Puerto Rico Electric Power Authority

A WORLD CLASS CORPORATION
MAIN PROJECTS OVERVIEW

Eng. Josué A. Colón Ortiz, Director
Generation, Transmission & Distribution

The Electric Energy System Evolution

Puerto Rico Electric Power Authority

PREPA, welcome the British Investment Mission to our Monacillos T.C. Facilities

The Electric Energy System Evolution

Puerto Rico, The Shining Star of the Caribbean

Puerto Rico Electric Power Authority

PREPA is a modern public utility offering a full range of services such as:

- Produce
- Transmit
- Distribute, and
- Sell electricity

PREPA is a public corporation of the Government of Puerto Rico, and is empowered to:

- Make contracts
- Acquire properties
- Borrow money, and
- Issue bonds

The Electric Energy System Evolution

Puerto Rico Electric Power Authority

To provide electric services to our clients in the most efficient, economical and reliable way, without harming the environment

Mission

To be competitive with electric utilities at a world-class level

Vision

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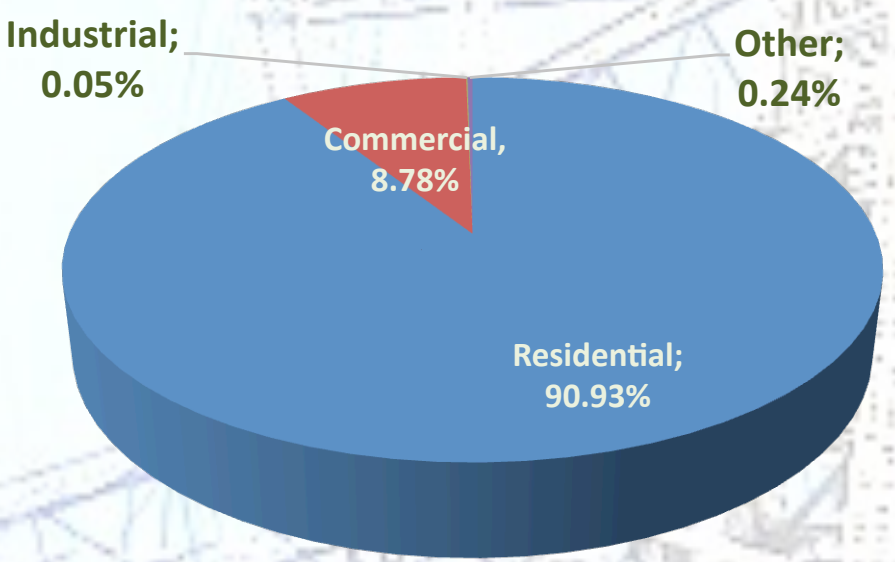
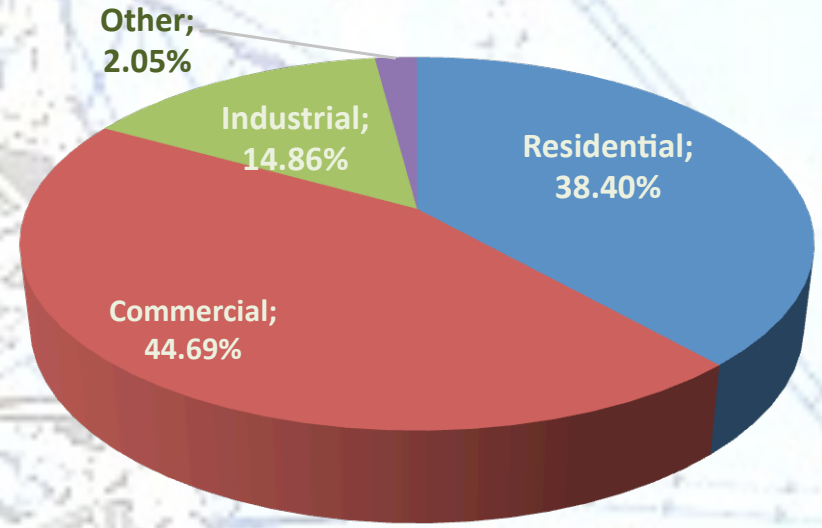
PREPA Customers Distribution





Revenues: $4.0 billion

1.5 million customers

The Electric Energy System Evolution Plan

Puerto Rico Electric Power Authority

Puerto Rico Electric Power Authority is a government owned corporation established in 1941. Governed by a Board of Directors, constituted by nine members. Seven are appointed by the Governor of Puerto Rico with the Senate's consent. The other two members are client representatives, that are elected by an election among clients, which is monitored by the Department of Consumer Affairs.

The Board of Directors appoints an Executive Director who runs the operational and administrative organization of this public corporation.

Clients: 1.5 millions

Puerto Rico Electric Power Authority

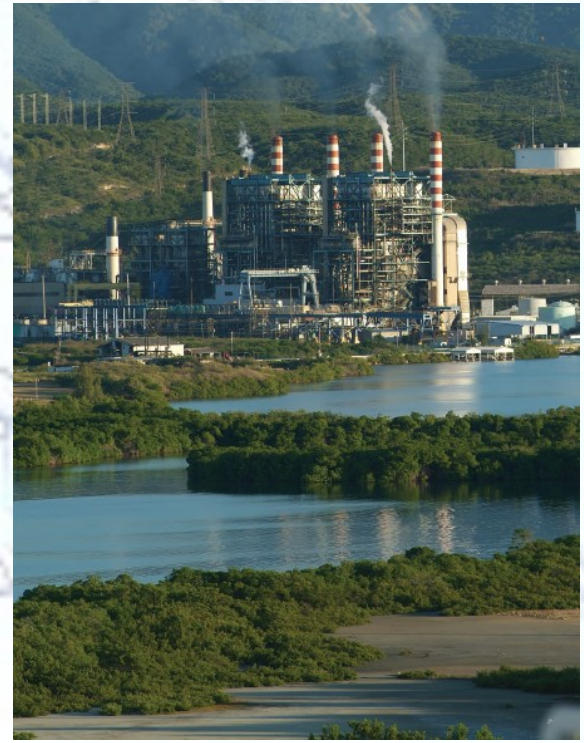
PREPA IS A COMPANY WITH:

- Comprehensive capital investment plans to respond to short and medium term projected demand
- Strong strategic planning to reduce fuel oil dependence
- Strong debt service coverage
- Effective system management including redundancies for emergency preparedness

PREPA

Among public utilities in the USA, PREPA is*:

- Number 1 in clients
- Number 1 in revenues
- Number 6 in sales kWh
- Number 7 in generation kWh



*American Public Power Association, 2007-2008

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PREPA ELECTRIC SYSTEM MAIN FACILITIES

The Electric Energy System Evolution

Puerto Rico Electric Power Authority

PREPA's Operational Profile 2010

Employees	8,800
Generation	
• San Juan Power Station	400 MW
• Palo Seco Power Station	602 MW
• Costa Sur Power Station 990 MW	
• Aguirre Power Station	900 MW
• Aguirre Combined Cycle	592 MW
• San Juan Combined Cycle	440 MW
• Cambalache Combustion Turbines Power Station	248 MW
• Mayagüez Combustion Turbines Power Station 220 MW	
• Other (18) Combustion Powered Turbines	378 MW
* Vieques & Culebra Diesel Units	8 MW
•21 Hydroelectric Powered Turbines	99.8 MW
• Coal Power Station (Private-AES)	454 MW
• Natural Gas Power Station (Private-ECO)	507 MW
•TOTAL INSTALLED CAPACITY PREPA	4,878 MW
•PREPA PLUS COGENERATORS	5,839 MW

Power Lines	
Distribution	
• Primary	
•13.3 KV	4,479 mi
•8.32 KV	4,334 mi
•4.16 KV	7,130 mi
•Secondary	15,503 mi
•Total	31,446 mi
Transmission	
• 38 KV	1,425 mi
•115 KV	731.5 mi
•230 KV	374.1 mi
•Total	2,530.6mi
Substations	344
Feeders	1,271

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PREPA ELECTRIC SYSTEM INFRASTRUCTURE

•Rated: 248 MW
•In Service: 1997

Palo Seco
Units 1, 2, 3, 4

•Rated: 602 MW
•In Service: '59, 67', 68'

San Juan
Units 7, 8, 9, 10

•Rated: 400 MW
•In Service: '59, 67', 68'

San Juan Units 5 & 6

•Rated: 440 MW
•In Service: 2008

• Rated: 220 MW
•In Service: 2008

South Coast
Units 3, 4, 5, 6

•Rated: 990 MW
•In Service: '60, 62', 69', 72'

EcoEléctrica (LNG)

•Rated: 507 MW
•In Service: 2000
Privately Owned

Aguirre Units 1 & 2

•Rated: 900 MW
•In Service: 1971

Combined Cycle

•Rated: 592 MW
•In Service: 1971

AES (Coal)

