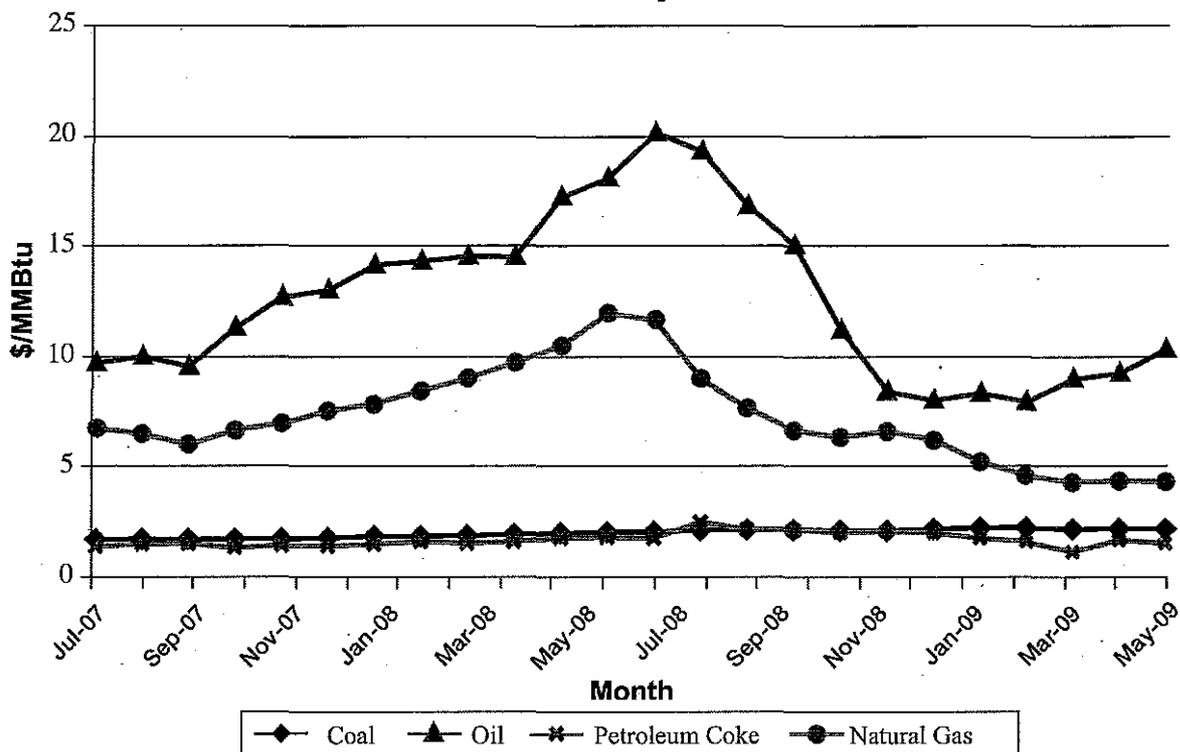
Although the data in the chart below is based on mainland facilities, the chart shows the volatility from July 2007 to June 2009 in the price of most fossil fuels used at electric generating plants as reported to the Energy Information Administration's (EIA), the reporting arm for the Department of Energy. It should be noted that the natural gas data in the chart reflect pipeline gas, while the only natural gas available in Puerto Rico is liquefied natural gas (LNG), which has a different pricing basis.

FUEL OIL

The Authority's average cost of fuel oil, including transportation and fuel-handling costs in fiscal year 2009 was \$76.23 per barrel. The total costs of fuel for fiscal year 2009 and the five-year forecast period are shown in *Appendix III, Detail of Operating and Maintenance Expenses*.

The Authority's projected cost of fuel per barrel including handling charges for fiscal year 2010 is \$65.99 and is forecasted to be \$80.38, \$94.04, \$100.22, and \$104.40 in 2011 through 2014, respectively. As discussed in the *Annual Budget* section, these fuel costs were utilized in the Authority's amended Annual Budget that was developed in January 2010. The forecasted prices of fuel are based on EIA indices for the types of fuel oil the Authority burns adjusted for the Authority's location and inci-

U.S. Electric Utility Fuel Costs



dental charges. The composite barrel cost is based specifically on the mix the Authority has forecast to be utilized in the generating units. For its short-term projection the Authority used the EIA's *Short-term Energy Outlook* dated August 2009. For its intermediate-term projections the EIA's *Preliminary Annual Energy Outlook 2009* dated December 2008 was used.

These projected fuel costs were used to develop the annual costs of fuel and the fuel adjustment revenues in the Authority's Current Forecast (See *Appendix I, Intermediate-Term Financial Planning Forecast*).

The Authority's oil fired units generated 69.8% of the System total energy in fiscal year 2009. Its total fuel oil storage capacity is 4.7 million barrels, including rented storage. This maximum capacity would be sufficient for the Authority to operate more than 50 days; however, the Authority typically maintains a 30 day inventory of fuel oil. It is worthwhile to note that the Authority has never had to curtail electric service from fuel oil shortages or from problems delivering fuel to its generating facilities.

NATURAL GAS AND COAL

Natural Gas

In March 2000 the Authority entered into a 22-year contract with EcoEléctrica, L.P. to purchase all the power produced by the first natural gas fired facility on the island. In fiscal year 2009, EcoEléctrica, L.P. represented 8.6% of the System's capacity and provided 15.1% of the Authority's dispatchable energy. For fiscal year 2010 the energy provided to the Authority's system is forecast to be 15.8% of the total.

As discussed above, part of the Authority's long-term fuel strategy has been to increase the use of natural gas in new and selected existing units. While the excess liquefied natural gas (LNG) storage capacity at the EcoEléctrica facility could be sufficient to supply a nominal 500 MW gas-fired combined cycle plant; any subsequent increased utilization of gas will require new LNG infrastructure for handling, storage, and gasification.

To establish the forecast cost of LNG, exclusive of EcoEléctrica, the Authority uses the EIA's projected price for imported LNG and applies an adjustment factor for transportation costs and re-gasification costs in Puerto Rico.

App-248

Coal Fueled AES-PR

The AES-PR plant began commercial operation in November 2002. The plant uses fluidized bed boilers, which are considered a clean coal-burning technology. The Authority has entered into a 25-year PPA to purchase all the power produced by the facility. Although AES-PR comprises 7.7% of the System's capacity, this co-generator also provided 15.5% of the Authority's dispatchable energy during fiscal year 2009. It is anticipated that the plant will provide 16% of the system's total generation in fiscal year 2010.

To establish the forecast cost of energy from the AES-PR coal plant, AES provides the Authority with the annual forecast costs from its supplier.

ENERGY SALES FORECAST

The Authority's annual Current Forecast contains detailed projections of short-to-intermediate-term sales and revenues. The methodology and results of the Current Forecast are discussed in the *Current Forecast* section above. As is usually the case, this year three economic consultant's projections of the economy of Puerto Rico were examined in the Current Forecast. The consultants forecast two key macroeconomic indicators Gross Domestic Product and Gross National Product, which are used with other variables to project the intermediate-term electric sales and revenues.

To account for the uncertainty inherent in economic forecasting the Authority generally chooses the least optimistic economic consultant's projections over the intermediate five-year period for its financial forecast. In this year's Current Forecast an exception was made to utilize the least expansive for the first two years of the forecast period, as discussed in the Current Forecast section.

SHORT-TO-INTERMEDIATE TERM ENERGY SALES FORECAST

As discussed in the *Current Forecast* section, the growth rate in the Authority's total kWh sales has been steadily slowing over the last several years and actually contracted over the past two years. The actual total kWh sales in fiscal year 2009 decreased 5.5% from the previous year and the three largest sectors experienced a decline as they did in fiscal year 2008 when total kWh sales experienced a decrease of 5.2%. The projection from last year's Current Forecast was a 1.3% decrease in energy sales for fiscal year 2009.

As shown in the table below, total sales for fiscal year 2010 are projected to decrease by 3.5%. The annual decrease in total energy sales is projected to continue to fiscal year 2012 and increase marginally during the final two years of the five-year forecast. The Current Forecast projects annual kWh sales for fiscal years 2011 through 2014 to be -1.1%, -0.4%, 0.2%, and 0.7%, respectively.

Last year's Current Forecast projected that energy sales would decrease at a CAGR of 0.3% over the five-year period ending in fiscal year 2013. This year's Current Forecast for fiscal years 2009 through 2014 projects an annual decrease of 0.8% over the five-year period. For comparative purposes the EIA projects that the CAGR for U.S. mainland electric sales for the five calendar years ending in 2014 will be 1.6%.

The projected energy sales through fiscal year 2014, taken from the Authority's Current Forecast, are summarized in *Appendix I, Intermediate-Term Financial Planning Forecast*.

The table below, Short-term Energy Sales Forecast, shows actual kilowatt-hour sales and percent change from the prior year by major client classifications for fiscal years 2008 and 2009. It also shows the projected kilowatt-hour sales and percent change from the prior year by major client classifications for fiscal years 2009 and 2010 taken from the Authority's Current Forecast.

SHORT-TERM ENERGY SALES FORECAST

(GWh)

	FY 2008 Actual ¹	FY 2009 4/09 Estimate	FY 2010 Actual ¹	4/09 Forecast ²
Residential Sales	6,577.2	6,346.5	6,367.6	6,035.5
Annual Increase (Decrease)	(6.7%)	(6.1%)	(5.8%)	(4.9%)
Commercial Sales	8,743.6	8,514.5	8,498.1	8,349.9
Annual Increase (Decrease)	(1.9%)	(2.7%)	(2.8%)	(2.0%)
Industrial Sales	2,772.5	3,332.7	3,288.6	3,188.2
Annual Increase (Decrease)	(9.5%)	(10.4%)	(12.1%)	(5.0%)
Other Sales	358.2	361.5	361.2	361.5
Annual Increase (Decrease)	(6.2%)	0.9%	0.9%	0.0%
Total Sales	19,601.6	18,574.5	18,595.8	17,929.0
Annual Increase (Decrease)	(5.2%)	(5.2%)	(5.5%)	(3.5%)

1. As reported in the Authority's Preliminary June 2009 Governing Board Report.
2. Percentage is calculated on forecast sales for fiscal year 2009
3. Other Sales are comprised of Agricultural, Other Public Authorities, and Public Lighting.

The kWh sales statistics for the U.S. cited in the following discussions are taken from EIA reports: *Annual Energy Outlook 2009 with Projections to 2030* dated March 2009, and *Short-term Energy Outlook—August 2009*. The U.S. 2008 calendar year energy sales are preliminary and 2009 are estimated.

RESIDENTIAL KWH SALES

Fiscal year 2009 marks the fourth consecutive year that there has been a decline in residential energy sales. During fiscal year 2009 residential energy sales were 6,367.6 GWh or 5.8% less than fiscal year 2008, which in turn had experienced residential energy sales that were 6.7% below the previous year. The continuing economic recession and the increased cost of living has played a large part in the decline in energy sales to this sector. In the Authority's Current

Forecast, residential kWh sales for fiscal year 2010 are estimated to decrease by 4.9%.

Actual residential kWh sales for the five-year period ended June 30, 2009 decreased at a CAGR of 2.8%. The Current Forecast projects the residential sector consumption to decrease at a CAGR of 2.5% through fiscal year 2014.

The average number of residential clients the Authority served during fiscal year 2009 was 1,324,752—an increase of 0.8% from the previous year. In the past five-year period the number of residential clients increased at a CAGR of 0.6%. For fiscal year 2010 the number of residential customers is projected to increase by 0.2% and the forecasted CAGR five-year period ending in 2014 in the number of residential clients is forecast to increase by 0.2%.

In fiscal year 2009 the average annual electric consumption per residential client was 4,806.6 kWh, which was 6.8% less than the previous fiscal year; this continued a trend of decreased consumption over the last six years. In fiscal year 2010 the average residential energy consumption is forecast to decrease by 5.0%, with a slowly improving negative trend continuing throughout the five-year period. The past five year CAGR of average residential consumption contracted by 3.4%. The future five-year CAGR in average residential consumption is forecast to be negative 2.7%.

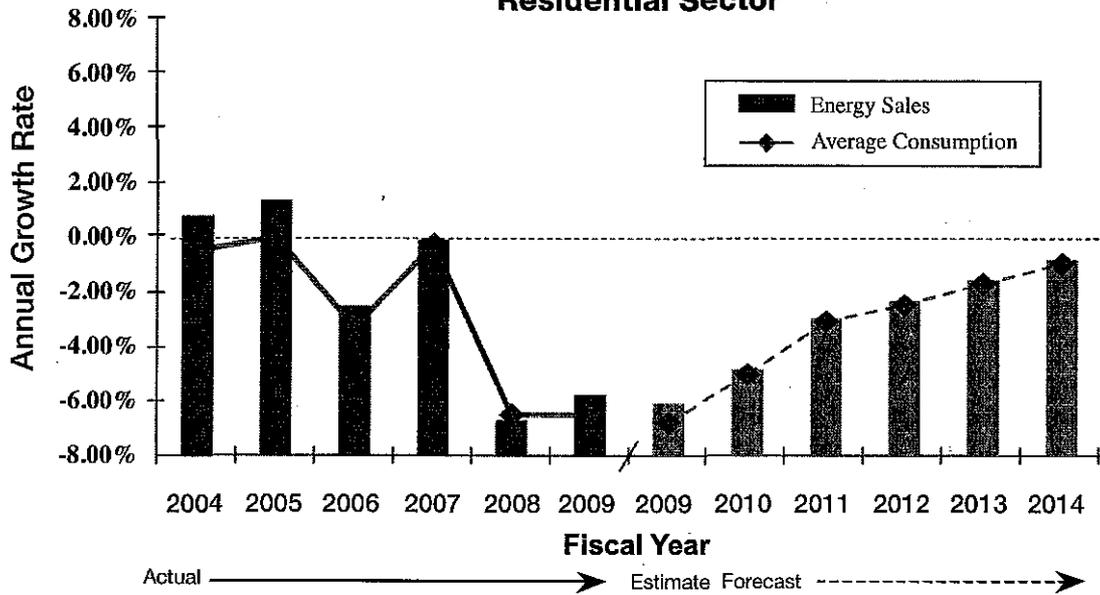
EIA data for recent performance of the U.S. electric sales are preliminary. These data show that U.S. residential energy sales decreased 1.2% in calendar year 2008 and are estimated to increase by 0.3% in calendar year 2009. The preliminary five-year CAGR in U.S. residential kWh sales for calendar years 2004 through 2009 is 1.3%. The projected five-year compound growth rate in U.S. residential kWh sales for calendar years 2009 through 2014 is 0.3%.

According to EIA statistics, the average electric consumption of the Authority's residential clients is approximately 46% of the average electric consumption of residential clients of the U.S. South Atlantic Census Division.

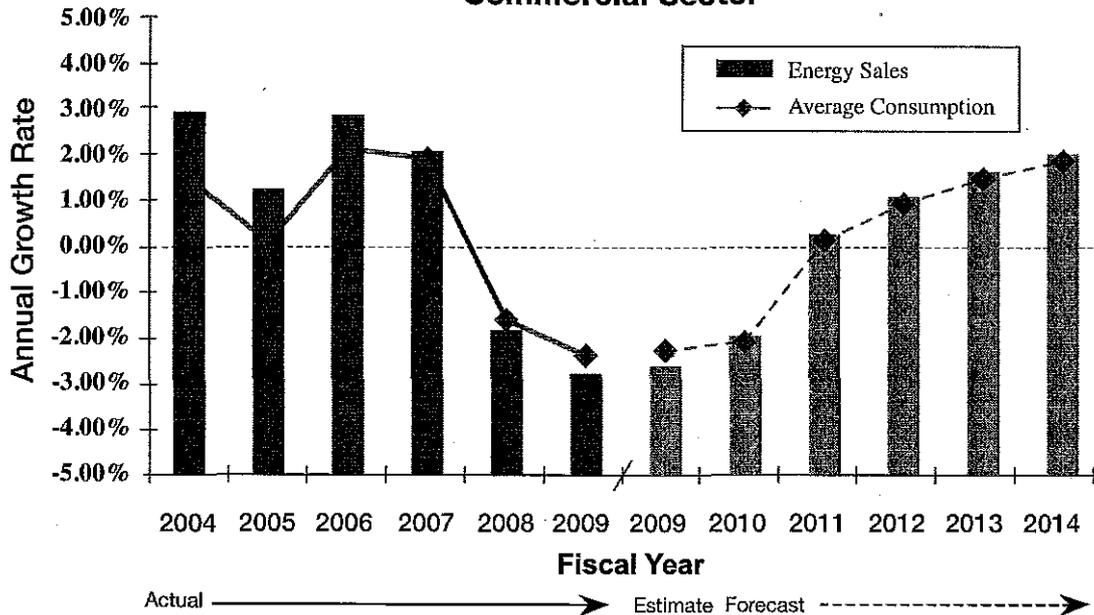
COMMERCIAL KWH SALES

Commercial kWh sales declined for the second consecutive year in fiscal year 2009, with a decrease of 2.8% from the previous fiscal year. In fiscal year 2008 commercial kWh sales decreased 1.9% from those of the previous fiscal year. The Current Forecast projects that commercial power sales will decrease by 2.0% in fiscal year 2010.

Change in kWh Sales and Average Consumption Residential Sector



Change in kWh Sales and Average Consumption Commercial Sector



The five-year CAGR of commercial sales from 2004 through 2009 was 0.2%, however, the Current Forecast projects a future five-year CAGR from 2009 through 2014 of 0.5%. This year's Current Forecast contrasts with last year's forecast which projected a 0.1% contraction in the CAGR in commercial energy sales over the five-year period ending 2013.

The average number of commercial clients during fiscal year 2009 was 129,492, a decrease of 0.4%

from the previous fiscal year. The CAGR in the commercial client base for the five years through fiscal year 2009 was 0.3%. In fiscal year 2010 the average number of commercial clients is projected to increase by 0.1% and uniformly continue that rate of expansion for the future five years through 2014.

The average annual consumption per commercial client during fiscal year 2009 was 65,627 kWh for a decrease of 2.4% from the previous year. The

Authority's actual five-year CAGR in consumption per commercial client through the end of fiscal year 2009 was negligible. For fiscal year 2010 the average kWh consumption per commercial client is projected to decrease by 2.1%. The Current Forecast projects a CAGR of 0.4% in electric consumption per commercial client over the next five fiscal years.

Based on preliminary EIA data, U.S. commercial kWh sales grew 0.6% in calendar year 2008 and are estimated to decrease by 1.1% in calendar year 2009. The preliminary five-year CAGR in U.S. commercial kWh sales for calendar years 2004 through 2009 is 1.7%. The projected five-year CAGR in U.S. commercial kWh sales for calendar years 2009 through 2014 is 2.1%.

According to EIA statistics, the average kWh consumption of the Authority's commercial clients is approximately 74% of commercial clients of the South Atlantic Census Division of the U.S.

INDUSTRIAL KWH SALES

Industrial kWh sales for the fiscal year 2009 decreased 12.1% compared to the previous year during which industrial kWh sales decreased 9.5%. Actual industrial kWh sales for the five-year period ending in fiscal year 2009 decreased at a CAGR of 4.2%.

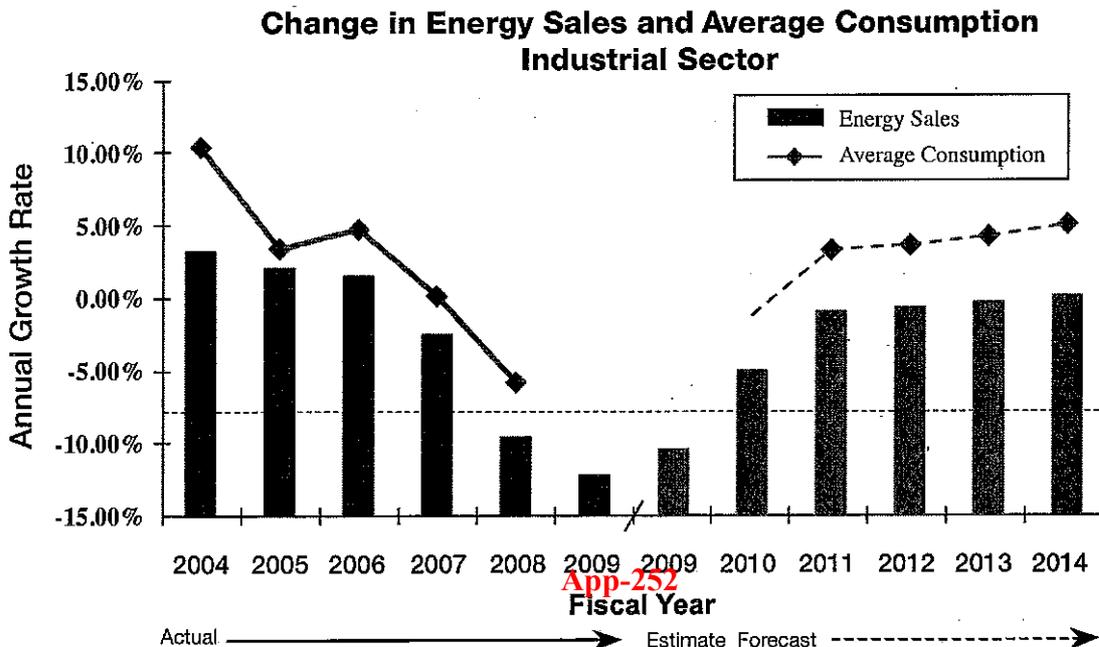
The Current Forecast projects that in fiscal year 2010 industrial energy sales will decrease by 5.0% followed by marginal annual contractions of less than 1.0% to 2013 and a 0.2% increase in 2014. This sector is forecasted to contract at a CAGR of 1.3% for the five-year period through fiscal year 2014.

During fiscal year 2009 the Authority reclassified 612 government industrial clients from the industrial General Service at Secondary Voltage tariff to the corresponding commercial tariff, to lower these clients' rates. The transfer of these clients from the industrial to commercial base reduced the size of the industrial sector by more than 40%. At the end of fiscal year 2009 the Authority served 898 industrial clients. The average annual consumption of those clients at the end of fiscal 2009 was 3,662.1 MWh. The Current Forecast projects the number of industrial clients to decrease by approximately 34 clients per year over the next five years. The average consumption per Industrial client is omitted from the graph below for fiscal years 2009 and 2010 because of the reclassification.

The CAGR for the future five-year period ending in 2014 in energy use per client is projected at 2.9%.

Preliminary EIA data show total industrial U.S. kWh sales decreased 2.8% in calendar year 2008 and are projected to decrease by 10.3% in calendar year 2009. The preliminary five-year CAGR in U.S. industrial kWh sales for calendar years 2004 through 2009 is negative 2.9%. The projected CAGR in U.S. industrial kWh sales for calendar years 2009 through 2014 is 2.7%.

According to EIA statistics, the average kWh consumption of the Authority's industrial clients is approximately 100% more than those of the South Atlantic Census Division of the U.S.



OTHER CLASSES KWH SALES

The sum of the kWh sales in fiscal year 2009 to clients in the public lighting, agricultural and other public agency classes, known as the "Other" sector, represented less than 2% of the Authority's total energy sales. In 2009 the group's kWh sales were 0.9% more than for the previous year. In fiscal year 2008 the Other sector posted a decrease in kWh sales of 6.2%. The Authority's Current Forecast projects virtually no change in kWh sales to this group throughout the forecast period.

The number of clients in this group is projected to remain unchanged during the forecast period.

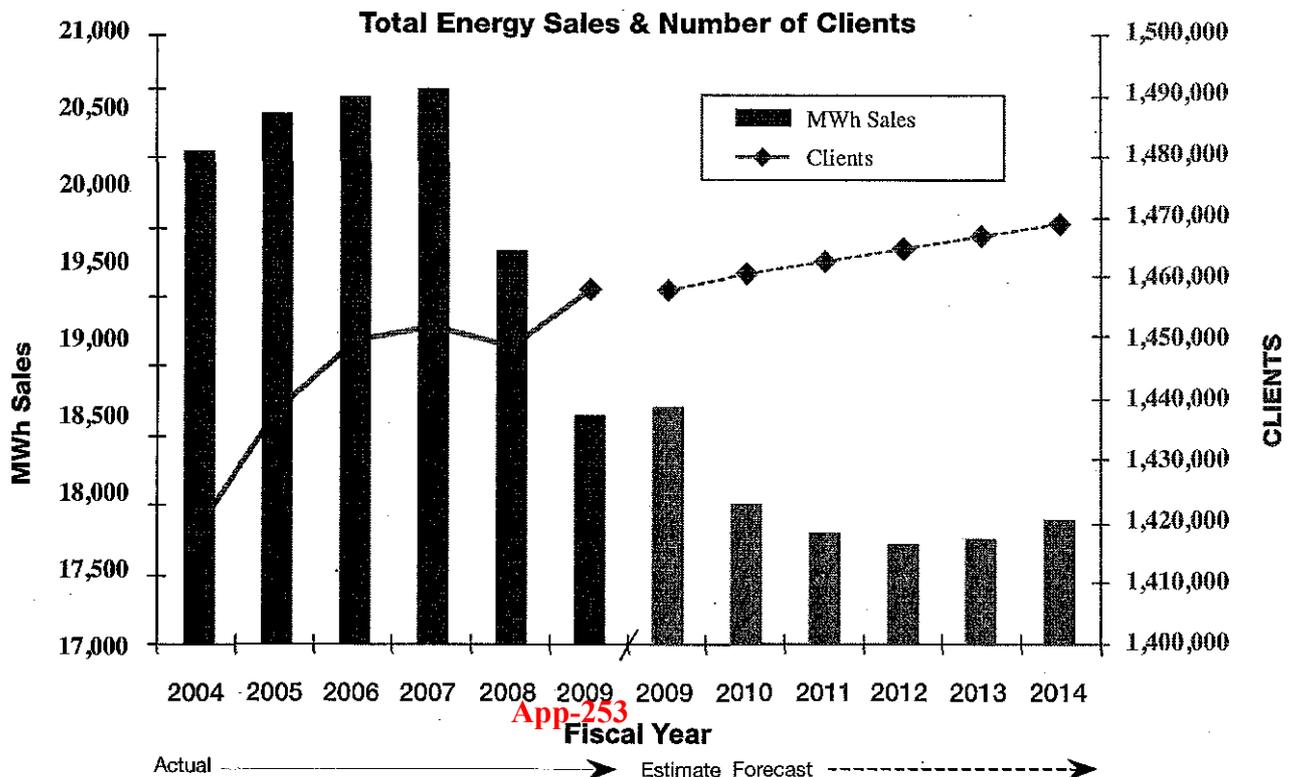
TOTAL KWH SALES

Total energy sales in fiscal year 2009 declined for the second consecutive year, with sales of 18,515.8 GWh, a decrease of 5.5% from those of the previous fiscal year. In fiscal year 2008 the total kWh sales decreased 5.2% over those of 2007. Actual total kWh sales for the five-year period ended June 30, 2009, decreased at a CAGR of 1.8%. In the Current Forecast total kWh sales are expected to decrease by 3.5% for fiscal year 2010 and to decrease at a CAGR of 0.8% per year over the five-year period ending in fiscal year 2014; this contrasts with the 0.3% growth in total kWh sales projected in last year's forecast for the five-year period ending in fiscal year 2013.

The average number of clients that the Authority served during fiscal year 2009 increased 0.7% from the previous fiscal year to 1,458,636. Over the five-year period ending in 2009 the CAGR in the number of clients was 0.5%. The total number of clients is projected to grow by 0.2% in fiscal year 2010. The total number of clients is projected to increase at a CAGR of 0.2% per year through the next five years of the forecast period ending in 2014.

The average electric consumption of the Authority's clients in fiscal year 2009 was 12,694 kWh, a decrease of 6.2% from the previous year. Over the past five-year period the CAGR was negative 2.3%. The Current Forecast projects the average consumption of the Authority's clients will continue to decrease in fiscal year 2010 by 3.7%, and the five-year CAGR is projected to decrease by 1.0% annually through fiscal year 2014.

