

RESEARCH PAPER



Restructuring the Puerto Rico Electricity Sector



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“Sunlight is said to be the best of disinfectants”

– Justice Louis D. Brandeis

Introduction

The availability of high quality, reliable and cost efficient electric power is of strategic importance for the future economic development of Puerto Rico. This means that without access to relatively affordable and reliable electric power it will be extremely difficult, if not outright impossible, to promote sustained growth in basically any area of economic endeavor in Puerto Rico, be it in industrial biotechnology, retail commerce, small and medium enterprises, tourism or services because the cost of electric power is usually one of the top cost drivers in each of these industrial or commercial sectors.

The Puerto Rico Electric Power Authority (the “Authority” or “PREPA”), created pursuant to Act No. 83 of May 2, 1941 (the “Act”), is the sole provider of electric power in Puerto Rico. According to the Act, the Authority was created “for the purpose of conserving, developing and utilizing the water and power resources of the Commonwealth, to make the benefits of those resources available to the residents of Puerto Rico in order to promote the general welfare and to increase commercial activity in, and the prosperity of, the Commonwealth.”¹

During recent years, however, local private sector organizations such as the Puerto Rico Chamber of Commerce, the Puerto Rico Manufacturers Association, the United Retailers Association and the Food Marketing, Industry and Distribution Association, among others, have expressed concerns about the extent to which PREPA is actually fulfilling these objectives. In specific, these organizations have complained about the cost, reliability and quality of electric power service in Puerto Rico.

With this paper, the Center for the New Economy, in fulfillment of its mission as Puerto Rico’s only independent, non-profit think tank, dedicated to developing innovative policy alternatives to foster economic growth, seeks to present a balanced and nuanced assessment of the state of the electricity sector in Puerto Rico. In the first chapter, we provide a brief history and a current profile of the electric power sector in Puerto Rico. In the second chapter, we analyze the management, financial performance and operations of the Authority. The experience in connection with the broad-scale restructuring of the electricity sector that has taken place over the last 20 years in the United States and in various foreign countries is the subject of chapter three. In chapter four we present a proposal to restructure the Puerto Rico electricity sector. In the final chapter, we set forth the principal findings of our work and provide some policy recommendations to the government of Puerto Rico. In the conclusion, we present some closing thoughts on the state of the Puerto Rico electric energy sector.

¹ 22 LPRA §196 – Preamble

I. History and Profile of the Electric Power Market in Puerto Rico

Historical Background –The first private lighting system in Puerto Rico was installed in 1893 by José Ramón Figueroa, of Villalba. From that time, up until the inauguration of the Carite #1 Hydroelectric Plant in 1915, all electric power in Puerto Rico was produced and distributed by private companies established in the island's urban centers.² By the 1930s, Puerto Rico had 11 “Insular” and 11 municipal power plants, while private plants furnished electricity to all but one of the remaining municipalities.³

This pattern of multiple, relatively small providers was the norm in the early years of the electric power industry. For example, between 1887 and 1893, twenty-four central station power companies were established within Chicago alone.⁴ Competition in this market was brutal and inefficient. With overlapping distribution lines, the battle for customers was fierce and operating costs extremely high.

After a period of intense competition, consolidation became the standard in the industry as it became evident that electricity production, transmission and distribution had the characteristics of what was then called a “natural monopoly.” Vertically integrated utilities, which generated the electrical energy, transmitted it from the power plants to the load centers, and distributed it to individual customers, became the industry standard for most of the 20th century. In most instances, these “public utilities” were subject to regulation by state public utility commissions which regulated profits and the rates of return these monopolists were allowed to realize.

In Puerto Rico the same forces pushing for consolidation and integration in the electric industry were at play and converged with the economic development objectives of the Popular Democratic Party (PPD). Indeed, the creation of the Authority was part of a broader economic development agenda pushed by the PPD majority in the Puerto Rico Senate. This agenda included the enactment of legislation in 1941 for the creation of the Minimum Wage Board, the Land Authority, the Food and Supplies Commission and the centralization of all drinking-water systems, which at the time were operated by municipalities.⁵

At the time of the Authority’s creation, however, the largest of the remaining private concerns owned the distribution system in San Juan as well as a steam generating plant and two hydroelectric projects. In general terms, the government owned most of the generating capacity, in the form of hydro projects, while private companies controlled the distribution for the largest market, which consisted of San Juan and its environs.

² This information is from the historical sketch posted by PREPA at www.aeepr.com/historia.

³ Victor S. Clark, editor, *Porto Rico and Its Problems*, (Washington, DC: The Brookings Institution, 1930), p. 352.

⁴ Steven Stoft, *Power System Economics: Designing Markets for Electricity*, (New York, NY: John Wiley and Sons, Inc., 2002), p. 6.

⁵ James Dietz, *Economic History of Puerto Rico: Institutional Change and Capitalist Development*, (Princeton, NJ: Princeton University Press, 1986), p.187.

The government of Rexford G. Tugwell pushed for the expropriation of the private lines by arguing that at a time when surpluses of electricity were available from public water developments, the private companies “were using precious fuel oil for their Diesel and steam generators.”⁶ Tugwell, working through the power division of the U.S. Department of the Interior, “persuaded the Federal Works Agency of the necessity to take the private lines and entrust them to our Authority for operation.” President Roosevelt signed a seizure order to that effect in 1942.⁷

The private power producers, however, did not go quietly into the night. They challenged the taking in federal courts on grounds that their properties were taken illegally under the federal Lanham Act. The U.S Circuit Court in Boston agreed with the plaintiffs. However, as the Authority was still in possession of the transmission and distribution lines and equipment, a new taking was devised under the broad powers granted to the President under the War Powers Act.⁸ The private power companies fought on.

Finally, after close to two years of legal wrangling, the government of Puerto Rico purchased the distribution system in an out of court settlement transaction in 1944. In the poignant words of then Governor Tugwell:

I felt that the price we paid was outrageous; but we had done our best. That it was a good investment, however, we had the assurance of the New York bankers who loaned us the funds for the purchase as well as for extensions and improvements. The negotiations leading up to this had been long and devious and had to be parallel with those for the purchase. If the Canadian interests [the owners of the San Juan power company] did not lose, neither did the bankers, of course, though we expected that. In fact, when we finally came to the point of paying too much and borrowing under conditions and at rates calculated to please Wall Street, we were suddenly regarded benignly by all the powers that be. I had thought that we ought to be castigated for the deal. But that did not happen. There was not a word of criticism and a good deal of congratulation. The people of Puerto Rico would pay for it over a period of some twenty years in inflated rates; but absolutely no one showed any concern over that.⁹

Thus, the conflict of these disparate, but in the end mutually reinforcing, interests—the greed of absentee owners, the dreams of central planners, the avarice of New York bankers, and the necessities of a nation at war—set the stage for the tumultuous birth of PREPA’s monopoly in electricity generation, transmission and distribution in Puerto Rico.

To be fair in the discussion of this historical record, we note that in the 1940s, Puerto Rico was an extremely poor and rural country, with a per capita income of \$146 and with 70% of its population living in rural areas. In addition, the island’s economy was predominantly agricultural and private capital was limited and could not satisfy the

⁶ Rexford G. Tugwell, *The Stricken Land: The Story of Puerto Rico*, (Garden City, NY: Doubleday & Company, Inc., 1946), p. 345.

⁷ *Id.* at 346.

⁸ *Id.* at 458.

⁹ *Id.* at 622.

demand for investment in large infrastructure projects. Therefore, sixty years ago this kind of state intervention in the economy was deemed imperative in order to jumpstart economic growth in Puerto Rico.

The Electric Power System in Puerto Rico Today – Table I below presents a summary profile of the electric power system in Puerto Rico at the beginning of the 21st century.