•Rated: 454MW
•In Service: 2002
Privately Owned

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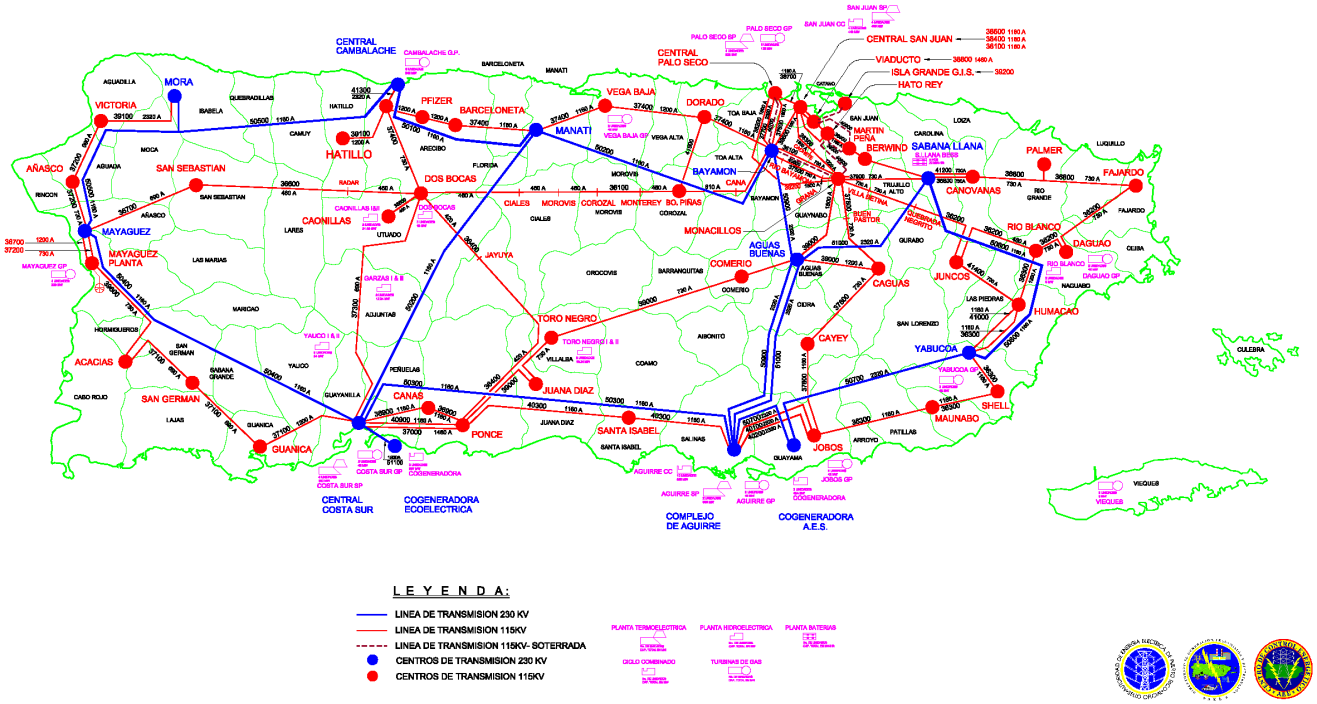
Puerto Rico Electric Power Authority
115V – 230KV Transmission Lines



PREPA Electric System

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PREPA Energy Management System

Generation

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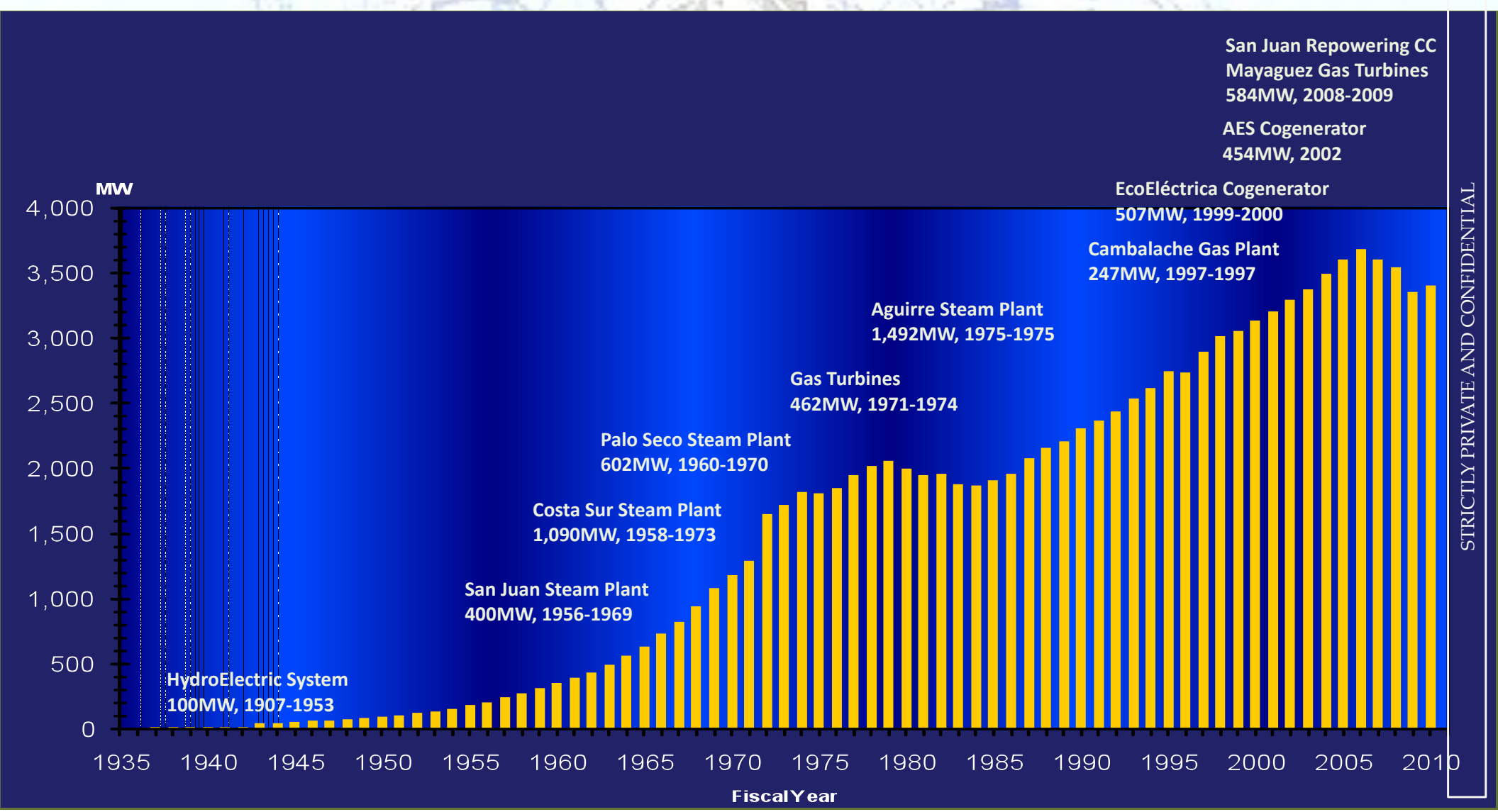
Generation Capacity Expansion



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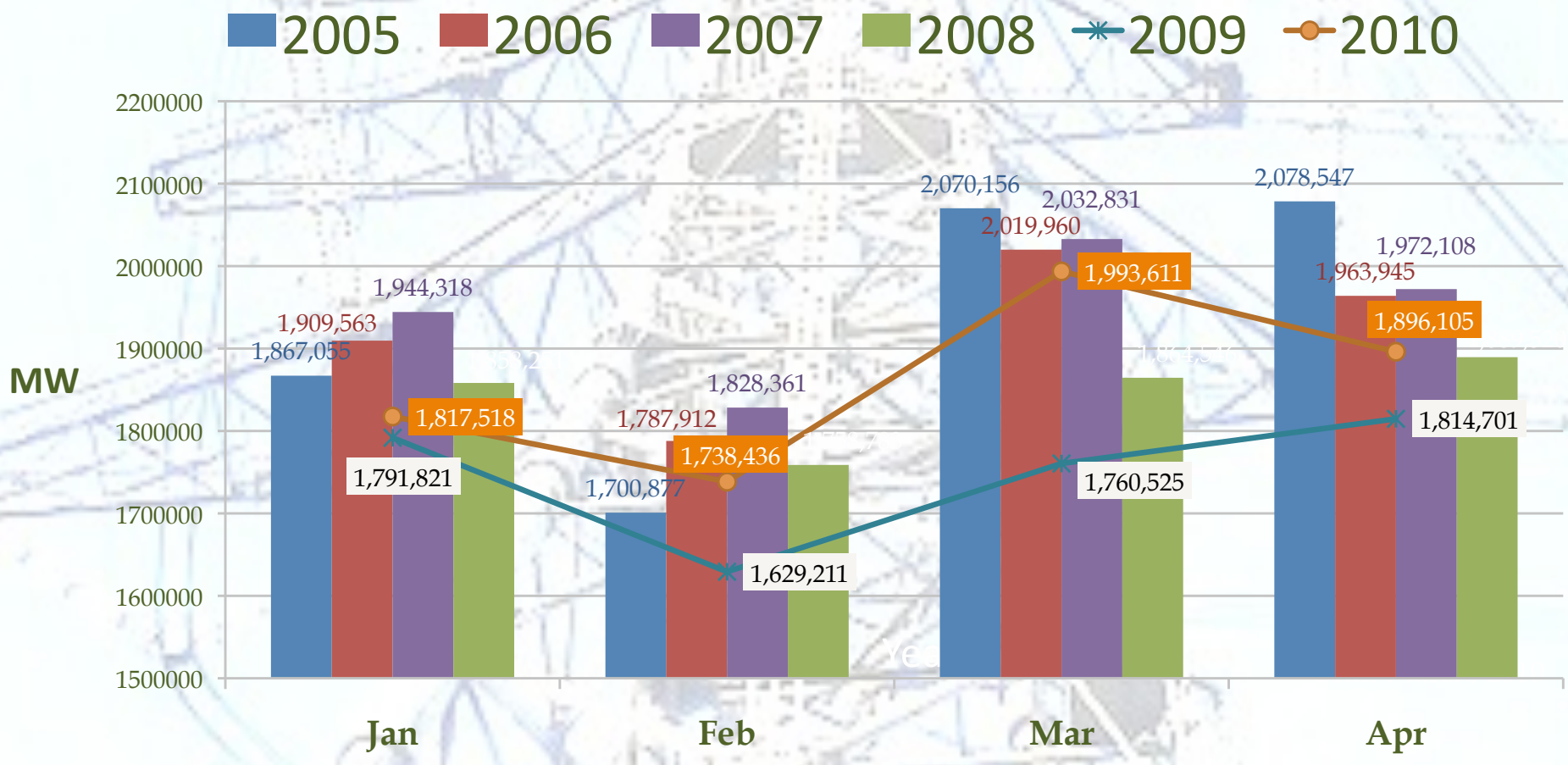
System Energy Production
January to April form 2005 to 2010