The preliminary data for total U.S. kWh sales show a decrease of 0.9% in calendar year 2008. For calendar year 2009 total kWh sales in the U.S. are estimated to contract by 2.9%. The CAGR for the U.S. preliminary total kWh sales during the five-year period between calendar years 2004 and 2009 is 0.3% and is projected to be 1.6% for the five-year period ending in 2014.



RATES

Section 706 of the 1974 Agreement charges the Consulting Engineers to prepare each year a report setting forth their recommendations as to any necessary or advisable revisions of rates and charges.

Section 502 of the 1974 Agreement details the Authority's responsibilities with respect to rates as follows:

The Authority further covenants that it will at all times fix, charge and collect reasonable rates and charges for the use of the services and facilities furnished by the System and that from time to time, and as often as it shall appear necessary, it will adjust such rates and charges so that the Revenues will at all times be sufficient

(B) *after the outstanding 1947 Indenture Bonds have been paid or provision has been made for their payment and the release of the 1947 Indenture:*

(a) *to pay the Current Expenses of the System, and*

(b) *to provide an amount at least equal to one hundred twenty per centum (120%) of the aggregate Principal and Interest Requirements for the next fiscal year on account of all the bonds then outstanding under this Agreement, reduced by any amount deposited to the credit of the Bond Service Account from the proceeds of bonds to pay interest to accrue thereon in such fiscal year.*

The revenues generated by the Authority's various rate schedules provide the moneys necessary for it to meet all of its obligations as detailed in the 1974 Agreement. Among its obligations are: paying the current expenses of the System; financing future growth by issuing Power Revenue Bonds; making deposits to specified funds; maintaining a minimum specified debt service ratio; and paying Contributions in Lieu of Taxes.

Typically, the client's bill consists of the appropriate base rate and an adjustment charge. The base rate encompasses current expenses, i.e. operation and maintenance (O & M) expenses (excluding the cost of fuel and purchased power), monies for funding requirements, Contributions in Lieu of Taxes associated with base rate revenue, depreciation and amortization, insurance, and debt service. The base rate has three components—a demand charge, a customer charge, and an energy charge, except for clients that receive electric service at secondary voltage. The base rate for clients served at secondary

voltage is comprised of a customer charge and an energy-related charge. The adjustment charge has two components: the charge for purchased fuel and the charge for purchased power. (For a discussion of these charges see *Adjustment Charge* below.)

RATE SCHEDULES

CLASSIFICATIONS AND REVENUES

In order to serve different segments of its clientele, the Authority provides electric service in six client classifications. Ranking these classes in their order of revenue generated during fiscal year 2009, they are: Commercial, Residential, Industrial, Public Lighting, Public Authorities, and Agricultural. Three of these classifications—Commercial, Residential, and Industrial—represented 98.0% of the kilowatt-hour sales and contributed 97.2% of the Authority's revenues from the sale of electricity. The remaining three classifications—Public Lighting, Other Public Authorities, and Agricultural – collectively represented the balances of the Authority's kilowatt-hour sales and revenue from the sale of electricity.

Four rate schedules apply to the large majority of the Authority's client base. These four rate schedules are: GRS (General Residential Service), GSS (General Service at Secondary voltage), GSP (General Service at Primary voltage), and GST (General Service at Transmission voltage). These four rate schedules serve the majority of the Authority's clients because they were designed for wide applicability and they have few, if any, load characteristic requirements. To broaden their usage, the GSS, GSP, and GST rate schedules are available to both commercial and industrial clients. During fiscal year 2009 the core four rates accounted for 86.8% of the Authority's kilowatt-hour sales and 87.9% of its revenues from the sale of electricity.

The following table shows the major contribution of these four rate schedules to the Authority's electric sale and its total revenue. In each of the largest three classification there is dominant rate schedule. For example, although three rate schedules apply to the Residential classification, the GRS rate schedule serves 86.0% of the Residential clients and accounts for 91.1% of the Residential class revenue. Within the Commercial classification nine rate schedules apply, however, the GSP rate schedule, which serves 7.8% of the Commercial clients, accounts for 53.4% of the Commercial class revenue. The rate schedule that generates the second most revenue in the Commercial classification is the GSS rate that serves 91.8% of the Commercial clients and accounts for

30.3% of the Commercial class revenue. While thirteen rate schedules apply to the Industrial classification, the GST rate schedule which serves 28.6% of the Industrial clients, accounts for 51.3% of the Industrial class revenue.

**SUMMARY OF CORE RATE SCHEDULES
ALL CLASSES**

	Per Cent of Total MWH Sold	Per Cent of Total Revenue	Price Range cents/kWh
General Residential Service	31.0%	31.4%	21.85
General Service Secondary Voltage	12.7%	14.5%	24.64 - 27.51
General Service Primary Voltage	25.6%	26.6%	22.36 - 23.03
General Service Transmission Voltage	17.6%	15.4%	18.80 - 18.84

In February 2006 the Authority prepared a new Rate Schedule booklet to include the Special Industrial Incentive Rates previously approved. The current rate schedules are comprised of more than 80 subcategories to accommodate various service levels and load profiles. As shown on the Rates Table, the Authority presently serves all clients under 39 of the subcategories. Seven of the rate schedules are common to both the commercial and the industrial classifications.

As shown on the Rates Table, the average revenue for all power sold by the Authority was 21.53 cents/kWh during fiscal year 2009. The lowest average cost among the four popular rate schedules was 18.80 cents/kWh for GST-Industrial, with the highest average cost being 27.51 cents/kWh for GSS-Industrial.

The Authority's ten largest industrial clients (25.0% of the classification's consumption) paid an average of 17.47 cents/kWh during fiscal year 2009. This was 4.8% less than the industrial class average.

The Rates Table below shows all the rate schedules in use during fiscal year 2009 by the Authority's clients, with the average number of clients, total annual sales and average pricing for each rate schedule.

PRICE COMPARISONS

The Authority's average price per kilowatt-hour varies significantly among its client classifications. The Public Lighting class paid the highest average cost of 34.78 cents/kWh while the Industrial class paid the lowest average cost of 18.31 cents/kWh. These price variations are attributable to the differences in the cost of providing public service and

socioeconomic objectives of the Commonwealth government and the Authority.

The average prices in cents/kWh for the Authority, Hawaii, and the U.S. are shown in the following table for the year ended June 30, 2009. The data for the State of Hawaii are provided because its geographical characteristics and fuel mix are similar to Puerto Rico's. The U.S. Department of Energy—Energy Information Administration (EIA) data were used as a reference to derive the pricing for the State of Hawaii and the U.S. The U.S. data are comprised of all fifty states and Washington D.C.

2009 AVERAGE PRICE COMPARISON

	(Cents/kWh)		
	Authority	Hawaii	U.S.
Residential	21.58	24.06	11.47
Commercial	22.32	21.38	10.15
Industrial	18.31	17.73	6.93
All Classes	21.53	20.90	9.86

ADJUSTMENT CHARGE

Prior to October 1999 the Authority's electric service rates consisted primarily of a base charge and a fuel adjustment charge. During that period, the base charge was comprised of the client and energy charges, and in most cases the demand charge. The energy charge included a fuel charge of \$2.00 per barrel. The fuel adjustment charge recovered the Authority's fuel oil costs in excess of the \$2.00 in the base charge. The fuel adjustment clause also recovered all other fuel-related costs.

The Authority revised the fuel adjustment clause in November 1999 to recover the cost of purchasing power from EcoEléctrica, a cogeneration plant, during its test and start-up period. On March 28, 2000, following the required public hearing, a permanent revision of the Authority's rate structure was approved that incorporated a purchased power charge in the electric service rates to recover its cost of purchased power from the EcoEléctrica plant. Since then the purchased power charge has been applicable for purchases from both cogenerators—EcoEléctrica and, subsequently, AES-PR. The rate structure revision also removed the \$2.00 per barrel fuel charge from the base charge and included all fuel related charges in the newly defined adjustment charge. The fuel charge and the purchased power charge, both of which became effective June 5, 2000, are collectively shown on the client's bill as the adjustment charge.

RATES TABLE

Rate Schedule	Average Number of Clients	Total MWh	Total Revenue (\$000) ¹	Average Cost Cents/kWh ²
Residential Class				
103,104 (RH-3)	41,004	150,962	27,797	18.41
109,110 (LRS)	145,044	485,418	94,478	19.46
111,112 (GRS)	1,138,704	5,731,181	1,252,068	21.85
Total Residential Class	1,324,752	6,367,561	1,374,344	21.58
Commercial Class				
060 Telephone Booth	59	11	3	25.60
070-080 Cable TV	3	12,747	3,054	23.95
082 Security Cameras	133	256	66	26.00
211 (GSS)	118,857	2,330,512	574,299	24.64
212 (GSP)	10,118	4,527,901	1,012,550	22.36
213 (GST)	321	1,616,749	304,675	18.84
282 (SBS-P)	0	8,943	2,048	22.90
283 (SBS-T)	0	(7,426)	(1,432)	19.29
862	1	8,426	1,758	20.87
Total Commercial Class	129,492	8,498,118	1,897,022	22.32
Industrial Class				
311 (GSS)	215	16,108	4,432	27.51
312 (GSP)	379	207,540	47,804	23.03
313 (GST)	257	1,641,045	308,521	18.80
333 (LIS)	2	181,043	23,106	12.76
343 (PPBB)	2	1,425	2,128	149.33
363 (TOU-T)	10	356,902	64,550	18.09
393 (SBS-T-TOU)	1	37,332	8,062	21.59
603 (SR-GST)	13	257,949	43,301	16.79
613 (SR-GST)	12	323,261	54,360	16.82
633 (SR-TOU-T)	1	10,304	1,667	16.18
643 (SR-TOU-T)	3	95,047	15,502	16.31
Industrial Class (continued)				
653 (SR-TOU-T)	1	102,782	17,419	16.95
673 (SR-LIS)	-	22,013	4,492	20.41
963 (TOU-T)	3	35,847	6,640	18.52
Total Industrial Class	898	3,288,597	601,985	18.31
Other Classifications				
Public Lighting				
2-41 (Non Meter P/L)	162	238,256	87,562	36.75
72 (PLG Bus Shelter)	3	798	177	22.13
73 (PLG Police)	5	33	6	18.32
414 (LP-13)	10	4,140	1,049	25.33
421 (PLG)	78	1,633	383	23.45
422 (PLG)	85	1,570	322	20.53
423 (PLG)	632	4,567	998	21.85
424 (PLG)	1,195	19,520	4,006	20.52
050-056 (Dusk to Dawn) ³	-	3,172	681	21.46
Total Public Lighting	2,168	273,691	95,183	34.78
Agricultural				
711 (GAS)	1,322	30,523	6,912	22.65
Total Agricultural	1,322	30,523	6,912	22.65
Public Authorities				
513 (GST-Public Authority)	4	57,285	10,735	18.74
Total Public Authorities	4	57,285	10,735	18.74
Total⁴ Other Classifications	3,494	361,499	112,830	31.21
Total	1,458,636	18,515,775	3,986,181	21.53

¹ Includes the Adjustment Charge.

² Calculated differences are due to rounding.

³ Includes the residential fuel subsidy.

⁴ Includes Public Lighting, Agricultural and Public Authorities classes.

The Authority invoiced \$2,914.2 million through the adjustment charge in fiscal year 2009: \$2,161.6 million for fuel and \$752.6 million for purchased power. The adjustment charge constituted 73.1% of the Authority's \$3,986.2 million electric revenue.

SUBSIDIES AND CREDITS

In accordance with various Commonwealth laws and regulations, the Authority provides subsidies to low consumption residential clients, energy conserving hotels, charitable organizations, agricultural clients, low-income clients with life sustaining equipment and small water companies distributing potable water.

The Authority's subsidies benefited 494,099 clients in fiscal year 2009, which is approximately 34% of its client base. The total value to the Authority for the benefits credited to these clients during fiscal year 2009 was \$78.7 million. In fiscal year 2008, approximately 33% of the Authority's clients benefited from \$70.7 million in subsidies. Funds for these subsidies were drawn from the Set Aside monies discussed in the *Contributions in Lieu of Taxes and Set Aside* section in the *Financial* section.

RESIDENTIAL FUEL SUBSIDY

Under provisions of Act No. 106 of the Legislature of Puerto Rico, approved on June 28, 1974, the

Commonwealth began to subsidize the fuel adjustment charge (now the fuel charge, a component of the adjustment charge). In 1991 the subsidy qualification criteria were made more restrictive, to focus the subsidy on those clients truly in need. The new criteria are still in place and apply to the Authority's residential clients who consume up to 425 kilowatt-hours of electricity monthly or 850 kilowatt-hours bimonthly and meet the following criteria: those on the "Lifeline" residential rate (LRS), the government-administered public housing rate (RH-3), full-time students, the handicapped, and those 65 years of age or older. Additionally, all fuel subsidy recipients must be permanent residents of the Commonwealth of Puerto Rico and may receive the subsidy on only one dwelling. The subsidy is provided in the form of a credit against the recipient's electric bill. As of the end of fiscal year 2009, there were 300,000 clients or 23% of the total residential classification who qualified for subsidization. The purchased power component of the adjustment charge is not subsidized.

During fiscal year 2009 the total residential fuel subsidy was \$30.6 million; during the previous fiscal year this subsidy totaled \$24.3 million. The Commonwealth's contribution to the fuel charge subsidy program is deducted from the electric energy sales set aside. (See *Contributions in Lieu of Taxes and Other* section).

Until the end of fiscal year 1992, the subsidy was paid by the Commonwealth and was recorded as a receivable by the Authority. On June 30, 1991, the Commonwealth owed the Authority \$94.9 million on account of the fuel charge subsidy program. In October 1991, the Authority and the Commonwealth entered into a non-interest bearing, fifteen-year payment plan for payment of this past due amount. In June 2004, the Legislature of the Commonwealth of Puerto Rico superseded the 1991 agreement with a revised agreement containing an eight-year payment schedule that totaled \$55.7 million. This amount includes an allocation for past due Commonwealth government account receivables and the unpaid balance of the fuel adjustment subsidy. As of the end of fiscal year 2009 the balance owed by the Commonwealth was \$18.9 million.

The Authority pays the entire fuel subsidy for all residential rate classifications until the price of oil reaches \$18.00 per barrel. Once the price of oil exceeds \$18.00 per barrel, the Commonwealth pays (by means of the electric energy sales set aside) the incremental price until it reaches \$30.00 per barrel. This subsidy amount can not exceed more than \$100

million per year. The client pays the incremental amount over \$30.00. For the other recipients of the residential fuel subsidy, the Commonwealth pays (once again, by means of the electric energy sales set aside) the entire subsidy up to \$30.00 per barrel. The Authority's monthly average cost of fuel in fiscal year 2009 ranged from a low of \$ 50.15 per barrel in March 2009 to a high of \$128.29 per barrel in July 2008; the average fuel cost for the fiscal year 2009 was \$ 76.23 per barrel.

The residential fuel subsidy applies to the fuel adjustment charge for service at secondary voltage. The subsidy for qualifying residential clients is a sliding scale percentage that corresponds to their monthly consumption level. As shown on the table below, the subsidy percentage decreases as monthly consumption increases. The subsidy is not cumulative through the incremental blocks of consumption; for example, a client with a monthly consumption of 325 kWh would receive a 55% subsidy of the fuel adjustment charge. There is no subsidy if the monthly consumption exceeds 425 kWh.

Monthly Consumption (kWh)	% of Total Fuel Component Subsidized
0-100	90
101-200	75
201-300	65
301-400	55
401-425	*
Over 425	0

*For the first 400 kWh of consumption, 55% of the fuel charge will be subsidized; over 400 kWh the client will be charged 100% of the fuel charge for each additional kilowatt-hour up to 25 kWh.

RESIDENTIAL RATE SUBSIDY

The Authority serves its residential clients using three rates—GRS, LRS (Lifeline), and RH-3 (Public Housing). In fiscal year 2009, 86% of its residential clients were served using the GRS rate. The remaining residential clients were served using the LRS and RH-3 rates that are reserved for those who qualify as low-income; these rates have lower customer and energy charge components as compared to the GRS Rate.

During fiscal year 2009 the Authority served an average of 186,048 residential clients under the LRS and RH-3 rates, which provided a total subsidy of \$18.3 million.

HOTEL SUBSIDY PROGRAM

Under Act No. 101 of July 9, 1985, the Authority started providing an 11% discount on its monthly electric bills to hotels that are certified by the Puerto Rico Tourism Company. This subsidy is designed to help conserve energy and promote tourism. In order to qualify for this discount the hotels are obligated to: develop programs for conserving and using energy more efficiently; submit evidence annually to the Commonwealth's Energy Affairs Administration, which administers the program, showing that they are implementing their programs; and remain current in paying their electric bills. Small hotels are only required to demonstrate compliance every five years. If a participating hotel does not pay its bill within 60 days, the hotel can be dropped from the program.

Act No. 266 of November 16, 2002, amended several articles of Act No. 101. The most notable change was the reduction in the number of rooms required to qualify for the discount from fifteen to only two. This subsidy, like the residential fuel subsidy, takes the form of a credit on the client's bill. During fiscal year 2009, an average of 185 establishments benefited from the \$6.5 million in hotel subsidies.

CHARITABLE ORGANIZATIONS SUBSIDY

This subsidy applies to charitable organizations, such as churches, which provide religious services to the community at no charge. The subsidy enables any qualifying charitable organization to use the GRS rate (average cost of 21.85 cents/kWh for 2009) in place of the other applicable commercial rates (24.64 cents/kWh for GSS or 22.36 for GSP). The usage of GRS rate over GSS rate saved 2.79 cents/kWh in fiscal year 2009; GRS rate over GSP rate saved only 0.51 cents/kWh.

The Authority subsidized \$3.5 million to serve an average of 2,963 charitable organizations in fiscal year 2009.

LIFE PRESERVATION SUBSIDY

The Life Preservation subsidy is available to qualifying low-income clients who require electrically powered essential medical equipment. The subsidy provides full credit for the electrical consumption of the medical device, based on the certification of need and hours of operation established by a physician from the Department of Health of Puerto Rico.

This subsidy served an average of 3,572 clients and amounted to \$3.6 million in fiscal year 2009.

AGRICULTURAL SUBSIDY

The Agricultural service rate (GAS) is available to farmers, animal breeders and rural irrigation water suppliers. This rate is available for the clients whose load is up to 50 kVA. If the Authority did not provide the GAS rate to these clients they would be served under the more expensive GSS rate. The average price differential between the GSS and GAS rates was 2.27 cents/kWh using the Rate Schedule booklet.

This subsidy served an average of 1,322 clients and amounted to \$613 thousand in fiscal year 2009.

RURAL ELECTRIFICATION AND IRRIGATION SUBSIDY

The Authority originally was constituted as the Puerto Rico Water Resource Authority which generated power from hydro-electric facilities. It included dams and infrastructure that also provided most of the island's water. The Authority still maintains jurisdiction over all dams on the island, however the Puerto Rico Aqueducts and Sewers Authority (PRASA) is the current public agency that is responsible for the water system on the island.

As part of its legacy responsibilities the Authority provides certain technical and maintenance services for dams that supply PRASA and some irrigation users. During fiscal year 2009 the Authority valued the cost of providing these beneficial services at \$5.0 million in uncompensated expenses.

OTHER SUBSIDIES & CREDITS

In 2004 a subsidy was established for cooperative water companies that provide potable water to rural communities which were either not served or inadequately served by PRASA. In order to qualify for the subsidy, the rural water company must be registered with the Commonwealth, its operation must meet Commonwealth health standards and the water quality must comply with US EPA criteria. During fiscal year 2009 an average of nine rural water companies took advantage of this subsidy and received a benefit of approximately \$4,500.

Since July 1, 2007, the Authority has allowed a 10% credit on its residential clients' basic rate charge for those clients who are current in their payments and pay the Authority directly from their personal bank account. Approximately 4,250 residential clients took advantage of this credit and saved \$156,950 during fiscal year 2009.

The Authority provides a 10% credit for power, up to a maximum of \$40 per month, to small commer-

cial clients with less than seven employees on the weekly payroll. This credit applies for up to three years. In fiscal year 2009 the credit provided a total benefit of \$3,204 to two dozen clients.

The manufacturing industrial credit is provided to all new manufacturing industry clients and to the clients who expand their business operation. During fiscal year 2009, the Authority provided its manufacturing industry users a credit of \$10.2 million; a credit of \$7.0 million was provided during the previous fiscal year. This credit is discussed below in *Special Rates*.

SELECTED RATES

Over the last decade the Authority has developed a number of specialized rates to address certain pricing and operational issues for some of its large commercial and industrial clients. By design, these rates have limited applications and are almost exclusively available to clients purchasing power at the transmission level.

SPECIAL RATES

In order to promote an increase in industrial development in Puerto Rico, the Authority instituted five new special rates. These special rates offer a discount for new industries and expansion of existing industrial clients on or after February 12, 2002. New industrial clients receive a discount of approximately 11% on their total electric bill. Also, existing industrial clients that expand their operations receive a discount of approximately 11% on the demand, energy, and adjustment charges associated with its expansion. Public hearings regarding these rates were held in December 2002. These rates were available for five years effective July 30, 2003. While these rates expired on July 30, 2008, they are available to existing users to complete the balance of their five year term. The Authority has identified savings to industry from these rates of \$10.2 million during the course of the fiscal year ending June 30, 2009. The five special rates are designated as follows:

- General Service at Transmission Voltage-Special (SR-GST)
- Time of Use Rate at Transmission Voltage-Special (SR-TOU-T)
- Large Industrial Service 115 kV-Special (SR-LIS)
- Standby Service at Transmission Voltage-Special (SR-SBS) and
- Time of Use Rate-Cool Storage Conditioning Systems-Special (SR-TOU-C)

Three of these rates—SR-GST, SR-TOU-T, and SR-LIS—were used during fiscal year 2009, while only SR-GST and SR-LIS were used in the previous two years by eligible clients. The SR-GST rate was used by 25 clients with a combined average cost of 16.80 cents/kWh. The SR-TOU-T Rate served five clients at a combined average cost of 16.62 cents/kWh; the SR-LIS Rate, with an average cost of 20.41 cents/kWh, was used by one client for part of the year.

LARGE INDUSTRIAL SERVICE RATE

In September 1997, the Authority adopted the Large Industrial Service (LIS) rate in order to encourage large industrial clients to remain part of its client base. To be eligible for this rate clients must meet the following criteria: receive service at 115 kV; have a demand of 12,000 kW or greater; a minimum load factor of 80%; and an average monthly power factor of 95% or more. The Authority served only two clients for the past two fiscal years 2008 and 2009 using the LIS Rate. The average cost per kWh for this rate was 12.76 cents/kWh in fiscal year 2009, making it the lowest among all the existing rates offered by the Authority. Its average cost was 17.07 cents/kWh in fiscal year 2008.

TIME-OF-USE RATES

Time-of-Use (TOU) rates are a component of the Authority's Demand-Side Management (DSM) program. (For a discussion on the DSM program refer to *Demand-Side Management and Energy Conservation Programs* in the *Demand and Energy Forecast* section.) These rates are designed to encourage shifting consumption from on-peak hours to off-peak hours when the total system demand is otherwise lower. The Authority offers several TOU rates for commercial and industrial clients. Currently these rates are only offered to the Authority's commercial and industrial clients.

On May 28, 1996, the Authority's Governing Board adopted Resolution Number 2160, which approved revised load requirements, thereby increasing the number of clients eligible for TOU rates. As of June 30, 2009, a total of 19 clients were served under these rates, resulting in \$113.8 million in revenues, approximately 19% of the total for the industrial classification. Ten clients were served using the TOU-T (time of use at transmission voltage) rate at an average cost of 18.09cents/kWh. The SBS-T-TOU (time of use at standby service at transmission voltage) rate served only one client at an average cost of 21.59 cents/kWh in fiscal year 2009.

Five clients were served under SR-TOU-T (Special time of use rate at transmission voltage) rate. The SR-TOU-T Rates are available under Special Rates to manufacturing clients who are either new or have added to their electric load during the past fiscal year. The combined average cost for these three SR-TOU-T rates serving these five clients was 16.62 cents/kWh for fiscal year 2009 .

The last TOU rate utilized in fiscal year 2009 was the TOU-T rate, which applies to industrial clients who have a load demand of 1,000 KVA to 3,000 KVA. During fiscal year 2009 this TOU-T rate served three clients with an average cost of 18.52 cents/kWh.

Another available TOU rate is the Cool Storage Air Conditioning Systems (TOU-A/C) commercial rate. Although this rate has been in existence for almost two decades, it has attracted few clients and the last one changed to a conventional rate effective the beginning of the past fiscal year.

POWER PRODUCERS AT BUS BAR RATE

On March 28, 2000, the Authority's Governing Board, under Resolution Number 2812 approved the Power Producers at Bus Bar (PPBB) rate. This rate, which became effective June 5, 2000, is only available to large power producers who are connected at 230 kV and have a power purchase agreement with the Authority for all its electrical output. In addition, the power producer must have at least an 85% equivalent availability. Under this rate a power producer can purchase power from the Authority for startup, scheduled maintenance, and for backup power.

Presently, only EcoEléctrica and AES-PR qualify for this rate. The black-start energy requirements for these two power producers are 12.0 MW and 38.7 MW, respectively.

The Authority generated \$2.1 million in revenues from the sale of 1,425 MWh of power from the two cogenerators in fiscal year 2009.

STANDBY SERVICE RATE

The Standby Service Rate (SBS) is applicable to industrial or commercial clients who generate power for their own use and not for resale. This rate schedule provides four levels of service: supplementary, auxiliary, maintenance, and interruptible power. When the client's generator is unable to generate enough power needed to satisfy its load, whether because of a limi-

tation or a scheduled or forced outage, then the client starts to receive its needed power automatically from the Authority. The demand, customer, and energy-related costs for this rate are the same as those in the corresponding service class that would apply, namely GSP, GST, TOU-P, or TOU-T rates.

The only standby rate in use at the end of fiscal year 2009 was for one industrial client utilizing the SBS-T-TOU rate. This was discussed above in *Time-of-Use Rates* above. The average cost of the SBS rate serving the industrial client was 21.59 cents/kWh. The Authority derived \$8.1 million in revenue from the sale of 37,332 MWh from this rate.

SECURITY CAMERAS RATE

As part of an increased public safety program, security camera surveillance systems and wireless telecommunication equipment have been installed on the Authority's poles and structures.

The Authority instituted a temporary rate for unmetered small load service (USSL) in July 2007 and subsequently added this new rate in its rate structure in January 2008. The rate is applicable to all security cameras and communication equipment installed on the Authority's electric poles throughout the entire island of Puerto Rico. Before installation of these security devices, the client is required to provide all equipment specifications to the Authority's Director of Generation, Transmission and Distribution. The electric consumption for each installed security camera may not exceed 200 kWh per month.

During fiscal year 2009 an average of 133 clients used this rate and paid an average cost of 26.00 cents per kWh.

COST OF SERVICE

A cost of service study is an analytical tool that determines the proper allocation of capital investment and expenses associated with providing electric power. The results of the studies are used when designing various rate schedules.

In fiscal year 2008 the Authority performed a cost of service study based on fiscal year 2007 data. The study employed methodologies that are commonly accepted in the electric utility industry.

The revenues, expenses and surplus or deficiency data from the most recent cost of service study for major rate schedules and classes of service are summarized below:

**2008 COST OF SERVICE RESULTS
BASED ON 2007 DATA**
(\$ millions)

Rate Schedule/Class	Collected Revenues	Cost to Serve	Recovered Cost Percentage
Residential	1,299.5	1,487.6	87.4
Commercial	1,701.8	1,609.5	105.7
Industrial	644.0	568.9	113.2
Other Classes	103.8	124.9	83.1

It should be noted that the results of a Cost of Service study are not the only criteria used to design rates. The Authority uses other important criteria including socioeconomic, energy conservation, and load management objectives.