Table I
Profile of the Electric Power System in Puerto Rico
As of December 31, 2004

	<u>Generation</u>	<u>Transmission</u>	<u>Distribution</u>
Size	8 Generation Facilities	2,338 circuit miles	30,248 circuit miles
	5365 MW	331 miles of 230kV lines	1,086 distribution substations
	2,992 MW Steam	676 miles of 115 kV lines	
	592 MW Combined Cycle	1,331 miles of 38 kV lines	
	711 MW Turbine	162 switchyards	
	100 MW Hydrological	71 transmission substations	
	9 MW Diesel		
	961 MW Co-Generation		
Cost	\$2.4 billion*	\$1.0 billion	\$2.2 billion

Source: PREPA Official Statement
 * Excluding private co-generation plants

- **Generation Facilities** – As of December 31, 2004 investment in Authority-owned production plant and equipment totaled approximately \$2.4 billion, based on original cost. The total nameplate rating of the Authority-owned generating facilities was 4,427 MW, with a total dependable generating capacity of 4,404 MW. The Authority also purchases power under long-term power purchase agreements from two co-generation facilities. Pursuant to these agreements, the Authority can purchase 507 MW of net dependable generating capacity from EcoEléctrica and 454 MW of net dependable generating capacity from AES-PR. The Authority has dispatch control over both facilities, and their output is fully integrated into PREPA’s system.
- **Transmission** – Transmission plant in service as of December 31, 2004 totaled \$1.0 billion, based on original cost. As of that date, the electric transmission system consisted of 2,338 circuit miles of transmission lines and 162 transmission switchyards. Transmission lines include 331 circuit miles of 238kV lines, 676 circuit miles of 115kV lines and 1,331 circuit miles of 38kV lines. The Authority also owns 34 miles of underground 38kV cable and 55 miles of 38 kV submarine cable. Seventy-one transmission substations are located at generating sites and at other sites throughout the island.

- **Distribution** – Distribution plant in service as of December 31, 2004 totaled \$2.2 billion based on original cost. As of that date, the electric distribution system consisted of 30,248 circuit miles of distribution lines and 1,086 distribution substations, 766 of which were client-owned.

Oil Dependency – Puerto Rico depends mostly on oil-fired units to produce its electric energy. As recently as 1998, approximately 99% of the power produced by the Authority was generated from fuel oil. After the addition of the AES and EcoEléctrica co-generation facilities to the system, approximately 27% of the Authority’s annual energy requirements are provided by non-oil fired generating facilities. The Authority forecasts this percentage to increase to 33% upon AES and EcoEléctrica reaching full contracted availability requirements.¹⁰

Even if AES and EcoEléctrica reach full contracted capacity, 67% of total electric generating capacity in Puerto Rico would depend on oil as its fuel source. This profile of generating capacity is substantially different than the profile for U.S. publicly-owned utilities. As shown in Table 2 below, in 2003 only 8% of the total installed power generating capacity operated by publicly-owned utilities in the United States depended on oil for fuel. Natural gas and coal-based units accounted for 60% of the total installed power generating capacity operated by publicly-owned utilities in the United States.

Table 2

**U.S. Electric Generating Capacity
Publicly-Owned Utilities
2003**

	Nameplate Capacity (MW)	%
Gas	29,744	30.8%
Coal	29,010	30.1%
Water	20,727	21.5%
Nuclear	8,578	8.9%
Oil	7,780	8.1%
Other	625	6.0%

Source: American Public Power Association

Obviously, Puerto Rico still lags behind the United States in terms of diversifying its sources for energy production. As of December 31, 2004, the total nameplate rating of the Authority-owned generating facilities was 4,427 MW, of which 4,327 MW, or 97%, consisted of oil-fired units, a stark contrast with publicly-owned electric utilities in the

¹⁰ PREPA, *Official Statement of the Puerto Rico Electric Power Authority*, prepared in connection with the issuance of \$993,450,000 of Power Revenue Bonds and Power Revenue Refunding Bonds, March 24, 2005, p. 30.

United States, which depended on oil fired units for only 8% of their generation capacity.

Electricity Consumption Trends – During the period from fiscal year 2000 through fiscal year 2004, the average number of clients served by the Authority increased from 1,344,907 in 2000 to 1,419,602 in 2004. This increase represents a compound annual growth rate (CAGR) of 1.36%. Electric energy sales to those customers, measured in gigawatt hours, increased from 18,145 GWh in 2000 to 20,260 GWh in 2004. This increase represents a moderate CAGR of 2.79%. Thus, during this period PREPA’s electric energy sales increased at twice the growth rate in its customer base.

As shown in Table 3 below, PREPA revenues in connection with its sales of electric energy grew at a CAGR of 6.99% during the same period. Revenues, therefore, increased at a rate that was 2.5 times the rate of growth of electricity sales. The higher growth rate in energy revenues, relative to the growth of energy sales, is explained to a large extent by the increase in the cost of fuel and power purchased by the Authority, both of which costs are passed on to clients through a separate charge included in electric service rates. We also note that the rate of growth exhibited by PREPA revenues was 1.4 times higher than the 4.98% CAGR in Puerto Rico GNP during the four-year period under study.

Table 3
PREPA Clients, Electricity Sales, Revenues and GNP
Fiscal Years Ended June 30,

	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>CAGR</u>
Average Number of Clients	1,344,907	1,365,668	1,383,888	1,401,301	1,419,602	1.360%
% Change Prior Year	--	1.54%	1.33%	1.26%	1.31%	
Electric Energy Sales (GWh)	18,145	18,723	19,130	19,887	20,260	2.795%
% Change Prior Year	--	3.19%	2.17%	3.96%	1.88%	
Electric Energy Revenues (\$MM)	\$1,984.227	\$2,329.103	\$2,162.171	\$2,508.758	\$2,600.268	6.993%
% Change Prior Year	--	17.38%	-7.17%	16.03%	3.65%	
GNP (\$MM)	\$41,418.6	\$44,046.6	\$45,071.3	\$47,438.5	\$50,320.0	4.987%
% Change Prior Year	--	6.34%	2.33%	5.25%	6.07%	
Energy Revenues/GNP	4.79%	5.29%	4.80%	5.29%	5.17%	
Residential	1.53%	1.77%	1.61%	1.83%	1.78%	
Commercial	2.12%	2.33%	2.15%	2.36%	2.33%	
Industrial	0.95%	0.99%	0.85%	0.91%	0.88%	
Other	0.19%	0.20%	0.19%	0.19%	0.17%	

Source:
PREPA Official Statement; PR Planning Board; CNE Analysis

Total PREPA energy revenues during the four year period under analysis consistently accounted for around 5% of GNP, which gives an indication of the relative size and importance of the Authority in the context of the Puerto Rican economy. In this regard, it is interesting to note that revenues from commercial clients, which account for only 9.00% of PREPA's clients, equaled 2.33% of total Puerto Rico GNP in 2004. This statistic lends credibility to some of the complaints voiced by representatives of the commercial sector in Puerto Rico regarding the high cost of electricity.

Nonetheless, these aggregate statistics hide significant variations among residential, commercial and industrial clients. In order to gain a better understanding of how the electricity market in Puerto Rico works, we need to disaggregate the data and analyze the individual client segments. Table 4 below presents a breakdown of the Puerto Rico electricity market by client segment.