TECHNOLOGY

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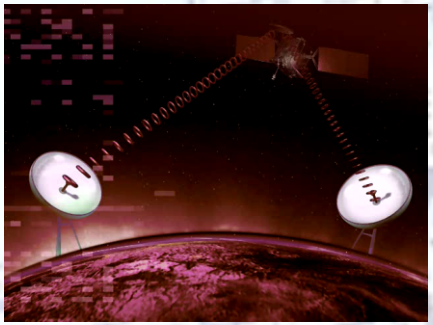
Technology Available at PREPA

- Fuel Purchasing Management
- Computerized Vehicle Fleet Management (Fleet Focus)
- Technology
  - + Management and Planning Systems as Primavera, STORMS & EMPAC
  - + Geographic Information System (GIS) based technology:



G/Electric: Power lines diagrams digitalization
- OMS: Outage Management Systems
- ARCGIS: ESRI based geographical system for project design

Automatic Vehicle Location (upgrading to 740)
Surveying correction system(antennas)

+ Preventive Maintenance with Asset Management and MRO System (EMPAC)
+ Energy Management System (SCADA – Siemmens)

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Technology Available at PREPA

- Telecommunications
  - + Microwaves
  - + Largest Fiber Optics Network in the Island
  - + Radio Trunking System
- Help Desk Management System
- WEB Services
- Internet based Electronic Bill Present and Payment System
- Interactive Voice Response System with Payment Options
- Intranet Real Time Weather Stations
- Oracle e-Business Suit

Education Centers

- Electric System Training Center (CASE)
- Electric Distribution Training Center (CADE)
- Commercial Operations Training Center (CAOC)
- More trainings centers

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Directional Drilling System

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Air Fleet Utilization for Engineering Works

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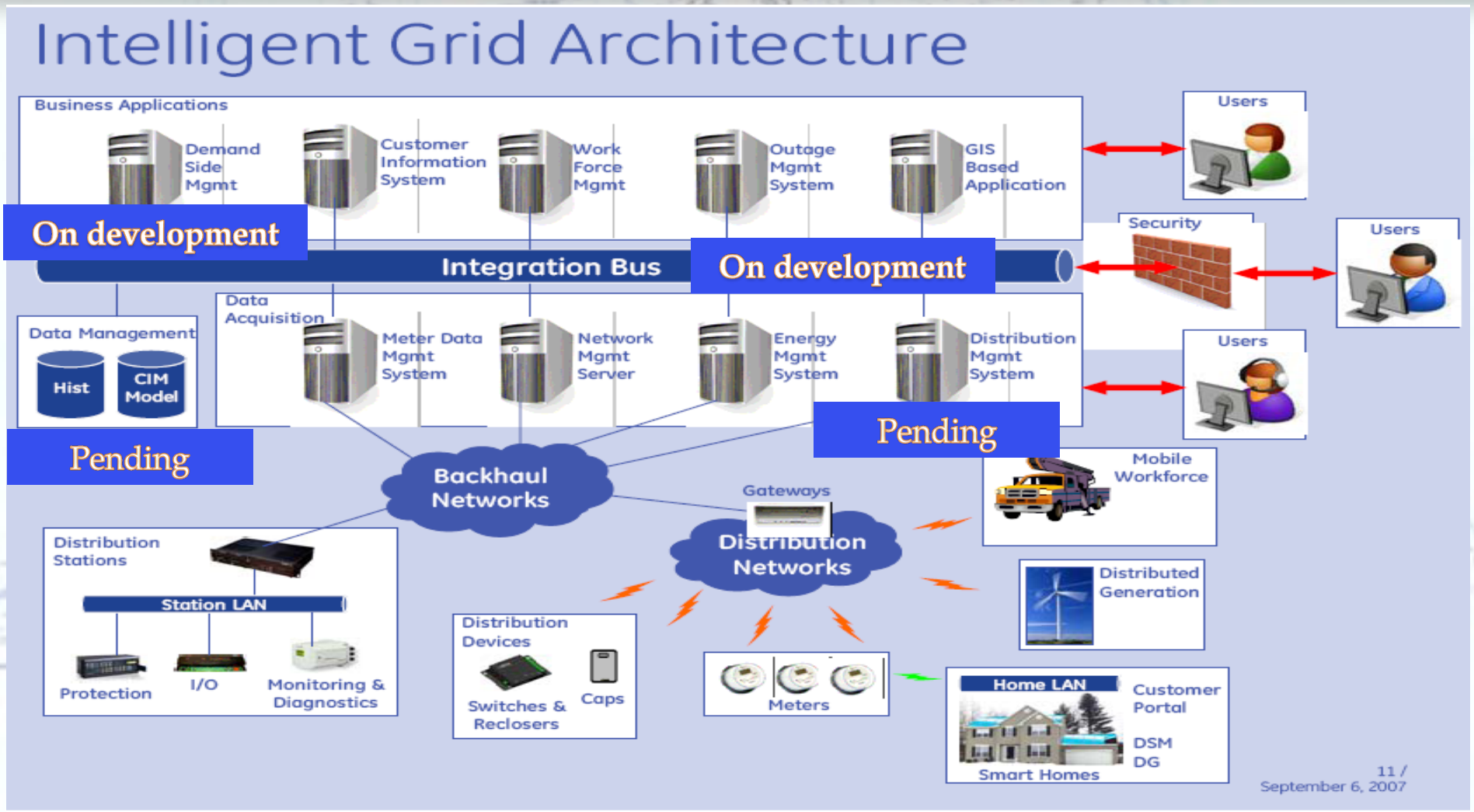
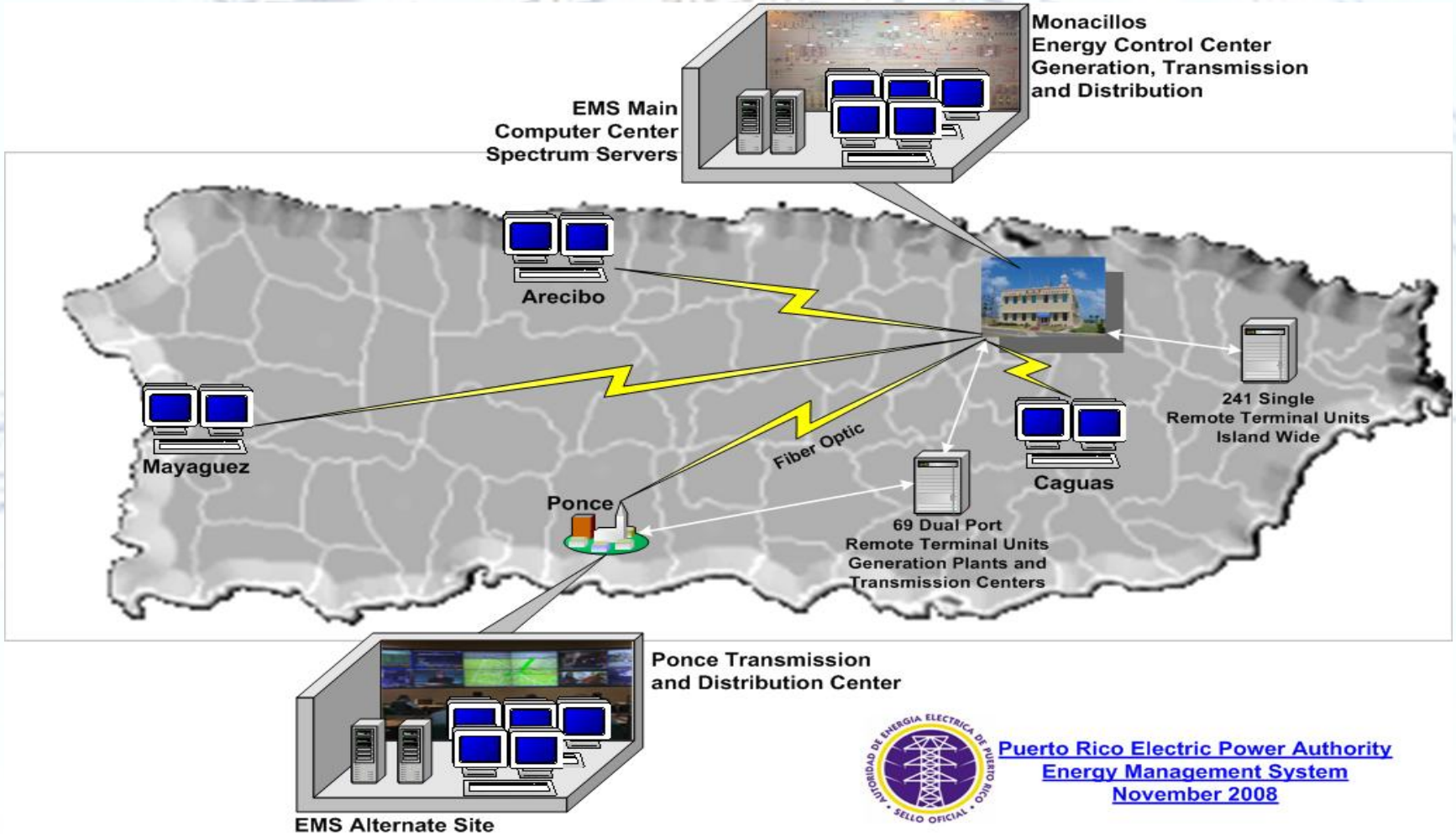