**CONSULTING ENGINEERS
RECOMMENDATION**

The 1974 Agreement stipulates that after payment of all current expenses, the remaining net revenue must equal or exceed 120 per centum of outstanding debt service. The Consulting Engineers monitors on an ongoing basis that the Authority's rate schedules will generate sufficient revenues to pay its current expenses and have adequate debt service coverage. The Authority's debt service coverage ratio for fiscal year 2009 was 1.45. The debt service coverage for fiscal year 2010 is forecasted to be 141% based on the Authority's amended Annual Budget discussed in the *Financial* section.

The Consulting Engineers has reviewed the Authority's rate schedules and other pertinent data and believes that the Authority will receive sufficient revenues in fiscal year 2010 to cover current expenses, to make all required deposits in accordance with the 1974 Agreement's dictates, and to exceed its 120% debt service coverage requirement. Refer to *Net Revenues* in the *Financial* section for further discussion of debt service coverage.

FINANCIAL

ANNUAL BUDGET

The Annual Budget, prepared in conformance with Section 504 of the Trust Agreement, consists of four statements and two exhibits. The four Statements are: a pro forma income statement for the ensuing fiscal year; a projection of capital expenditures also for the ensuing fiscal year; a summary of capital expenditures and the sources of construction funds to support the expenditures; and a schedule of funds to be provided by the Government Development Bank for Puerto Rico (GDB). The two exhibits are a five-year projection of debt service and Contractual Obligations and Contributions in Lieu of Taxes and Other.

In April 2009 an amendment to the 2008-09 Annual Budget of Current Expenses and Capital Expenditures was developed; it revised items such as the projected energy sales, fuel consumption and costs, purchased power costs, and projected net revenues. The amended Annual Budget was adopted by the Governing Board on April 21, 2009. The amended Annual Budget is the budget which applies in this Annual Report when reference is made to the 2008-09 Annual Budget.

The Proposed Annual Budget of Current Expenses and Capital Expenditures – Fiscal Year 2009-2010 was approved in May 2009 by the Consulting Engineers prior to the Governing Board's adoption in June 2009.

In July 2009 the Authority revised its Capital Improvement Program for fiscal years 2011 and 2012 by decreasing the total budget from \$350 million for each year to \$300 million and increasing the budget for fiscal year 2014 from \$350 million to \$400 million; the Governing Board adopted the revised Capital Improvement Program on July 21, 2009.

In January 2010 the Authority prepared an amended 2009-2010 Annual Budget to address higher fuel costs than had been projected. The amended Annual Budget incorporated higher revenues resulting from the increased fuel costs and from an energy theft recovery initiative, lower projected operating expenses, and modifications to debt financing. In view of the significant revisions in the amended budget and their affect on the Authority's financial status regarding Trust Agreement requirements, the Consulting Engineers have incorporated the amended budget in the discussions and evaluations within the *Financial* section and *Appendices* of this Annual Report.

REVENUES

Total revenues for fiscal year 2010 are forecasted to be \$3,604,632,000 compared to the actual revenues in fiscal year 2009 of \$4,007,267,000, a decline of 10%. The Authority's revenues for fiscal year 2009 include more than \$8,400,000 for billings of power lost to theft as a result of a significant new initiative to recover these losses. Beginning in fiscal year 2010 the Authority has adjusted the forecasted total revenues from electricity to reflect recovery of sales lost to theft. This additional revenue is forecasted to be \$16,955,000 in fiscal year 2010 and \$50,000,000 per year for fiscal years 2011 through 2014. For fiscal years 2011 through 2014 total revenues are forecasted to be \$3,944,854,000, \$4,298,742,000, \$4,470,276,000, and \$4,597,297,000 respectively. *Appendix II, Income Statement*, presents the Authority's income statements (including interest income) for fiscal years 2009 through 2014.

As shown on *Appendix I, Intermediate-Term Revenue Planning Forecast*, base revenues from sales of electricity for fiscal year 2009, excluding fuel and purchased power included in the adjustment clause, were \$1,071,966,000 and are forecasted to be \$1,041,657,000 for fiscal year 2010 or a decrease of 2.8%. The projections for fiscal years 2011 through 2014 are \$1,033,043,000—a decrease of 0.8%, \$1,031,436,000—a decrease of 0.2%, \$1,035,536,000—an increase of 0.4%, and \$1,044,806,000—an increase of 0.9%, respectively.

ACCOUNTS RECEIVABLE

The Authority's accounts receivable balance for fiscal year 2009 was \$1,028.9 million or approximately 3.1% less than the previous year. Of the \$1,028.9 million balance, \$471.4 million applied to government clients, an increase of 31.9% over the previous fiscal year, and \$557.5 million applied to general clients, which is a decrease of 20.8% from the previous fiscal year.

The Auditor's Report for fiscal year 2009 shows the allowance for uncollectible accounts increased to \$163.6 million in the past fiscal year; this was an increase of \$19.8 million or 14% over the previous year.

At the end of fiscal year 2009 the following five government agencies accounted for approximately 48% of the total government amounts owed to the Authority:

Client	A/R Balance
Department of Education	\$66.3 million
Aqueducts and Sewer Authority (ASA)	\$63.3 million
Public Building Authority	\$58.5 million
Port Authority	\$33.2 million
Medical Services Administration	\$14.0 million

The Authority has made a concerted effort to collect overdue accounts from general clients. The actions taken include meeting with political groups, disconnecting electrical service, referring clients to collection and credit rating agencies, and setting up a payment schedule.

COMPARISON OF BUDGETED EXPENSES TO ACTUAL EXPENSES FY 2009 AND FY 2010 PROJECTIONS

(in thousands)

Current Expenses	2009 Amended Budget	2009 Actual	2009 Difference	2010 Amended Budget	Change from Previous Year
Fuel Cost	\$ 1,848,270	\$ 1,919,789	\$ 71,519	\$ 1,529,493	\$ (390,296)
Purchased Power	670,914	671,849	935	711,701	39,852
Other Expenses	59,674	62,271	2,597	57,119	(5,152)
Transmission & Distribution	140,215	162,334	22,119	146,601	(15,733)
Maintenance	246,879	225,107	(21,772)	237,727	12,620
Customer Actng & Collection	113,202	111,126	(2,076)	112,674	1,548
Administrative & General	201,410	222,477	21,067	142,428	(80,049)
Interest Charges	3,476	2,819	(657)	3,998	1,179
Total	\$ 3,284,040	\$ 3,377,772	\$ 93,732	\$ 2,941,741	\$ (436,031)

EXPENSES

The Authority's budget for Current Expenses for fiscal year 2009 and the amounts actually expended, as well as those budgeted for fiscal year 2010 are shown below.

In fiscal year 2009 the Authority's current expenses were 3% or \$93.7 million more than that budgeted. Extracting fuel and purchased power the remaining current expenses were also 3% more than that budgeted.

Current expenses less fuel oil, purchase power and interest charges are projected to decrease 11% in fiscal year 2010 as compared to actual expenses in fiscal year 2009; a reduction of 2% is forecasted in fiscal year 2011, with 0.2% annual decreases for fiscal years 2012 through 2014. The largest contribution to the reduction of current expenses less fuel oil, purchased power and interest between fiscal years 2009 and 2010 is the \$80.0 million drop in administrative and general costs. This significant savings is based principally on two factors: more than 60% of the savings reflect the difference in the budgeted costs for retirees under a new health care plan, while most of the balance is attributed to savings associated with employees taking early retirement during fiscal year 2010.

OPERATING AND MAINTENANCE EXPENSES

In fiscal year 2009, total Operating and Maintenance (O&M) expenses were \$3,377,772,000 and for fiscal years 2010 through 2014 are forecasted to be \$2,941,741,000, \$3,205,620,000, \$3,520,599,000, \$3,668,155,000 and \$3,771,444,000. *Appendix III, Detail of Operating and Maintenance Expenses*, shows O&M expenses by category for fiscal years 2009 through 2014.

The cost of fuel oil is the largest component of O&M expenses. During fiscal year 2009 approximately 69% of the System's energy was generated by the Authority's oil-fired plants, with a total fuel cost of \$1,920 million; this constituted 57% of the total O&M expenses for the year. The fuel prices forecasted in the Authority's amended budget, coupled with the forecasted decline in energy sales, result in the projected total cost of fuel decreasing substantially in fiscal year 2010, then rebounding the following year and increasing each year to 2014. The actual average cost of fuel in fiscal year 2009 and the forecasted costs during fiscal years 2010 through 2014 are discussed in the *Fuel Mix* section above. In addition, *Appendix IV, Annual Generation, Fuel*

Consumption, and Fuel Costs for Thermal Stations, shows the cost of fuel and the generating efficiency (kWh generated per barrel) for each major generating facility. Actual data are shown for fiscal year 2009 and forecast data through 2014.

The ratio of O&M expenses to Total Operating Revenues in fiscal year 2009 was 84.3%. In fiscal years 2010 through 2014 it is projected to be 81.6%, 81.3%, 81.9%, 82.1% and 82.0%, respectively.

DEPRECIATION EXPENSE

Appendix IX, Depreciation Expense, shows the actual depreciation accrual for fiscal year 2009 as \$304,468,833. The estimates for the ensuing five fiscal years are \$343,245,000, \$352,245,000, \$361,245,000, \$370,245,000, and \$379,245,000, respectively. Depreciation Expense is excluded from statements required for Trust Agreement purposes.

The Consulting Engineers completed a comprehensive depreciation review of the Authority's Plant-in-Service in May 2000. The overall result was three-tenths of 1% increase in the Authority's composite annual depreciation accrual rate (expense).

The review confirmed statistically that the production plant's average service life is increasing. It also showed that net negative salvage (cost of removal less salvage) of retired capital equipment was escalating due to increased labor costs and the costs associated with the removal of hazardous materials. This increased cost of removal component contributes to an increase in the annual composite depreciation accrual rate.

The Authority's Governing Board reviewed and accepted the study's results and in fiscal year 2001 the Authority implemented the recommended depreciation accrual rates.

Data is presently being collected to update the depreciation requirements as of the end of fiscal year 2009.

NET REVENUES

Net Revenues, as defined under the Trust Agreement, are shown in *Appendix II, Income Statement, as Balance to Revenue Fund*. For fiscal year 2010 the Net Revenues are forecast to be \$662,891,000 compared to \$629,496,000 in fiscal year 2009. For fiscal years 2011 through 2014 net revenues are forecasted to be \$739,234,000, \$778,143,000, \$802,121,000 and \$825,853,000, respectively.

Based on the amounts shown in *Appendix II, Income Statement*, the ratio of Net Revenues to Principal and Interest Requirements (Debt Service Coverage) was

1.45 in fiscal year 2009. The Debt Service Coverage is projected to be 1.41, 1.61, 1.58, 1.49 and 1.44 for fiscal years 2010 through 2014, respectively. The Debt Service Coverage graph shows the five-year history and the five-year projection of the ratio of Net Revenues to Principal and Interest Requirements.

The Authority's total revenues include the Commonwealth Government's estimated annual fuel charge subsidy payments to the Authority, which are deducted from the electric energy sales set aside. (See *Contributions in Lieu of Taxes and Set Aside* section below). In fiscal year 2009 the Commonwealth's fuel charge subsidy amounted to \$30,579,000. The subsidy is forecasted to be \$21,297,000, \$20,445,000, \$19,957,000, \$19,518,000, and \$19,554,000, respectively, in fiscal years 2010 through 2014.

The forecasted net revenues for the next five years are sufficient to meet the 1974 Trust Agreement's coverage requirement for the outstanding Power Revenue Bonds as well as those expected to be issued in the interim. (See *Appendix II, Income Statement*.)

CONTRIBUTIONS TO THE COMMONWEALTH

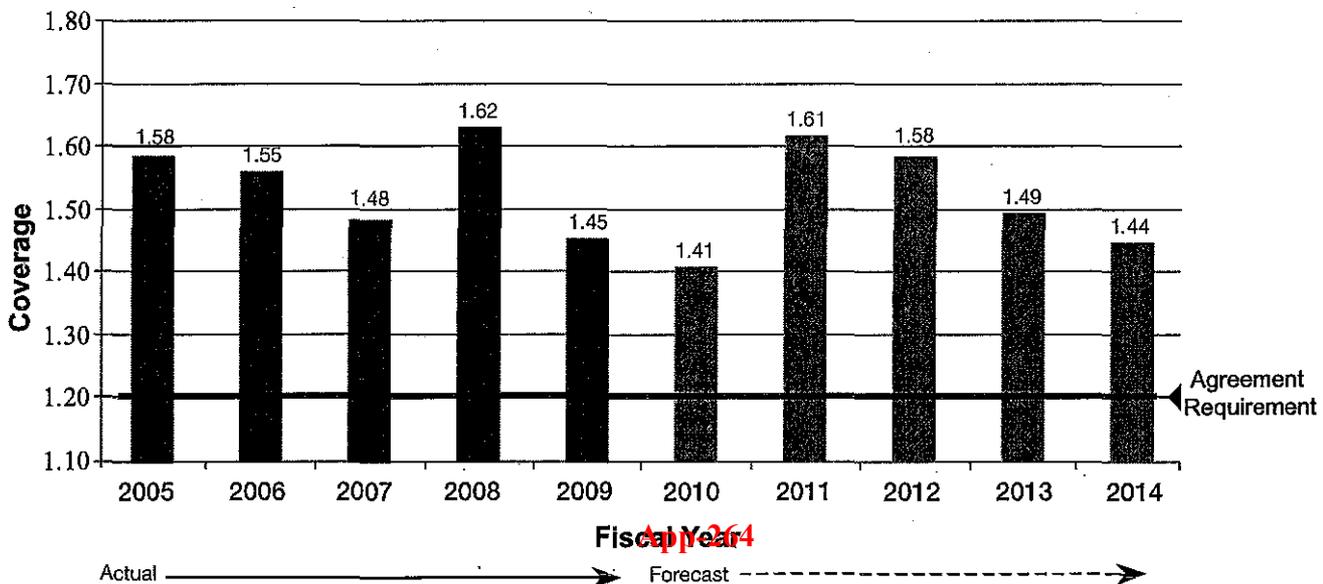
CONTRIBUTIONS IN LIEU OF TAXES AND OTHER

The Authority, in accordance with the Authority Act, as originally enacted, was required to set aside annually from its Net Revenues an amount equal to 6% of its annual gross electric energy sales, computed on the basis of an annual average fuel price capped at \$30 per barrel, to be paid to the island's municipali-

ties as contributions in lieu of taxes (CILT). The Authority was also required to set aside annually from its Net Revenues an additional amount equal to 5% of its annual gross electric energy sales, computed on the basis of an annual average fuel price capped at \$30 per barrel, to be paid to the Commonwealth government as contributions in lieu of taxes. These combined contributions in lieu of taxes, amounting to 11% of the Authority's annual gross electric energy sales, were to be paid from the Authority's Net Revenues after certain defined expenditures and subject to compliance with its obligations under both the now defunct 1947 Trust Indenture and the existing 1974 Agreement. The contributions in lieu of taxes for distribution to the municipalities were and are paid to the Commonwealth's Secretary of the Treasury.

Prior to 1981 the Authority was not required to increase its rates and charges to make the CILT payments to the island's municipalities or to fund the electric energy sales set aside. However, with the change in the law at the time of the 1981 rate increase, the Authority became legally obligated to make the CILT payments to the municipalities and fund the electric energy sales set aside based upon the availability of Net Revenues. If the Net Revenues in any year were not sufficient to cover both the CILT and the electric energy sales set aside, the amounts were reduced to the amount available, and any remaining balance did not carry forward as a liability in future years.

Debt Service Coverage Fiscal Years 2004-2014



In 1991 the Commonwealth government and the Authority reached an agreement whereby the Commonwealth government would forego its 5% contributions in lieu of taxes. The Authority would use those moneys, now known as the “electric energy sales set aside” as follows: One-fifth of the set aside is to be applied to cover the cost of the Commonwealth government’s residential fuel charge subsidy program subsequent to June 30, 1991 (see the following discussion). If any balance remains, it is to be used to reduce the amount owed by the Commonwealth to the Authority on account of such subsidy as of June 30, 1991. Another one-fifth of the set aside must be paid to the Commonwealth government’s Secretary of the Treasury for distribution to the municipalities, thereby increasing the CILT due the municipalities from 6 to 7%. The remaining three-fifths of the set aside is to be used for any lawful purpose of the Authority.

In May 1998, the Municipality of Ponce filed a complaint seeking payment from the Authority for the full amount of the contributions in lieu of taxes and electric energy sales set aside for prior fiscal years. The island’s other 77 municipalities subsequently joined the suit. The complaint challenged the Authority’s disposition of Net Revenues in making deposits to certain funds under both the 1947 Trust Indenture and the 1974 Agreement for the purposes of paying the costs of capital improvements. The municipalities sought retroactive payment of the amount by which their share of the contributions in lieu of taxes and electric energy sales set aside had been reduced by such application.

The Authority settled this litigation with the municipalities by offering a monetary payment of \$68 million and \$57 million for electric infrastructure projects, for a total of \$125 million.

In 2004 legislation was enacted that revised the formula for computing contributions in lieu of taxes and set aside. The amended legislation requires that 11% of the Authority’s gross electric energy sales be distributed to fund all government rate subsidies programs, to pay contributions in lieu of taxes to the municipalities, to finance the Authority’s Capital Improvement Program and for other legal purposes. The amendment changed the calculation of contribution in lieu of taxes payable to the municipalities in that it will be the greatest of the following amounts: 1—twenty-percent of the Authority’s Adjusted Net Revenues (Net Revenues, as defined in the 1974 Agreement), less the cost of government rate subsidies; 2—the cost collectively of the actual annual

electric power consumption of the municipalities; or 3—the prior five-year moving average of the contributions in lieu of taxes paid to the municipalities collectively. If the Authority does not have sufficient funds available in any year to pay the contributions in lieu of taxes then the difference will be accrued and carried forward for a maximum of three years.

The law permits the Authority to reduce the CILT payments / remittances to municipalities by the balance of the accounts receivable due the Authority for electric service provided to municipalities. The Authority’s CILT obligation for fiscal year 2009 was \$187.7 million, which was the value of the electric power consumed by the municipalities during the fiscal year. During fiscal year 2009 the Authority was credited with remitting \$113.0 million in payments and services. The difference of \$74.7 million will be carried forward for payment by the Authority over a maximum of three fiscal years. In fiscal year 2009 the Authority also made annual installments of \$11.4 million and \$5.9 million towards the unpaid CILT balances from fiscal years 2007 and 2008, respectively. At the end of fiscal year 2009, the unpaid CILT balance totaled \$97.9 million.

The amount of \$181.4 million for Contributions in Lieu of Taxes and Other shown on *Appendix II, Income Statement*, includes \$42.1 million for the hotel subsidy, the residential fuel subsidy, and the rural electrification and irrigation subsidy, which are discussed in the *Rates* section, and a payment of \$8.9 million to amortize the outstanding line of credit used in the settlement of the municipalities lawsuit.

ECONOMIC INCENTIVES ACT

To spur economic development the Commonwealth Government enacted the Economic Incentives for the Development of Puerto Rico Act (Economic Incentives Act) in May 2008. The Economic Incentive Act is scheduled to be in effect for ten years starting on July 1, 2008.

In comparison to the Tax Incentives Act of 1998, which expired at the end of fiscal year 2008, the Economic Incentive Act expands the scope of businesses eligible for tax exemptions and credits. The three sections of the Economic Incentive Act that may most effect the Authority are the Energy Investment Credit, the Energy Cost Credit, and Wheeling. The tax credits in the Economic Incentive Act are based on the preferential income tax on Industrial Development Income.

The Energy Investment Credit section establishes a one-time tax credit of fifty percent for investments by eligible businesses in systems and equipment for generating electrical energy and for investments which improve efficiency. The energy generation may be for self consumption or for commercial resale. The amount of the tax credit for new self generated capacity is limited to 25% of the eligible firm's income tax. The tax credit for commercial generation is limited to \$8 million per eligible business and \$20 million per year in the aggregate.

The Energy Cost Credit allows eligible businesses to receive a credit of 3% of the cost of their industrial energy consumption against income tax. Additional credits are available based on the number of employees and payroll cost up to a total maximum credit of 10% of the payments made to the Authority for energy consumed in the operation of the eligible business. The maximum credit will be reduced 1% per year between 2013 and 2017. The aggregate amount for this tax credit is capped at \$75 million per fiscal year and \$600 million through fiscal year 2018.

Under the Wheeling provision, in 2010 the Authority will establish the technical criteria and tariffs that will apply to qualifying generators for moving their power—wheeling—on the Authority's system to the generator's clients or for the Authority to purchase the generator's power for general distribution to the Authority's clients. The Economic Incentive Act establishes a new administrative entity, the Energy Matters Office, whose duties include overseeing the implementation of the wheeling provision. The Energy Matters Office will have the power to assign an arbitrator to establish rates between the Authority and a qualifying generator if there is a disagreement between the two parties.

Funding for the tax credits established by the Economic Incentive Act will be drawn from the Commonwealth's General Fund and partially from payments by the Authority. The Authority's payments will be based on reductions in operating costs, improved efficiencies, revenues from wheeling and lower costs in purchased power. The Authority's payments may not in any way be subsidized or passed through to its clients and the Authority is prohibited from reducing its number of employees or payroll. The tax credit will end if the Authority's average retail cost of power is 10 cents/kwh for two consecutive years.

The Authority incurred no costs during fiscal year 2009 attributable to the Economic Incentive Act,

however, it estimates costs in fiscal year 2010 will be \$3.2 million and total \$44.0 million in the five years ending in fiscal year 2014.

FINANCING

LONG-TERM CAPITAL FINANCING

The Government Development Bank for Puerto Rico (GDB) is the primary fiscal agent for the Commonwealth of Puerto Rico and is responsible for overseeing and maintaining the Commonwealth's overall creditworthiness. In this capacity it coordinates all bond issues and lines of credit for the Authority as well as other agencies of the commonwealth government and municipal governments. The GDB also sets the timing of all bond sales.

The Authority's actual and forecasted capital expenditures for fiscal years 2009 through 2014 are summarized by category in *Appendix VI, Capital Expenditures*. *Appendix X, Details of Capital Improvement Program*, provides a breakdown by Budget Item Number of the expenditures shown in *Appendix VI*. The Authority's sources of funds and anticipated financing needs for fiscal years 2010 through 2014, as well as those realized in fiscal year 2009, are presented in *Appendix VII, Sources of Funds for Capital Expenditures*.

The U.S. Department of Agriculture's Rural Utilities Service (RUS), which replaced the Rural Electrification Administration (REA) in a 1994 reorganization, oversees various programs of both the defunct REA and the Rural Development Administration. One of the REA's programs provided low interest financing for rural electrification projects. Over the years, the Authority took advantage of this opportunity to develop portions of its System. As part of the Series KK and Series MM refunding, the Authority refinanced all of the outstanding REA Power Revenue Bonds except for the Series I issue with a face value of \$26.6 million.

As of June 30, 2009, the Authority had \$6,030,691,000 in Power Revenue Bonds outstanding, including REA bonds. (See *Appendix V, Debt Service Coverage Under the 1974 Trust Agreement*.)

The debt service coverage for all bonds outstanding under the 1974 Agreement as of June 30, 2009 was 145%, exceeding the 1974 Trust Agreement's 120% requirement.

INTERIM FINANCING

Lines of Credit & Notes Payable

As of the end of fiscal year 2009 the Authority had ten lines of credit; seven for construction financing and three for fuel financing and working capital. There are also two term loans that are financed through a large commercial bank.

Two of the financings relate to the settled litigation with the municipalities of Puerto Rico. One is a \$64.2 million term loan to fund payments made under the settlement agreement regarding litigation with the municipalities. As of June 30, 2009 the balance was \$48.1 million, of which \$39.1 million is considered long-term. There are five years remaining on this note. The other is a \$57 million credit line for infrastructure improvements which matures on June 30, 2010.

There are two lines of credit with commercial banks for fuel financing that had their terms extended by one year during fiscal year 2009; one with a limit of

\$200 million which matures on June 30, 2010, the other has a credit limit of \$275 million, previously \$225 million, and expires on June 30, 2010.

In June 2003 the Authority and GDB entered into an agreement for a \$200 million credit line to be used for interim financing of the Capital Improvement Program. In June 2006 this \$200 million credit line was refinanced with a bridge loan between the Authority and a large commercial bank. During the present fiscal year the term of the credit line had been extended by 13 months and expires on July 31, 2010. As of June 30, 2009 the credit line had been exhausted.

During fiscal year 2009 the Authority established an additional line of credit to be used for interim financing of the Capital Improvement Program; its limit is \$96 million of which \$48 million was available at the end of the year.

There are two \$100 million lines of credit related to the restoration of the Palo Seco Power Plant. One is

LINES OF CREDIT – TERM LOANS AS OF JUNE 30, 2009 (in thousands)

Purpose		
Lines of Credit-Construction Financing		
	Limit	Outstanding Debt
1 Construction-Interim Financing CIP	\$ 200,000	\$ 200,000
2 Infrastructure Muni Settlement	57,000	56,961
3 Isabela Irrigation System	25,354	6,104
4 Capital Improvement Program	400,000	250,000
6 Emergency Liquidity ³	96,000	48,000
7 Palo Seco Restoration & Extra Expenses	100,000	50,000
8 Palo Seco Restoration & Extra Expenses	100,000	50,000
Subtotal	\$ 978,354	\$ 661,065
Lines of Credit-Operational Financing		
	Limit	Outstanding Debt
1 Operational Financing - Fuel	\$ 200,000	\$ 199,892
2 Fuel Financing	275,000	275,000
3 Interest Basis Swap Collateral	150,000	11,622
Subtotal	\$ 625,000	\$ 486,514
Total	\$ 1,603,354	\$ 1,147,579
Term Loans		
	Total Note	Balance
1 Muni's Settlement Agreement ¹	\$ 64,208	\$ 48,058
2 Commonwealth Debt - Residential Fuel Sub. ²	41,585	21,741
Total		\$ 69,799
Outstanding Credit Lines & Term Loans		\$ 1,217,378

1) \$39,058 considered long-term

2) \$16,363 considered long-term

3) \$48,000 considered long term

with a commercial bank and the other with the GDB. The credit line with the GDB was extended by one year during fiscal year 2009 and will expire on June 30, 2010. The credit line with the commercial bank matures on December 18, 2009. At the end of fiscal year 2009 there were no monies available under these lines of credit.

During fiscal year 2007 the Authority established a \$400 million credit line with a commercial bank for interim financing for its Capital Improvement Program. As of June 30, 2009, \$150 million was available under this credit line.

There is a credit line for the Authority's restoration of the Isabela Dam of approximately \$25.4 million. As of June 30, 2009, approximately \$6.1 million had been withdrawn. The Authority expects to be reimbursed for any monies spent under this credit line from the Commonwealth government.

In December 2004, the Authority sold \$55.7 million of the Commonwealth Government's accounts receivable to a commercial bank for a discounted amount of \$41.6 million. The notes yield an interest from 2.6% to 4.4%. The Authority is responsible to service the note; however the Commonwealth will make annual payments to the Authority for the total amount due, therefore making the transaction a pass-through. The outstanding balance as of June 30, 2009 was \$21.7 million of which \$16.3 is considered long-term. This note corresponds to appropriations that were intended to pay part of the accumulated debt of various government agencies with the Authority and the outstanding balance of certain subsidies as of December 31, 2006. This note is considered extra-constitutional debt of the Commonwealth and the Legislature has assigned 1% of the proceeds from the sales and use tax towards the \$6.3 million annual payment.

During fiscal year 2009 the Authority initiated a \$150 million line of credit with the GBD for covering collateral on its power revenue bonds that are based on interest basis swaps. This line of credit expires on December 31, 2009. As of June 30, 2009 \$11.6 million has been withdrawn.

In summary, as of the end of fiscal year 2009 the Authority had credit lines totaling \$1,603.4 million, of which \$1,147.6 million had been withdrawn, and term loans with a remaining balance of \$69.8 million for a total balance of \$1,217.4 million.