Table 4

Electricity Sales, Revenues and Clients
Fiscal Years Ended June 30,

	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>CAGR</u>
Electric Energy Sales (GWh)	18,145	18,723	19,130	19,887	20,260	2.795%
% Change Prior Year	--	3.19%	2.17%	3.96%	1.88%	
Residential	6,385	6,631	6,910	7,280	7,338	3.539%
% Change Prior Year	--	3.85%	4.21%	5.35%	0.80%	
Commercial	7,206	7,583	7,865	8,167	8,400	3.907%
% Change Prior Year	--	5.23%	3.72%	3.84%	2.85%	
Industrial	4,091	4,019	3,876	3,963	4,092	0.006%
% Change Prior Year	--	-1.76%	-3.56%	2.24%	3.26%	
Other	463	490	479	477	430	-1.832%
% Change Prior Year	--	5.83%	-2.24%	-0.42%	-9.85%	
Total	18,145	18,723	19,130	19,887	20,260	
Electric Energy Revenues (\$MM)	\$1,984.227	\$2,329.103	\$2,162.171	\$2,508.758	\$2,600.268	6.993%
% Change Prior Year	--	17.38%	-7.17%	16.03%	3.65%	
Residential	\$633.151	\$779.682	\$725.797	\$867.684	\$897.965	9.128%
% Change Prior Year	--	23.14%	-6.91%	19.55%	3.49%	
Commercial	\$878.697	\$1,026.219	\$969.182	\$1,117.317	\$1,171.110	7.446%
% Change Prior Year	--	16.79%	-5.56%	15.28%	4.81%	
Industrial	\$391.906	\$436.313	\$382.140	\$432.296	\$444.070	3.173%
% Change Prior Year	--	11.33%	-12.42%	13.13%	2.72%	
Other	\$80.473	\$86.889	\$85.052	\$91.461	\$87.123	2.005%
% Change Prior Year	--	7.97%	-2.11%	7.54%	-4.74%	
Total	\$1,984.227	\$2,329.103	\$2,162.171	\$2,508.758	\$2,600.268	
Average Number of Clients	1,344,907	1,365,668	1,383,888	1,401,301	1,419,602	1.360%
% Change Prior Year	--	1.54%	1.33%	1.26%	1.31%	
Residential	1,217,584	1,237,053	1,254,043	1,270,371	1,287,010	1.396%
% Change Prior Year	--	1.60%	1.37%	1.30%	1.31%	
Commercial	122,243	123,380	124,759	125,890	127,705	1.099%
% Change Prior Year	--	0.93%	1.12%	0.91%	1.44%	
Industrial	1,986	1,929	1,874	1,804	1,679	-4.111%
% Change Prior Year	--	-2.87%	-2.85%	-3.74%	-6.93%	
Other	3,094	3,306	3,212	3,236	3,208	0.909%
% Change Prior Year	--	6.85%	-2.84%	0.75%	-0.87%	
Total	1,344,907	1,365,668	1,383,888	1,401,301	1,419,602	

Source: PREPA Official Statement; CNE Analysis

Residential Consumption – Residential clients accounted for 90.66% of total clients, 36.22% of energy sales and 34.53% of PREPA energy revenues during fiscal year 2004. During the period from fiscal year 2000 through fiscal year 2004, the average number of residential clients increased by 69,426, from 1,217,584 in 2000 to 1,287,010 in 2004. This increase represented a CAGR of 1.39%, which is slightly higher than the 1.36% compound annual growth rate in the overall average number of clients during that period. The fact that 90 percent of clients accounted for only 34 percent of revenues is explained in large part by the subsidies the Authority is statutorily required to provide to certain qualifying clients (mostly low-income households).

During the period from fiscal year 2000 through fiscal year 2004, electric energy sales to residential clients increased by 953 GWh, from 6,385 GWh in 2000 to 7,338 GWh in 2004. This increase represented a CAGR of 3.53%, which is significantly higher than the 2.79% compound annual growth rate of total electric energy sales during that period.

During that same period, electric energy revenues from residential clients increased by \$264.81 million, from \$633.15 million in 2000 to \$897.96 million in 2004. This increase represented a CAGR of 9.12%, which is 1.3 times higher than the 6.99% growth rate of total energy revenues during the period under analysis. This rate of growth is explained by higher fuel and purchased energy costs that are included in customer rates.

Revenues from the residential client segment were the leading driver of revenue growth, as they grew faster than revenues from any other client segment during this period. Furthermore, as we show in Table 5 below, the 9.12% growth rate in residential revenues was 2.08 times the 4.38% CAGR of total consumer expenditures in Puerto Rico during the 2000-2004 period. In other words, consumer spending for electric power grew at twice the rate of overall consumer spending during this four year period.

Table 5
Residential Electric Energy Revenues and Personal Consumption
Fiscal Years Ended June 30,

	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>CAGR</u>
Electric Energy Revenues (\$MM)	\$1,984.227	\$2,329.103	\$2,162.171	\$2,508.758	\$2,600.268	6.993%
% Change Prior Year	--	17.38%	-7.17%	16.03%	3.65%	
Residential	\$633.151	\$779.682	\$725.797	\$867.684	\$897.965	9.128%
% Change Prior Year	--	23.14%	-6.91%	19.55%	3.49%	
Total Personal Consumption Expenditures (\$MM)	\$36,132.6	\$37,590.3	\$38,844.9	\$40,980.0	\$42,905.2	4.389%
% Change Prior Year	--	4.03%	3.34%	5.50%	4.70%	
Residential Electricity Costs/PCE	1.75%	2.07%	1.87%	2.12%	2.09%	

PREPA Official Statement; PR Planning Board; CNE Analysis

Commercial Consumption – Commercial clients accounted for 9.00% of total clients, 41.46% of energy sales and 45.04% of PREPA energy revenues during fiscal year 2004. During the period from fiscal year 2000 through fiscal year 2004, the average number of commercial clients increased by 5,462, from 122,243 in 2000 to 127,705 in 2004. This increase represented a CAGR of 1.09%, which is slightly lower than the 1.36% compound annual growth rate in the average number of clients during that period.

In terms of energy sales, electric energy sales to commercial clients increased by 1,194 GWh, from 7,206 GWh in 2000 to 8,400 GWh in 2004. This increase represented a CAGR of 3.90%, which is 1.3 times higher than the 2.79% compound annual growth rate of total electric energy sales during that period. Demand from commercial users was the leading driver of load growth during this four year period, as the rate of growth of sales to commercial clients outstripped the growth of energy sales to other client segments.

During the 2000-2004 period, electric energy revenues from commercial clients increased by \$292.42 million, from \$878.69 million in 2000 to \$1,171.11 million in 2004, an amount that equaled 2.33% of total Puerto Rico GNP in that year. The increase in commercial revenues represented a CAGR of 7.44%, which is 1.06 times higher than the 6.99% growth rate of total energy revenues during the period under analysis.

Industrial Consumption – Industrial clients accounted for 0.12% of total clients, 20.20% of energy sales and 17.08% of PREPA energy revenues during fiscal year 2004. During the period from fiscal year 2000 through fiscal year 2004, the average number of industrial clients decreased by 307, from 1,986 clients in 2000 to 1,679 clients in 2004. This decrease represented a CAGR of -4.11%, which is substantially lower than the 1.36% compound annual growth rate in the average number of clients during that period. This decrease is explained by two principal factors. First, a number of manufacturing operations closed down during the 2001-2002 recession. Second, several large industrial users have decided to satisfy their power demand from internal sources.

In terms of energy sales, electric energy sales to industrial clients increased by 1 GWh, from 4,091 GWh in 2000 to 4,092 GWh in 2004. This increase represented a CAGR of 0.006%, which is essentially 100% lower than the 2.79% compound annual growth rate of total electric energy sales during that period.

During the 2000-2004 period, electric energy revenues from industrial clients increased by \$52.17 million, from \$391.90 million in 2000 to \$444.07 million in 2004. The increase in industrial revenues represented a CAGR of 3.17%, which is 2.2 times lower than the 6.99% growth rate of total energy revenues during the period under analysis.

However, we note that while the total number of industrial clients *decreased* by 15.45% and industrial consumption of energy *did not grow at all* between 2000 and 2004, revenues from industrial clients nonetheless *increased* at a compound annual rate of 3.17%. This statistic lends credibility to some of the complaints voiced by

representatives of the manufacturing sector in Puerto Rico regarding the high cost of electricity for industrial purposes.

Other Consumption – Other clients accounted for 0.23% of total clients, 2.12% of energy sales and 3.35% of PREPA revenues during fiscal year 2004. During the period from fiscal year 2000 through fiscal year 2004, the average number of other clients increased by 114, from 3,094 clients in 2000 to 3,208 clients in 2004. This increase represented a CAGR of 0.90%, which is substantially lower than the 1.36% compound annual growth rate in the average number of clients during that period.

In terms of energy sales, electric energy sales to other clients decreased by 33 GWh, from 463 GWh in 2000 to 430 GWh in 2004. This decrease represented a CAGR of -1.83%, which is substantially lower than the 2.79% compound annual growth rate of total electric energy sales during that period.

During the 2000-2004 period, electric energy revenues from other clients increased by \$6.65 million, from \$80.47 million in 2000 to \$87.12 million in 2004. The increase in other revenues represented a CAGR of 2.00%, which is approximately 3.5 times lower than the 6.99% compound growth rate of total energy revenues during the period under analysis. However, we note that while the consumption of energy by other clients decreased at compound annual rate of -1.83% between 2000 and 2004, revenues from other clients nonetheless increased at a compound annual rate of over 2%.