Smart Grid

Smart Grid – Technology drive to efficiency and operational cost reduction

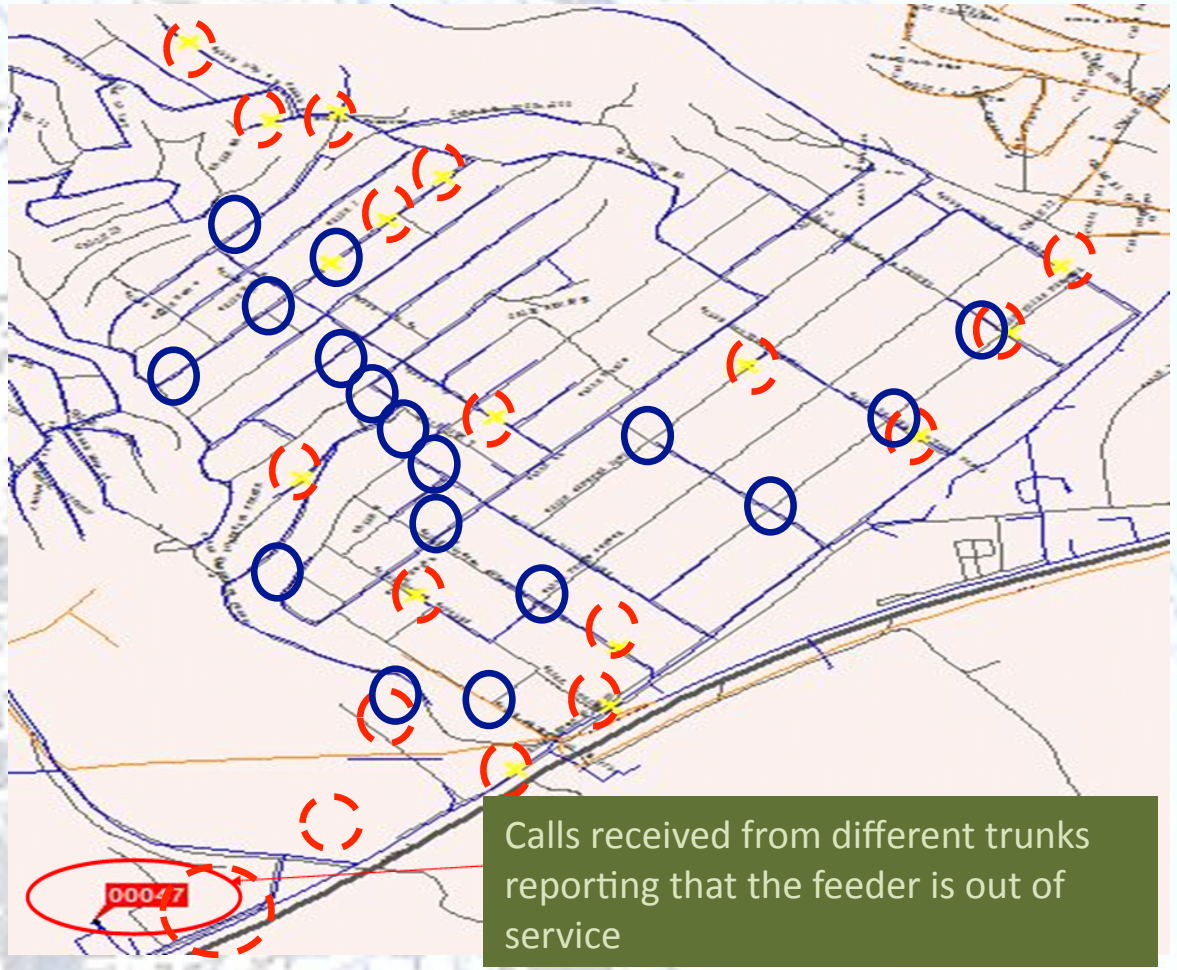
Energy Management System Replacement

- Actually, the system allows PREPA to remotely control and dispatch energy generation units, based on an economic scheme
- The system also controls the open and reclose and fault detection of transmission lines over the island



Outage Management System

- According to the customers calls, the system calculates the most probable causes
- Then, a note is created and a brigade is dispatched
- All emergency dispatch vehicles are under a satellite locator system



Calls received from different trunks reporting that the feeder is out of service

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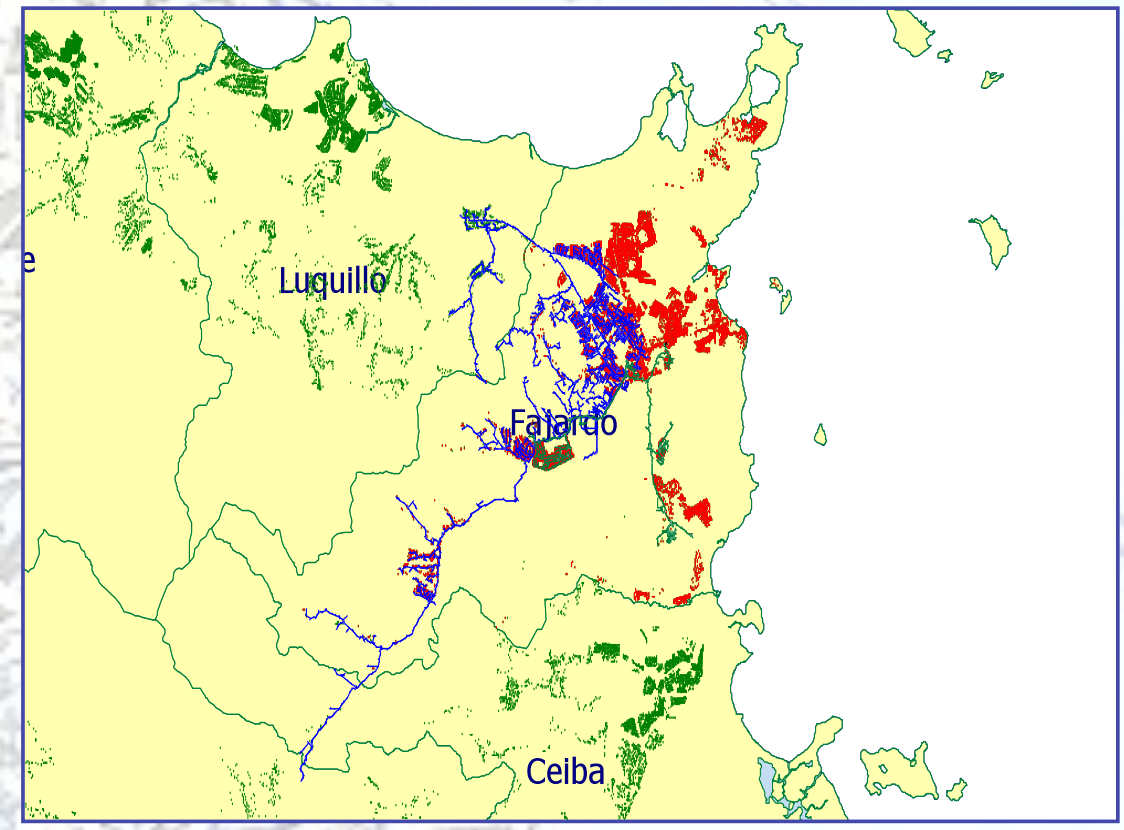
Integrated Geographic Information System for Outages and Fleet Management and Design of Facilities

- Spatial analysis
  - Route
  - Office
  - Municipality
  - District
  - Region
- Electric
  - Transformer
  - Fuses
  - Feeder
  - Substation