The Authority is evaluating paying down a portion of their interim financing debt with some of the pro-

ceeds of the next long term financing which is contemplated in the amended annual budget for fiscal year 2010.

CAPITAL IMPROVEMENT PROGRAM

The fiscal year 2010 Capital Improvement Program (CIP) projects a five-year period of expenditures for extensions and improvements to the System. An overview of the scope of these projects for fiscal year 2010 is provided below and is summarized by functional group in *Appendix VI, Capital Expenditures*. An expanded presentation of the CIP is in *Appendix X, Details of Capital Improvement Program*, which lists the extensions and improvements by Budget Item Number (BIN) through fiscal year 2014.

The Authority develops the CIP on the basis of supporting its objectives of providing dependable electric power service to the island of Puerto Rico at the lowest cost, consistent with applicable environmental and social obligations.

The total capital expenditures in fiscal year 2008 established an historically high level principally because of the costs associated with the construction of the Authority's two newest production plant projects, San Juan Units 5&6 and the new combustion turbines at Mayagüez. The budget for fiscal year 2009 was established at \$446.0 million, which was 33% less than the previous year's actual expenditures, in large measure because of the scheduled completion of these projects. The combined cycle San Juan Units 5&6 entered service during the second quarter of fiscal year 2009. The eight new combustion turbines at Mayagüez were in service by the end of the fiscal year.

Actual capital expenditures during fiscal year 2009 were \$480.2 million, or 7.7% above the budget. Fiscal year 2009 marked the first year of planned significant reductions in the capital improvement program expenditures over the next four years. The CIPs in million of dollars are projected to be \$350.0, \$300.0, \$300.0, \$350.0, and \$400.0 for fiscal years 2010 through 2014, respectively. These figures do not include Contributions in Aid of Construction, i.e., capital contributed by either the Authority's clients, FEMA or the Commonwealth Government for special construction services. However, allowance for funds used during construction (AFUDC) and annual cost escalations are included.

The table below shows by functional group the amounts budgeted for the Capital Improvement Program and that actually expended in fiscal year 2009:

**BUDGETED FY 2009 CIP TO ACTUAL CIP AND
FY 2010 CIP BUDGET**

	(in thousands)			
	2009 Budget	2009 Actual	2010 Over Budget	2010 Budget
Production	\$ 185,328	\$246,578	\$ 61,250	\$ 128,014
Transmission	104,638	91,508	(13,130)	117,151
Distribution	80,489	105,028	24,529	75,322
Other	75,551	37,100	(38,451)	29,513
Total	\$446,006	\$480,214	\$34,208	\$350,000

The Authority's CIP budget for fiscal year 2010 is 27.1% less than the previous year's actual expenditures. As discussed above, the largest budget item reduction is in the cost of production plant expansion, however, reductions apply to all functional groups with the exception of transmission which is forecasted to increase by 28% over fiscal year 2009 spending levels. The transmission budget reflects priority projects which were deferred or constrained while system operation restraints were in place because of the prolonged outages at the Palo Seco steam plant. For perspective on the magnitude of the projected CIP for the five years ending in fiscal year 2014, which is \$1,700 million, this amount is 17% less than the total actual CIP expenditures for the five year period ending in fiscal year 2004, without adjusting for inflation.

As shown in *Appendix II, Income Statement*, during fiscal year 2010 the Authority plans to make no contributions to the Capital Improvement Fund. Funding for the Capital Improvement Program is discussed further in *Capital Improvement Fund* section below.

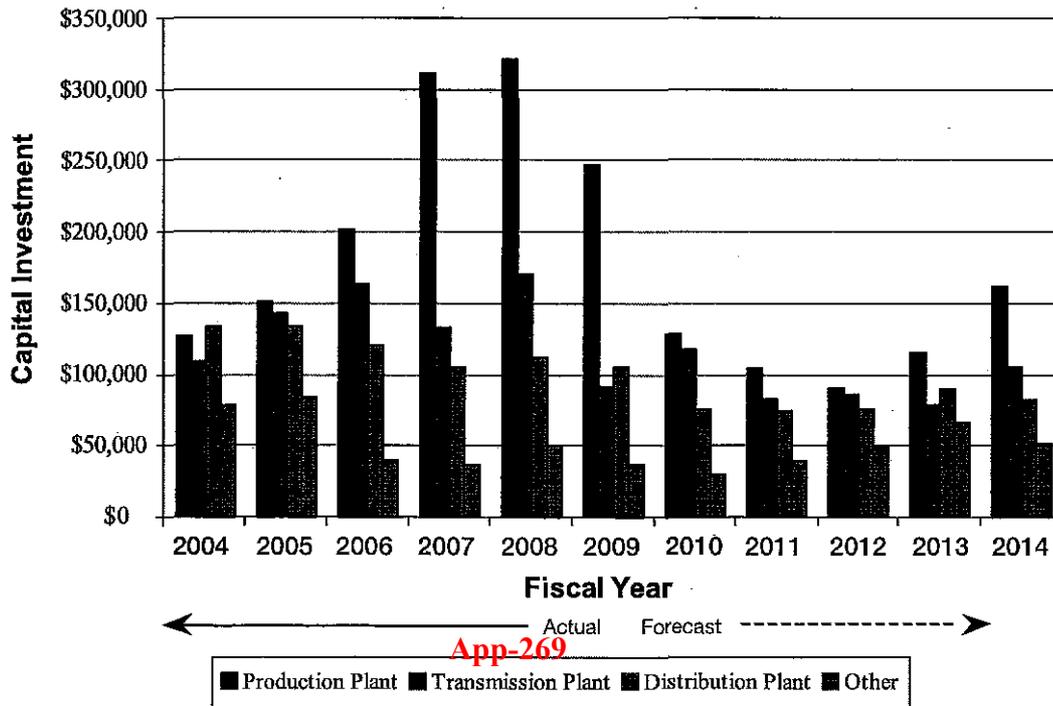
Each year, the Consulting Engineers reviews the Authority's five-year Capital Improvement Program. We believe that the moneys shown in the CIP for extensions and improvements to the System over the forecast period are reasonable. We also approve the Annual Budget of Current Expenses and Capital Expenditures prior to the beginning of each fiscal year. The Annual Budget includes the expenditures for the first year of the CIP.

The CIP is comprised of numerous budget items grouped into five general categories. The largest expenditures are in production plant, transmission plant, and distribution plant. The chart below shows the trends and relative values of these groups over the five-year budget period.

PRODUCTION PLANT

The CIP for fiscal year 2010 includes \$128.0 million for production plant related projects. These projects are grouped in two classifications: expansion projects—\$12.5 million and rehabilitation projects—\$115.5 million.

Capital Improvement Program (in thousands) 2004-2014



The final phase of the current production plant expansion program is the completion of civil and non-essential balance of plant work associated with the new replacement combustion turbines at the Mayagüez plant. Some of the balance of plant work associated with the new combustion turbine project had been constrained in fiscal year 2009 by erection sequencing.

The rehabilitation projects are the major refurbishment work planned for the Authority's operating production plants. A representative scope of these projects is discussed in the *Production Plant* section. For example, these activities include the work planned for the major overhauls at Aguirre Unit 1, Costa Sur Unit 6 and San Juan Unit 8. The projects at production plants include improvements to various major systems, such as the boiler, steam turbine-generator, combustion turbine, control systems, hydroelectric plant, and balance of plant systems. The Authority has identified projects within the rehabilitation category that are for pollution control, or for environmental issues, that have a total value of \$10.3 million for fiscal year 2010. Environmental projects include air and water pollution control projects, new sanitary sewer construction at existing production plants, spill containment dikes around fuel oil storage tanks and spill prevention, control and countermeasures at Authority substations.

TRANSMISSION PLANT

The CIP for fiscal year 2010 includes \$117.2 million for transmission plant related projects. Expansion projects are budgeted at \$79.8 million and rehabilitation projects have a budget of \$37.4 million.

The expansion projects are the new transmission lines, transmission centers, switchyards, high voltage equipment, and extensions at existing facilities to support the growth of the transmission system. The major planned projects for the 230, 115 and 38 kV systems are described in the *Transmission* section. These projects include the new 230 kV lines from Costa Sur to Cambalache and from Costa Sur to Aguas Buenas, the new 115 kV GIS transmission center at San Juan steam plant, the new 38 kV underground projects in various municipalities around the island, new 115/38 kV transmission centers at Hato Tejas and Las Cruces, and increasing the capacity of the existing Victoria and Canovanas transmission centers.

Improvements to the 230, 115 and 38 kV systems constitute the rehabilitation projects. These include replacement of structurally deteriorating lines and

poles, especially in the 38 kV system, and the upgrading of the supervisory control and data acquisition (SCADA) system.

DISTRIBUTION PLANT

The distribution system CIP budget for fiscal year 2010 is \$75.3 million and is comprised of \$17.0 million for expansion projects and \$58.0 million for rehabilitation projects.

The distribution expansion projects include new substations, including 13.2 kV substations at Factor, Yabucoa, Hato Tejas, and Rio Bayamón. The expansion projects also include new underground distribution lines, temporary substations and portable equipment, new 13.2 kV feeders, and work associated with service to new clients.

The rehabilitation projects to the distribution system include improvements to existing substations and line facilities, replacement of distribution poles and lines, and the improvement and/or extension of underground distribution lines; this scope includes the work in the historic district of Ponce. The largest budget item account in this category is directed to the purchase of automated meters. The balance of the distribution projects addresses numerous miscellaneous requirements such as the purchase and installation of breakers, sectionalizers, voltage regulators, capacitors, and similar distribution equipment and systems.

GENERAL PLANT

The fourth category within the CIP is the general plant which for fiscal year 2010 totals \$24.2 million. This category is composed of \$7.8 million for general land and buildings and \$16.4 million for equipment.

General land and buildings includes moneys for the acquisition of land and rights of way and for structures. The land acquisition budget includes funds for new transmission line rights of way; it also includes land for future locations of photovoltaic arrays and wind turbines. Regarding structures and buildings, the general plant funds are for the construction of new and improvements to technical offices, buildings, warehouses and customer service facilities. These projects include the restoration of the Electric Service Center building in Monacillos.

The equipment group is made up of computer equipment at \$5.4 million, transportation equipment (land and air) at \$6.5 million, communications equipment at \$1.0 million and other equipment at \$3.5 million.

PRELIMINARY INVESTIGATIONS

The final category in the CIP is for preliminary studies and surveys. The fiscal year 2010 budget for these activities is \$5.3 million. These studies are performed by the engineering, planning and environmental groups to support the evaluations of various system improvements and environmental compliance alternatives. Other studies evaluate improvements to the operation and maintenance of the transmission and distribution system.

FUNDING OF THE EMPLOYEE'S RETIREMENT SYSTEM

The Employee's Retirement System of the Authority is a separate trust fund created and administered by the Authority. The Retirement System is funded by contributions from both the Authority, based on annual actuarial valuations, and plan members. The Retirement System's independent actuary prepared an actuarial valuation dated September 17, 2009 for fiscal year 2008 and the results showed that the Retirement System's unfunded accrued liability had decreased from \$825.6 million as of the end of fiscal year 2007 to \$765.7 as of the end of fiscal year 2008.

The Authority's contribution rate was 21.1% in fiscal year 2007, 21.8% in fiscal year 2008, 21.1% in fiscal year 2009 and is anticipated to be 19.7% for the fiscal year ending June 30, 2010.

The following table summarizes the status of the Authority's Pension Plan for the year ending June 30, 2008:

AUTHORITY'S PENSION PLAN	
Plan Members Contribution Rate (Estimated based on member data for actuarial valuation)	10.1%
Annual Pension Cost (in thousands)	\$76,290
Percentage of Annual Pension Cost Contributed	99.6%
Net Pension Obligation (in millions)	\$13.5
Contributions made and accruals (in thousands)	\$75,995
Based on the June 30, 2006 Actuarial:	
Value of Assets (in millions)	\$1,571.2
Actuarial Accrued Liability	\$2,336.9
Unfunded Actuarial Accrued Liability	\$765.7
Funded Ratio	67.2%
Estimated Covered Payroll	\$362.9
Unfunded Contribution Rate	13.7%

INVENTORIES AND OTHER PROPERTIES

The Material Management Division's mission is to support all of the Authority's installations with the material and equipment necessary to accomplish the Authority's goal of providing electric service to clients at the lowest possible cost. A part of the Administrative Services Directorate, the Authority's Material Management Division has two main subdivisions, which are Purchasing and Warehouses.

The Warehouses subdivision utilizes 34 warehouses and manages an extensive inventory worth in excess of \$195.1 million of which \$91.2 million is transmission and distribution material and \$103.9 is related to its production plant spare inventory. The spare parts inventory for transmission and distribution plant includes the safekeeping of a number of items, such as transformers; poles; fuses, breakers; structures; and insulators. Among the items for production plant includes; spare rotors for units at the Aguirre and Costa Sur Steam Plants; and a spare turbine rotor for Palo Seco Units No. 3 & 4. For a (partial) list of spare components for the production plant refer to the *Spare Components* section in the *System's Operations* section.

FUNDING RECOMMENDATIONS

Section 706 of the 1974 Agreement reads in part:

it shall be the duty of the Consulting Engineers to include in such report [this Annual Report] their recommendations as to the amount that should be deposited monthly during the ensuing fiscal year to the credit of the Reserve Maintenance Fund...; deposited during the ensuing fiscal year to the credit of the Self-insurance Fund...and deposited during the ensuing fiscal year to the credit of the Capital Improvement Fund

These three funds were created and funded in 1996 when the 1947 Trust Indenture was defeased.

There have been four major events that have caused losses to the Authority since the Reserve Maintenance and Self-insurance Funds were created.

The first was Hurricane Hortense in fiscal year 1997 that caused an estimated \$36.0 million in damages to the Electric System. The entire loss of this event was borne by the Authority.

In fiscal year 1999 Hurricane Georges devastated the island. Total damages were estimated at \$239.9 million of which \$12.7 million was covered by insurance, \$168.0 million was provided by the Federal Emergency Management Agency (FEMA) and the remainder of \$59.2 million was the responsibility of the Authority.

Tropical Storm Jeanne in fiscal year 2005 caused an estimated \$60 million in damages of which FEMA provided \$11.8 million in aid and the balance of \$42.8 million came from various funds of the Authority.

The most recent event was the fires at the Palo Seco Power Plant during fiscal year 2008. The total damages are estimated to be \$363.2 million of which insurance payments to the end of fiscal year 2009 amounted to \$301.3 million. Insured losses were still being negotiated at the end of the past fiscal year, leaving the Authority's share from \$61.9 million and \$33.8 million.

The specific utilization of money from the Reserve Maintenance and self-insurance Funds is discussed below.

RESERVE MAINTENANCE FUND

Section 512 of the 1974 Agreement reads in part:

moneys held for the credit of the Reserve Maintenance Fund shall be disbursed only for the purpose of paying the cost of unusual or extraordi-

nary maintenance or repairs, maintenance or repairs not recurring annually and renewals and replacements, including major items of equipment.

At the end of fiscal year 2009, the Reserve Maintenance Fund's balance was \$5.6 million. The Reserve Maintenance Fund is a restricted fund in which the moneys are held in trust by the Authority.

Since the fund was created in 1996 there have been two instances when the Authority withdrew moneys from this fund.

The first instance occurred in fiscal year 2005, when \$7.1 million was withdrawn and applied as part of the \$45 million costs to repair the System following damages caused by Tropical Storm Jeanne. Additional sources of funds to restore the System came from FEMA and the Authority's Self-insurance Fund.

The second instance began in April 2007 when the Authority sought the Consulting Engineers' concurrence regarding the use of the Reserve Maintenance Fund as an interim source of funds for the recovery of the Palo Seco Steam Plant. The Consulting Engineers concurred, but stipulated that any moneys withdrawn from the Reserve Maintenance Fund should be replenished using the proceeds from the Authority's insurance program within a reasonable timeframe. Consistent with the Consulting Engineers intent, the Authority borrowed \$9.4 million from the Reserve Maintenance Fund during fiscal year 2007 and \$58.3 million during fiscal year 2008, a total of \$67.7 million dollars. The withdrawals were carried as an inter-fund debt of the General Fund as part of the Palo Seco Steam Plant recovery project. During the same period the Authority returned \$14.7 million from insurance proceeds, \$5.0 million in fiscal year 2007 and \$9.7 million in fiscal year 2008, netting a \$53 million inter-fund debt of the General Fund to the Reserve Maintenance Fund.

Consistent with the Consulting Engineers responsibilities under the 1974 Trust Agreement, the Consulting Engineers recommended that the Authority deposit \$5 million to the Reserve Maintenance Fund in fiscal year 2009. At the request of the Authority, the Consulting Engineers agreed that the monies would be added to the Reserve Maintenance Fund and concurrently reduce the \$53 million inter-fund debt to approximately \$48 million.

The Consulting Engineers recommend that the Authority deposit \$5 million into the Reserve Maintenance Fund during fiscal year 2010.

SELF-INSURANCE FUND

Section 507 (g) of the 1974 Agreement reads in part:

to the credit of the Self-insurance Fund...such amount, if any, of any balance remaining after making the deposits under clauses (a), (b), (c), (d), (e), and (f) above, as the Consulting Engineers shall from time to time recommend; and

Section 512A of the 1974 Agreement reads in part:

moneys held for the credit of the Self-insurance Fund (1) shall be disbursed...only for the purpose of paying the cost of repairing, replacing or reconstructing any property damaged or destroyed from or extraordinary expenses incurred as a result of a cause which is not covered by insurance...or (2) shall be transferred to the Revenue Fund in an amount, approved by the Consulting Engineers, equal to the loss of income from the System as a result of a cause which is not covered by insurance.

Section 512A of the 1974 Agreement further reads:

If the Authority shall have determined that all or any portion of the moneys held to the credit of the Self-insurance Fund is no longer needed for the purposes specified in the second preceding paragraph, the Authority may withdraw an amount equal to such portion from the Self-insurance Fund and transfer such amount to the credit of the Bond Service Account; provided, however, that no such transfer shall be made prior to the time that the Consulting Engineers shall have approved such transfer in writing.

As of the end of fiscal year 2009 the balance of the Self-insurance Fund was \$62.6 million. Similar to the Reserve Maintenance Fund, the Self-insurance Fund is a restricted fund in which the moneys are held in trust by the Authority. The Authority has withdrawn moneys from this fund four times since its creation in 1996. The first withdrawal, in fiscal year 1997 for \$32 million, was for damages caused by Hurricane Hortense. The second withdrawal for \$30 million in fiscal year 1999 was for damages caused by Hurricane Georges. Then in fiscal year 2005 for damages caused by Tropical Storm Jeanne \$18.3 million was withdrawn. It should be noted that these amounts were used to supplement insurance payments and reimbursements from FEMA. They represented only a fraction of the moneys required to restore the Authority's facilities.

In fiscal year 2007, at the request of the Authority, the Consulting Engineers authorized the withdrawal of moneys from the Self-insurance Fund to cover

uninsured losses associated with the Palo Seco Steam Plant fires. During fiscal year 2008 the Authority withdrew \$25.4 million from this fund for the uninsured losses associated with the Palo Seco Steam Plant fires. Also during fiscal year 2008 the Authority deposited \$5.0 million to this fund. In fiscal year 2009 the Authority deposited \$10 million to the fund in accordance with the Consulting Engineers recommendations.

For fiscal year 2010 the Consulting Engineers recommends that the Authority deposit \$10 million to the Self-insurance Fund.

CAPITAL IMPROVEMENT FUND

Section 507 (h) of the 1974 Agreement reads in part:

to the credit of the Capital Improvement Fund such amount, if any, of any balance remaining after making the deposits under clauses (a), (b), (c), (d), (e), (f), and (g) above, as the Consulting Engineers shall recommend as provided by Section 706 of this Agreement; provided, however, that if the amount so deposited to the credit of said Fund during any fiscal year of the Authority shall be less than the amount recommended by the Consulting Engineers, the requirement therefore shall nevertheless be cumulative and the amount of any such deficiency in any such fiscal year shall be added to the amount otherwise required to be deposited in each fiscal year thereafter until such time as such deficiency shall have been made up, unless such requirement shall have been modified by the Consulting Engineers in writing, a signed copy of such modification to be filed with the Authority.

Section 512B of the 1974 Agreement reads in part:

Moneys held for the credit of the Capital Improvement Fund shall be disbursed...only for paying the cost of anticipated extensions and Improvements of the System the cost of which has not otherwise been provided for from the proceeds of bonds issued under the provisions of this Agreement.

The Consulting Engineers approves annually the Authority's budget for the ensuing fiscal year; the budget includes amounts for the first year of the five-year CIP. (For further discussion, refer to the *Annual Budget* in the *Financial* section) The Amended Budget for fiscal year 2009 projected that the Capital Improvement Program (CIP) expenditures would be \$446.0 million, of which no monies would come from the Capital Improvement Fund. The actual CIP expenditures for fiscal year 2009,

however, totaled \$480.2 million, of which \$4.7 million was financed internally through the Capital Improvement Fund. For fiscal year 2010 the Capital Improvement Program is budgeted \$350.0 million, of which no amount will come from internal funds. The internally generated funds portions of the CIP for fiscal years 2011 through 2014 are projected to be 7%, 3%, 1% and 0.4%, respectively.

The table below shows the Authority's actual deposits to the Capital Improvement Fund compared with that which was budgeted.

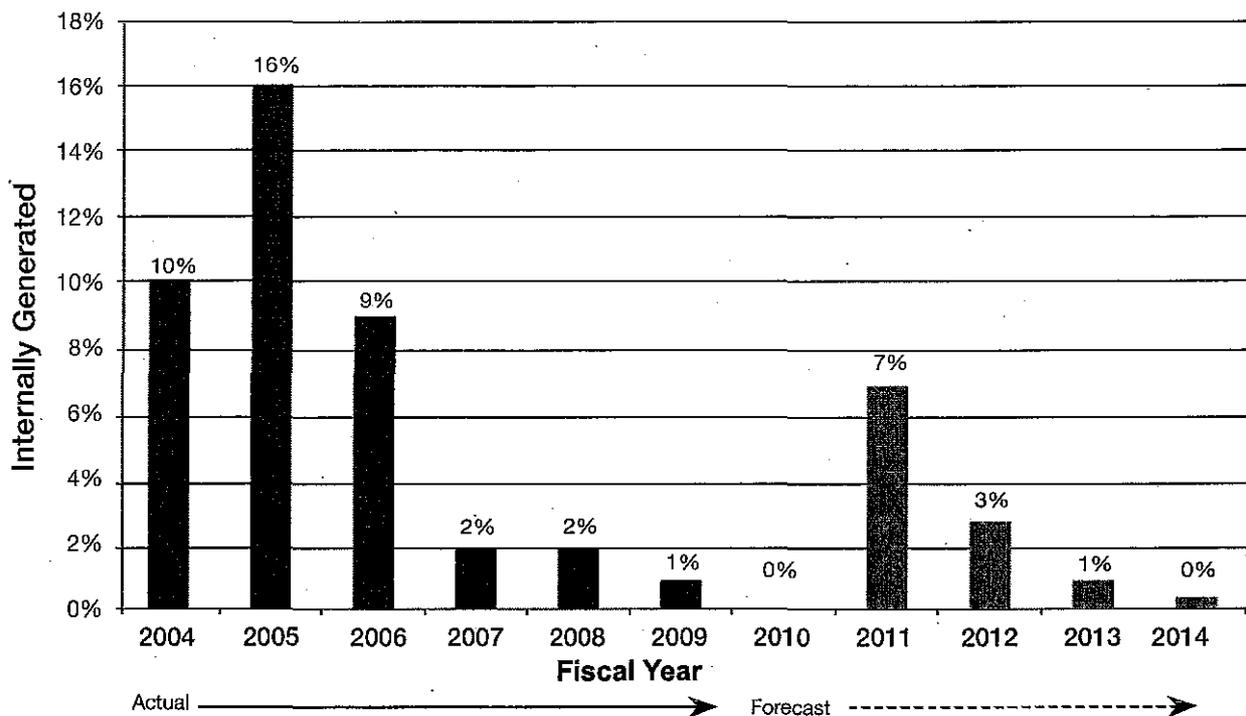
CAPITAL IMPROVEMENT FUND			
Fiscal Year	Amount Budgeted	Amount Deposited	Difference
2009	\$ 0.0	\$ 4.7	\$ 4.7
2008	\$ 100.3	\$ 6.6	(\$ 93.7)
2007	\$ 69.6	\$ 10.2	(\$ 59.4)
2006	\$ 63.8	\$ 49.6	(\$ 14.2)
2005	\$ 77.4	\$ 83.0	\$ 5.6
2004	\$ 96.7	\$ 43.1	(\$ 53.6)

The level of deposits to the Capital Improvement Fund over the past five years was negatively impacted by overruns in discretionary budgets, the increased payments for Contributions in Lieu of Taxes, and the servicing of short-term financings required for working capital.

The Capital Improvement Fund also serves as an additional reserve for the payment of the principal of and the interest on the Power Revenue Bonds and meeting the amortization requirements to the extent that moneys in the 1974 Sinking Fund, including the 1974 Reserve Account, in the Reserve Maintenance Fund, and in the Self-insurance Fund are insufficient for such purpose.

The chart below shows the annual portions of internally generated funds for the total financing sources of capital expenditures since 2004 and those forecasted through 2014.

**Internally Generated Funds Portion of Financing Sources
Fiscal Years 2004-2014**



HUMAN CAPITAL

HUMAN RESOURCES

On June 30, 2009, the Authority had a total workforce of 9,216 employees: 9,184 permanent employees and 32 temporary employees or probationary employees who had been employed by the Authority for less than 12 months. The total number of employees on June 30, 2009 reflects a net decrease of 213 employees; 152 of whom were temporary employees who held entry level positions and 61 of whom were permanent employees. On June 30, 2008 the Authority had 9,429 employees, 9,245 of whom were permanent and 184 were temporary.

During March 2009 the Authority reduced the number of directorates from twelve to six. Three directorates, the Electric System, the Transmission & Distribution Directorate and the Engineering Directorate were consolidated into the Generation, Transmission & Distribution Directorate. The Client Services Directorate was merged with the Finance Directorate which was renamed the Finance & Client Services Directorate. The Communication and Community Relations and the Corporate Security Directorates were brought within the Executive Directorate. The Labor Affairs Directorate was realigned within the Human Resources Directorate. The Legal Directorate, Planning and Environmental Protection Directorate, and the Administrative Services Directorates maintained their directorate status. Ninety-two percent of the Authority's employees were employed in one of the following three directorates: 5,963 worked in the Generation, Transmission & Distribution Directorate or approximately 65% of the Authority's employees; the Finance & Client Services Directorate employed 1,794 persons or 19% of the Authority's workforce; and 750 employees were employed in the Administrative Services Directorate, approximately 8% of the Authority's workforce. An additional 709 persons were employed in one of the four other directorates or by the Governing Board.

The Authority prepares its employees for their job assignments by providing a wide range of training programs and refresher training programs. The Human Resources and Labor Affairs Directorate provides the Authority's employees with training in the areas of safety, health, computer usage and administrative skills. The training programs providing job specific, technical knowledge of the type needed by the employee to effectively perform their assigned

work are provided by the directorate within which they are employed. Bargaining and non-bargaining unit employees, supervisors and managers participate in these programs.

The Authority is exploring actions that would reduce the impact on their operations of the escalating cost of the medical insurance coverage which they provide for employees and retirees.

LABOR AFFAIRS

The following paragraphs provide an overview of the bargaining units within the Authority and of the status of the labor agreements applicable to these bargaining units.

At the end of fiscal year 2009 four different unions represented 6,413 of the Authority's employees or 70% of the Authority's workforce. The other 2,803 employees are members of the executive, managerial, and administrative staff. The terms of employment for these 2,803 employees are not established by a collective bargaining agreement. The figures for fiscal year 2008 are similar; 6,576 employees represented by unions, (70% of the workforce), and 2,853 in executive, managerial, and administrative positions. In an effort to improve efficiency the Authority terminated 148 of its temporary employees during the last quarter of fiscal year 2009.