Projected Generation Capacity and Load Growth – In general, demand for energy in Puerto Rico is related to the level of economic activity in Puerto Rico, energy costs and climatological factors. PREPA bases its projection of future load growth on various economic models developed by private consultants and uses the highest growth scenario as its base case for planning the additional generating capacity needed by the system.¹¹ Table 6 below sets forth the five-year generating capacity and peak load projections used by PREPA in its most recent bond offering.

Table 6

Projected Generation Capacity and Load Growth

Fiscal Years Ending June 30,

(in MW, except percentages)	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>CAGR</u>
Dependable Capacity	5,315	5,265	5,729	5,729	5,729	1.893%
Peak Load	3,624	3,727	3,845	3,952	4,083	3.026%
Reserve Margin	1,691	1,538	1,884	1,777	1,646	-0.672%
Dependable Reserve Margin %	46.66%	41.27%	49.00%	44.96%	40.31%	

Source: PREPA Official Statement

¹¹ PREPA, *Official Statement of the Puerto Rico Electric Power Authority*, prepared in connection with the issuance of \$993,450,000 of Power Revenue Bonds and Power Revenue Refunding Bonds, March 24, 2005, p. 33.

These projections take into account that the Authority recently commenced construction of new generating units projected to provide a total of 464 MW of combined cycle dependable generating capacity to replace two 44 MW steam-generating units removed from service in fiscal year 1997. The new generating units are expected to be in service during fiscal year 2007.

Nonetheless, even with the new units coming on line in fiscal year 2007, PREPA forecasts that during the 2005-2009 period (1) peak loads will grow at a CAGR that is 1.6 times faster than the growth rate in generating capacity and (2) its dependable reserve margin will decline from 46.6% in 2005 to 40.3%. PREPA plans to respond to this situation by adding new additional capacity after fiscal year 2009 and according to its Official Statement, the Authority's governing board has already approved construction by a private company of a co-generation plant on the western part of the island that will add approximately 526 MW of generating capacity in fiscal year 2010.¹²

Capital Expenditures – During the five fiscal years ended June 30, 2004, the Authority spent \$2.04 billion in capital expenditures, of which \$651.72 million were spent in production plant, \$432.47 million were spent in transmission facilities, \$623.03 million were spent in distribution facilities and \$342.25 were spent in other plant and equipment. Of the total \$2 billion in capital expenditures, \$1.60 billion, or 78.5% of these expenditures, were financed with borrowed funds, while \$439.67 million, or 21.5%, were financed with internally generated funds.

The projected capital improvement program for the five fiscal years ending June 30, 2009, is estimated to cost approximately \$2.12 billion, of which \$803.63 million will be spent on production plant, \$505.15 million will be spent on transmission facilities, \$468.06 million will be spent on distribution facilities and \$350.48 million will be spent on other plant and equipment. The Authority estimates that \$414.56 million, or 19.5% of these expenditures will be financed with internally generated funds and that \$1.71 billion, or 80.5% of these expenditures, will be financed from borrowed funds, mostly the proceeds from future bond offerings. While the Authority does not disclose the criteria for evaluating these investments, it would be particularly interesting to find out the basis for approving new investment in generation units, given that most PREPA plants date from the 1960s.

Chapter Summary – In this chapter we have ascertained that PREPA supplies virtually all of the electric power consumed in the Commonwealth of Puerto Rico and works as a vertically integrated utility. To recapitulate, as of December 31, 2004, the Authority served approximately 1.4 million clients and had utility plant totaling approximately \$8.3 billion, including \$2.4 billion of production plant in service and \$3.2 billion of transmission and distribution plant in service all based on original cost. Its production facilities, together with two private co-generation facilities with long-term power purchase agreements with the Authority, have a dependable generating capacity of 5,365 megawatts.

¹² *Id.* at 34.

II. PREPA: Management, Financial Performance and Operations

In this chapter we delve deeper into the management and the financial and operating performance of this sizeable public corporation, which in fiscal year 2004 generated revenues equal to 5.1% of Puerto Rico GNP.

Management and Operations Overview – The Authority is governed by a board consisting of nine members, seven of which are appointed by the Governor of the Commonwealth of Puerto Rico. The governing board, in turn, appoints an Executive Director who is the chief executive officer of the Authority and is responsible for the general operation of the Authority. The governing board also appoints a Deputy Executive Director who is responsible for the supervision of all administrative functions carried out by the Authority.

The other principal officers and senior management tend to be largely career employees. As we show on Table 7 below, as of March 24, 2005 the average length of service of the Authority’s senior management was 23.7 years.

Table 7

**PREPA Senior Management
Tenure of Service**

<u>Position</u>	<u>Tenure (in Years)</u>
Acting Executive Director	33
Director -- Electric System	31
Director -- T&D	20
Director -- Customer Service	22
Director -- Finance	16
Director -- Planning	23
Director -- Administrative	21
Director -- Engineering	23
General Counsel	17
Director -- Human Resources	31
Average	23.70

Source: PREPA Official Statement

In general, the presence of senior personnel with long tenures is not necessarily bad for the Authority. Seasoned senior management constitutes a repository of institutional memory and experience. However, career workers have a vested interest in legacy systems and operations and may not be receptive to demands for change made by outside stakeholders. This situation raises the potential problem of “path dependence.” According to Douglass North, path dependence arises when:

...institutions that have accumulated give rise to organizations whose survival depends on the perpetuation of those institutions and which hence will devote resources to

preventing any alteration that threatens their survival...Path dependence is not “inertia,” rather it is the constraints on the choice set in the present that are derived from historical experiences of the past.¹³

In the case of the Authority, the legal monopoly that gave birth to PREPA has also given rise to a diverse set of groups and organizations (management, labor unions, suppliers) whose survival depends on the perpetuation of the Authority’s monopoly and which we can expect to devote substantial resources to preventing any alteration that threatens the status quo.

In terms of size, with \$2.6 billion in revenues and 9,966 employees, PREPA is the second largest Puerto Rican company after Popular, Inc., which had \$2.59 billion in revenues and 10,640 employees in 2003, if we take into account government-owned public corporations. Furthermore, as shown on Table 8 below, in 2003 out of 2,010 publicly owned electricity providers in the United States, PREPA ranks 1st by electric energy revenues, 2nd in terms of customers, and 5th in terms of total energy sales.¹⁴

Table 8
Top Ten Largest U.S. Public Utilities
By Customers, Energy Sales, and Revenues in 2003

<u>By Customers Served</u>		<u>By MWh Sales</u> (in MWh)		<u>By Revenues</u> (in \$000s)	
Los Angeles Dept. of Water	1,535,271	New York Power Auth.	47,482,468	PREPA	\$2,581,896
PREPA	1,410,270	Salt River Project	33,084,762	Long Island Power Auth.	\$2,561,516
Long Island Power Auth.	1,082,903	Santee Cooper	24,059,568	Los Angeles Dept. of Water	\$2,276,462
Salt River Project	802,164	Los Angeles Dept. of Water	23,916,597	New York Power Auth.	\$2,252,134
San Antonio City	601,186	PREPA	20,163,433	Salt River Project	\$2,021,044
Sacramento Municipal	547,651	Long Island Power Auth.	19,177,619	San Antonio City	\$1,274,641
Memphis Light, & Gas	404,994	San Antonio City	18,261,632	Santee Cooper	\$1,033,500
JEA	378,500	Nebraska Public Power	17,571,070	Sacramento Municipal	\$1,014,992
Seattle City Light	365,445	JEA	16,164,540	Austin Energy	\$844,069
Austin Energy	360,873	Seattle City Light	14,564,843	JEA	\$832,620

Source: American Public Power Association

Statutory Powers – Act No. 83 of May 2, 1941 granted the Authority extremely broad powers, including, among others: the power to execute contracts; to acquire properties by eminent domain or otherwise; to borrow money and to issue bonds for any of its corporate purposes; to secure payment of its bonds and all other obligations by pledging its revenues; to determine, fix, alter, charge and collect reasonable rates, fees, rentals and other charges for the use of its facilities; to have complete control and supervision

¹³ Douglass C. North, *Understanding the Process of Economic Change*, (Princeton, NJ: Princeton University Press, 2005), p. 52.

¹⁴ American Public Power Association, *2005-06 Annual Directory & Statistical Report*, p.36-40.

of its properties and activities; and to create, acquire and maintain affiliate or subsidiary corporations and partnerships.