Outage Management Systems

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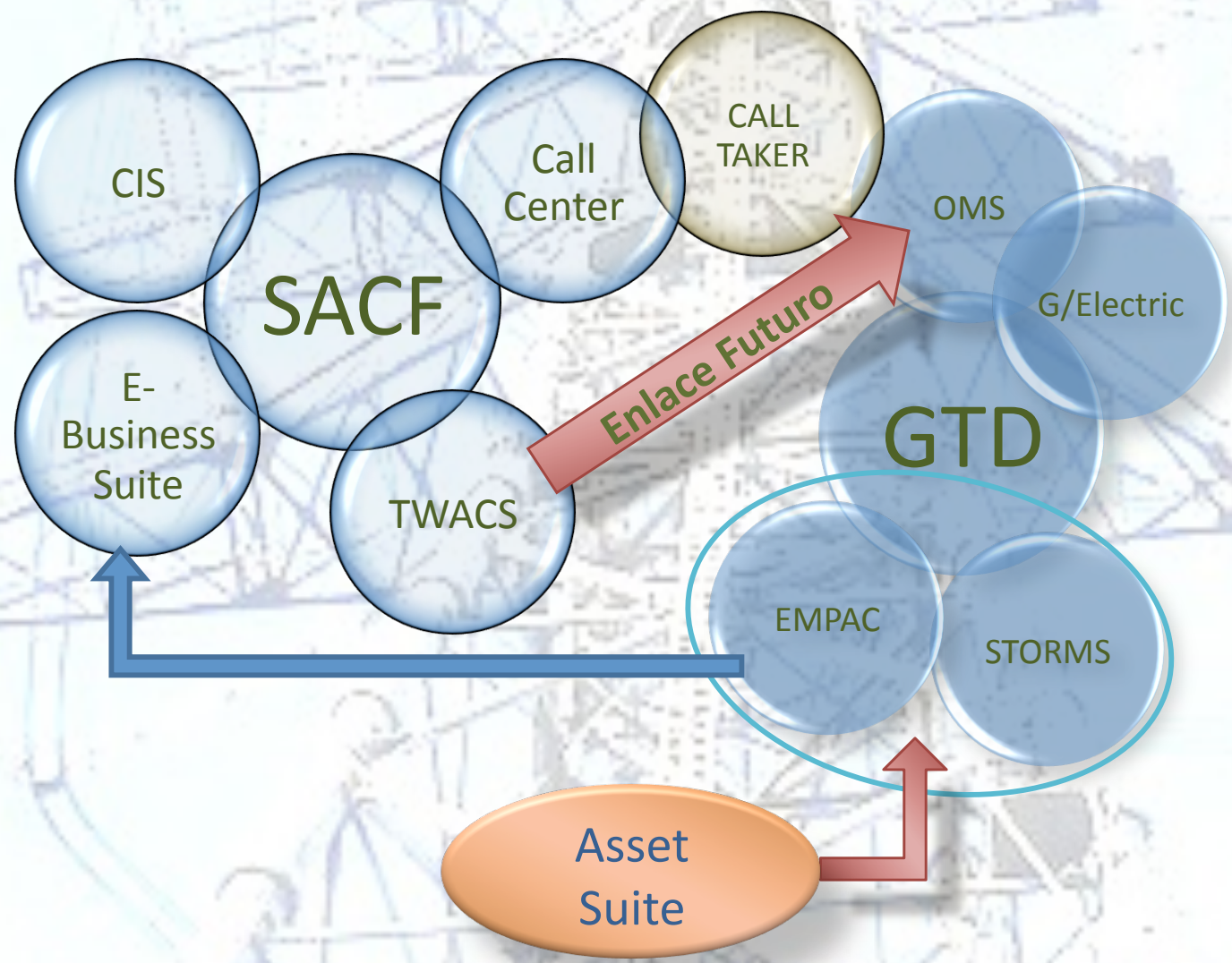
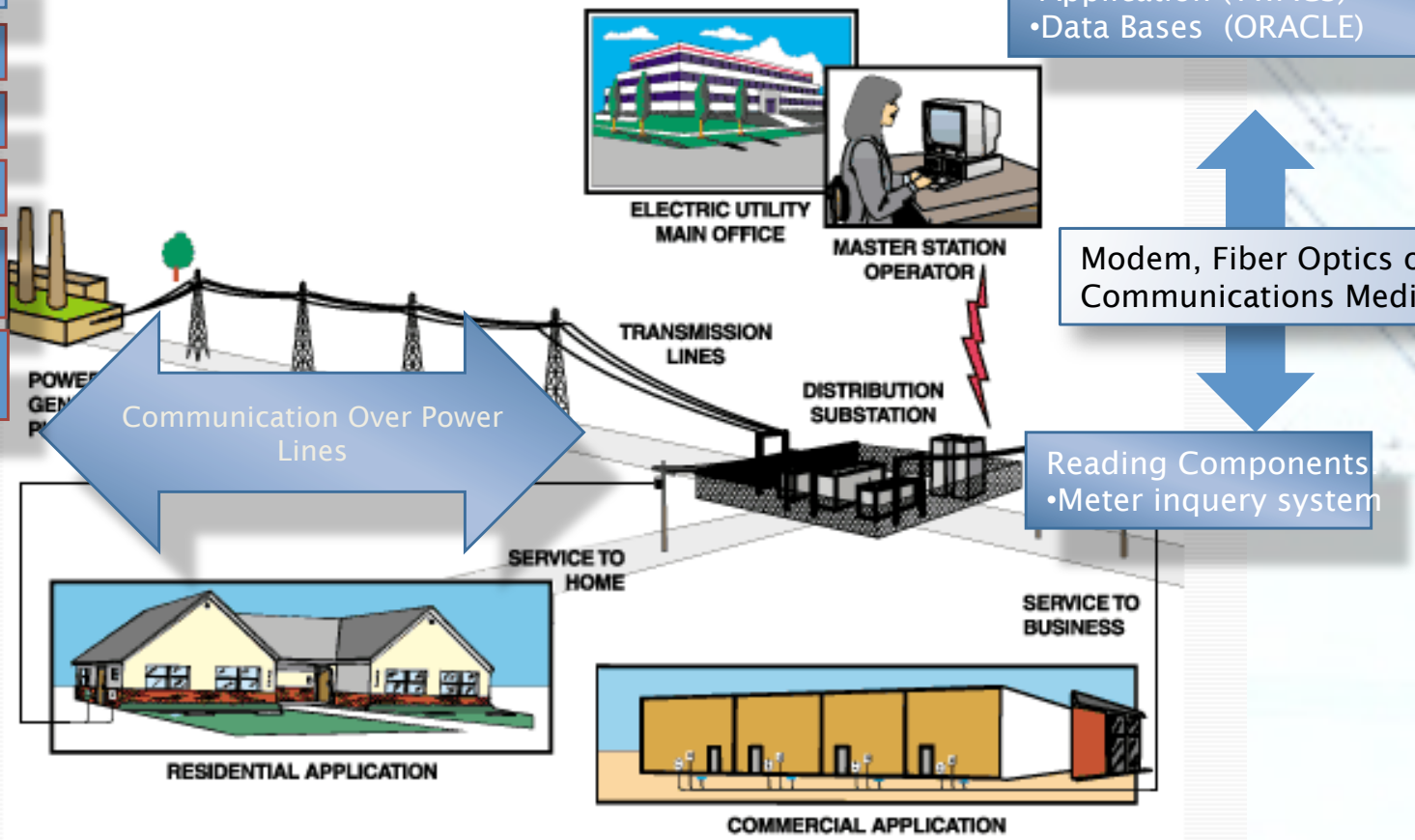
System Integration



Smart Grid – Technology drive to efficiency and operational cost reduction

Automatic Meter Reading

- Automatic Meter Reading
- Theft Losses Detectition
- Connect/Disconnect
- Load Control
- Others
- Capacitor Bank and Load Distribution Control
- System Outage Autodetection



System Administration Component
•Application (TWACS)
•Data Bases (ORACLE)

Modem, Fiber Optics or Other Communications Media

Reading Components
•Meter inquery system

Actual

Future

Generation, Transmission, and Distribution Projects Toward Smart Grid

- Upgrade of existing Energy Management System (EMS) enables modules to manage a basic wheeling system
- Conversion of analog microwave telecommunications to a digital system
- Implementation of a Distribution Automation (DA) system on various distribution feeders between the municipalities of Humacao and Caguas
- Validation of meters and distribution transformers data of the Outage Management System (OMS) and implementing the integration of this system with the new Customer Service System (CSS)
- Upgrade of the existing CSS

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New Research and Development

PREPA is developing new technology to:

- Broadband over Power Lines Technology
  - ✓ Internet
  - ✓ Providing tools to empower the customers to understand its electric energy consumption
  - ✓ Connect and disconnect service remotely
  - ✓ Video surveillance and other IP based serviced
- New Generation IP based AMI for electric and water systems
- Automatic Restoration System
- Award winning GIS design and outage management system

