

The Panamanian power system

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With a population of 3 million people and a surface of 29 thousand square miles, Panama is a small country by most standards. Its power system and energy market are also small. Here we discuss the origin, privatization, and present state of the Panamanian power system.

1. Origin of the Panamanian power system

In 1954, the governments of Panama and the United States of America created an organization called SCIFE¹, whose purpose included to research and evaluate the hydroelectric potential of Panama. From 1955 to 1960, some consulting firms were hired to recommend ways to develop the hydroelectric resources and study the problems of rural electrification in the central provinces² of the country, whose power came from three private companies: Panamá Eléctrica S.A., Eléctrica del Interior S.A., and Santiago Eléctrica S.A.

In January 31, 1961, the government created the Institute of Hydraulic Resources and Electrification (IRHE³), with 300 employees, to coordinate and expand the utilities services. It was also in charge of gas and telecommunications. In September 16 of the same year, IRHE took charge of the operation and maintenance of the utilities in the central provinces and other regions, including Panamá Eléctrica S.A. and Eléctrica del Interior S.A.

In 1969, less than a year after the military *coup d'etat* of 1968 that started 21 years of military dictatorship in the country, the government transformed IRHE into an autonomous institution, with capacity to promote the electrification of the Republic. In 1972, the company that supplied energy to the provinces of Panamá and Colón, called Compañía Panameña de

¹ Servicio Cooperativo Interamericano de Fomento Económico

² Panama encompasses nine provinces and five Indian reserves. The western provinces are Chiriquí and Bocas del Toro. The central provinces are Veraguas, Los Santos, Herrera and Coclé. The eastern provinces are Colón, Panamá and Darién. Panama City, the largest load center of the country, is found in Panama province. The largest hydroelectric resources are found in Chiriquí and Bocas del Toro.

³ Instituto de Recursos Hidráulicos y Electrificación

Fuerza y Luz, was nationalized by the government and became part of IRHE. Its 84 MW of installed capacity represented 37% of the total capacity of the country; its 1,300 employees joined IRHE's workforce. The same was done in 1973 to Compañía Santiago Eléctrica, which supplied Veraguas, and Empresas Eléctricas de Chiriquí, which supplied Chiriquí. This added 25 MW and 721 new workers to IRHE. In 1974, the responsibility for telecommunications was transferred to a new institution, called INTEL⁴.

In 1976, Bayano, a new hydroelectric plant in Panama province, with a capacity of 150 MW and a cost of \$104M, started operations. In 1979, two additional hydroelectric plants located in Chiriquí, with combined capacities of 90 MW and a cost of \$90M, started operations. The same year, the western part of the country, where most hydroelectric potential is located, was connected through 943 transmission towers and 230-KV transmission lines to Panama City in the eastern part of the country, where most loads are located. Several thermal generating units were added to the system, including three steam turbines with a total capacity of 120 MW, installed in Colon, and five gas turbines: two were installed in Panama in 1983 (43 MW, \$9M) and three in Colon in 1988 (60 MW, \$33M).

Led by the populist policies of the military government, the utility started to expand its generation capacity in increments disproportionate for the country's load of the time. The best example of this is Fortuna, a 300 MW hydroelectric project finished in 1984, when demand in the country was only 386 MW. Inefficient investment resulted in high capital requirements for installed capacity: Fortuna cost \$532M, twice its originally expected cost.

In 1985, Panama and Costa Rica connected its networks through a 230 KV transmission line. Up to this date, there is no connection between Panama and Colombia. In 1997, after decades of diverting utility revenues to finance other areas, the Panamanian government decided that IRHE's future as a government-owned utility was not bright and decided to do what many other countries were doing at that time: to privatize the utility.

⁴ Instituto Nacional de Telecomunicaciones (National Institute for Telecommunications)

2. Privatization of the Panamanian power system

The law that started the process of privatization of the electric utility, known as Law 6, was approved on February 3, 1997. This law defined the frame for the activities of generation, transmission, distribution and marketing of electric energy. A Restructuring Unit was created inside IRHE to create the necessary markets and at least 6 new companies from the pieces of the former utility, at the least cost and with the least impact on service and workforce. The restructuring process took 22 months. The consulting firm Arthur Andersen performed an operative and financial analysis and decided to divide IRHE in 8 companies, including 3 local distribution companies (LDCs), 1 transmission company (Transco) and 4 generation companies (Gencos). The public bid for the stock of these companies was held in May 28, 1998 for the Discos and in November 18, 1998 for the Gencos. Table 1 shows the names of the companies, the buyers, the amount paid, and the percent of stock sold. The government kept the rest of the stock, including 100% of the stock of ETESA⁵, the only transmission company in the country. The government received \$590M from these sales of stock.