The following provisions of the Act are particularly relevant to our financial and operating analysis:

Regulation – PREPA has full powers to draft, enact, amend, and rescind rules and regulations concerning the generation, transmission, distribution, sale, use and consumption of electric power in Puerto Rico.¹⁵

Rates and Tariffs – The Authority has the power to determine, alter, establish, and collect reasonable rates for electric service in Puerto Rico. According to the Act, these rates shall produce sufficient revenues to cover the operating costs of the Authority, the payment of principal of and interest on its bonds and other contractual obligations.¹⁶ Public hearings are required prior to setting permanent rates, but PREPA has taken the position that the authority for the final approval of rates is vested solely on PREPA. We note, however, that Act No. 21 of May 31, 1985 authorizes the Legislature of Puerto Rico to review the rates of certain public corporations, including the Authority. The Authority nonetheless asserts that, pursuant to an opinion of the Attorney General of Puerto Rico rendered at the request of another public corporation, Act No. 21 does not grant a veto power to the Legislature over rates properly adopted by a public corporation.¹⁷

Tax Exemption – The Act exempts the Authority from the payment of any tax, duty or excise on its property or income derived from any of its activities. According to the Act, this tax exemption is justified because the Authority has been created with the objectives of “conserving the natural resources of the island, promoting the general welfare and fomenting commerce and economic prosperity” in Puerto Rico.¹⁸

Contributions in Lieu of Taxes – Under the Act, the Authority is required to pay to the Puerto Rico Secretary of the Treasury certain contributions in lieu of taxes. Prior to an amendment that became effective in September 2004, the amount of this contribution was equal to 6% of the Authority’s gross electric sales computed based on annual average fuel oil price of up to \$30 per barrel. In addition, the Authority was also required to set aside from its Net Revenues, as such term is defined in the 1974 Trust Indenture, an additional amount equal to 5% of its annual gross electric sales (based on KWh). One-fifth of the set aside amount was applied to cover the costs of the fuel oil subsidy program and another one fifth of the set aside was paid to the Puerto Rico Secretary of the Treasury for distribution to the municipalities. The balance of the set aside was used to fund certain of the Authority’s capital improvement and other purposes.

¹⁵ 22 LPRA §196(c)

¹⁶ 22 LPRA §196(l)

¹⁷ PREPA, *Official Statement of the Puerto Rico Electric Power Authority*, prepared in connection with the issuance of \$993,450,000 of Power Revenue Bonds and Power Revenue Refunding Bonds, March 24, 2005, p. 37.

¹⁸ 22 LPRA §212(a)(1)

The Act was amended in September of 2004 to change the formula for computing both, the contribution in lieu of taxes and the electric energy sales set aside. Pursuant to the amendment, 11% of the Authority's gross electric energy sales will be used by the Authority to fund its government subsidy programs, to pay contributions in lieu of taxes to municipalities, and to finance the Authority's capital improvement program and for other purposes. The amendment also provides that the amount of the contribution in lieu of taxes payable to the municipalities will be the greater of the following amounts: (1) 20% of the Authority's Net Revenues, as defined in the 1974 Trust Indenture, less the cost of its government subsidy programs; (2) actual electric power consumption by the municipalities; or (3) the average of the contributions in lieu of taxes paid to municipalities during the prior five years. If the Authority does not have sufficient available funds in any year to pay such contribution to the municipalities, the difference will be accrued and carried forward for a maximum of three years.

In summary, the Act charters PREPA as a vertically-integrated, self-regulated, tax-exempt publicly-owned monopoly with broad powers to issue regulations that govern its business and to set the rates at which its services must be purchased by its clients.

Financial Performance – How effectively has PREPA utilized its status as a government-authorized monopoly? The answer to this question has two dimensions: the first is financial, in specific, what has been PREPA's financial performance. The second, concerns the efficiency with which PREPA carries out its operations. In this section we will focus on financial performance and will take up the analysis of operations in the next section.

Table 9 below shows some selected financial indicators of the Authority:

Table 9
PREPA Selected Financial Indicators
Fiscal Years Ended June 30,

(in \$000, except percentages)	<u>2004</u>	<u>2003</u>	<u>Change</u>	<u>% Change</u>
Current Assets	\$786,692	\$758,177	\$28,515	3.76%
Total Assets	<u>\$6,563,108</u>	<u>\$6,209,379</u>	\$353,729	5.70%
Current Liabilities	\$867,930	\$871,865	-\$3,935	-0.45%
Long-Term Debt	\$4,577,721	\$4,226,311	\$351,410	8.31%
Total Liabilities	<u>\$6,042,601</u>	<u>\$5,664,600</u>	\$378,001	6.67%
Equity (net assets)	<u>\$520,507</u>	<u>\$544,779</u>	-\$24,272	-4.46%
Operating Revenues	\$2,605,764	\$2,513,963	\$91,801	3.65%
Operating Income	\$371,771	\$411,502	-\$39,731	-9.66%
Net Interest Expense	\$270,012	\$256,931	\$13,081	5.09%
Net Income	<u>-\$24,272</u>	<u>\$52,434</u>	-\$76,706	-146.29%
Operating Cash Flow	<u>\$300,185</u>	<u>\$422,279</u>	-\$122,094	-28.91%
Selected Financial Ratios				
Return on Assets	3.74%	4.98%	--	--
Return on Equity	-4.66%	9.62%	--	--
Operating Income/Operating Revenues	14.27%	16.37%	--	--
Profit Margin Ratio	-0.93%	2.09%	--	--
Leverage Ratio	12.61	11.40	--	--
Current Ratio	0.91	0.87	--	--
Operating Cash Flow/Current Liabilities	34.59%	48.43%	--	--
Long-Term Debt Ratio	89.79%	88.58%	--	--
Debt-Equity Ratio	92.07%	91.23%	--	--

Source: PREPA Official Statement; CNE Analysis

At first glance, it is clear that PREPA's financial performance for fiscal year 2004 was deficient at best and quite dismal at worst. According to the Authority's Management Discussion and Analysis included in its audited financial statements for the fiscal year ended June 30, 2004, the following were among PREPA's financial highlights for that year:

- The Authority's net assets decreased by \$24.3 million (or 4.5%) and increased by \$52 million (or 10.6%) as a result of operations during fiscal years ended June 30, 2004 and 2003.

- Operating income was \$371.8 million and \$411.5 million for fiscal years ended June 30, 2004 and 2003, representing a 9.7 percent decrease and an 11.9 percent increase when compared to fiscal years 2002-2003 and 2001-2002, respectively.
- Operating expenses increased \$131.5 and \$303.7 million for fiscal years ended June 30, 2004 and 2003, representing a 6.3 and 16.9 percent increase, when compared to previous fiscal years.

Therefore, PREPA, which is a vertically-integrated, self-regulated monopoly with the market power and the legal authority to recover all its costs from its customers, reported a *net loss*, on a GAAP basis, of \$24.27 million for the fiscal year ended June 30, 2004.

Analyzing PREPA's financial statements we find that its financial performance was below par in virtually every area during fiscal year 2004. Total assets increased \$353.7 million, or 5.70%, from \$6,209,379,000 in 2003 to \$6,563,108,000 in 2004. However, total liabilities, increased \$378.0 million, or 6.67%, from \$5,664,600,000 in 2003 to \$6,042,601,000 in 2004. Accordingly, the equity (net assets) of the Authority decreased \$24.27 million, or 4.46%, from \$544,779,000 in 2003 to \$520,507,000 in 2004.

Operating revenues increased \$91.80 million, or 3.65%, from \$2,513,963,000 in June 2003 to \$2,605,764,000 in June 2004. However, operating income decreased \$39.73 million, or 9.66%, from \$411,502,000 in 2003 to \$371,771,000 in June 2004. Meanwhile, net interest expense increased \$13.08 million, or 5.09%, from \$256,936,000 in June 2003 to \$270,012,000 in June 2004. The bottom line result was that the Authority's net income decreased by \$76.70 million, or 146.29%, from \$52.4 million in June 2003 to a loss of \$24.27 million in June 2004.