Fuel Diversification

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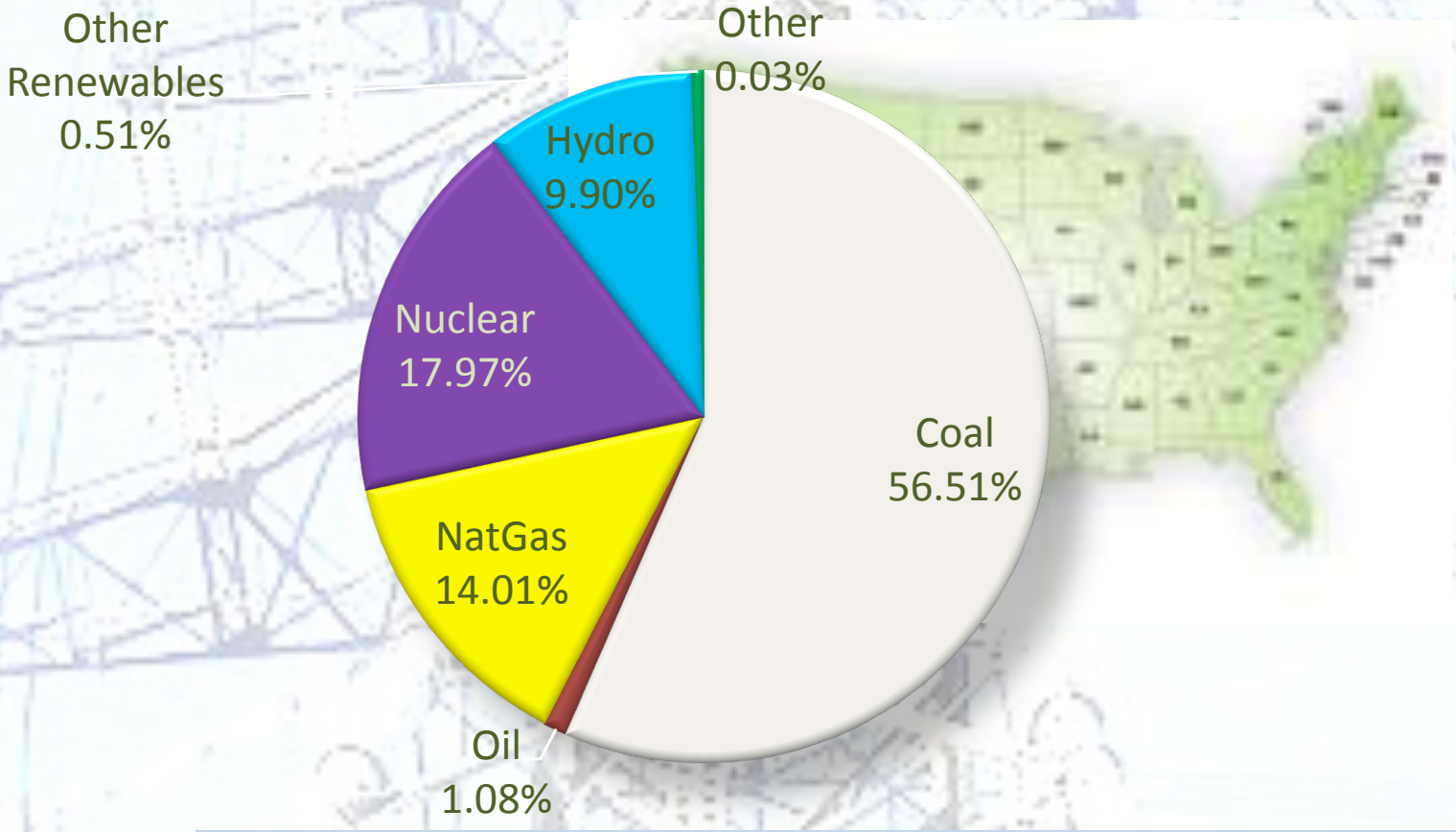
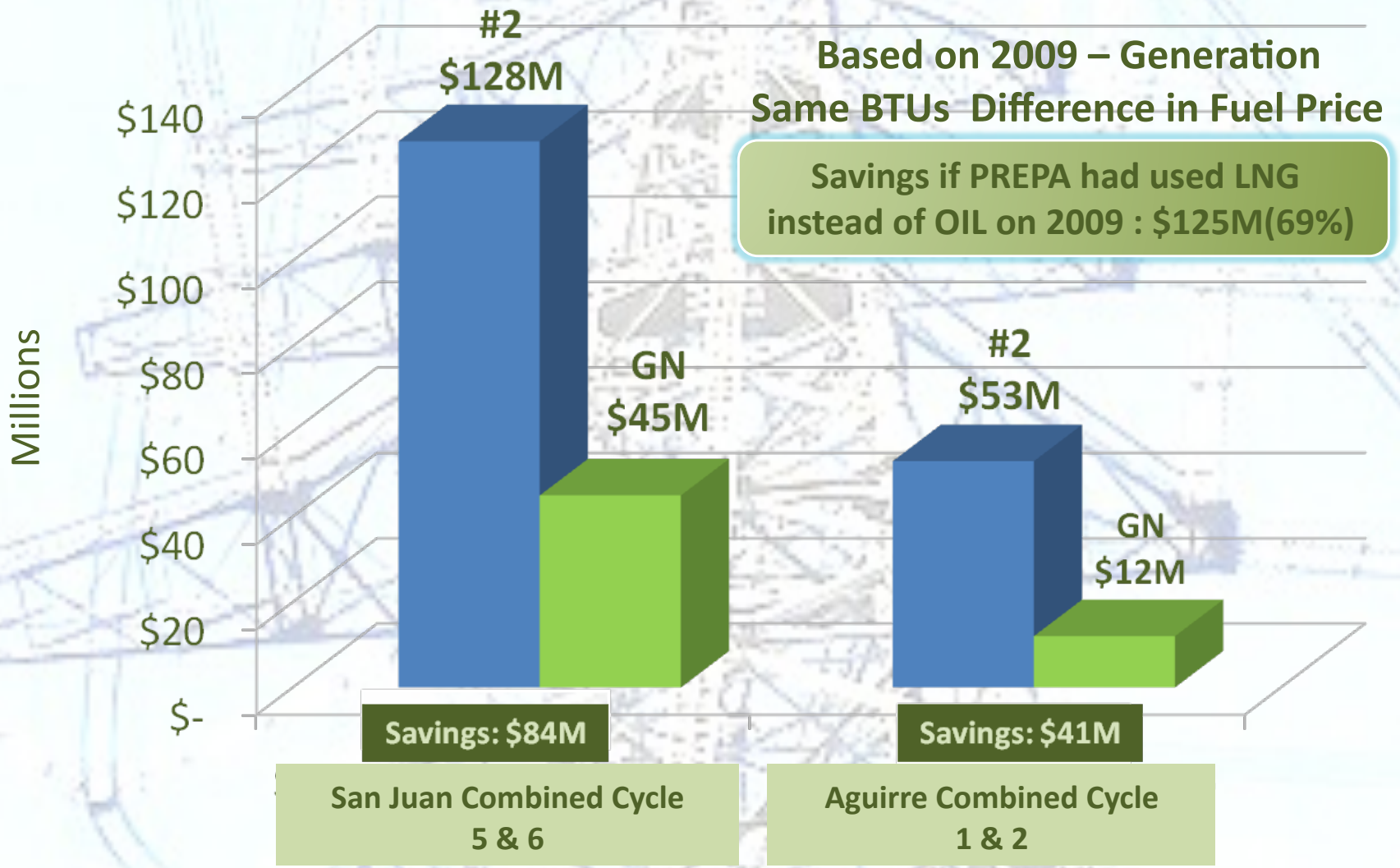
Electricity Fuel Source Diversification 2009



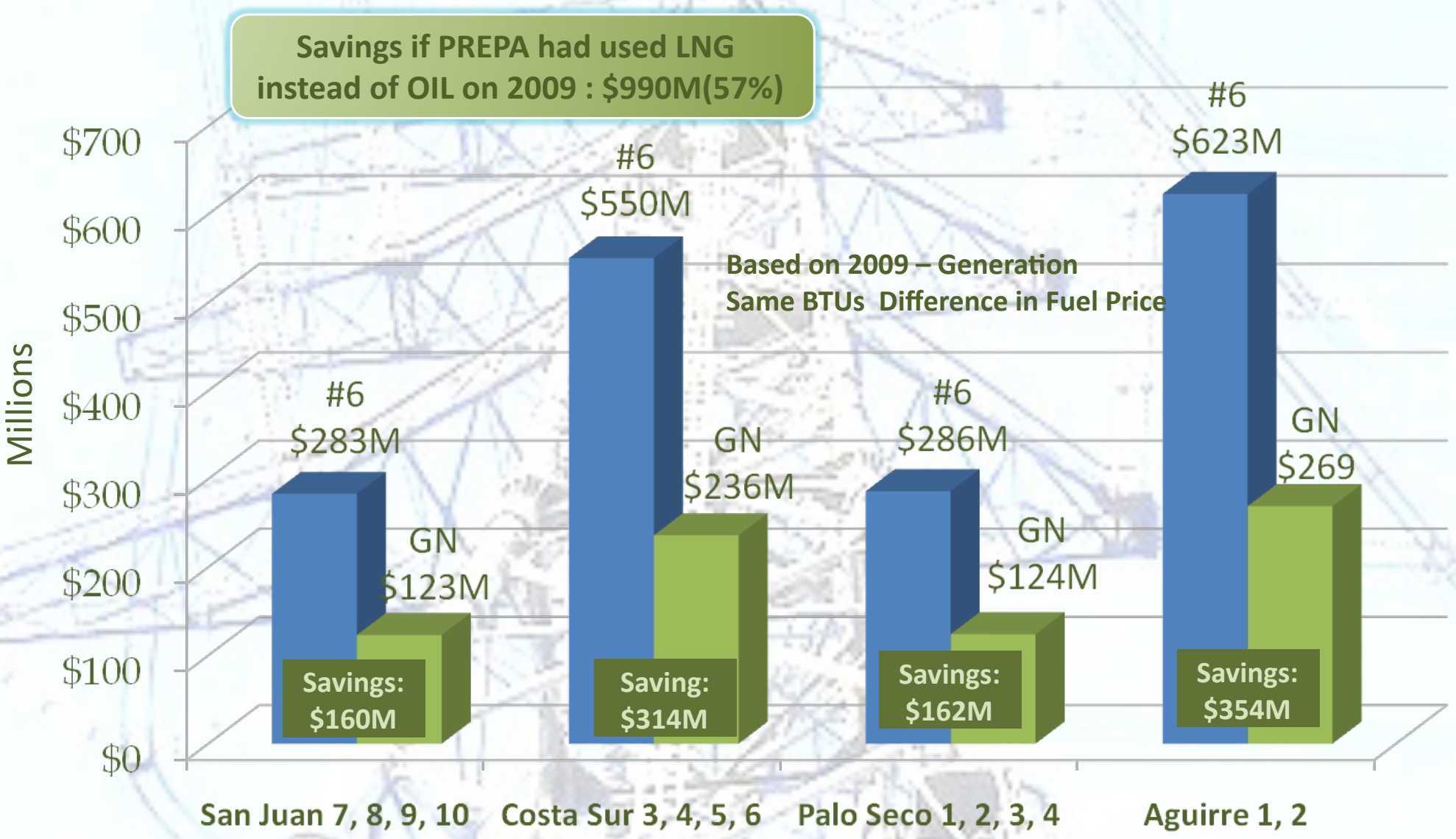
Source: US Energy Information Administration