During fiscal year 2009 the Authority concluded the renegotiation of a contract with UTIER the largest of the four unions that represent certain of their employees. The results of this effort and the status of the collective bargaining agreements with the other three unions are described in the following paragraphs. Union and Authority representatives meet on a regular basis during the term of a collective bargaining agreement to discuss labor-management issues.

The Authority concluded the renegotiation of a collective bargaining agreement with the Electric Energy Authority's Pilot Union (UPAEE) in June 2006. The four-year agreement, which established wages, hours, and, conditions of employment for the Authority's six pilots, became effective on July 3, 2006 and will terminate on July 2, 2010. The pilots are scheduled to receive a 4% increase on July 3, 2009 for the final year of the agreement

The renegotiation of the agreement between the Authority and the Independent Professional Employees Union (UEPI), which represented 393 of the Authority's employees at the end of fiscal year 2009, was signed on February 13, 2008. The multi-

year agreement, which will terminate on December 13, 2010, established a 4% increase each December 14 during the term of the agreement.

In January 2008 the Authority completed the renegotiation of the current labor agreement with the Insular Union of Industrial and Electrical Construction Workers, (UTICE). The three-year agreement, which will terminate on January 26, 2011, called for an initial increase of 4% and for annual increases of 4%. UTICE represented 959 of the Authority's employees at the end of fiscal year 2009.

On August 28, 2008 the Authority and representatives of Union of Workers of Electrical Industry and Irrigation of Puerto Rico, (UTIER), signed a collective bargaining agreement that replaced the one that had terminated in November 2005. The parties had spent three years renegotiating the agreement. During the renegotiation of the agreement the union had called for several, brief and partial work stoppages, none of which caused the Authority's service to be interrupted. The current agreement remains in effect for four years, terminating on August 24, 2012. On June 30, 2009 UTIER represented 5,055 of the Authority's employees. The agreement calls for 4% wage increases each year on the anniversary date of the agreement. The agreement freezes the entry level pay rate for newly hired employees for the four-year term of the agreement. A labor management committee meets periodically to discuss matters of mutual interest.

EMPLOYEE SAFETY

Each of the Authority's directors is responsible to the Executive Director for the safety and health of the employees working within their respective directorate. Subordinate managers, supervisors, and ultimately the workers themselves share this responsibility. The Occupational Safety Division assigns the safety and health professionals and certain of the other resources needed to assist the directors in their efforts to prevent accidents and job-related illnesses. The Occupational Safety Division ensures that the Authority's workplace safety and health programs comply with relevant Federal and Commonwealth statutes and are consistent with the objectives of the Authority.

The Division's staff of 29 comprised largely of safety and health professionals provides assistance to managers and supervisors in the day-to-day implementation of safety and health programs. Thirteen of the

29 are assigned to other operating facilities and regional offices. The following is a sampling of the distribution of safety and health professionals across the island, there are eight Safety and Industrial Hygiene Officers, and five are assigned to generating stations, one each at: Central Aguirre Steam, Aguirre Combined Cycle, Central Costa Sur, Central Palo Seco, and Central San Juan. Two Safety and Industrial Hygiene Officers are based in Santurce and one is based in Monacillos; from the office locations they provide consulting services to the other directorates and to the Cambalache Power Plant. A Health and Safety Officer is assigned in each of the regional Transmission and Distribution offices in Arecibo, Carolina, Ponce, San Juan, Bayamon, Caguas, and Mayagüez. A Health and Safety Officer based in the Authority's Santurce office accepts assignments throughout the Commonwealth. The Authority has a single Safety Consultant responsible for the development and implementation of safety programs for the Authority's construction sites. The Hazard Communication Section provides training in hazardous waste operations and emergency response (HAZWOPER) to 300 employees and initial and refresher training in hazard recognition, personal protective equipment, and hazard communication at facilities throughout the Commonwealth to more than 3,000 of the Authority's employees each year.

Work-related illness and accident costs include medical care, workers compensation, salary continuation, fringe benefits, worker replacement, overtime, administrative costs, and other related expenses. Safety personnel provide a wide range of safety instruction programs; in addition to the hazard communication training noted above these include: confined space training, respirator use, ergonomics, energy lock out, hearing and eye protection, and emergency reporting. Much of the Authority's supervisory training focuses on the importance of conducting and recording job briefings so that subordinates fully understand the exposures that they might encounter in the course of completing a work assignment and the actions necessary to mitigate the exposures. Supervisory training programs increase the awareness of both the direct and indirect costs of accidents and illnesses, including their effect on the Authority's cost of doing business.

In calendar year 2008, the Authority reported to OSHA that its employees worked a total of

16,350,798 hours and sustained 1,507 incidents of work related injury or illness that were recordable in accordance with the OSHA's requirements. There were two fatalities. Both were the result of an electrical contact. The frequency with which the Authority's employees reported work-related injuries or illnesses in calendar year 2008 was 18.4, slightly higher than the frequency reported in calendar year 2007. This frequency continues to be more than four times the frequency rate experienced by mainland utilities in the same timeframe.

Six years ago legislation was enacted that for the first time made the Authority and other Puerto Rican public corporations subject to financial penalties, in the same manner as private corporations, for violations of OSHA regulations. The Authority's managers and supervisors were briefed on the change in the OSHA penalty provisions. In calendar year 2008, the Authority was cited seven separate times for violating OSHA regulations. The proposed penalty was ultimately dismissed in four of the seven instances; Authority ultimately paid \$4,250 in settlement of the fines levied for the three other cited violations. This amount was less than half of the amount of the fines levied during the prior calendar year.

The employees of the Occupational Health Division, within the Human Resources Directorate, are responsible for providing first aid and medical treatment to employees from the reported onset of a work related injury or illness until the employee returns to work, is reassigned, or reclassified administratively. The initial interface is frequently at one of the eight dispensaries that are staffed with registered nurses and located at the Authority's main office in Santurce, in regional offices in Monacillos, Caguas, and Ponce. The other four dispensaries are located at the Aguirre, Costa Sur, Palo Seco, and San Juan steam electric plants. Employees were seen for initial treatment at these dispensaries more than 22,220 times, the majority of the time these treatments classified as for non-occupational conditions.

Following a work related injury or illness almost all employees are referred from the Authority's dispensary or a first aid facility to one of the Commonwealth's treatment clinics, which are a part of the Corporación del Fondo del Seguro del Estado (CFSE) or Fondo for short. The physicians and medical staff employed by Fondo provide the medical care required by the Authority's employees following a work related injury or illness and

determine when the employee is capable of returning to work. A long-term goal of the Authority has been the reduction in the average number of work-days lost by their employees following a lost work-day illness or incident. The cooperation of Fondo is critical to accomplishing this goal. During fiscal year 2007 the Authority was accepted into a Fondo program whereby Fondo committed to providing a coordinated interdisciplinary team of medical personnel to assist the Authority's employees to achieve the earliest return to work possible. The expectation is that by giving the Authority's employees priority status that the interval between appointments for follow-up care will be shortened enabling the injured or ill employee to return to work as soon as the required recuperation is complete. Throughout the year the Authority's representatives met with Fondo administrators to review the case management of employees being treated by Fondo. Other public entities also participate in this program.

The Authority uses a team of investigators to monitor cases for possible abuse of the Authority's employee accident leave policy. The Authority retains a physician to evaluate the fitness of an employee to return to work following a lost workday incident. When the evaluation has concluded that the employee is fit to return to work the Authority charges any subsequent time off against the employee's accrued vacation pending their return to work. Authority staff meets periodically with the staff of the clinics providing medical care to the Authority's employees in an effort to achieve the most expeditious provision of medical care for their employees. A separate section within this department manages the administrative issues associated with employees who are disabled.

Since 1995 the Authority has had a random drug-testing program, which has been implemented in steps. The random drug-testing program applies to approximately 5,800 employees in safety sensitive positions. During calendar year 2008 the Authority randomly tested 2,607 of the employees working in safety-sensitive positions; each were given two tests, 55 of them (2.1%) tested positive for illegal substances. The program provides for treatment and counseling for those individuals who test positive for drug use. An employee who tests positive for drugs three times may be terminated.

In 71.8% of the instances in which an employee sustained a work-related injury or illness the employee did not work on the day following the event. Twenty-eight percent of employees who sustained a work related injury or illness reported for work on the day following the onset of a work related illness or injury. Slightly more than half of those employees who reported for work on the day following the incident were reassigned to other duties or put on restricted duty. On average these employees were transferred or placed on restricted duty for 28 days. The ratio of injured or ill employees reporting for work the day after an injury or illness rather than staying home was the same as in the calendar year 2007. However, following a disabling incident, one that led to the employee's reassignment or rendered the employee unable to report for work, employees lost an average of 60 workdays, two more than the average number in calendar year 2007. For each quarter year during 2008 there were 416 employees recuperating at home due to a work related event. On average 336 employees had been released by Fondo to return to work while continuing to receive medical care at a Fondo facility; these employees were paid under the Authority's salary continuation plan for work time missed while receiving medical care.. Another 151 employees were using their accrued annual or sick leave to pay for time away from work while receiving medical care.

SUPPLEMENTARY INFORMATION

EXECUTIVE DIRECTOR CHANGE

On January 13, 2009 the Authority's Governing Board appointed Ing. Miguel A. Cordero López as Executive Director of the Authority, a position he held previously from 1993 to 2000. He replaced Ing. Juan F. Alicea Flores who had been named Executive Director in 2008.

Ing. Cordero is a professional electrical engineer with more than 30 years experience with the Authority. He served as the Director of the Transmission and Distribution prior to being appointed Executive Director in 1993. In addition to his service with the Authority, Ing. Cordero has served in management positions in many public sector agencies and Authorities. During Ing. Cordero's first tenure as Executive Director he initiated a major capacity expansion program and oversaw improvements to the existing generating plants. These programs brought cogenerators and fuel diversity to the System, lowered the cost of electricity and improved the quality of service.

PREPA SUBSIDIARIES

At the end of fiscal year 2009 the Authority owned four subsidiaries. The first (PREPA.Net) was created in 2005 for ownership of its fiberoptic network. Two other subsidiaries associated with power projects are discussed in *Alternative Energy Sources* in the *Capacity Planning* section. PREPA Oil & Gas was established to provide a mechanism for the Authority to participate in a wide range of commercial and operational projects for fuel supply and infrastructure. The Authority formed PREPA Renewables to expand the Authority's ability to participate in or assist in the development of renewable energy projects. The fourth subsidiary is PREPA Utilities which was formed to develop, construct and operate industrial projects and other related infrastructure to improve the electric infrastructure of the Authority.

In the year 2000 the Authority began the acquisition of a fiber optic cable system to modernize the Authority's internal communication systems and thereby provide faster and more secure data transmission for operations, load management, system protection, and security. In order to meet its optical fiber cable requirements, the Authority entered into a long-term agreement with Puerto Rico Information Networks, Inc. (PRIN) a private, independent, non-profit corporation incorporated in Puerto Rico.

Battery Energy Storage System, BESS. The Authority is claiming damages of more than \$18 million against the co-defendants; the case is entering its fourth year and continues in discovery.

During fiscal year 2008 the Authority awarded a contract to Skanska Energy Services, LLC (Skanska) to engineer, procure, and construct a 42 mile long gas pipeline from Guaynilla to the Authority's Aguirre Combined Cycle Plant. Early in fiscal year 2009 construction began with site development, environmental stabilization, and pipe fabrication. These activities continued until ordered stopped in early December 2008 by the Superior Court of Ponce following actions brought by southern communities in opposition to the gas pipeline. Skanska complied with the court ordered suspension and remained mobilized in anticipation of an order allowing construction to proceed. In response to the continuing opposition by certain communities the gas pipeline project was cancelled in April. Later that month the Commonwealth government announced a decision to utilize the former gas pipeline material to construct a water pipeline to transport water eastward from Guayanilla. The water pipeline would spur additional economic development in the southern half of the island. The Authority's efforts to transfer the pipeline project to the Aqueduct and Sewer Authority were continuing at the end of the fiscal year. Skanska inventoried materials and equipment and began demobilization while beginning negotiations with the Authority for recovery of compensation consistent with their contract with the Authority. At the end of fiscal year 2009 the Authority and Skanska were negotiating in an effort to reach a settlement of all matters related to the pipeline project. The Authority was also in discussion with the Commonwealth for the recovery of the project costs that followed from the decision to convert the gas pipeline to a water pipeline.

The Authority is making a concerted effort to significantly reduce the theft of electricity. Electricity theft is occurring across client classes and has been identified as having a material impact on the Authority's operations. During the last quarter of fiscal year 2009 the Authority identified more than 800 clients who had engaged in energy theft. At the end of the fiscal year these clients were being summoned to hearings before Administrative Law Judges who had the authority to make summary judgments regarding the theft and to assess fines. Through these proceedings the Authority collected approximately \$100,000 in restitution during fiscal year 2009.

During the fiscal year the Authority closed more than 120 civil suits that had been brought against the Authority. The suits were settled for amounts between 10% and 12% of the damages claimed. These settlements were not material.

INSURANCE

The Risk Management Office, under the Finance Directorate, manages the Authority's Insurance Program. It is responsible for managing and controlling the Authority's resources to minimize risks of accidental losses. In addition, it analyzes, assesses, and recommends insurance policies and bonds for contracts and purchase orders. It settles property claims against the Authority valued at less than \$10,000.

During fiscal year 2009 the Authority maintained a layered set of All Risk Property and Boiler and Machinery policies that provided a combined coverage of \$750 million. The All Risk Property Policy provides coverage for business interruption, wind, flood, and earthquake; it excludes coverage of transmission and distribution lines other than underground lines, which is common in the electric utility industry. In addition to the two policies cited above the Authority's Insurance Program contains policies for Terrorism and Pollution, Builders Risk, Public Liability, Personal Auto Policy-Employees, Commercial Auto Policy-PREPA, Crime, Directors and Officers Liability, Fiduciary Liability, Aviation, Hull and Hull Risks, Owner Controlled Insurance Program (OCIP) Rolling Wrap-up, and Employment Practices Liability. The Authority holds a self-insured general retention of \$2 million under its All Risk Property Policy for direct damage from all perils; the retention is \$25 million under this policy for losses caused by natural events such as floods, wind, and earthquake. The business interruption coverage within the All Risk Property Policy is capped at \$200 million with the Authority covering the costs from the first thirty days of the interruption. Property and Boiler and Machinery losses in excess of 300 million are covered by another policy that provides an additional \$250 million in coverage. The public liability coverage remains at \$75 million with the Authority holding \$1 million retention, up to an annual aggregate of \$2 million.

In May 2009 the Authority made a number of changes to their Insurance Program, these changes will be in effect during fiscal year 2010 and are as follows. Within the All Risk Property Policy the Authority's retention under the \$550 million of

Under the agreement, PRIN designed and built a fiber optic cable system that was installed on the Authority's rights-of-way (mainly its transmission lines). The fiber-optic cable is an integral part of the overhead ground wires which protect transmission lines from lightning strikes. When completed in August 2002, title to the system was transferred to the Authority.

The Authority financed its acquisition of the fiber optic system from PRIN by selling \$43.7 million of Subordinate Obligations in October 2002. The agreement provided for the long-term lease to PRIN of any excess capacity for a 25-year period. Any resulting lease revenues, which were not derived from the production and sale of electric energy, would be used to benefit the Authority's ratepayers.

In June 2005 the Authority created Prepa.Network Incorporated (PREPA.Net) to replace PRIN and market the excess communication capacity of the fiber optic network. Prepa.Net offers Next Generation Telecommunications (NGT) service to carriers, Internet Service Providers (ISPs), and large enterprises. The services include SONET, metro and long haul Ethernet transport services, wireless last mile, and Internet Protocol (IP) services optimized for Voice over Internet Protocol (VoIP) and other related services.

During fiscal year 2008 PREPA.net acquired Ultracom, one of three submarine cable firms on the island, to obtain international fiber optic cable capacity and satellite teleport facilities. The acquisition was financed with a term loan of \$10.1 million.

PREPA.net's total assets at the end of fiscal year 2009 were \$20.1 million and its net income was \$2.1 million. In addition to the term loan, during fiscal year 2009 PREPA.Net had a revolving line of credit of \$2 million for working capital.

LEGAL AFFAIRS

The Authority's Legal Affairs Directorate is responsible for a wide range of contract and litigation related activities. The following discussion summarizes the status of a number of the issues that the Authority litigated during fiscal year 2009.

The Authority contracted with Abengoa, Puerto Rico, S.E., as the primary contractor for the San Juan Units 5 & 6 repowering project. In May 2000, Abengoa unilaterally declared the construction contract terminated and filed a legal complaint for breach of contract against the Authority claiming approximately \$18 million in damages.

Subsequently, the Authority filed a counter claim for breach of contract and for damages in the amount of \$200 million which they incurred as a result of the contract termination by Abengoa. In October 2007 the lawsuit was certified as complex litigation necessitating specialized treatment. The case was still in the discovery phase of technical matters phase at the end of fiscal year 2009. Early in fiscal year 2010 the parties will meet to discuss the use of arbitration to resolve their issues. As discussed in the *Production Plant* section, San Juan Units 5 & 6 went into commercial operation during the second quarter of the past fiscal year.

In June 2006 the Office of the Comptroller of Puerto Rico reported that the Authority overcharged its clients approximately \$49.8 million between September 1999 and December 2003, and insisted that the Authority credit its customers that amount. Subsequent to the release of the Comptroller's report several additional suits were filed by various clients against the Authority seeking reimbursement for alleged overcharges; the total of all the claims is more than \$700 million. The court ordered that all the plaintiff's cases regarding this matter be consolidated and ordered that the case be classified as complex litigation. The plaintiff's appeals were unsuccessful in requesting a class action determination. The Authority holds that charges were determined correctly, in accordance with the established rates, and that these allegations are similar to ones in a previous lawsuit in which the Authority prevailed. At the close of fiscal year 2009 the case continued to make its way through the court system with little expectation of a speedy resolution.

As part of the settlement in 2007 of the litigation over the Contributions in Lieu of Taxes, CILT, the Authority agreed to perform certain infrastructure projects for the municipalities involved in the litigation. Among them was a multi-phased project for the Municipality of Ponce, a portion of which was to be paid for by the Municipality of Ponce. The Municipality became delinquent on \$3 million due the Authority for phases one and two of the work. The Authority suspended work on the project and the Municipality sued the Authority in court. The matter was resolved in court, the Municipality paid the Authority the amount due and the Authority resumed work on the infrastructure project.

Three years ago the Authority filed suit in Puerto Rican Court against the Brazilian manufacturer and the manufacturer's Puerto Rico agent over the failure of the more than 6,000 batteries in the Sabana Llana

windstorm damage coverage is \$50 million with a \$25 million deductible per occurrence up to an annual aggregate of \$25 million. The pollution insurance formerly covered by the Terrorism and Pollution Policy remains unchanged at \$250 million per pollution event with the Authority responsible for the retention of \$300 million however the Authority has dropped insurance coverage for losses caused by terrorism. The deductible on the Authority's \$550 million Boiler and Machinery Policy was increased from \$10 million to \$25 million per occurrence. Coverage under the Directors and Officers Liability Policy is \$40 million. With the completion of major construction projects the Authority reduced Builders Risk Policy coverage to \$35 million. The cost of the Authority's Insurance Program as renewed with these changes is approximately \$19.1 Million.

The Authority has identified losses of \$363.2 million that resulted from the fires at the Palo Seco Steam Plant on December 29 and 30 of 2006. The losses covered by the Boiler and Machinery Policy were estimated to be \$16.9 million; the losses covered by the All Risk Property Policy due to fire damage were estimated to be \$102.8 million. The Authority's estimate of Business Interruption losses, primarily fuel related, stood at \$243.4 million. These excess fuel related costs were being processed for recovery. As of June 30, 2009 the Authority had been reimbursed a total of \$301.3 million for losses associated with the two Palo Seco events; another \$28.1 million was being negotiated.

The Tenth Supplemental Agreement created the Self-insurance Fund. This fund is to be used to pay for the cost of repairing, replacing, or reconstructing property damaged or destroyed from or extraordinary expenses incurred as a result of a cause that is not covered by insurance. It can also be used, when approved by the Consulting Engineers, to cover loss of income due to a cause, which is not covered by insurance. The monies in the Self Insurance Fund allow the Authority to increase its insurance deductibles thereby lowering its insurance premiums. Refer to the *Funding Recommendations* section for the Consulting Engineer's recommendation concerning the Self-insurance Fund.

The Eleventh Supplemental Agreement created the position of "Independent Consultant", a consultant or consulting firm or corporation to be employed by the Authority under Section 706 of this Agreement to carry out the duties of said Independent Consultant. Section 706 of the 1974 Agreement reads in part:

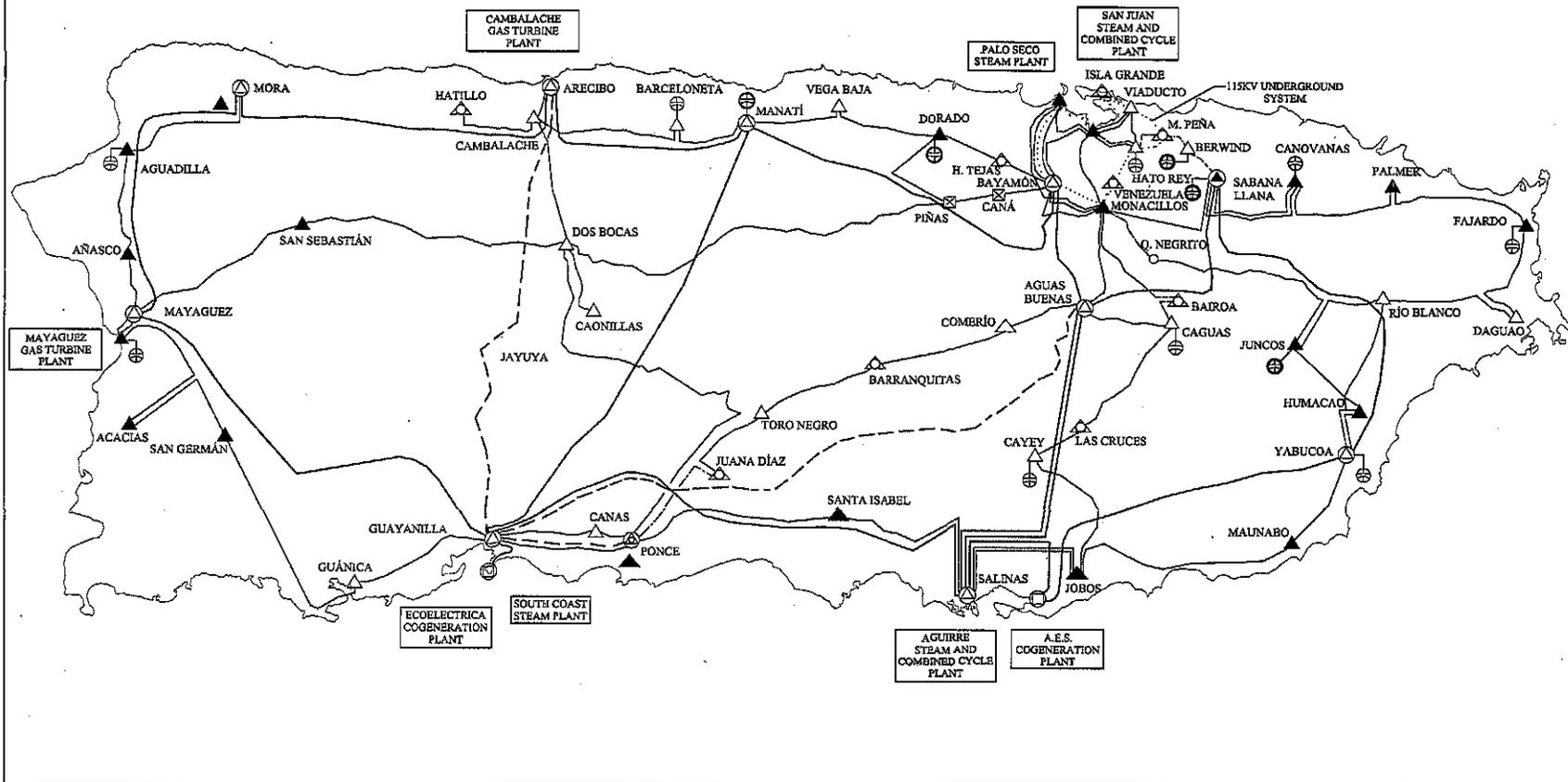
The Authority covenants and agrees...it will, for the purpose of carrying out the duties imposed on the Independent Consultant by this Agreement, employ one or more independent firms having a wide and favorable repute in the United States for expertise in risk management and other insurance matters related to the construction and operation of electric systems.

It shall be the duty of the Independent Consultant to prepare and file with the Authority and the Trustee at least biennially, on or before the first day of November, beginning November, 1999, a report setting forth its recommendations, based on a review of the insurance then maintained by the Authority in accordance with Section 707 of this Agreement and the status of the Self-insurance Fund, of any changes in coverage, including its recommendations of policy limits and deductibles and self-insurance, and investment strategies for the Self-insurance Fund.

An independent risk management consultant has been retained by the Authority in compliance with Section 707 of the Trust Agreement. The report of the Independent Consultant is scheduled for issuance in October 2009.