Perhaps more troublesome is the reduction in the amount of cash generated from operating activities, which decreased \$122.09 million, or 28.91%, from \$422,279,000 in June 2003 to \$300,185,000 in June 2004. This decrease in operating cash flow raises a red flag because PREPA is highly leveraged, with a leverage ratio, measured as total assets divided by total equity, of 12.61 in June 2004, a slight increase from 11.4 in June 2003; a long-term debt ratio, measured as total long-term debt divided by total long-term debt plus equity, of 89.79% in June 2004, which is also slightly higher than the 88.5% reported for June 2003; and a debt-equity ratio, measured as total liabilities divided by total liabilities plus equity, of 92.07% in June 2004, which is also higher than the 91.23% reported in June 2003.

In terms of profitability, PREPA's return on assets for fiscal year 2004, defined as net income plus interest expense divided by total assets, was 3.74%, down from 4.98% for fiscal year 2003. While its return on equity for fiscal year 2004, defined as net income divided by equity (net assets), was -4.66%, a substantial decrease from the 9.62% return obtained for fiscal year 2003.

PREPA's operations were also significantly less effective in generating income during fiscal year 2004 when compared to operations for fiscal year 2003. The ratio of

operating income to operating revenues declined from 16.37% in June 2003 to 14.27% in June 2004; while PREPA's profit margin, measured as net income divided by total revenues, also experienced a significant decline, from 2.09% in June 2003 to -0.93% in June 2004.

In terms of liquidity, as of June 30, 2004, PREPA's current liabilities exceeded current assets by \$81.23 million, for a current ratio, defined as current assets divided by current liabilities, of 0.91, a slightly better coverage than the 0.87 registered in June 2003. At the same time, cash flow from operations was sufficient to cover only 34.5% of current liabilities in June 2004, a significant deterioration from the 48.4% coverage of current liabilities registered in June 2003.

How does the Authority's financial performance compares with that of other U.S. public utilities? Table 10 below sets forth this comparison using a set of ratios developed by the American Public Power Association (APPA).

Table 10
Comparison of PREPA's Financial Performance with U.S. Public Utilities
2003

	U.S. Median	PREPA
Revenue per KWh (cents per KWh)		
All Customers	6.40	12.61
Residential Customers	7.00	11.92
Commercial Customers	6.80	13.68
Industrial Customers	5.20	10.91
Debt to Total Assets	0.270	0.821
Operating Ratio	0.864	0.745
Current Ratio	2.470	0.87
Net Income per Revenue Dollar	\$0.0350	\$0.0208
Uncollectible Accounts per Revenue Dollar	\$0.0021	\$0.0146

Source: American Public Power Association --
Selected Financial and Operating Ratios of Public Power Systems, 2003 Data;
CNE Analysis

During 2003 PREPA reported significantly higher revenues per KWh when compared to the median revenues reported by U.S. public utilities. However, PREPA was only 59% as profitable as its counterparts in the United States. The Authority reported 2.08 cents of net income per revenue dollar while the median publicly-owned power producer in the United States reported 3.50 cents of net income per revenue dollar.

PREPA was also significantly more leveraged when compared to U.S. power producers, as its ratio of debt to total assets in fiscal year 2003 was 82.1%, or 3 times the 27.0% debt to total assets ratio reported by the median U.S. power producer. The Authority was also significantly less liquid than its U.S. counterparts, as its current ratio, measured

as current assets to current liabilities, was only .87, which is substantially less than the 2.47 times short-term coverage reported by the median U.S. power producer. Finally, PREPA had significantly higher uncollectible accounts in relative terms, as it reported 1.46 cents out of every revenue dollar as uncollectible, while the median U.S. power producer reported only 0.2 cents out of every revenue dollar as uncollectible during 2003.

In summary, PREPA was significantly less profitable during fiscal year 2004 when compared to fiscal year 2003, as it reported a \$24 million loss, and its financial position became a little bit more leveraged and slightly less liquid when compared to fiscal year 2003. In addition, PREPA's financial performance in terms leverage, liquidity and profitability was also substantially below that of its U.S. counterparts.

Operating Performance – In this section we analyze how PREPA's operating performance compares and contrasts with that of other utilities in the United States. Table I I shows the six largest U.S. publicly owned utilities in terms of revenues.

Table I I
PREPA and Its U.S. Peers
2003

	<u>Revenues</u>	<u>Employees</u>	<u>MWh Sales</u>	<u>MWh Sales/ Employee</u>
PREPA	\$2,581,896,000	9,635	20,163,433	2,093
Long Island Power	\$2,561,516,000	85	19,177,619	225,619
Los Angeles City Power	\$2,276,462,000	8,139	23,916,597	2,939
New York Power Authority	\$2,252,134,000	1,650	47,482,468	28,777
Salt River Project	\$2,021,044,000	4,230	33,084,762	7,821
San Antonio City	\$1,274,641,000	4,030	18,261,632	4,531

Source: American Public Power Association; CNE Analysis

In 2003, PREPA was ranked number one in terms of revenues, while in terms of energy sales it ranked 4th. However, PREPA also had the highest number of employees when compared to the other firms in this peer group. This relatively high number of employees means that PREPA's workers are the least productive, in terms of MWh sales per employee, in this peer group. Furthermore, by this metric, PREPA, with 2,093 MWh sold per employee, is only 71% as productive as the next closest power producer in the group, the Los Angeles Department of Water and Power, which sold 2,939 MWh per employee.

In addition, as we show on Table 12 below, PREPA's average revenues per KWh, for all client segments, are among the highest in the nation. On average, the Puerto Rican energy customer paid 12.61 cents per KWh in 2003, which equals 169.9% of the average rate of 7.42 cents per KWh paid by the average customer in the United States.

Table 12
Average Revenue per KWh
2003

(cents/KWh)	Puerto Rico	U.S.	PR/US
Residential	11.92	8.70	137.01%
Commercial	13.68	7.98	171.43%
Industrial	10.91	5.13	212.67%
Other	19.19	7.58	253.17%
All Classes	12.61	7.42	169.95%

Source: American Public Power Association; CNE Analysis

To be fair, the Authority has always claimed that it is unjust to compare it with U.S. electric power producers because, unlike most electric utilities in the United States, which are able to purchase power from neighboring systems in the event of unscheduled outages or temporary surges in demand, the Authority, as an island utility is not able to do so.¹⁹

In general terms, this is a valid argument. However, in our view it cannot account for the entire differential between U.S. and Puerto Rico electricity rates because there are other island jurisdictions where energy prices are lower than in Puerto Rico. For example, Table 13 below compares international industrial and household electricity prices for eight island jurisdictions in addition to Puerto Rico.

¹⁹ PREPA, *Official Statement of the Puerto Rico Electric Power Authority*, prepared in connection with the issuance of \$993,450,000 of Power Revenue Bonds and Power Revenue Refunding Bonds, March 24, 2005, p. 32.

Table 13

International Electricity Prices

2001 (4thQ)

(U.S. cents/KWh)	Industrial	Household
Chinese Taipei (Taiwan)	5.60	7.5
Dominican Republic	10.40	8.7
Haiti	6.7	6.8
Ireland	6.00	9.4
Jamaica	11.00	14.6
New Zealand	2.80	5.6
Trinidad & Tobago	2.30	2.8
United Kingdom	4.80	10.1
Puerto Rico	10.86	11.76

Source: Energy Information Administration -- U.S. DOE

In 2001, the last year for which we obtained comparable data, Puerto Rico charged the second highest industrial and household rates, second only to Jamaica in both cases, when compared to the rest of this island group. Other islands, however, were able to sell electricity at a much cheaper price. Therefore, it is clear that geographical factors alone cannot account for PREPA's overall underperformance.

The reasonable deduction is that while the inability to purchase power off the U.S. nation-wide electric grid adversely affects PREPA's competitiveness, geographic isolation cannot, by itself, explain the entire rate differential between U.S. and Puerto Rico electric utilities. There must be other factors at play. In order to discern what other factors are at play here, it is necessary to probe deeper into PREPA's operations.

The APPA publishes a yearly compilation of selected financial and operating ratios for over 400 public power systems in the United States. The most recent edition of this publication was published on May 2005 and contains data for 2003. Table 14 below sets forth the U.S. median for nine operating ratios for public power producers and compares PREPA's performance against these standards.