Objective 1: Diversification of Fuel Sources



*LNG price of 2010, Oil price, as purchased on 2009

Objective 1: Diversification of Fuel Sources



*LNG price of 2010, Oil price, as purchased on 2009

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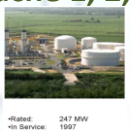
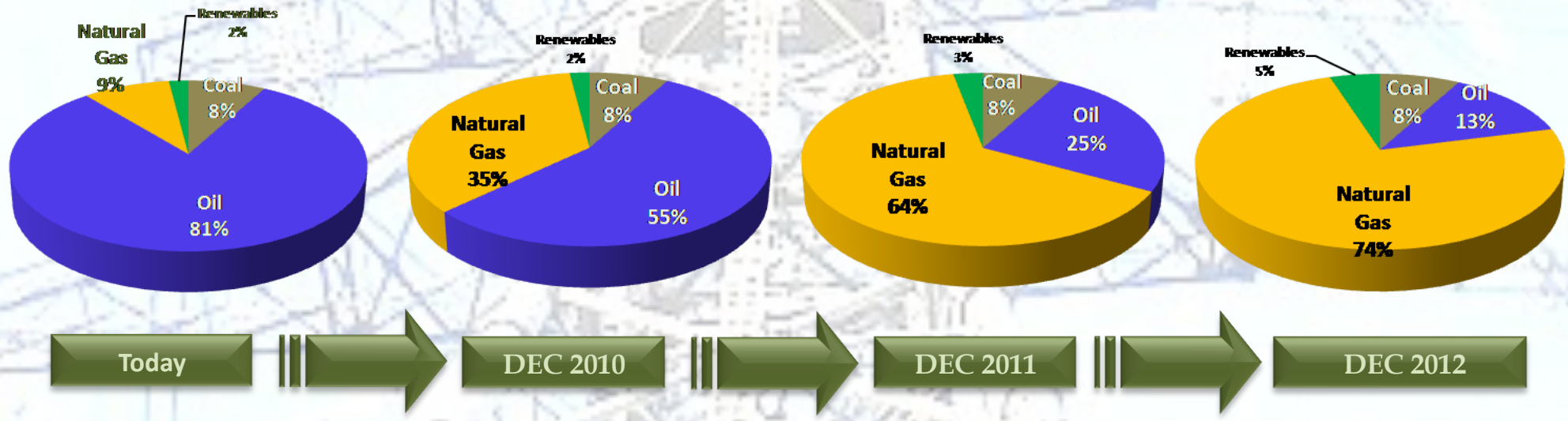
Implementation Timeline and Teams

	Capacity	Current Fuel	Schedule	Strategy	Team
South Coast 5, 6	1,090 MW	#6	1st	Convert units 5 and 6 to LNG December 2010.	Designer, LNG provider, and PREPA
1 to 4 	270 MW		2nd	Replace units 1 to 4 to LNG Combined Cycle by 2012.	Public Private Partnership
San Juan CC 5, 6 	440 MW	#2	3rd	Liquefied Natural Gas (LNG) Ready by 2012.	Designer, LNG provider, and PREPA
San Juan 7, 8, 9, 10 	400 MW	#6	4th	Convert to LNG by 2012.	Designer, LNG provider, and PREPA
Palo Seco 3, 4 	432 MW	#6	4th	Convert to LNG by 2012.	Designer, LNG provider, and PREPA
Cambalache 1, 2, 3 	247 MW	#2	5th	Convert to LNG by 2012.	Designer, LNG provider, and PREPA
Aguirre 1 & 2 	900 MW	#6	6th	Convert to LNG by 2014	Designer, LNG provider, and PREPA
				Buoy System	Public Private Partnership

Diversification of Fuel Sources –Installed Capacity



- Fuel oil dependency reduction is the best alternative to lower the energy price in Puerto Rico
- LNG and coal are intermediate steps to renewable energy sources

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Submarine Power Cable with Telecom Fiber from Fajardo to Saint Thomas

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Submarine Power Cable with Telecom Fiber from Fajardo to Saint Thomas

- Estimated construction Cost: $60 -70 Million ($1.2 Million per mile installed over approximately 50 miles).
- Route: Fajardo – St Thomas.
- Initial Minimum Load: 50 MW @ 115 KV
- An Interconnection with the Virgin Islands WAPA will allow PREPA to sell excess capacity to WAPA.

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PREPA, Energy for the Caribbean

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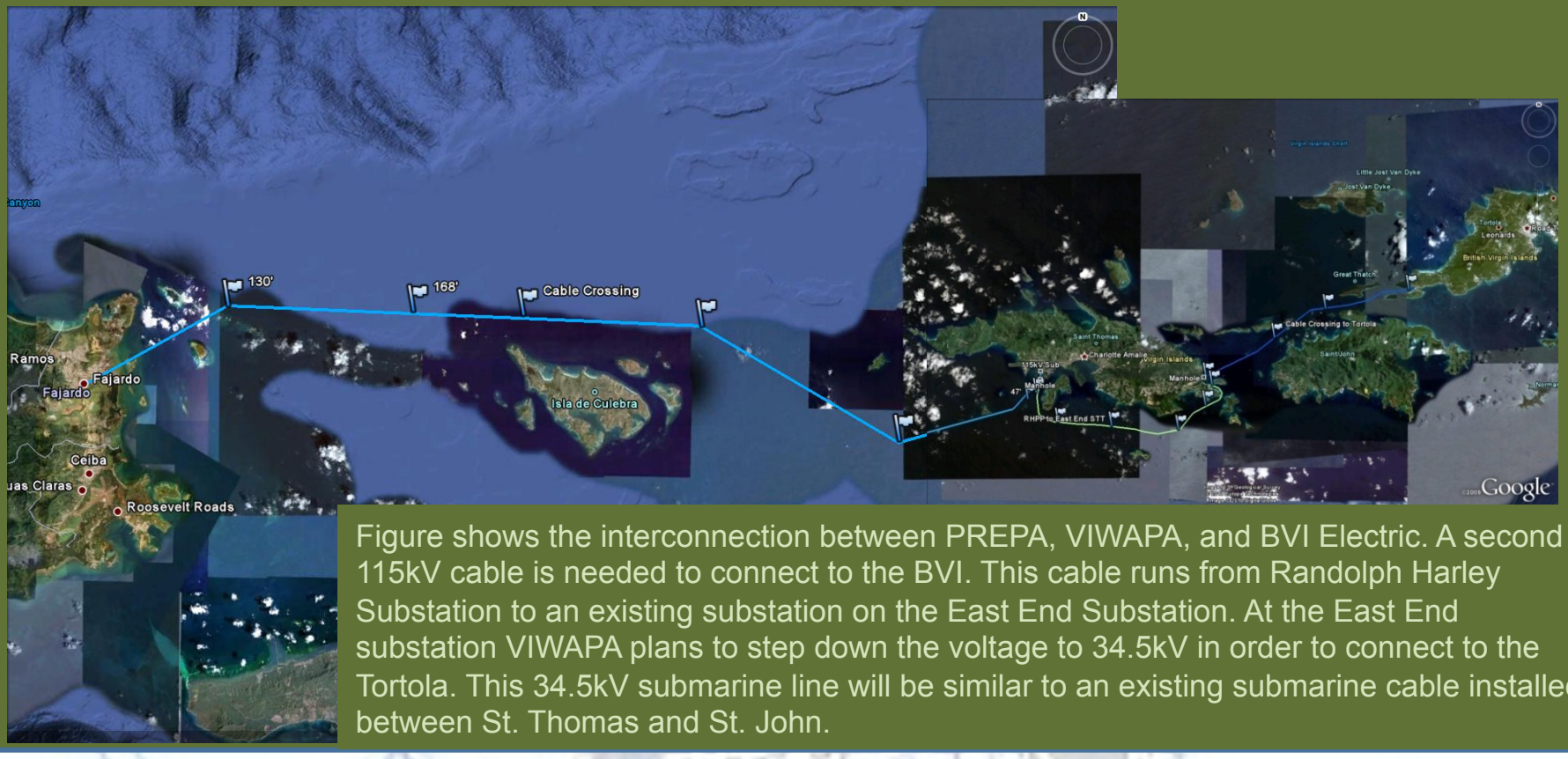

Figure shows the interconnection between PREPA, VIWAPA, and BVI Electric. A second 115kV cable is needed to connect to the BVI. This cable runs from Randolph Harley Substation to an existing substation on the East End Substation. At the East End substation VIWAPA plans to step down the voltage to 34.5kV in order to connect to the Tortola. This 34.5kV submarine line will be similar to an existing submarine cable installed between St. Thomas and St. John.