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PREPA'S TRANSMISSION SYSTEM 2014



LEGEND:

—————	230 KV LINE	⊗	230/115 KV TRANSFORMER
-----	NEW 230 KV LINE	⊕	NEW 230/115 KV TRANSFORMER
- - - - -	RECONSTRUCTED 230 KV LINE	⊗	230/115 KV TRANSFORMER INCREASE CAPACITY
—————	115 KV LINE	⊕	115/38 KV TRANSFORMER
-----	NEW 115 KV LINE	⊗	NEW 115/38 KV TRANSFORMER
- - - - -	RECONSTRUCTED 115 KV LINE	⊕	115/38 KV TRANSFORMER INCREASE CAPACITY
⋯⋯⋯	115 KV UNDERGROUND LINE	⊗	230 KV SWITCHYARD
⊕	115 KV CAPACITOR BANK	⊕	NEW 230 KV SWITCHYARD
⊗	NEW 115 KV CAPACITOR BANK	⊗	NEW 115 KV SWITCHYARD

PLANNED TRANSMISSION SYSTEM IMPROVEMENTS THRU FY 2014

After PREPA

APPENDICES

**APPENDIX I
INTERMEDIATE-TERM FINANCIAL PLANNING FORECAST**

	Actual		Forecast									
	2009		2010		2011		2012		2013		2014	
	Amount	Increase %	Amount	Increase %	Amount	Increase %	Amount	Increase %	Amount	Increase %	Amount	Increase %
kWh SALES (000)												
Residential	6,367,561	(5.77)	6,038,349	(5.17)	5,859,889	(2.96)	5,722,924	(2.34)	5,633,381	(1.56)	5,587,448	(0.82)
Commercial	8,498,118	(2.81)	8,340,909	(1.85)	8,358,539	0.21	8,443,262	1.01	8,575,214	1.56	8,742,327	1.95
Industrial	3,288,597	(12.13)	3,188,314	(3.05)	3,159,331	(0.91)	3,138,422	(0.66)	3,130,438	(0.25)	3,135,603	0.16
Public Lighting	273,691	1.54	275,027	0.49	275,027	0.00	275,781	0.27	275,027	(0.27)	275,027	0.00
Agricultural	57,285	95.25	30,021	(47.59)	30,021	0.00	30,103	0.27	30,021	(0.27)	30,021	0.00
Others	30,523	(48.65)	56,421	84.85	56,421	0.00	56,575	0.27	56,421	(0.27)	56,421	0.00
TOTAL	18,515,775	(5.54)	17,929,041	(3.17)	17,739,248	(1.06)	17,667,067	(0.41)	17,700,502	0.19	17,826,847	0.71
CUSTOMERS (12 month average)												
Residential	1,324,752	0.78	1,327,116	0.18	1,329,026	0.14	1,330,943	0.14	1,332,853	0.14	1,334,759	0.14
Commercial	129,492	(0.40)	129,710	0.17	129,891	0.14	130,085	0.15	130,280	0.15	130,478	0.15
Industrial	898	(40.69)	865	(3.67)	830	(4.05)	796	(4.10)	762	(4.27)	727	(4.59)
Public Lighting	2,168	16.56	2,148	(0.92)	2,148	0.00	2,148	0.00	2,148	0.00	2,148	0.00
Agricultural	1,322	(3.29)	1,322	0.00	1,323	0.08	1,322	(0.08)	1,322	0.00	1,322	0.00
Others	4	(20.00)	4	0.00	4	0.00	4	0.00	4	0.00	4	0.00
TOTAL	1,458,636	0.65	1,461,165	0.17	1,463,222	0.14	1,465,298	0.14	1,467,369	0.14	1,469,438	0.14
kWh PER CUSTOMER												
Residential	4,807	(6.50)	4,550	(5.34)	4,409	(3.09)	4,300	(2.48)	4,227	(1.71)	4,186	(0.96)
Commercial	65,627	(2.42)	64,304	(2.01)	64,351	0.07	64,906	0.86	65,821	1.41	67,002	1.79
Industrial	3,662,135	48.15	3,685,912	0.65	3,804,768	3.22	3,942,603	3.62	4,109,834	4.24	4,310,930	4.89
Public Lighting	126,241	(12.89)	128,039	1.42	128,039	0.00	128,389	0.27	128,039	(0.27)	128,039	0.00
Agricultural	43,332	101.89	22,709	(47.59)	22,692	(0.08)	22,771	0.35	22,709	(0.27)	22,709	0.00
Others	14,321,250	20.47	13,541,040	(5.45)	13,540,967	(0.00)	13,578,065	0.27	13,540,967	(0.27)	13,540,967	0.00
BASE REVENUE (\$000)												
Residential	\$ 308,274	(6.51)	\$ 290,405	(5.80)	\$ 281,822	(2.96)	\$ 275,235	(2.34)	\$ 270,928	(1.56)	\$ 268,719	(0.82)
Commercial	\$ 569,484	(2.64)	\$ 562,120	(1.29)	\$ 563,309	0.21	\$ 569,018	1.01	\$ 577,911	1.56	\$ 589,173	1.95
Industrial	\$ 139,441	(14.06)	\$ 134,128	(3.81)	\$ 132,908	(0.91)	\$ 132,029	(0.66)	\$ 131,693	(0.25)	\$ 131,910	0.16
Public Lighting	\$ 50,556	0.85	\$ 50,704	0.29	\$ 50,704	0.00	\$ 50,842	0.27	\$ 50,704	(0.27)	\$ 50,704	0.00
Agricultural	\$ 2,582	60.87	\$ 1,588	(38.50)	\$ 1,588	0.00	\$ 1,593	0.31	\$ 1,588	(0.31)	\$ 1,588	0.00
Others	\$ 1,629	(43.00)	\$ 2,712	66.48	\$ 2,712	0.00	\$ 2,719	0.26	\$ 2,712	(0.26)	\$ 2,712	0.00
TOTAL	\$1,071,966	(5.26)	\$1,041,657	(2.83)	\$ 1,033,043	(0.83)	\$ 1,031,436	(0.16)	\$ 1,035,536	0.40	\$ 1,044,806	0.90
FUEL OIL ADJUSTMENT (\$000)												
Residential	\$ 791,686	(11.78)	\$ 613,375	(22.52)	\$ 709,393	15.65	\$ 810,145	14.20	\$ 844,418	4.23	\$ 881,226	4.36
Commercial	\$ 983,819	(10.53)	\$ 800,282	(18.66)	\$ 955,239	19.36	\$ 1,128,336	18.12	\$ 1,213,436	7.54	\$ 1,301,620	7.27
Industrial	\$ 343,108	(20.04)	\$ 279,720	(18.47)	\$ 330,307	18.08	\$ 383,691	16.16	\$ 405,246	5.62	\$ 427,090	5.39
Public Lighting	\$ 33,026	(8.58)	\$ 27,949	(15.37)	\$ 33,272	19.05	\$ 39,013	17.25	\$ 41,197	5.60	\$ 43,347	5.22
Agricultural	\$ 3,922	(3.75)	\$ 3,175	(19.05)	\$ 3,634	14.46	\$ 4,261	17.25	\$ 4,500	5.61	\$ 4,735	5.22
Others	\$ 6,044	(12.07)	\$ 4,897	(18.98)	\$ 5,837	19.20	\$ 6,845	17.27	\$ 7,228	5.60	\$ 7,605	5.22
TOTAL	\$ 2,161,605	(12.60)	\$ 1,729,398	(19.99)	\$ 2,037,682	17.83	\$ 2,372,291	16.42	\$ 2,516,025	6.06	\$ 2,665,623	5.95
PURCHASED POWER (\$000)												
Residential	\$ 274,384	1.08	\$ 282,848	3.08	\$ 280,164	(0.95)	\$ 282,053	0.67	\$ 285,147	1.10	\$ 270,344	(5.19)
Commercial	\$ 343,719	3.91	\$ 368,893	7.32	\$ 377,259	2.27	\$ 392,832	4.13	\$ 409,759	4.31	\$ 399,313	(2.55)
Industrial	\$ 119,436	(7.79)	\$ 128,957	7.97	\$ 130,450	1.16	\$ 133,304	2.19	\$ 136,560	2.44	\$ 130,751	(4.25)
Public Lighting	\$ 11,601	8.36	\$ 12,883	11.05	\$ 13,140	1.99	\$ 13,583	3.37	\$ 13,912	2.42	\$ 13,298	(4.41)
Agricultural	\$ 2,109	70.36	\$ 1,404	(33.43)	\$ 1,435	2.21	\$ 1,484	3.41	\$ 1,520	2.43	\$ 1,453	(4.41)
Others	\$ 1,361	(33.22)	\$ 2,261	66.13	\$ 2,305	1.95	\$ 2,383	3.38	\$ 2,441	2.43	\$ 2,333	(4.42)
TOTAL	\$ 752,610	0.92	\$ 797,246	5.93	\$ 804,733	0.94	\$ 825,639	2.60	\$ 849,339	2.87	\$ 817,492	(3.75)
REVENUES (\$000)-incl. adj. charge												
Residential	\$ 1,374,344	(8.29)	\$ 1,186,628	(13.66)	\$ 1,271,379	7.14	\$ 1,367,433	7.56	\$ 1,400,493	2.42	\$ 1,420,289	1.41
Commercial	\$ 1,897,022	(5.87)	\$ 1,731,295	(8.74)	\$ 1,895,807	9.50	\$ 2,090,186	10.25	\$ 2,201,106	5.31	\$ 2,290,106	4.04
Industrial	\$ 601,985	(16.50)	\$ 542,805	(9.83)	\$ 593,665	9.37	\$ 649,024	9.32	\$ 673,499	3.77	\$ 689,751	2.41
Public Lighting	\$ 95,183	(1.84)	\$ 91,536	(3.83)	\$ 97,116	6.10	\$ 103,438	6.51	\$ 105,813	2.30	\$ 107,349	1.45
Agricultural	\$ 8,613	24.50	\$ 6,167	(28.40)	\$ 6,657	7.95	\$ 7,338	10.23	\$ 7,608	3.68	\$ 7,776	2.21
Others	\$ 9,034	(23.25)	\$ 9,870	9.25	\$ 10,854	9.97	\$ 11,947	10.07	\$ 12,381	3.63	\$ 12,650	2.17
TOTAL	\$ 3,986,181	(8.37)	\$ 3,568,301	(10.48)	\$ 3,875,478	8.61	\$ 4,229,366	9.13	\$ 4,400,900	4.06	\$ 4,527,921	2.89

**APPENDIX II
INCOME STATEMENT**

	<u>Actual</u>	<u>Forecast</u>				
	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>
REVENUES						
Revenues from Appendix I	\$ 3,986,180,000	\$ 3,568,301,000	\$ 3,875,478,000	\$ 4,229,366,000	\$ 4,400,900,000	\$ 4,527,921,000
Add'l Revenues from Theft Recovery	-	16,955,000	50,000,000	50,000,000	50,000,000	50,000,000
From Sales of Electricity	3,986,180,000	3,585,256,000	3,925,478,000	4,279,366,000	4,450,900,000	4,577,921,000
From Commonwealth Government for Rural Electrification	19,000	-	-	-	-	-
Other Operating Revenue-Net	14,641,000	5,259,800	5,259,800	5,259,800	5,259,800	5,259,800
Total Operating Revenue	4,000,840,000	3,590,515,800	3,930,737,800	4,284,625,800	4,456,159,800	4,583,180,800
Other Income-Net	6,428,000	14,116,200	14,116,200	14,116,200	14,116,200	14,116,200
Total Revenues	\$ 4,007,268,000	\$ 3,604,632,000	\$ 3,944,854,000	\$ 4,298,742,000	\$ 4,470,276,000	\$ 4,597,297,000
CURRENT EXPENSES						
Operating Expenses	3,374,953,000	2,937,743,000	3,201,542,000	3,516,439,000	3,663,912,000	3,767,116,000
Miscellaneous Interest and Other	2,819,000	3,998,000	4,078,000	4,160,000	4,243,000	4,328,000
Total Current Expenses	3,377,772,000	2,941,741,000	3,205,620,000	3,520,599,000	3,668,155,000	3,771,444,000
Balance to Revenue Fund	629,496,000	662,891,000	739,234,000	778,143,000	802,121,000	825,853,000
1974 SINKING FUND						
Interest on Bonds	261,486,000	290,033,000	272,166,000	293,793,000	314,602,000	340,473,000
Bond Redemption	173,040,000	181,724,000	187,150,000	199,621,000	224,128,000	235,029,000
Reserve Account	(29,523,000)	-	-	-	-	-
Total Sinking Fund Payments	405,003,000	471,757,000	459,316,000	493,414,000	538,730,000	575,502,000
Balance	224,493,000	191,134,000	279,918,000	284,729,000	263,391,000	250,351,000
TRANSFERS						
Reserve Maintenance Fund ¹	-	5,000,000	5,000,000	5,000,000	-	-
Self Insurance Fund	10,000,000	10,000,000	10,000,000	10,000,000	-	-
1974 Capital Improvement Fund	4,695,000	-	20,204,000	7,912,000	2,705,000	1,419,000
Interest on Notes	28,434,000	17,938,000	16,249,000	15,834,000	15,578,000	15,360,000
Total	43,129,000	32,938,000	51,453,000	38,746,000	18,283,000	16,779,000
Balance	181,364,000	158,196,000	228,465,000	245,983,000	245,108,000	233,572,000
Contributions in Lieu of Taxes and Other	181,364,000	158,196,000	228,465,000	245,983,000	245,108,000	233,572,000
Balance	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

1. In lieu of a \$5 million deposit to the Reserve Maintenance Fund in FY 2009, the Authority applied \$5 million to partially repay funds borrowed by the General Fund as part of the Palo Seco Steam Plant recovery project.

**APPENDIX III
DETAIL OF OPERATING and MAINTENANCE EXPENSES**

	Actual ¹	Forecast				
	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>
OPERATION						
Thermal and Gas Production						
Fuel Expense per PB projections						
Fuel	\$ 1,919,788,752	\$ 1,529,493,000	\$ 1,803,904,000	\$ 2,101,653,000	\$ 2,229,579,000	\$ 2,362,527,000
Purchased Power	671,848,891	711,701,000	715,987,000	734,818,000	755,910,000	727,567,000
Other Production Costs	59,894,465	54,939,459	51,288,000	51,161,280	51,045,120	50,939,520
Hydroelectric Plant Production	2,376,114	2,179,541	2,137,000	2,131,720	2,126,880	2,122,480
Transmission	24,039,346	21,709,550	18,829,800	18,783,300	18,740,700	18,702,000
Distribution	138,294,382	124,891,450	106,702,200	106,438,700	106,197,300	105,978,000
Client Accounting						
and Collection	111,126,317	112,674,000	101,349,000	101,098,000	100,868,000	100,660,000
Administrative and General	222,476,628	142,428,000	180,318,000	179,874,000	179,465,000	179,094,000
Interest Charge	2,819,366	3,998,000	4,078,000	4,160,000	4,243,000	4,328,000
<i>Total Operation</i>	<u>\$ 3,152,664,261</u>	<u>\$ 2,704,014,000</u>	<u>\$ 2,984,593,000</u>	<u>\$ 3,300,118,000</u>	<u>\$ 3,448,175,000</u>	<u>\$ 3,551,918,000</u>
MAINTENANCE						
Thermal and Gas Production	113,909,179	118,945,044	110,513,500	110,240,500	109,990,000	109,763,000
Hydroelectric Plant	3,417,593	3,568,683	4,420,540	4,409,620	4,399,600	4,390,520
Transmission	33,038,124	34,498,722	30,943,780	30,867,340	30,797,200	30,733,640
Distribution	67,346,556	70,323,911	66,308,100	66,144,300	65,994,000	65,857,800
General Plant	7,395,935	10,390,640	8,841,080	8,819,240	8,799,200	8,781,040
<i>Total Maintenance</i>	<u>\$ 225,107,387</u>	<u>\$ 237,727,000</u>	<u>\$ 221,027,000</u>	<u>\$ 220,481,000</u>	<u>\$ 219,980,000</u>	<u>\$ 219,526,000</u>
TOTAL O & M	<u>\$ 3,377,771,648</u>	<u>\$ 2,941,741,000</u>	<u>\$ 3,205,620,000</u>	<u>\$ 3,520,599,000</u>	<u>\$ 3,668,155,000</u>	<u>\$ 3,771,444,000</u>

1. Audited

APPENDIX IV
ANNUAL GENERATION, FUEL CONSUMPTION, AND FUEL COSTS FOR THERMAL STATIONS

	Actual 2009	Actual/Estimated ¹ 2010	Forecast			
			2011	2012	2013	2014
AGUIRRE STEAM PLANT						
Net MWh-Generated	4,765,593	4,926,472	3,276,261	2,765,128	2,910,509	2,933,486
Barrels of Fuel Oil Used	7,729,140	7,834,882	5,238,786	4,456,958	4,701,381	4,695,051
MBTUx1000	48,694	49,352	32,980	28,052	29,587	29,557
kWh Per Barrel	617	629	625	620	619	625
Cost of Fuel	\$ 547,551,636	\$ 506,691,312	\$ 412,479,035	\$ 418,350,385	\$ 467,730,974	\$ 484,879,162
Cost of Fuel Per Barrel	\$ 70.84	\$ 64.67	\$ 78.74	\$ 93.86	\$ 99.49	\$ 103.27
\$/Mbtu	\$ 11.24	\$ 10.27	\$ 12.51	\$ 14.91	\$ 15.81	\$ 16.40
COSTA SUR STEAM PLANT						
Net MWh-Generated	4,834,335	3,381,705	4,603,744	4,690,269	4,800,528	4,739,180
Barrels of Fuel Oil Used	8,231,663	5,759,583	7,748,089	7,880,785	8,064,999	7,973,443
MBTUx1000	51,859	36,285	48,813	49,649	50,809	50,233
kWh Per Barrel	587	587	594	595	595	594
Cost of Fuel	\$ 545,698,574	\$ 356,678,531	\$ 590,457,689	\$ 701,606,003	\$ 768,654,954	\$ 783,951,211
Cost of Fuel Per Barrel	\$ 66.29	\$ 61.93	\$ 76.21	\$ 89.03	\$ 95.31	\$ 98.32
\$/Mbtu	\$ 10.52	\$ 9.83	\$ 12.10	\$ 14.13	\$ 15.13	\$ 15.61
PALO SECO STEAM PLANT						
Net MWh-Generated	1,315,773	2,847,157	2,931,018	2,926,045	2,854,253	2,425,156
Barrels of Fuel Oil Used	2,264,347	4,772,810	4,868,202	4,867,429	4,741,026	4,048,681
MBTUx1000	14,259	30,060	30,658	30,653	29,857	25,495
kWh Per Barrel	581	597	602	601	602	599
Cost of Fuel	\$ 155,945,367	\$ 298,320,705	\$ 367,064,215	\$ 434,372,192	\$ 452,785,608	\$ 400,341,426
Cost of Fuel Per Barrel	\$ 68.87	\$ 62.50	\$ 75.40	\$ 89.24	\$ 95.50	\$ 98.88
\$/Mbtu	\$ 10.94	\$ 9.92	\$ 11.97	\$ 14.17	\$ 15.17	\$ 15.70
SAN JUAN STEAM PLANT						
Net MWh-Generated	2,081,798	1,036,677	412,017	427,968	250,496	604,376
Barrels of Fuel Oil Used	3,344,359	1,906,971	767,355	802,498	473,232	1,131,452
MBTUx1000	21,069	12,014	4,836	5,056	2,981	7,128
kWh Per Barrel	622	544	537	533	529	534
Cost of Fuel	\$ 223,923,934	\$ 118,274,012	\$ 55,257,857	\$ 71,927,960	\$ 44,945,122	\$ 111,281,050
Cost of Fuel Per Barrel	\$ 66.96	\$ 62.02	\$ 71.99	\$ 89.63	\$ 94.97	\$ 98.35
\$/Mbtu	\$ 10.63	\$ 9.84	\$ 11.43	\$ 14.23	\$ 15.08	\$ 15.61
AGUIRRE COMBINED-CYCLE UNITS						
Net MWh-Generated	465,777	123,730	420,327	298,103	314,397	451,885
Barrels of Fuel Oil or Equivalent	928,633	222,764	729,625	522,503	547,409	784,852
MBTUx1000	5,850	1,293	4,234	3,032	3,177	4,555
kWh Per Barrel (or equivalent)	502	555	576	571	574	576
Cost of Fuel	\$ 139,492,982	\$ 20,115,481	\$ 74,629,270	\$ 60,854,018	\$ 67,898,602	\$ 101,991,428
Cost of Fuel Per Barrel	\$ 150.21	\$ 90.30	\$ 102.28	\$ 116.47	\$ 124.04	\$ 129.95
\$/Mbtu	\$ 23.84	\$ 15.56	\$ 17.62	\$ 20.07	\$ 21.37	\$ 22.39
COMBUSTION-TURBINES & DIESELS						
Net MWh-Generated	102,715	110,406	45,866	89,818	36,759	59,175
Barrels of Fuel Oil Used	216,634	265,807	114,955	223,480	92,313	147,989
MBTUx1000	1,257	1,542	667	1,297	536	859
kWh Per Barrel	474	415	399	402	398	400
Cost of Fuel	\$ 33,732,686	\$ 23,729,793	\$ 11,839,591	\$ 26,157,348	\$ 11,397,470	\$ 19,166,420
Cost of Fuel Per Barrel	\$ 155.71	\$ 89.27	\$ 102.99	\$ 117.05	\$ 123.47	\$ 129.51
\$/Mbtu	\$ 26.83	\$ 15.38	\$ 17.75	\$ 20.17	\$ 21.28	\$ 22.32
CAMBALACHE						
Net MWh-Generated	126,140	238,916	122,407	177,784	100,714	139,953
Barrels of Fuel Oil or Equivalent	665,976	493,435	255,406	374,889	210,285	292,132
MBTUx1000	3,865	2,863	1,482	2,175	1,220	1,695
kWh Per Barrel	490	484	479	474	479	479
Cost of Fuel	\$ 90,247,850	\$ 45,051,703	\$ 27,486,452	\$ 45,995,404	\$ 27,227,452	\$ 39,638,372
Cost of Fuel Per Barrel	\$ 135.51	\$ 91.30	\$ 107.62	\$ 122.69	\$ 129.48	\$ 135.69
\$/Mbtu	\$ 23.35	\$ 15.73	\$ 18.55	\$ 21.14	\$ 22.31	\$ 23.38
MAYAGUEZ TURBINES						
Net MWh-Generated	124,451	449,959	586,853	534,392	476,897	644,522
Barrels of Fuel Oil or Equivalent	193,024	768,418	983,291	896,869	800,458	1,081,923
MBTUx1000	1,120	4,457	5,715	5,202	4,643	6,275
kWh Per Barrel	645	586	596	596	596	596
Cost of Fuel	\$ 22,934,567	\$ 64,361,370	\$ 92,802,169	\$ 95,371,988	\$ 90,777,462	\$ 128,350,665
Cost of Fuel Per Barrel	\$ 118.82	\$ 84.64	\$ 79.41	\$ 106.34	\$ 113.41	\$ 118.63
\$/Mbtu	\$ 20.48	\$ 14.44	\$ 16.24	\$ 18.33	\$ 19.55	\$ 20.45
REPOWERED SAN JUAN UNITS, 5 & 6						
Net MWh-Generated	913,442	932,642	1,138,252	1,752,371	1,961,659	1,856,778
Barrels of Fuel Oil or Equivalent	1,609,918	1,294,606	1,846,199	2,418,324	2,703,816	2,561,079
MBTUx1000	9,342	7,509	10,708	14,026	15,682	14,854
kWh Per Barrel	567	720	725	725	726	725
Cost of Fuel	\$ 160,261,158	\$ 105,573,173	\$ 180,908,959	\$ 255,994,919	\$ 307,094,737	\$ 302,013,407
Cost of Fuel Per Barrel	\$ 99.55	\$ 81.55	\$ 97.99	\$ 105.86	\$ 113.58	\$ 117.92
\$/Mbtu	\$ 17.15	\$ 14.06	\$ 16.89	\$ 18.25	\$ 19.58	\$ 20.33
TOTAL THERMAL						
Net MWh-Generated	14,930,024	14,047,664	13,736,745	13,661,878	13,706,212	13,854,511
Barrels of Fuel Oil	25,183,694	23,319,276	22,554,108	22,443,735	22,334,919	22,716,607
MBTUx1000	157,315	145,375	140,092	139,142	138,492	140,652
kWh Per Barrel	593	602	609	609	614	610
Fuel Cost	\$ 1,919,788,754	\$ 1,538,796,080	\$ 1,812,925,237	\$ 2,110,630,217	\$ 2,238,512,381	\$ 2,371,613,141
Cost of Fuel Per Barrel	\$ 76.23	\$ 65.99	\$ 80.38	\$ 94.04	\$ 100.22	\$ 104.40
\$/Mbtu	\$ 12.20	\$ 10.59	\$ 12.94	\$ 15.17	\$ 16.16	\$ 16.86
PURCHASED POWER-ECOELECTRICA						
Net MWh-Generated	3,290,550	3,622,402	3,550,905	3,561,228	3,550,905	3,550,906
Cost	\$ 414,989,328	\$ 428,737,961	\$ 431,195,327	\$ 446,218,721	\$ 462,015,315	\$ 484,480,218
\$/MWh	\$ 126.12	\$ 118.36	\$ 121.43	\$ 125.30	\$ 130.11	\$ 136.44
PURCHASED POWER-AES						
Net MWh-Generated	3,373,152	3,446,996	3,377,488	3,357,532	3,362,521	3,362,521
Cost	\$ 256,839,561	\$ 282,962,569	\$ 284,791,505	\$ 288,599,707	\$ 293,894,665	\$ 243,086,490
\$/MWh	\$ 76.15	\$ 82.09	\$ 84.32	\$ 85.96	\$ 87.40	\$ 72.29
PURCHASED POWER						
Net MWh-Generated	6,663,702	7,069,398	6,928,393	6,918,760	6,913,426	6,913,427
Cost	\$ 671,848,891	\$ 711,700,530	\$ 715,986,832	\$ 734,818,428	\$ 755,909,980	\$ 727,566,708
\$/MWh	\$ 100.82	\$ 100.67	\$ 103.34	\$ 106.21	\$ 109.34	\$ 105.24
TOTAL (Including Purchased Power)						
Net MWh-Generated	21,593,726	21,117,062	20,665,138	20,580,638	20,619,638	20,767,938
Cost	\$ 2,591,637,645	\$ 2,250,496,610	\$ 2,528,912,069	\$ 2,845,448,645	\$ 2,994,422,361	\$ 3,099,179,849
\$/MWh	\$ 120.02	\$ 106.57	\$ 122.38	\$ 138.26	\$ 145.22	\$ 149.23
HYDROELECTRIC						
Net MWh-Generated	169,463	107,116	126,170	126,170	126,170	126,170
TOTAL (Including Hydro & PP)						
Net MWh-Generated	21,763,189	21,224,178	20,791,308	20,706,808	20,745,808	20,894,108
Cost	\$ 2,591,637,645	\$ 2,250,496,610	\$ 2,528,912,069	\$ 2,845,448,645	\$ 2,994,422,361	\$ 3,099,179,849

1. FY 2010 consists of 3 months actual, 9 months estimated

Cost of fuel includes shipping and handling charges
Future generation based on Current Forecast

**APPENDIX V
DEBT SERVICE COVERAGE UNDER THE 1974 TRUST AGREEMENT**

Date of Issue	Series	Principal Amount After Payments and Refunding	Maximum Principal & Interest	Adjusted Net Revenues		Average Net Revenues	
				12 Consecutive Months Preceding Date of Issue	Percent Coverage	5 Years Following Current Year	Percent Coverage
7/1/1993	REA-I	26,631,000	240,632,252	367,577,000	152.75	447,586,000	186.00
4/1/1994	S	31,440,000 ¹	267,390,756	421,241,000	157.54	491,034,600	183.64
	(Refunding)						
5/1/1997	AA	50,555,000 ²	319,985,410	448,850,000	140.27	573,065,000	179.09
5/1/1997	BB	51,285,000 ³	319,985,410	448,850,000	140.27	573,065,000	179.09
	(Refunding)						
7/1/1997	CC	88,450,000	319,099,985	448,850,000	140.66	573,065,000	179.59
	(Refunding)						
3/15/1998	DD	93,585,000 ⁴	360,810,198	509,343,000	141.17	611,400,000	169.45
3/15/1998	EE	325,645,000 ⁵	360,810,198	509,343,000	141.17	611,400,000	169.45
	(Refunding)						
9/1/1998	GG	93,280,000 ⁶	349,986,029	552,061,000	157.74	652,800,000	186.52
	(Refunding)						
4/6/1999	FF	96,175,000 ⁷	347,959,070	520,905,000	149.70	681,738,800	195.92
	(Refunding)						
8/1/2000	HH	39,905,000 ⁸	390,015,290	565,528,000	145.00	703,124,400	180.28
1/3/2002	II	21,345,000 ⁹	415,641,309	636,368,000	153.11	746,303,000	179.55
1/3/2002	JJ	179,580,000	415,641,309	636,368,000	153.11	746,303,000	179.55
	(Refunding)						
7/2/2002	KK	384,970,000 ¹⁰	415,923,000	627,086,000	150.77	746,303,000	179.43
	(Refunding)						
7/2/2002	LL	98,125,000	415,923,000	627,086,000	150.77	746,303,000	179.43
10/3/2002	MM	65,415,000 ¹¹	415,918,000	630,219,000	151.52	746,303,000	179.44
	(Refunding)						
8/19/2003	NN	171,525,000 ¹²	442,399,978	664,780,000	150.27	728,160,000	164.59
8/26/2004	OO	128,830,000	442,395,314	635,751,000	143.71	711,111,000	160.74
	(Refunding)						
8/26/2004	PP	86,800,000	442,395,314	635,751,000	143.71	711,111,000	160.74
	(Refunding)						
4/4/2005	QQ	95,270,000	473,784,011	612,777,000	129.34	711,111,000	150.09
	(Refunding)						
4/4/2005	RR	236,265,000 ¹³	473,784,011	612,777,000	129.34	711,111,000	150.09
4/4/2005	SS	467,295,000	473,784,011	612,777,000	129.34	711,111,000	150.09
	(Refunding)						
5/3/2007	TT	643,530,000	455,022,444	698,001,000	153.40	723,100,000	158.92
5/3/2007	UU	1,300,035,000	455,022,444	698,001,000	153.40	723,100,000	158.92
5/30/2007	V V	557,410,000	455,022,444	698,001,000	153.40	723,100,000	158.92
	(Refunding)						
6/26/2008	WW	697,345,000	476,874,792	662,928,000	139.02	756,405,000	158.62

The total debt issued under the Trust Agreement is \$14,027,733,431 which includes refundings totaling \$7,778,311,431. As of June 30, 2009 the outstanding debt under the 1974 Trust Agreement is \$6,030,691,000.