Table 14

**Comparison of PREPA's Operating Performance with U.S. Public Utilities
2003**

	U.S. Median	PREPA	PREPA/ U.S
Customers per Non-Generation Employee	307	182	59.32%
Total O&M Expense per KWh Sold	\$0.055	\$0.094	170.79%
Total O&M Expense per Customer*	\$286	\$428	149.65%
Total Power Supply Expense per KWh Sold	\$0.0450	\$0.0701	155.67%
Purchased Power Cost per KWh	\$0.0430	\$0.0630	146.52%
Accounting, Customer Service & Sales Exp. per Cust.	\$44.00	\$64.02	145.50%
Admin. & General Exp. Per Customer	\$104.00	\$119.12	114.54%
Energy Loss %	4.15%	12.16%	293.10%
System Load Factor	55.30%	76.56%	138.44%

Source: American Public Power Association -- Selected Financial and Operating Ratios of Public Power Systems, 2003 Data; CNE Analysis
* Excluding Power Supply Expense

According to this analysis, PREPA's operations are substantially less efficient than the operations of its U.S. counterparts and it underperforms in virtually every area of operations under consideration.

In terms of customers served by each non-generation employee, we find that each non-generation worker at PREPA serves an average of 182 customers. This average is only 59% of the 307 customers served by each non-generation employee at the median U.S. public power producer. This low ratio could be indicative of a large presence of non-power producing workers at PREPA.

With respect to operations and maintenance (O&M) costs, we find that PREPA's O&M costs, on a per KWh basis, are 1.7 times higher than the median O&M expense in the United States. If we breakdown total O&M costs into pure O&M costs (excluding expenses related to power production and supply) per customer and total power supply expense per KWh sold, we find that PREPA is staggeringly inefficient in both power production and in the maintenance of its operations.

PREPA's total O&M expense (excluding power supply costs) per customer equals \$428 per customer, which is 1.5 times higher than the \$286 per customer spent on operations and maintenance by the median U.S. power producer. In terms of total power supply expense per KWh sold, we find that PREPA's fuel, purchased power and other production costs amounted to 7 cents per KWh sold, which also was 1.5 times higher than the median total power supply expense per KWh sold in the United States. These two ratios indicate that PREPA's production and maintenance processes are extremely inefficient. The inefficiency in production is due in large part to PREPA's outmoded generation technology and its dependency on oil; while the inefficiency in

pure O&M expenses (excluding power supply costs) are explained in large part, as we demonstrate below, by relatively high accounting, administrative and general expenses.

In terms of purchased power costs per KWh, we find that PREPA's costs, on a per KWh basis, equaled 6.3 cents, which was 1.4 times higher than the 4.3 cents per KWh that the median U.S. power producer paid in 2003. This higher cost is explained by the fact that there are only two significant power producers other than PREPA in Puerto Rico.

With respect to administrative expenses, we find that PREPA's accounting, customer service and sales expenses per customer were \$64.02 per customer, which was 1.4 times higher than the \$44 per customer spent by the median U.S. power producer. In addition, administrative and general expenses per customer at PREPA were \$119.12 per customer, or 1.14 times the \$104 per customer spent by the median U.S. publicly-owned utility. These two ratios are indicative of significant overstaffing in the administrative and support areas of the Authority, which are not directly related to power generation, transmission and distribution.

In terms of energy losses, we find that PREPA's energy loss ratio of 12.16% is almost 3 times higher than the median energy loss ratio in the United States. This higher energy loss ratio can be only partially explained by the use of older technology as many U.S. public power producers, specially the smaller ones, also use substantially old equipment. Transmission losses are low in Puerto Rico relative to the U.S. as electricity in Puerto Rico is not transmitted over thousands of miles as it is in the United States. The most plausible explanation, then, for this higher energy loss ratio is to be found in metering and billing losses as well as losses attributed to the theft of electricity.

Finally, in order to be fair to PREPA, we must note that, due to the absence of significant seasonal variations in demand in Puerto Rico, it operates with a relatively high load factor, which is usually measured as the ratio of the system average load to peak system demand. Using the APPA's methodology, we find that in 2003 the PREPA operated with a system load factor of 76.56%, which is 1.3 times higher than the 55.3% system load factor reported as the median in the United States. This relatively higher system load factor means that the Authority has much less flexibility in scheduling maintenance. Accordingly, the Authority must have greater total reserve capacity than other utilities in the United States to cover instances of generating unit outages (scheduled and unscheduled, partial or total).²⁰

In our view, while the necessity of operating a system with a relatively higher load factor may explain some of PREPA's higher production and maintenance costs, it cannot, however, account for its significantly higher administrative and general expenses per customer or for its higher energy loss ratio. It is clear that there exist substantial inefficiencies in both areas.

²⁰ PREPA, *Official Statement of the Puerto Rico Electric Power Authority*, prepared in connection with the issuance of \$993,450,000 of Power Revenue Bonds and Power Revenue Refunding Bonds, March 24, 2005, p. 32.

In summary, PREPA’s workers are less productive than their counterparts in the United States, both in terms of MWh sold per worker and of customers served per employee. In addition, PREPA substantially underperforms its U.S. counterparts in terms of O&M expenses per KWh sold and in terms of O&M expense per customer. PREPA also reports significantly higher administrative, accounting, customer service, general and sales expenses per customer when compared with mainland public power producers. These higher ratios seem to be indicative of the existence of a relatively larger administrative and support staff at PREPA.

Fuel Adjustment and Purchased Power Charges – PREPA’s electric service rates consist of (i) basic charges, made up of demand, client and energy related charges, (ii) fuel adjustment charges to recover the cost to the Authority of fuel oil; and (iii) purchased power charges to recover cost to the Authority of power purchased from EcoEléctrica and AES-PR.²¹ In this sense, PREPA operates essentially under a cost of service (COS) regulatory regime, with the important caveat that it is not held accountable to an independent regulator. Under COS regulation, suppliers are allowed to recover all their costs, plus a regulated “normal” rate of return on their investment. In the long run this type of regulatory regime takes away all incentive to minimize costs, as all costs are eventually passed-through to the consumer.²²

PREPA, however, apparently goes a little bit further in the recovery of their costs than what would be expected under a typical COS regulatory scheme. Table 15 below sets forth below a comparison of the fuel adjustment charge that PREPA charges its customers and PREPA’s actual reported fuel expense.

Table 15
Analysis of Fuel Adjustment Charges and PREPA's Fuel Expense
Fiscal Years Ending June 30,

	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>
Fuel Adjustment Charge	\$825,924,000	\$1,059,108,000	\$806,806,000	\$994,406,000	\$970,972,000
Fuel Expense	\$801,433,000	\$944,760,000	\$720,292,000	\$886,425,000	\$864,700,000
Annual Difference	\$24,491,000	\$114,348,000	\$86,514,000	\$107,981,000	\$106,272,000
Expense/Charge	97.03%	89.20%	89.28%	89.14%	89.06%
Cumulative Difference	\$24,491,000	\$138,839,000	\$225,353,000	\$333,334,000	\$439,606,000

Source: PREPA Official Statement; CNE Analysis

As can be seen from the table above, since 2000, the amount “recovered” by PREPA through the fuel adjustment charge paid by its customers has consistently exceeded the amount actually spent on fuel by PREPA. In recent years, the amount of this overcharge

²¹ *Id.* at 37.

²² Stoft, *Power System Economics*, supra, n.4, at 11.

has exceeded \$100 million. The cumulative overcharge since 2000 equals the staggering sum of \$439.6 million.

Our analysis also demonstrates that the ratio of fuel expenses to fuel adjustment charges remains fairly constant at 89% since 2001. In order to understand the reasons for this discrepancy, we need to analyze the formula used by PREPA to calculate the fuel adjustment charge. This formula is set forth below:

$$\text{FCC}(\$/\text{kWh}) = \frac{\$/\text{BBL} \times \text{BLS estimados} \pm \text{Ajuste}_c}{0.89 \times \text{Generación Neta Total Estimada} \times E_i}$$

Where:

“**\$/BBL**” is the fuel price per barrel of oil applicable to the month of the invoice. It consists of the average of (1) the estimated fuel cost for the month of the invoice and (2) the actual fuel cost for the second month prior to the month of the invoice.

“**BLS estimados**” is the estimated amount of oil barrels that will be used by PREPA power generation plants during the month of the invoice.