Name of the Company	Description	Buyer	Price (Million \$)	% Sold
EDEMET ⁶ , EDECHI ⁷	2 Discos	Unión Fenosa	\$212M	51%
Elektra NE ⁸	1 Disco	Constellation	\$90M	51%
EGE Bahía Las Minas	1 Genco	Enron	\$78M ⁹	51%
EGE Fortuna	1 Genco	Hydro Quebec, Costal	\$118M	49%
EGE Bayano, EGE Chiriquí	2 Gencos	AES	\$92M	49%

Table 1 - Results of the privatization of the Panamanian electric utility

3. Current structure of the Panamanian power system

3.1 Generation

In January 2004, 70% of generation was hydro; the rest was powered by fossil fuels.

⁵ Empresa de Transmisión Eléctrica, S.A.

⁶ Empresa de Distribución Eléctrica Metro-Oeste, S.A.

⁷ Empresa de Distribución Eléctrica Chiriquí, S.A.

⁸ Empresa de Distribución Noreste, S.A.

⁹ Enron paid \$92M, but later received \$14M from the government as compensation for overcharge

There is no natural gas in Panama: fossil plants use fuel oil, marine diesel and light diesel. The average marginal cost¹⁰ in the energy spot market, from 1998 to 2003, is \$51.00/MWh.

The system has a total installed capacity of 1.5 GW. EGE Bahía Las Minas, now called BLM Corp, has a capacity of 280 MW. EGE Fortuna has 300 MW. EGE Chiriquí and EGE Bayano were merged in one company, now called AES Panamá; it built several new hydroelectric projects, for a total of 550 MW. Since 1997, four privately-owned Gencos were installed: PEP (60 MW), PanAm (96 MW), Copesa (44 MW), and Pedregal (53 MW). The rest of the generation comes from the generation units of the Panama Canal Authority.

3.2 Distribution

The maximum demand registered in the Panamanian system to the date is 883 MW. Distribution and retail sales are in charge of local distribution companies (LDC). LDCs buy power in bulk through contracts and the spot market, deliver it, and sell it to consumers in their area. There are three LDCs in Panama: 1) EDEMET, which distributes power to the central provinces and half of Panama City, has 50% of the energy demand. 2) Elektra NE, which distributes power to the eastern provinces and the other half of Panama City, has 40% of the energy demand. 3) EDECHI, which distributes power to the western provinces, has 8% of the energy demand. The remaining 2% of energy is sold retail to large customers (see 3.3).

3.3 Retail Sales

There is no retail wheeling in the Panamanian market for customers with demand smaller than a certain limit. Customers above this limit are called large customers, while those below the limit are called regulated customers. Originally the limit was 500 kW. Currently, it is 200 kW, and in 2005 it will be 100 kW. Regulated customers have no choice of their supplier: they must buy from their LDC. Large customers can buy energy either from the LDC, or from other

¹⁰ In Panama, marginal cost includes only variable generation costs: fuel, operation and management costs.

agents, including Gencos. When a large customer buys energy from a source other than its LDC, it pays the LDC and the Transco for the use of their networks.

3.4 Transmission

ETESA, Panama's only Transco, is fully owned by the government. Its purpose is to move power in bulk quantities from the generation sites to the delivery sites. Distribution is not performed by ETESA: this is the job of the LDCs. ETESA owns and maintains the transmission facilities, and performs many management and engineering functions to ensure that the system continues to work. ETESA is paid for the use of the transmission lines and other equipment: Gencos and LDCs pay half of the transmission expenses each. The system and the market operators are structurally part of ETESA, but they function as independent entities.

3.5 System operation

The system operator is called the National Dispatch Center (CND¹¹). It is in charge of forecasting, long-term planning, short-term scheduling, unit commitment, real-time operation with safety and stability considerations, and ex post evaluation of the operation of the system.

3.6 Market operation

The market operator, which is itself a unit inside CND, is called the Direction of Electrical Wholesale Market (MME¹²). It is in charge of authorizing supply contracts and managing the energy and capacity spot markets. MME notifies the agents how much energy was sold, from whom, and to whom. It also allocates the payments for ancillary services.

3.7 Regulatory Institution

The regulatory institution is the Public Utilities Regulating Entity (ERSP¹³), created in 1996 by the government to regulate all public utilities, including electricity and telecommunications.

¹¹ Centro Nacional de Despacho

¹² Dirección del Mercado Mayorista de Electricidad

¹³ Ente Regulador de los Servicios Públicos