The superscripted Principal Amounts in the table reflect the effects of refundings described below:

1. \$4,760,000 refunded by Series OO and deducted from the original \$163,875,000 Series S issue.
2. \$62,335,000 refunded by Series UU; \$5,450,000 refunded by Series QQ, \$269,615,000 refunded by Series SS and deducted from the original \$464,840,000 Series AA issue.
3. \$30,285,000 refunded by Series SS and deducted from the original \$100,750,000 Series BB issue.
4. \$39,770,000 refunded by Series V V; \$278,710,000 refunded by Series UU; \$10,220,000 refunded by Series OO and deducted from the original \$508,555,000 Series DD issue.
5. \$2,740,000 refunded by Series SS and deducted from the original \$380,515,000 Series EE issue.
6. \$5,875,000 refunded by Series SS and deducted from the original \$109,695,000 Series GG issue.
7. \$24,035,000 refunded by Series UU and deducted from original issue \$196,825,000 Series FF issue.
8. \$342,180,000 refunded by Series UU; \$108,300,000 refunded by Series JJ; \$10,435,000 refunded by Series KK; \$11,335,000 refunded by Series OO; \$63,210,000 refunded by Series SS and deducted from the original \$612,240,000 Series HH issue.
9. \$493,960,000 refunded by Series UU and deducted from the original \$515,305,000 Series II issue.
10. \$7,765,000 refunded by Series SS and deducted from the original \$401,785,000 Series KK issue.
11. \$11,000,000 refunded by Series SS and deducted from the original \$105,055,000 Series MM issue.
12. \$288,590,000 refunded by Series V V; \$57,190,000 refunded by Series UU and deducted from original amount \$517,305,000 Series NN issue.
13. \$273,255,000 refunded by Series V V and deducted from original amount \$509,520,000 Series RR issue.

APPENDIX VI
CAPITAL EXPENDITURES

	Actual ¹	Forecasted				
	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>
Production Plant	\$ 246,578,000	\$ 128,014,000	\$ 104,005,000	\$ 90,250,000	\$ 115,001,000	\$ 161,500,000
Transmission Plant	91,508,000	117,151,000	82,537,000	85,697,000	78,715,000	105,032,000
Distribution Plant	105,028,000	75,322,000	74,246,000	75,519,000	89,937,000	81,998,000
General Land and Buildings	22,345,000	7,826,000	8,981,000	12,551,000	27,286,000	18,426,000
General Equipment	15,191,000	16,412,000	26,215,000	31,491,000	32,296,000	27,039,000
Preliminary Surveys and Investigations	<u>(436,000)</u>	<u>5,275,000</u>	<u>4,016,000</u>	<u>4,492,000</u>	<u>6,765,000</u>	<u>6,005,000</u>
Provision for incidental and Emergency Work	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
SUBTOTAL	\$480,214,000	\$350,000,000	\$300,000,000	\$300,000,000	\$350,000,000	\$400,000,000
Construction Costs in Previous Year Reimbursed in Current Year	80,480,000	101,849,000	104,226,000	105,476,000	106,226,000	89,726,000
Construction Costs in Current Year to be Reimbursed Next Year	<u>(101,849,000)</u>	<u>(104,226,000)</u>	<u>(105,476,000)</u>	<u>(106,226,000)</u>	<u>(89,726,000)</u>	<u>(84,976,000)</u>
TOTAL FUNDS REQUIRED	\$ 458,845,000	\$ 347,623,000	\$ 298,750,000	\$ 299,250,000	\$ 366,500,000	\$ 404,750,000

1. Audited

**APPENDIX VII
SOURCES OF FUNDS FOR CAPITAL EXPENDITURES**

	<u>Actual¹</u>	<u>Forecast</u>				
	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>
FUNDS FROM BOND ISSUES AND NOTES						
REVENUE BONDS²						
Balance in Fund Start of Fiscal Year	\$ 567,265,000	\$ 15,805,000	\$ 163,004,000	\$ 92,352,000	\$ 108,223,000	\$ 29,815,000
\$1,030.9M Series "XX" Jan '10		1,000,000,000				
\$618.6M Series "YY" Jul '11			-	600,000,000		
\$670.1M Series "ZZ" Jul '13				-		650,000,000
Balance in Fund End of Fiscal Year	<u>(15,805,000)</u>	<u>(163,004,000)</u>	<u>(92,352,000)</u>	<u>(108,223,000)</u>	<u>(29,815,000)</u>	<u>(67,028,000)</u>
PAID FROM REVENUE AND REA BONDS	<u>\$ 551,460,000</u>	<u>\$ 852,801,000</u>	<u>\$ 70,652,000</u>	<u>\$ 584,129,000</u>	<u>\$ 78,408,000</u>	<u>\$ 612,787,000</u>
NOTES						
Notes Paid	(211,906,000)	(705,000,000)	-	(250,000,000)	-	(300,000,000)
Notes Issued-Regular Financing	98,000,000	200,000,000	250,000,000	-	300,000,000	100,000,000
PAID FROM NOTES	<u>\$ (113,906,000)</u>	<u>\$ (505,000,000)</u>	<u>\$ 250,000,000</u>	<u>\$ (250,000,000)</u>	<u>\$ 300,000,000</u>	<u>\$ (200,000,000)</u>
FUNDS FROM OTHER SOURCES						
Transfers from General Fund (Net) ³	(401,000)	(30,928,000)	(41,652,000)	(60,129,000)	(34,408,000)	(38,787,000)
Interest earned on Construction Fund	4,165,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000
Capitalized Interest on Sinking Fund	18,530,000	24,750,000	13,750,000	19,250,000	16,500,000	24,750,000
Grants and other (Principally From FEMA)	(1,003,000)	-	-	-	-	-
PAID FROM OTHER SOURCES	<u>21,291,000</u>	<u>(178,000)</u>	<u>(21,902,000)</u>	<u>(34,879,000)</u>	<u>(11,908,000)</u>	<u>(8,037,000)</u>
GRAND TOTAL	<u>\$ 458,845,000</u>	<u>\$ 347,623,000</u>	<u>\$ 298,750,000</u>	<u>\$ 299,250,000</u>	<u>\$ 366,500,000</u>	<u>\$ 404,750,000</u>

- 1. Audited
- 2. Net proceeds from the bond issues
- 3. Capital Improvement Funds net of capitalized interest transferred to the General Fund.

**APPENDIX VIII
SYSTEM CAPABILITY
MW OF GENERATING CAPACITY AT THE END OF THE FISCAL YEAR**

	Actual 2009	Forecasted Additions and Retirements				
		2010	2011	2012	2013	2014
STEAM-ELECTRIC UNITS						
Aguirre	900	-	-	-	-	-
Costa Sur	990	-	-	-	-	-
CS Unit 3					(85.0)	-
Palo Seco	602	-	-	-	-	-
San Juan	400	-	-	-	-	-
Total	2,892	-	-	-	(85.0)	-
COMBUSTION-TURBINE UNITS						
Aguirre	42	-	-	-	-	-
Cambalache	248	-	-	-	-	-
Costa Sur	42	-	-	-	-	-
Mayaguez	84	-	-	-	-	-
Units 3-1 & 3-2, 4-1 & 4-2	(84)	-	-	-	-	-
Palo Seco	126	-	-	-	-	-
Other	168	-	-	-	-	-
Total	626	-	-	-	-	-
NEW POWER PLANT						
Repowering (San Juan Units No. 5 & 6)	464	-	-	-	-	-
New Mayaguez Combustion Turbines	220	-	-	-	-	-
Cambalache Conversion to Combined-Cycle	-	-	-	-	-	-
Non-System Sources						
Cogenerators (Net)	961	-	-	-	-	-
Small Power Producer ¹	-	-	-	-	-	-
COMBINED-CYCLE UNITS						
Aguirre	592	-	-	-	-	-
DIESEL UNITS						
Culebra & Vieques	9	-	-	-	-	-
HYDROELECTRIC CAPACITY (Total)						
	100	-	-	-	-	-
EXISTING CAPACITY (End of Previous Fiscal Year)						
	5,264	5,864	5,864	5,864	5,864	5,779
CAPACITY INSTALLED						
	684	-	-	-	-	-
CAPACITY RETIRED						
	(84)	-	-	-	(85)	-
CUMULATIVE TOTAL CAPACITY (MW)						
	5,864	5,864	5,864	5,864	5,779	5,779
Less: PEAK LOAD (MW)*	3,351	3,223	3,190	3,175	3,206	3,248
RESERVE CAPACITY (MW)						
	2,513	2,641	2,674	2,689	2,573	2,531
RESERVE MARGIN (%)						
	75.0	81.9	83.8	84.7	80.3	77.9

* Peak load forecast from IAU-GI projection

1. PREPA has Power Purchase Agreements (PPA) with developers of 3 wind energy projects of 39 MW, 40 MW and 50 MW and a 50 MW waste-to-energy facility. None of these small projects completed permitting in fiscal year 2009.

**APPENDIX IX
DEPRECIATION EXPENSE**

	Actual ¹	Forecasted				
	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>
DEPRECIATION						
Steam Production Plant	\$ 49,815,454	\$ 56,635,012	\$ 58,120,001	\$ 59,604,990	\$ 61,089,980	\$ 62,574,969
Gas-turbine Production Plant	34,926,379	39,707,676	40,748,824	41,789,973	42,831,122	43,872,270
Hydroelectric Production Plant	1,445,957	1,643,903	1,687,007	1,730,111	1,773,214	1,816,318
Transmission Plant	45,562,852	51,800,243	53,158,463	54,516,683	55,874,902	57,233,122
Distribution Plant	120,190,620	136,644,287	140,227,147	143,810,006	147,392,866	150,975,726
General Plant ²	<u>52,527,571</u>	<u>56,813,879</u>	<u>58,303,558</u>	<u>59,793,237</u>	<u>61,282,916</u>	<u>62,772,595</u>
Total Depreciation Expense	<u>304,468,833</u>	<u>343,245,000</u>	<u>352,245,000</u>	<u>361,245,000</u>	<u>370,245,000</u>	<u>379,245,000</u>

1. Audited
2. Includes clearing accounts

**APPENDIX X
DETAILS OF CAPITAL IMPROVEMENT PROGRAM**

Budget Item Number	Estimated Expenditures by Fiscal Year					
	2010	2011	2012	2013	2014	
PRODUCTION PLANT						
<u>THERMAL PRODUCTION PLANT</u>						
100	New Generation	\$ 12,453,000	\$ -	\$ -	\$ -	\$ -
120	Auxiliary Electric Components	-	390,000	-	600,000	-
150	Fuel Handling and Storage Infrastructure	-	-	-	100,000	-
160	Boiler Improvements	21,300,000	5,825,000	10,200,000	7,850,000	15,400,000
165	Improvements to Steam Turbines and Generators	21,625,000	22,350,000	17,500,000	8,450,000	17,750,000
170	Improvements to Balance of Steam Plant	18,763,000	21,170,000	9,450,000	5,940,000	8,550,000
175	Pollution Control Projects	12,800,000	14,500,000	16,380,000	16,476,000	23,810,000
	<i>Total Thermal Production Plant</i>	\$ 86,941,000	\$ 64,235,000	\$ 53,530,000	\$ 39,416,000	\$ 65,510,000
<u>HYDROELECTRIC PRODUCTION PLANT</u>						
180	Improvements to Hydroelectric Plants	\$ 2,913,000	\$ 3,550,000	\$ 2,750,000	\$ 2,750,000	\$ 2,970,000
	<i>Total Hydroelectric Production Plant</i>	\$ 2,913,000	\$ 3,550,000	\$ 2,750,000	\$ 2,750,000	\$ 2,970,000
<u>OTHER PRODUCTION PLANT</u>						
185	Improvements to Combustion Turbines	\$ 13,800,000.00	\$ 14,770,000.00	\$ 12,300,000.00	\$ 12,684,000.00	\$ 13,260,000.00
187	Improvements to Balance of Simple Cycle Gas Turbines	3,300,000	3,500,000	3,500,000	3,500,000	3,500,000
190	Improvements to Combined Cycle Steam Turbines	1,700,000	4,500,000	-	5,000,000	600,000
195	Improvements to Combined Cycle Balance of Plant	1,700,000	1,500,000	800,000	1,600,000	3,250,000
196	Improvements to Combined Cycle Gas Turbines	12,600,000	9,000,000	14,930,000	16,500,000	14,000,000
198	Improvements to Combined Cycle Heat Recovery Boilers	-	-	580,000	5,390,000	1,700,000
199	Improvements to Other Production Plant	5,060,000	2,950,000	1,860,000	28,161,000	56,710,000
	<i>Total Other Production Plant</i>	\$ 38,160,000	\$ 36,220,000	\$ 33,970,000	\$ 72,835,000	\$ 93,020,000
	TOTAL PRODUCTION PLANT	\$ 128,014,000	\$ 104,005,000	\$ 90,250,000	\$ 115,001,000	\$ 161,500,000
TRANSMISSION PLANT						
205	New 230 kV Lines	\$ 11,200,000	\$ 13,000,000	\$ 13,000,000	\$ 13,700,000	\$ 15,500,000
207	New 115 kV Lines	-	-	5,500,000	10,000,000	9,000,000
210	New 38 kV Lines	1,830,000	3,070,000	8,300,000	2,140,000	2,115,000
213	115 kV Underground line	88,000	-	-	-	-
215	38 kV Underground System	12,700,000	3,000,000	3,307,000	4,750,000	6,348,000
218	Submarine Cables	1,500,000	-	-	-	4,000,000
225	230/115 kV Transmission Centers & Capacity Increase	5,000,000	1,000,000	-	-	1,000,000
230	115/38 kV Transmission Centers & Capacity Increase	38,765,000	20,450,000	24,000,000	22,000,000	13,400,000
235	New 230 kV Switchyards & Expansions	-	3,000,000	3,000,000	2,000,000	8,500,000
237	New 115 kV Switchyards & Expansions	850,000	500,000	-	-	500,000
242	New 38 kV Switchyards & Expansions	4,820,000	100,000	2,200,000	7,876,000	11,308,000
252	38 kV Air Breaks (Throwovers)	-	-	-	-	200,000
255	Energy Management System (SCADA)	2,250,000	4,150,000	3,475,000	1,700,000	1,200,000
265	230 kV Line Rehabilitation	-	-	-	-	500,000
267	115 kV Line Rehabilitation	8,000,000	6,010,000	-	2,000,000	7,700,000
275	38 kV Line Rehabilitation	21,273,000	17,577,000	14,020,000	6,549,000	13,600,000

**APPENDIX X
DETAILS OF CAPITAL IMPROVEMENT PROGRAM**

Budget Item Number	Estimated Expenditures by Fiscal Year				
	2010	2011	2012	2013	2014
TRANSMISSION PLANT (Cont'd.)					
280	\$ 2,000,000	\$ 2,400,000	\$ 2,500,000	\$ 2,500,000	\$ 2,470,000
285	800,000	800,000	800,000	800,000	800,000
288	50,000	50,000	-	-	1,000,000
290	-	800,000	500,000	-	-
292	5,725,000	6,250,000	4,495,000	2,500,000	5,000,000
294	300,000	380,000	600,000	200,000	891,000
TOTAL TRANSMISSION PLANT	\$ 117,151,000	\$ 82,537,000	\$ 85,697,000	\$ 78,715,000	\$ 105,032,000
DISTRIBUTION PLANT					
300	\$ 4,450,000	\$ 6,900,000	\$ 6,100,000	\$ 9,000,000	\$ 10,900,000
305	1,500,000	-	-	-	2,800,000
310	-	-	-	700,000	700,000
315	5,286,000	5,050,000	6,285,000	5,869,000	5,780,000
316	660,000	380,000	219,000	739,000	1,380,000
320	1,350,000	1,790,000	2,020,000	4,950,000	2,220,000
325	490,000	440,000	900,000	400,000	300,000
330	850,000	890,000	900,000	900,000	990,000
335	580,000	-	-	950,000	286,000
340	1,400,000	1,200,000	1,200,000	1,200,000	1,200,000
360	6,790,000	3,400,000	2,400,000	2,250,000	2,500,000
365	2,781,000	2,400,000	2,500,000	2,800,000	2,870,000
368	600,000	600,000	600,000	600,000	600,000
370	5,810,000	6,101,000	8,143,000	9,216,000	6,100,000
374	3,261,000	4,216,000	3,385,000	5,977,000	5,224,000
376	-	360,000	-	-	-
378	13,004,000	12,979,000	13,427,000	16,586,000	10,422,000
379	1,250,000	800,000	600,000	1,200,000	1,300,000
380	1,200,000	1,300,000	1,300,000	1,300,000	1,300,000
382	2,000,000	2,200,000	2,550,000	2,600,000	2,428,000
383	1,600,000	1,600,000	1,600,000	1,600,000	1,690,000
385	16,800,000	16,500,000	16,500,000	16,500,000	16,641,000
390	1,000,000	1,000,000	1,000,000	1,000,000	687,000
392	-	500,000	500,000	500,000	520,000
395	150,000	500,000	500,000	500,000	500,000
397	500,000	600,000	600,000	600,000	660,000
399	2,010,000	2,540,000	2,290,000	2,000,000	2,000,000
TOTAL DISTRIBUTION PLANT	\$ 75,322,000	\$ 74,246,000	\$ 75,519,000	\$ 89,937,000	\$ 81,998,000

**APPENDIX X
DETAILS OF CAPITAL IMPROVEMENT PROGRAM**

Budget Item Number	Estimated Expenditures by Fiscal Year					
	2010	2011	2012	2013	2014	
GENERAL PLANT						
GENERAL LAND AND BUILDINGS						
400	Land and Rights-of-Way	\$ 4,001,000	\$ 5,001,000	\$ 5,001,000	\$ 10,001,000	\$ 8,001,000
410	Construction of New Warehouses	-	-	-	4,800,000	-
430	Construction of New Technical Offices	-	-	500,000	6,400,000	3,800,000
462	Minor Improvements to Technical Offices	400,000	900,000	910,000	1,060,000	905,000
464	Improvements to Technical Offices	300,000	-	-	1,000,000	1,000,000
468	Improvements to Warehouses	405,000	160,000	160,000	205,000	660,000
470	Improvements to Workshops	300,000	500,000	600,000	600,000	650,000
472	Improvements to Other Buildings	100,000	600,000	400,000	330,000	270,000
474	Improvements to Operations Buildings & Grounds-Syst. Oper.	-	500,000	500,000	-	-
476	Improvements to Other Buildings & Grounds-Elect. System	1,000,000	50,000	2,550,000	1,000,000	1,250,000
478	Improvements to Buildings & Grounds--Admin. Serv.	520,000	570,000	600,000	600,000	625,000
480	Improvements to Buildings & Grounds--Cust. Serv. Offices	800,000	700,000	1,330,000	1,290,000	1,265,000
	TOTAL GENERAL LAND AND BUILDINGS	\$ 7,826,000	\$ 8,981,000	\$ 12,551,000	\$ 27,286,000	\$ 18,426,000
EQUIPMENT						
OFFICE EQUIPMENT						
512	Electric System	\$ -	\$ 200,000	\$ 200,000	\$ 300,000	\$ 80,000
513	Client Service	-	-	100,000	100,000	100,000
514	Transmission & Distribution	-	-	150,000	290,000	365,000
	<i>Total Office Equipment</i>	-	200,000	450,000	690,000	545,000
COMPUTER EQUIPMENT						
520	Executive Offices	50,000	250,000	260,000	220,000	220,000
521	Information Systems	1,500,000	3,187,000	3,326,000	3,329,000	3,353,000
522	Legal	5,000	5,000	25,000	5,000	5,000
523	Planning & Environmental	40,000	120,000	170,000	120,000	175,000
524	Engineering	100,000	30,000	-	-	-
525	Finance	20,000	5,000	5,000	5,000	5,000
526	Administrative Services	-	100,000	50,000	190,000	600,000
527	Human Resources	20,000	80,000	120,000	80,000	80,000
528	Electric System	500,000	653,000	3,935,000	3,000,000	400,000
529	Client Service	3,050,000	6,300,000	6,400,000	6,300,000	6,300,000
530	Transmission & Distribution	100,000	450,000	571,000	673,000	678,000
	<i>Total Computer Equipment</i>	5,385,000	11,180,000	14,862,000	13,922,000	11,816,000
TRANSPORTATION EQUIPMENT						
540	Air Transportation Equipment	3,550,000	2,000,000	-	-	65,000
545	Land Transportation Equipment	3,000,000	6,500,000	5,000,000	8,500,000	6,000,000
	<i>Total Transportation Equipment</i>	\$ 6,550,000	\$ 8,500,000	\$ 5,000,000	\$ 8,500,000	\$ 6,065,000

**APPENDIX X
DETAILS OF CAPITAL IMPROVEMENT PROGRAM**

Budget Item Number	Estimated Expenditures by Fiscal Year					
	2010	2011	2012	2013	2014	
COMMUNICATIONS EQUIPMENT						
550	Communications Equipment-Electric System	\$ 160,000	\$ 400,000	\$ 980,000	\$ 1,200,000	\$ 2,000,000
551	Communications Equipment-Client Services	210,000	210,000	185,000	265,000	275,000
553	Communications Equipment-T&D	100,000	100,000	100,000	100,000	100,000
555	Telephone and Data lines	500,000	1,000,000	1,000,000	1,000,000	800,000
	<i>Total Communication Equipment</i>	\$ 970,000	\$ 1,710,000	\$ 2,265,000	\$ 2,565,000	\$ 3,175,000
OTHER EQUIPMENT						
560	Planning and Environmental	\$ 545,000	\$ 490,000	\$ 425,000	\$ 375,000	\$ 675,000
562	Engineering	-	800,000	1,200,000	775,000	750,000
564	Administrative Services	-	250,000	580,000	180,000	240,000
565	Transportation Workshop	230,000	170,000	100,000	145,000	175,000
566	Human Resources	-	-	-	-	40,000
568	Electric System	1,005,000	1,115,000	3,145,000	2,410,000	1,250,000
570	Client Services	280,000	320,000	314,000	264,000	358,000
572	Transmission and Distribution	1,047,000	1,180,000	2,000,000	2,070,000	1,750,000
576	Purchase Other Equipment - Corporate Security	400,000	300,000	1,150,000	400,000	200,000
	<i>Total Other Equipment</i>	\$ 3,507,000	\$ 4,625,000	\$ 8,914,000	\$ 6,619,000	\$ 5,438,000
	TOTAL EQUIPMENT	\$ 16,412,000	\$ 26,215,000	\$ 31,491,000	\$ 32,296,000	\$ 27,039,000
	TOTAL GENERAL PLANT	\$ 24,238,000	\$ 35,196,000	\$ 44,042,000	\$ 59,582,000	\$ 45,465,000
PRELIMIN. SURVEYS & INVESTIGATIONS						
600	Engineering	\$ 4,175,000	\$ 3,000,000	\$ 4,000,000	\$ 5,000,000	\$ 5,000,000
605	Administrative Services	\$ 250,000	\$ 200,000	\$ 200,000	\$ 200,000	\$ 250,000
610	Planning and Environmental	350,000	216,000	100,000	1,260,000	410,000
611	Renewable Energy Sources	400,000	500,000	92,000	205,000	245,000
619	Preliminary Studies--Transmission & Distribution	100,000	100,000	100,000	100,000	100,000
	TOTAL PRELIMIN. SURVEYS & INVESTIGATIONS	\$ 5,275,000	\$ 4,016,000	\$ 4,492,000	\$ 6,765,000	\$ 6,005,000
	NET CAPITAL IMPROVEMENT PROGRAM	\$ 350,000,000	\$ 300,000,000	\$ 300,000,000	\$ 350,000,000	\$ 400,000,000

127 FERC ¶ 61,044
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Before Commissioners: Jon Wellinghoff, Chairman;
Sudeen G. Kelly, Marc Spitzer,
and Philip D. Moeller.

EcoEléctrica, L.P.

Docket No. CP95-35-001

ORDER AMENDING AUTHORIZATION UNDER SECTION 3
OF THE NATURAL GAS ACT

(Issued April 16, 2009)

1. On March 5, 2008, EcoEléctrica, L.P. (EcoEléctrica) filed an application to amend its previous authorizations under section 3 of the Natural Gas Act (NGA), issued by the Commission on May 15, 1996 (May 1996 Order), for the siting, construction, and operation of liquefied natural gas (LNG) facilities for the importation of natural gas into the Commonwealth of Puerto Rico (Puerto Rico).¹ EcoEléctrica seeks Commission approval of its Terminal Modification Project (project), which would install two additional vertical shell and tube heat exchange vaporizers at the EcoEléctrica LNG terminal in order to deliver a greater volume of natural gas to Puerto Rico Electric Power Authority's (Power Authority) Aguirre Combined Cycle Power Plant. During the course of reviewing EcoEléctrica's application a great deal of additional information was sought and provided that was necessary to complete Commission staff's environmental review of EcoEléctrica's proposal.² For the reasons discussed herein, we will approve the requested modifications to EcoEléctrica's previous authorizations under section 3 of the NGA, subject to the conditions discussed herein.

I. Background

2. In the May 1996 Order, the Commission authorized EcoEléctrica to site, construct, and operate LNG import terminal facilities, including: (1) a marine terminal with a

¹ *EcoEléctrica, L.P.*, 75 FERC ¶ 61,157 (1996).

² EcoEléctrica responded to four Commission staff environmental information requests. The responses and supplements were filed on April 24, 2008, May 30, 2008, July 18, 2008, August 5, 2008, September 5, 2008, September 29, 2008, October 8, 2008, and November 13, 2008.

1,800-foot pier for unloading LNG tankers; (2) two 1-million-barrel LNG storage tanks;³ (3) an LNG vaporization system;⁴ and (4) various control systems, piping, and other ancillary equipment. The Commission found that EcoEléctrica's LNG terminal would provide an environmentally acceptable alternative to oil in meeting the increasing electric demands of Puerto Rico. In view of these considerations, the Commission found that the LNG terminal would not be inconsistent with the public interest.⁵

3. In conjunction with the LNG import terminal, EcoEléctrica also constructed: (1) a 461-megawatt electric cogeneration facility that uses vaporized LNG as a fuel source for power generation; (2) a desalination facility capable of producing up to 4 million gallons of fresh water per day; (3) other facilities necessary for the operation of the cogeneration facility, including a 2.3-mile, 230-kilovolt transmission line connecting the plant substation to an existing Power Authority substation and a gas line to serve the cogeneration facility; and (4) a gas line to serve the Power Authority's Costa Sur power plant.⁶ The section 3 authorization granted in the May 1996 Order did not cover any of these facilities.

³ EcoEléctrica has only built one of the two LNG storage tanks approved in the May 1996 Order. EcoEléctrica has not commenced construction of the second storage tank or related facilities. Environmental Condition No. 11 of the May 1996 Order specified that "EcoEléctrica shall commence construction on its LNG facilities within 3 years of the date of this Order, or file a motion to extend the deadline, with the specific reasons why additional time is necessary." As noted, to date, over 12 years from issuance of the May 1996 Order, EcoEléctrica has not constructed the second authorized storage tank or four of the six authorized vaporizers. Nor did it ever file for an extension of time to construct these facilities. Therefore, the authorizations with respect to those facilities issued by the May 1996 Order have lapsed. Accordingly, should EcoEléctrica seek to build another LNG storage tank, or other related facilities, it must obtain prior Commission authorization.

⁴ The May 1996 Order authorized EcoEléctrica to install up to six vaporizers (consisting of two vertical shell and tube heat exchanger vaporizers and four open rack vaporizers) in conjunction with the two approved LNG storage tanks. Since EcoEléctrica only constructed one LNG storage tank, it only installed two vaporizers. As stated above, if EcoEléctrica seeks to build another LNG storage tank, or other related facilities, it must at such time seek Commission authorization.