PREPA, Energy for the Caribbean

Wheeling System

- The *Economic Incentives Act*, *Act No. 73 approved on May 28, 2008*, orders PREPA to identify and implement a wheeling system in Puerto Rico, which permits the operation of the wheeling service mechanism established by the Committee of Wheeling created by this act.
- *Act No. 73 of 2008* states that Eligible Energy Producers, dedicated to the production of energy, whether or not for commercial purposes, for consumption in Puerto Rico, may enter into agreements with PREPA to, either, use the facilities of PREPA for the transport of electric energy or sell electric energy to PREPA.

Wheeling System

As per Act. No. 73 of 2008, Eligible Energy Producers are:

Any business dedicated to the production of energy, whether or not for commercial purposes, for consumption in Puerto Rico, by means of natural gas or coal; or by means of renewable sources, including, but not limited to, solar, wind, geothermal, oceanic-thermal, oceanic-kinetic, hydro, biomass, hydrogen, solid waste, or recuperation of methane using high technology, including, but not limited to, alternate thermal conversion technology. Three (3) years from the effectiveness of this Act, the generation of energy with fossil sources or non-renewable sources will not be considered eligible. The 3-year term ends on July 1, 2011. This definition includes private consortiums or public-private partnerships.

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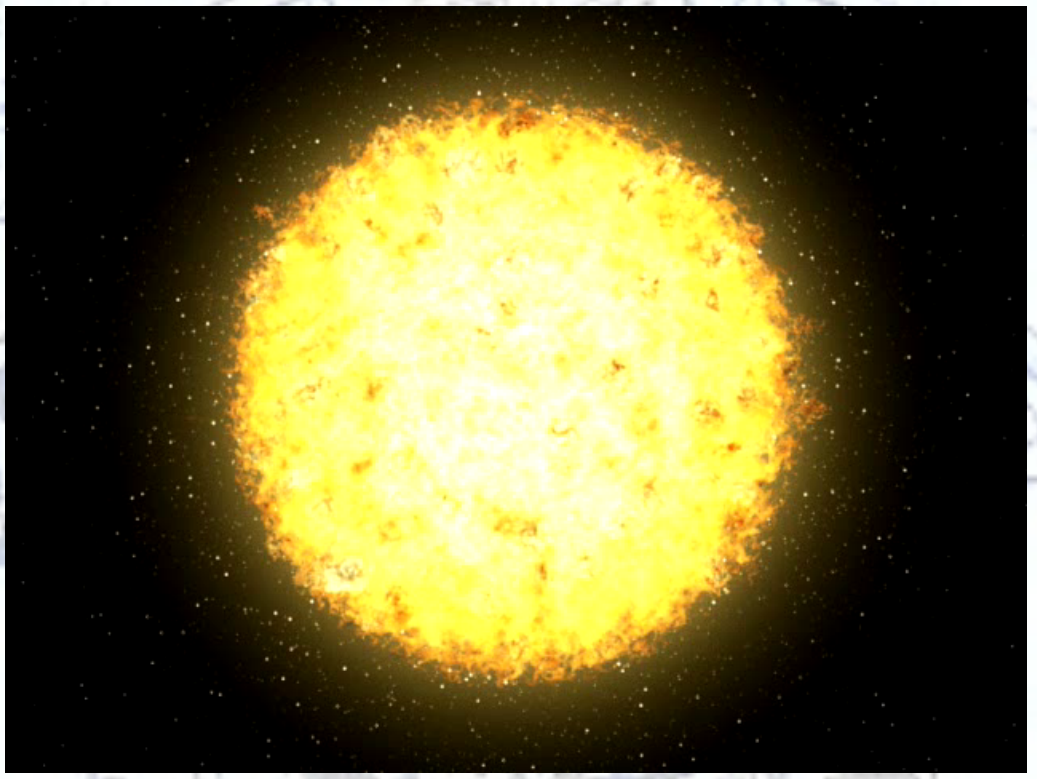
Renewable Energy



The Electric Energy Generation System Evolution

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Waste to energy

- Caguas 50 MW
- Arecibo 55 MW
- Manatí and Moca

Wind Farms

- Guayanilla 40 MW
- Arecibo 50 MW
- Naguabo 40 MW
- Santa Isabel

Solar

- Guayama 20MW

Renewable Sources Projects

Other Proposed Projects

Project Development - Buildings

- Computer Center in Santurce
- Energy Control Center in Monacillo
- Transmission and Distribution Offices in Monacillo
- Desalinization Plants in:
  - Aguirre
  - San Juan
  - South Coast

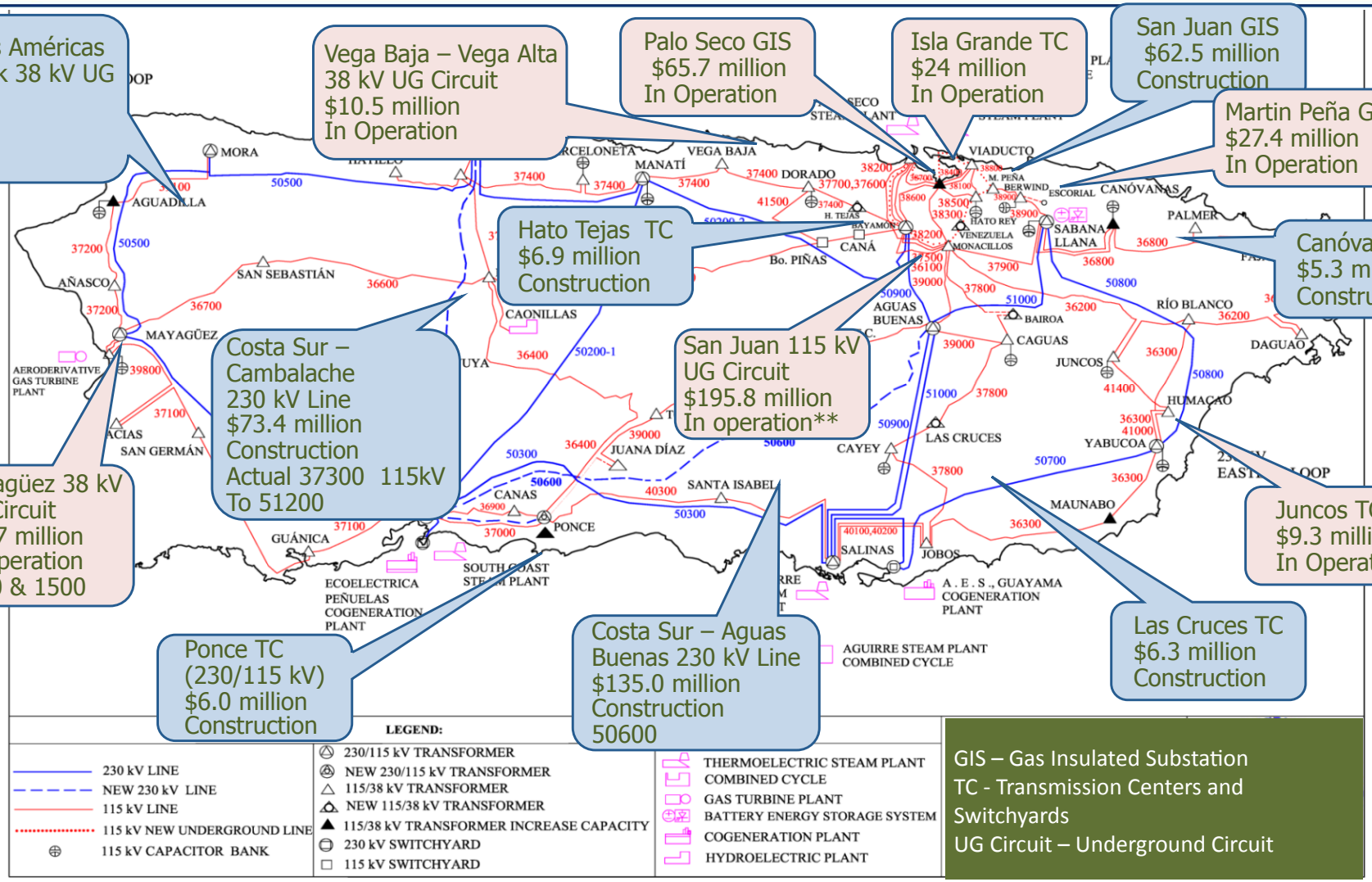
Will provide about five million gallons of water daily

Puerto Rico Electric Power Authority

Planned Distribution System Improvements Through 2014

- New distribution substations:
  - Río Bayamón II, Bayamón
  - Yabucoa 13.2 kV (Juan Martín)
  - Santa Isabel 13.2 kV
  - Hato Tejas 13.2 kV, Bayamón
- *Ponce en Marcha* Project: Converting existing aerial distribution lines into underground circuits in old Ponce
- Transfer of distribution loads from 4.16 kV, 7.2 kV, and 8.32 kV circuits to 13.2 kV feeders

Major Planned Transmission Improvements Through 2014



GIS – Gas Insulated Substation
TC - Transmission Centers and Switchyards
UG Circuit – Underground Circuit

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PREPA is ready for the world….