⁵ *EcoEléctrica, L.P.*, 75 FERC at 61,515 and 61,518.

⁶ The Power Authority's Costa Sur Power Plant was never converted to natural gas firing. Consequently, the pipeline intended to serve the plant was never constructed.

II. Proposal

4. In the instant proceeding, EcoEléctrica requests authority under section 3 of the NGA to construct two additional vertical shell and tube heat exchanger vaporizers within EcoEléctrica's existing 36-acre LNG facility site. EcoEléctrica also proposes to install other facilities associated with the vaporizers including: (1) one fixed speed, in-tank LNG sendout pump; (2) three seawater heat exchangers; (3) three water/glycol circulation pumps; (4) one water/glycol expansion tank at 1,800 gallons; (5) one seawater supply pump at 6,000 gallons per minute (gpm); and (6) three seawater circulation pumps.

5. The proposed modifications to EcoEléctrica's existing LNG terminal facilities would enable it to supply natural gas to the Power Authority's Aguirre Combined Cycle Power Plant (Aguirre electric plant), in Aguirre, Puerto Rico, once the plant's conversion from fuel oil to natural gas is completed. EcoEléctrica proposed to interconnect its existing 1.2-mile, 24-inch send-out pipeline, which extends to the fenceline of its 36-acre LNG terminal site, with a Power Authority pipeline that would carry the regasified LNG to its Aguirre electric plant.⁷

6. EcoEléctrica's proposed LNG terminal modifications would enable it to increase its regasified LNG send-out capacity by an additional 77.4 (average) to 93 (peak) million standard cubic feet per day (MMscf/day), resulting in a total send-out capacity of approximately 186 MMscf/day. The existing LNG storage tank has sufficient volume capacity to accommodate this additional send out. EcoEléctrica confirms that no new compressors, liquid nitrogen storage, or pipelines will be required to implement the planned increase in send out.

7. EcoEléctrica states there would be no net increase in the amount of water withdrawn or discharged as a result of the modifications. The proposed vaporization facilities would use a closed-loop vaporization system that draws heat as a side stream from the same volume of water as EcoEléctrica currently withdraws for its existing LNG facilities.

8. EcoEléctrica asserts that to accommodate the increased send out of vaporized LNG, a total of two LNG vessels per month would call at the EcoEléctrica LNG terminal;

⁷ The Power Authority began constructing a 42-mile-long, natural gas pipeline from the Aguirre electric plant in 2008. This pipeline will tap into EcoEléctrica's existing 1.2-mile long send-out pipeline. The Power Authority will own and operate the 42-mile long pipeline currently under construction. The Power Authority's new pipeline underwent separate environmental analyses conducted by the U.S. Army Corp of Engineers (Army Corp) and the Puerto Rico Environmental Quality Control Board.

this would be an increase of one LNG vessel per month over the historic level of traffic. EcoEléctrica consulted with the U.S. Coast Guard (Coast Guard), which expressed no objection to the increased frequency of LNG vessel deliveries related to EcoEléctrica's proposal.

9. EcoEléctrica states that the proposed modifications were designed, and would be constructed and operated according to U. S. Department of Transportation safety standards.⁸ All construction activities would occur within the fence line of the LNG terminal site. EcoEléctrica plans to place the facilities in service by the end of 2009.

III. Notice and Interventions

10. Public notice of EcoEléctrica's application was published in the *Federal Register* on March 24, 2008 (73 Fed. Reg. 15,511). Motions to intervene were due on or before April 8, 2008. Timely, unopposed motions to intervene were filed by Shell NA LNG LLC and Distrigas of Massachusetts LLC.⁹ No comments or protests were filed regarding the application.

IV. Discussion

11. Because the proposed LNG terminal facilities will be used to import gas from foreign countries, the siting, construction and operation of the facilities require approval by the Commission under section 3 of the NGA.¹⁰

⁸ 49 C.F.R. Part 193 (2008).

⁹ Timely, unopposed motions to intervene are granted by operation of Rule 214 of the Commission's Rules of Practice and Procedure. 18 C.F.R. § 385.214 (2008).

¹⁰ The regulatory functions of section 3 of the NGA were transferred to the Secretary of the U. S. Department of Energy (DOE) in 1977 pursuant to section 301(b) of the Department of Energy Organization Act (Pub. L. No. 95-91, 42 U.S.C. §§ 7101 *et seq.*). In reference to regulating the imports or exports of natural gas, the DOE Secretary has delegated to the Commission the authority to approve or disapprove the construction and operation of particular facilities, the site at which facilities shall be located and, with respect to natural gas that involves the construction of new domestic facilities, the place of entry or exit for exports. *See* DOE Delegation Order No. 00-044A.00 (2006), FERC Stats. & Regs. ¶ 9920 (reissuing, effective May 16, 2006, authorities contained in previous delegation orders). In addition, section 3(e)(1) of the NGA, as amended by section 311(c) of the Energy Policy Act of 2005 (EPAAct 2005), Pub. L. 109-58, 119 Stat. 594, provides that the Commission has exclusive authority to approve or deny applications for the construction or operation of LNG terminals. DOE

(continued)

12. The Commission's authority over facilities constructed and operated under section 3 of the NGA includes the authority to apply terms and conditions as necessary and appropriate to ensure that the proposed construction and siting is in the public interest.¹¹ Section 3 provides that the Commission "shall issue such order on application" if it finds that the proposal "will not be inconsistent with the public interest."¹²

13. The Commission previously authorized EcoEléctrica to install six vaporizers on its LNG facility. Currently, only two vaporizers have been installed. The two proposed vaporizers are of the same type and function as two of those initially authorized and installed. Although the proposed modifications will increase EcoEléctrica's send-out capacity from 93 MMscf/day to 186 MMscf/day, the send-out capacity will remain below the import capacity of 130 billion cubic feet (Bcf) per year currently authorized by DOE's Office of Fossil Energy (DOE/FE).¹³ The proposed project will not change the authorized level of expansion capacity or the deliverability of the terminal.¹⁴

14. To achieve a greater send-out capacity, EcoEléctrica will need to increase the incoming volumes of LNG. This will be accomplished by increasing vessel traffic to 24 LNG vessels per year, from the historic level of 12 LNG vessels per year. However, we note that EcoEléctrica's original October 1994 application, as well as the Coast Guard's 1996 letter of recommendation, contemplated a much higher amount of vessel traffic (up to 60 LNG vessel unloadings per year), than what would result from the

has retained authority to act on applications for authority to import or export natural gas. Such applications must be submitted to DOE's Office of Fossil Energy. The Commission does not authorize the importation of the commodity itself.

¹¹ See section 3(e)(3)(A) of the NGA, as enacted by section 311(c) of EPA Act 2005. See also *Distragas Corporation v. FPC*, 495 F.2d 1057, 1063-64, cert. denied, 419 U.S. 834 (1974); *Dynegy LNG Production Terminal, L.P.*, 97 FERC ¶ 61,231 (2001).

¹² 15 U.S.C. § 717b(a) (2006).

¹³ *EcoEléctrica, L.P.*, 75 FERC at 61,516. See DOE/FE Order No. 1042 (April 19, 1995) (granting EcoEléctrica authority to import 130 Bcf of LNG per year for a 40-year term).

¹⁴ Since there will be no impact on Puerto Rico or local safety concerns, the pre-filing procedures for review of LNG terminals established in Order No. 665 are not implicated by the addition of vaporizers requested herein. See *Regulations Implementing Energy Policy Act of 2005, Pre-Filing Procedures for Review of LNG Terminals and Other Natural Gas Facilities*, Order No. 665, FERC Stats. & Regs. ¶ 31,195 (2005).

proposed project. In reviewing EcoEléctrica's current proposal, the Commission's staff has consulted with the Coast Guard and the U.S. Fish and Wildlife Service. Neither of these agencies have expressed any concerns with the increase in LNG vessel traffic that will result from approval of EcoEléctrica's proposal. The Commission finds that the additional LNG vessels calling on the LNG facility would not have an adverse impact on public interest or the environment.

15. EcoEléctrica's LNG terminal was the first, and remains the only, source of natural gas in Puerto Rico. EcoEléctrica's proposed project will enable it to deliver natural gas to the Power Authority's Aguirre plant, replacing No. 2 distillate oil as the plant's fuel for generating electricity. The increase in natural gas supply is an environmentally acceptable alternative to oil in meeting the anticipated increases in electric demand of Puerto Rico.

16. The instant proposal will not have an impact on landowners, since all of the construction is taking place within EcoEléctrica's existing LNG terminal site. Currently, all of the regasified LNG sent out from EcoEléctrica's LNG terminal is used as fuel at its own facilities. Thus, EcoEléctrica has no existing customers that might be adversely affected by the costs or risks of recovery of those costs from the proposed modifications. Therefore, we find that, subject to the conditions imposed in this Order, EcoEléctrica's proposal is not inconsistent with the public interest.

V. Environmental Assessment

17. On June 11, 2008, the Commission issued a *Notice of Intent to Prepare an Environmental Assessment for the proposed EcoEléctrica Terminal Modification Project and Request for Comments on Environmental Issues* (NOI). The notice was published in the *Federal Register* on June 18, 2008 (73 Fed. Reg. 34,720). The NOI was sent to affected landowners; federal, state/commonwealth, and local government agencies; elected officials; environmental and public interest groups; and local libraries and newspapers. No comments were received in response to our NOI.

18. Like the authorizations granted in the original Order, Commission staff's conclusions and recommendations in its 1996 environmental impact statement are out-of-date. As a result, the environmental staff was not able to rely on its environmental impact statement to the extent that EcoEléctrica contemplated, and materials which EcoEléctrica had not prepared at the time its application was filed were needed for staff to complete its environmental review. In the end, EcoEléctrica was required to file a substantial amount of new and updated information and mitigation plans.

19. To satisfy the requirements of the National Environmental Policy Act (NEPA), our staff prepared an environment assessment (EA) which was distributed for public comment and placed in the record on February 13, 2009. Issuance of the EA was published in the *Federal Register* on February 23, 2009 (74 Fed. Reg. 8,079). The

analysis in the EA addressed: geology; soils; water resources and wetlands; vegetation; fisheries and wildlife (including threatened and endangered species); essential fish habitat; land use, recreation and visual resources; cultural resources; air quality and noise; safety; socioeconomics; cumulative impacts; and alternatives. The public comment period ended on March 16, 2009. No comments were received.

20. In a letter dated March 6, 2009, the U.S. Fish and Wildlife Service (FWS) concurred with the determination presented in our staff's Biological Assessment, that the project was not likely to adversely affect the brown pelican or the Antillean manatee. Because our consultation with the FWS is complete, we have modified the EA's recommendation that the Director of the Office of Energy Projects withholds authorization for the commencement of construction until the staff completes its consultation with the National Oceanic and Atmospheric Administration National Marine Fisheries Service.

21. Any state/commonwealth or local permits issued with respect to the jurisdictional facilities authorized herein must be consistent with the conditions of this certificate. The Commission encourages cooperation between regulated entities and local authorities. However, this does not mean that state/commonwealth and local agencies, through application of state/commonwealth or local laws, may prohibit or unreasonably delay the construction of facilities approved by this Commission.¹⁵

22. Based on the discussion in the EA, we conclude that if constructed in accordance with EcoEléctrica's application and supplements and the conditions imposed herein, approval of this proposal would not constitute a major federal action significantly affecting the quality of the human environment.

VI. Conclusion

23. For the reasons set forth herein, and subject to the conditions set forth below in the Appendix, we find that EcoEléctrica's proposed modifications are not inconsistent with the public interest under section 3 of the NGA. Thus, we grant the requested authorization to EcoEléctrica.

24. At a hearing held on April 16, 2009, the Commission on its own motion received and made part of the record all evidence, including the application and exhibits thereto,

¹⁵ See, e.g., *Schneidewind v. ANR Pipeline Co.*, 485 U.S. 293 (1988); *National Fuel Gas Supply v. Public Service Commission*, 894 F.2d 571 (2d Cir. 1990); and *Iroquois Gas Transmission System, L.P., et al.*, 52 FERC ¶ 61,091 (1990) and 59 FERC ¶ 61,094 (1992).

submitted in support of the authorization sought herein, and upon consideration of the record,

The Commission orders:

(A) EcoEléctrica's authorization under section 3 of the NGA, issued May 15, 1996, for its approved LNG terminal is amended as more fully described in EcoEléctrica's application and as conditioned herein.

(B) Except as provided herein, the authorization issued May 15, 1996, remains unchanged and EcoEléctrica must comply with all of the conditions applicable to the LNG terminal set forth in the Appendix to the May 15, 1996 Order.

(C) EcoEléctrica shall notify the Commission's environmental staff by telephone, e-mail, and/or facsimile of any environmental noncompliance identified by other federal, state/commonwealth, or local agencies on the same day that such agency notifies EcoEléctrica. EcoEléctrica shall file written confirmation of such notification with the Secretary of the Commission within 24 hours.

By the Commission.

(SEAL)

Kimberly D. Bose,
Secretary.

Appendix

Environmental Conditions for EcoEléctrica's LNG Terminal Modification Project Docket No. CP95-35-001

As recommended in the Environmental Assessment, this authorization includes the following conditions:

1. EcoEléctrica, L.P. (EcoEléctrica) shall follow the construction procedures and mitigation measures described in its application and supplements, including responses to staff data requests, and as identified in the Environmental Assessment (EA), unless modified by the order. EcoEléctrica must:
 - a. request any modification to these procedures, measures, or conditions in a filing with the Secretary of the Commission (Secretary);
 - b. justify each modification relative to site-specific conditions;
 - c. explain how that modification provides an equal or greater level of environmental protection than the original measure; and
 - d. receive approval in writing from the Director of the Office of Energy Projects (OEP) before using that modification.
2. The Director of OEP has delegated authority to take all steps necessary to ensure the protection of life, health, property, and all environmental resources during construction and operation of the project. This authority shall include:
 - a. stop-work authority and authority to cease operation; and
 - b. the design and implementation of any additional measures deemed necessary to assure continued compliance with the intent of the conditions of the Commission order.
3. **Prior to construction**, EcoEléctrica shall file an affirmative statement with the Secretary, certified by a senior company official, that all company personnel, environmental inspectors, and contractor personnel will be informed of the environmental inspector's authority and have been or will be trained on the implementation of the environmental mitigation measures appropriate to their jobs before becoming involved with construction and restoration activities.
4. **Within 60 days of the acceptance of this certificate and before construction begins**, EcoEléctrica shall file an initial Implementation Plan with the Secretary for review and written approval by the Director of OEP. EcoEléctrica must file revisions to the plan as schedules change. The plan shall identify:

- a. how EcoEléctrica will implement the construction procedures and mitigation measures described in its application and supplements (including responses to staff data requests), identified in the EA, and required by this Order;
 - b. how EcoEléctrica will incorporate these requirements into the contract bid documents, construction contracts (especially penalty clauses and specifications), and construction drawings so that the mitigation required at each site is clear to onsite construction and inspection personnel;
 - c. the number of environmental inspectors assigned to the project, and how the company will ensure that sufficient personnel are available to implement the environmental mitigation;
 - d. company personnel, including environmental inspectors and contractors, who will receive copies of the appropriate material;
 - e. the training and instructions EcoEléctrica will give to all personnel involved with construction and restoration (initial and refresher training as the project progresses and personnel change);
 - f. the company personnel (if known) and specific portion of EcoEléctrica's organization having responsibility for compliance;
 - g. the procedures (including use of contract penalties) EcoEléctrica will follow if noncompliance occurs; and
 - h. for each discrete facility, a Gantt or PERT chart (or similar project scheduling diagram), and dates for:
 - (1) the completion of all required surveys and reports;
 - (2) the mitigation training of onsite personnel;
 - (3) the start of construction; and
 - (4) the start and completion of restoration.
5. Beginning with the filing of its initial Implementation Plan, EcoEléctrica shall file updated status reports with the Secretary on a monthly basis until all construction and restoration activities are complete. On request, these status reports will also be provided to other federal and state/commonwealth agencies with permitting responsibilities. Status reports shall include:
- a. an update on EcoEléctrica's efforts to obtain the necessary federal authorizations;
 - b. the construction status of the project and work planned for the following reporting period;
 - c. a listing of all problems encountered and each instance of noncompliance observed by the environmental inspector during the reporting period (both for the conditions imposed by the Commission and any environmental conditions/permit requirements imposed by other federal, state/commonwealth, or local agencies);

- d. a description of the corrective actions implemented in response to all instances of noncompliance, and their cost;
 - e. the effectiveness of all corrective actions implemented;
 - f. a description of any landowner/resident complaints which may relate to compliance with the requirements of the order, and the measures taken to satisfy their concerns; and
 - g. copies of any correspondence received by EcoEléctrica from other federal, state/commonwealth, or local permitting agencies concerning instances of noncompliance, and EcoEléctrica's response.
6. EcoEléctrica must receive written authorization from the Director of OEP **before commencing service** from the project. Such authorization will only be granted following a determination that rehabilitation and restoration of the areas disturbed by the project are proceeding satisfactorily.
7. EcoEléctrica **shall not begin construction** until the FERC staff completes any necessary consultation with the National Oceanic and Atmospheric Administration National Marine Fisheries Service and EcoEléctrica requests and receives written notification from the Director of OEP that construction and/or use of mitigation (including implementation of conservation measures) may begin.

The following measures shall apply to the EcoEléctrica Terminal Modification Project design and construction details. Information pertaining to these specific recommendations shall be filed with the Secretary for review and approval by the Director of OEP either: prior to initial site preparation; prior to construction of final design; prior to commissioning; or prior to commencement of service as indicated by each specific condition. Specific engineering, vulnerability, or detailed design information meeting the criteria specified in Order No. 683 (Docket No. RM06-24-000), including security information, should be submitted as critical energy infrastructure information (CEII) pursuant to 18 C.F.R. § 388.112. *See Critical Energy Infrastructure Information*, Order No. 683, 71 Fed. Reg. 58,273 (October 3, 2006), FERC Stats. & Regs. ¶ 31,228 (2006). Information pertaining to items such as: offsite emergency response; procedures for public notification and evacuation; and construction and operating reporting requirements would be subject to public disclosure. This information should be submitted a minimum of 30 days before approval to proceed is required.

8. Complete plan drawings and a list of the hazard detection equipment shall be filed **prior to initial site preparation**. The list shall include the instrument tag number, type and location, alarm locations, and shutdown functions of the proposed hazard detection equipment. Plan drawings shall clearly show the location of all detection equipment.

9. Complete plan drawings and a list of the fixed and wheeled dry-chemical, fire extinguishing, and other hazard control equipment shall be filed **prior to initial site preparation**. The list shall include the equipment tag number, type, size, equipment covered, and automatic and manual remote signals initiating discharge of the units. Plan drawings shall clearly show the planned location of all fixed and wheeled extinguishers.
10. Facility plans showing the proposed location of, and area covered by, each monitor, hydrant, deluge system, hose, and sprinkler, as well as piping and instrumentation diagrams, of the firewater system shall be filed **prior to initial site preparation**.
11. The **final design** of the fixed and wheeled dry-chemical, fire extinguishing, and other hazard control equipment shall identify manufacturer and model.
12. The **final design** shall specify that dual temperature elements and transmitters are provided for low temperature alarm and shutdown at the discharge of each vaporizer.
13. The **final design** shall include a check valve between the LNG vaporizer discharge shutoff valve and the discharge manual isolation valve for all existing and proposed vaporizers.
14. The **final design** shall specify that for LNG and natural gas service, branch piping and piping nipples less than 2 inches are to be no less than schedule 160.
15. The **final design** shall include details of the shutdown logic, including cause and effect matrices for alarms and shutdowns.
16. The **final design** shall include details of the air gaps to be installed downstream of all seals or isolations installed at the interface between a flammable fluid system and an electrical conduit or wiring system. Each air gap shall vent to a safe location and be equipped with a leak detection device that: shall continuously monitor for the presence of a flammable fluid; shall alarm the hazardous condition; and shall shut down the appropriate systems.
17. The **final design** shall include a hazard and operability review of the completed design. A copy of the review and a list of the recommendations shall be filed with the Secretary.
18. The **final design** shall provide up-to-date Piping & Instrument Diagrams (P&IDs) including a description of the instrumentation and control philosophy, type of instrumentation (pneumatic, electronic), use of computer technology, and control

room display and operation. Drawings and all information should be clearly legible on 11- by 17-inch paper and the piping legend and symbology shall be in accordance with accepted practice. All drawings shall be filed in black and white. The following information shall be included on the P&IDs:

- a. equipment tag number, name, size, duty, capacity and design conditions;
 - b. piping with line number, piping class specification, size and insulation;
 - c. LNG tank pipe penetration size or nozzle schedule;
 - d. piping specification breaks and insulation limits;
 - e. isolation flanges, blinds and insulating flanges;
 - f. valve type, in accordance with the piping legend symbol;
 - g. all control valves numbered;
 - h. all valve operator types and valve fail position;
 - i. instrumentation numbered;
 - j. control loops including software connections;
 - k. alarm and shutdown set points;
 - l. shutdown interlocks;
 - m. relief valves numbered, with set point;
 - n. relief valve inlet and outlet piping size;
 - o. car-sealed valves and blinds;
 - p. equipment insulation;
 - q. drawing revision number and date;
 - r. all manual valves numbered, including check, vent, drain, and car-sealed valves; and
 - s. alarm and shutdown set points.
19. The **final design** shall specify that all hazard detection equipment include redundancy, fault detection, and fault alarm monitoring.
 20. All valves including drain, vent, main, and car-sealed valves shall be tagged in the field during construction and **prior to commissioning**.
 21. A tabulated list of the proposed hand-held fire extinguishers shall be filed **prior to commissioning**. The information shall include a list with the equipment number, type, size, number, and location. Plan drawings shall include the type, size, and number of all hand-held fire extinguishers.
 22. Updated Operation and Maintenance procedures and manuals, as well as safety procedure manuals, shall be filed **prior to commissioning**.
 23. FERC staff shall be notified of any proposed revisions to the security plan and physical security of the facility **prior to commencement of service**.

24. Progress on construction of the LNG terminal modifications shall be reported in monthly reports filed with the Secretary. Details shall include a summary of activities, projected schedule for completion, problems encountered and remedial actions taken. Problems of significant magnitude shall be reported to the FERC **within 24 hours**.

In addition, the following measures should apply throughout the life of the facility:

25. The facility shall be subject to regular FERC staff technical reviews and site inspections on at least an annual basis or more frequently as circumstances indicate. Prior to each FERC staff technical review and site inspection, EcoEléctrica shall respond to a specific data request including information relating to possible design and operating conditions that may have been imposed by other agencies or organizations. Up-to-date detailed piping and instrumentation diagrams reflecting facility modifications and provision of other pertinent information not included in the semi-annual reports described below, including facility events that have taken place since the previously submitted semi-annual report, shall be submitted.
26. **Semi-annual** operational reports shall be filed with the Secretary to identify changes in facility design and operating conditions, abnormal operating experiences, activities (including ship arrivals, quantity and composition of imported LNG, vaporization quantities, boil-off/flash gas, etc.), and plant modifications including future plans and progress thereof. Abnormalities shall include, but not be limited to: unloading/shipping problems, potential hazardous conditions from off-site vessels, storage tank stratification or rollover, geysering, storage tank pressure excursions, cold spots on the storage tanks, storage tank vibrations and/or vibrations in associated cryogenic piping, storage tank settlement, significant equipment or instrumentation malfunctions or failures, non-scheduled maintenance or repair (and reasons therefore), relative movement of storage tank inner vessels, vapor or liquid releases, fires involving natural gas and/or from other sources, negative pressure (vacuum) within a storage tank and higher-than-predicted boiloff rates. Adverse weather conditions and the effect on the facility also shall be reported. Reports should be submitted **within 45 days** after each period ending **June 30 and December 31**. In addition to the above items, a section entitled "Significant plant modifications proposed for the next 12 months (dates)" also shall be included in the semi-annual operational reports. Such information would provide the FERC staff with early notice of anticipated future construction/maintenance projects at the LNG facility.
27. In the event the temperature of any region of any secondary containment becomes less than the minimum specified operating temperature for the material, the

Commission shall be notified **within 24 hours** and procedures for corrective action should be specified.

28. Significant non-scheduled events, including safety-related incidents (i.e., LNG or natural gas releases, fires, explosions, mechanical failures, unusual over pressurization, and major injuries) and security related incidents (i.e., attempts to enter site, suspicious activities) shall be reported to the FERC staff. In the event an abnormality is of significant magnitude to threaten public or employee safety, cause significant property damage, or interrupt service, notification shall be made **immediately**, without unduly interfering with any necessary or appropriate emergency repair, alarm, or other emergency procedure. In all instances, notification shall be made to the Commission staff **within 24 hours**. This notification practice shall be incorporated into the LNG facility's emergency plan. Examples of reportable LNG-related incidents include:
- a. fire;
 - b. explosion;
 - c. estimated property damage of \$50,000 or more;
 - d. death or personal injury necessitating in-patient hospitalization;
 - e. free flow of LNG that results in pooling;
 - f. unintended movement or abnormal loading by environmental causes, such as an earthquake, landslide, or flood, that impairs the serviceability, structural integrity, or reliability of an LNG facility that contains, controls, or processes gas or LNG;
 - g. any crack or other material defect that impairs the structural integrity or reliability of an LNG facility that contains, controls, or processes gas or LNG;
 - h. any malfunction or operating error that causes the pressure of a pipeline or LNG facility that contains or processes gas or LNG to rise above its maximum allowable operating pressure (or working pressure for LNG facilities) plus the build-up allowed for operation of pressure-limiting or control devices;
 - i. a leak in an LNG facility that contains or processes gas or LNG that constitutes an emergency;
 - j. inner tank leakage, ineffective insulation, or frost heave that impairs the structural integrity of an LNG storage tank;
 - k. any condition that could lead to a hazard and cause a 20 percent reduction in operating pressure or shutdown of operation of a pipeline or an LNG facility;
 - l. safety-related incidents to LNG vessels occurring at or en route to and from the LNG facility; or

- m. an event that is significant in the judgment of the operator and/or management even though it did not meet the above criteria or the guidelines set forth in an LNG facility's incident management plan.

In the event of an incident, the Director of OEP has delegated authority to take whatever steps are necessary to ensure operational reliability and to protect human life, health, property or the environment, including authority to direct the LNG facility to cease operations. Following the initial company notification, the Commission staff would determine the need for an on-site inspection by the Commission staff, and the timing of an initial incident report (normally within 10 days) and follow-up reports.

- 29. EcoEléctrica shall develop an updated Emergency Response Plan (ERP) (including evacuation) and coordinate procedures with the Coast Guard, state/commonwealth, county, and local emergency planning groups; fire departments; state/commonwealth and local law enforcement; and appropriate federal agencies. This plan shall include at a minimum:
 - a. designated contacts with state/commonwealth and local emergency response agencies;
 - b. scalable procedures for the prompt notification of appropriate local officials and emergency response agencies based on the level and severity of potential incidents;
 - c. procedures for notifying residents and recreational users within areas of potential hazard;
 - d. evacuation routes/methods for residents and other public use areas that are within any transient hazard areas along the route of the LNG vessel transit;
 - e. locations of permanent sirens and other warning devices; and
 - f. an "emergency coordinator" on each LNG vessel to activate sirens and other warning devices.

The ERP shall be filed with the Secretary for review and written approval by the Director of OEP **prior to initial site preparation**. EcoEléctrica shall notify the FERC staff of all planning meetings in advance and shall report progress on the development of its ERP at **3-month intervals**.

- 30. The ERP shall include a Cost-Sharing Plan identifying the mechanisms for funding all project-specific security/emergency management costs that would be imposed on state/commonwealth and local agencies. In addition to the funding of direct transit-related security/emergency management costs, this comprehensive plan shall include funding mechanisms for the capital costs associated with any necessary security/emergency management equipment and personnel base. The

Cost-Sharing Plan shall be filed with the Secretary for review and written approval by the Director of OEP **prior to initial site preparation.**