“**Ajuste_c**” is the difference between (1) the actual cost of the fuel used by PREPA and (2) the money recovered through the fuel adjustment charge, excluding the portion corresponding to recovery of PREPA’s payments in lieu of taxes. Both amounts correspond to the second month prior to the month of invoice.

“**Factor 0.89**” is used to recover payments in lieu of taxes made by PREPA to the central government and the municipalities.

“**Generación Neta Total Estimada**” is the estimated net electric energy generated and purchased by PREPA corresponding to the invoiced month.

“**Factor E_i**” is the average efficiency for the 12 months ending two months prior to the invoiced month. This is the efficiency from the generation bus to the client connection point.

Two things immediately jump out in our analysis of this formula. First, PREPA is recovering not only its fuel costs, it also recovers the 11% of its gross electric energy sales it is statutorily required to pay by *decreasing* by 11% the amount of energy it actually generated and purchased.

To clarify how this mechanism operates it is better to work through an numerical example. According to PREPA, it spent \$864.7 million buying oil in fiscal year 2004 to produce 16,740.6 million KWh of power, for an average fuel oil cost per net KWh of 5.17 cents. If we ignore transmission losses, the average fuel adjustment charge for fiscal year 2004 should be 5.17 cents per KWh.

However, under the current formula, PREPA assumes that it spent \$864.7 million to produce only 14,890.3 million KWh of electric power *instead of* the 16,740.6 million KWh it actually produced. The effect of this revision is to increase the average fuel oil cost per net KWh to 5.80 cents. 5.17 is equal to 89.13% of 5.80. The extra 0.63 cents goes to reimburse PREPA not for higher oil costs but for its payments in lieu of taxes. This number, 0.63 cents, may not seem like much but it means, as we have shown on Table 15 above, that in fiscal year 2004 PREPA overcharged its customers by \$106 million.

Second, electric energy is a strange commodity in the sense that it is usually consumed within seconds of production. Any difference between the net amount of energy generated and purchased by PREPA and the amount of energy actually sold is due to transmission, metering and billing losses and to theft.

PREPA, through its fuel adjustment charge, is charging its clients for all the fuel used to produce the net amount of electric energy that it *generated* instead of charging them only for the amount of fuel used to produce the net amount of electric energy it *actually sold*. Therefore, PREPA is recovering from its paying customers the fuel costs associated with producing energy that was subsequently lost or unaccounted for in the electric system.

For example, in fiscal year 2004, the net amount of electric energy that PREPA *generated and purchased* was 23,015 million KWh. Of this amount, 2,755 million KWh were lost or otherwise were unaccounted for, resulting in net electric energy *sales* of 20,260 million KWh. PREPA, however, charges its clients for all the fuel used to produce the 23,015 million KWh it generated instead of charging them only for the fuel used to produce the 20,260 KWh it *actually sold*. By using the fuel expense for the net electric energy it generated, PREPA effectively passes on to its paying customers not only transmission losses, but also billing and metering losses as well as losses related to electricity theft. This rate structure, in short, allows PREPA to *externalize* the costs associated with energy losses.

Therefore, this rate structure provides no incentive for PREPA to increase its efficiency and may help explain why energy losses at PREPA are almost 3 times as high as in the United States. The economically efficient way of dealing with this situation would be to reduce the amount of the fuel expense used to calculate the fuel adjustment charge by a factor equal to $(1 - \text{Monthly Energy Loss } \%)$. For example, if energy losses for any given month amount to 10%, then the fuel expense used to calculate the fuel adjustment charge for that month should be multiplied by .90. This adjustment would have the effect of forcing PREPA to *internalize* these costs associated with energy losses as they would have to be paid out of the Authority's retained earnings.

The analysis with respect to purchased power charges is essentially the same. Table 16 below sets forth a comparison of the purchased power charge that PREPA charges its customers and PREPA's actual reported purchased power expense.

Table 16

Analysis of Purchased Power Charges and PREPA's Purchased Power Expense
Fiscal Years Ending June 30,

	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>
Purchased Power Charge	\$71,520,000	\$199,302,000	\$253,442,000	\$379,558,000	\$489,019,000
Purchased Power Expense	\$64,517,000	\$177,330,000	\$227,923,000	\$339,082,000	\$436,763,000
Annual Difference	\$7,003,000	\$21,972,000	\$25,519,000	\$40,476,000	\$52,256,000
Expense/Charge	90.21%	88.98%	89.93%	89.34%	89.31%
Cumulative Difference	\$7,003,000	\$28,975,000	\$54,494,000	\$94,970,000	\$147,226,000

Source: PREPA Official Statement; CNE Analysis

Just like in the case of the fuel adjustment charge, we notice that since 2000, the amount “recovered” by PREPA through the purchase power charge paid by its customers has consistently exceeded the amount actually spent on purchased power by PREPA. In recent years, the amount of this overcharge has exceeded \$50 million. The cumulative overcharge since 2000 equals the sizeable sum of \$147.2 million.

Our analysis also demonstrates that the ratio of purchased power expenses to purchased power charges remains fairly constant at 89% since 2001. In order to understand the reasons for this discrepancy, we need to analyze the formula used by PREPA to calculate the purchased power charge. This formula is set forth below:

$$\text{FCE}(\$/\text{kWh}) = \frac{\text{Costo Estimado de la Energía Comprada} \pm \text{Ajuste}_{\text{CE}}}{0.89 \times \text{Generación Neta Total Estimada} \times E_i}$$

Where:

“**Costo Estimado de la Energía Comprada**” is the estimated amount that PREPA will pay independent power producers (EcoEléctrica and AES-PR) for electric power purchased during the month corresponding to the invoice.

“**Ajuste_{CE}**” is difference between (1) the actual cost of the electric power purchased by PREPA and (2) the amount recovered through the purchased power charge, excluding the portion corresponding to recovery of PREPA’s payments in lieu of taxes. Both amounts correspond to the second month prior to the invoiced month.

“**Factor 0.89**” is used to recover payments in lieu of taxes made by PREPA to the central government and the municipalities.

“Generación Neta Total Estimada” is the estimated net electric energy generated and purchased by PREPA during the month corresponding to the invoice.

“Factor E_i” is the average efficiency for the 12 months ending two months prior to the invoiced month. This is the efficiency from the generation bus to the client connection point.

The same two issues discussed with respect to the fuel adjustment charge arise in the context of analyzing the purchased power charge. Again, PREPA is recovering not only its purchased power costs. It is also recovering the 11% of its gross electric energy sales it is statutorily required to pay by *decreasing* by 11% the amount of energy it actually purchased.

Second, PREPA charges its clients for the entire amount of energy it purchased from IPPs in Puerto Rico instead of charging them only for the amount of purchased energy it *actually sold*. By using the power purchase expense for the net electric energy it purchased, PREPA effectively passes on to its paying customers not only transmission losses, but also billing and metering losses as well as losses related to electricity theft. This rate structure, in short, allows PREPA to *externalize* the costs associated with energy losses.

It could be argued that all businesses try, in one way or another, to pass on to their customers costs associated with operating inefficiencies and with taxes. PREPA, however, is not just any other company. First, it is a publicly-chartered monopoly, created for the express purpose of promoting the economic development of Puerto Rico. As such, PREPA is not subject to competition and other market pressures that would limit its ability to pass on these costs to its customers.

Second, PREPA is required to make payments in lieu of taxes because the Puerto Rico legislature decided *as a matter of public policy* that PREPA should make these payments. There is no reasonable argument to justify the recovery of these payments as long as PREPA remains a government-owned corporation. These payments are, in effect, the premium PREPA is required to pay in order to maintain its ability to generate monopoly rents.

Third, PREPA’s obligation to make these payments in lieu of taxes is completely unrelated to and independent of its fuel and purchased power requirements. There is no valid reason, other than obfuscating and concealing the truth, to sneak-in the recovery of these payments into the formulae for calculating the fuel and purchased power charges. In the name of transparency, the recovery of these contributions in lieu of taxes, if it is allowed to take place at all, should be separate and independent from the recovery of fuel and purchased power costs.

Finally, even if we assume *arguendo* that PREPA should be allowed to recover these payments in lieu of taxes, such recovery should be allowed only to the extent that

PREPA *actually makes* such payments. However, as the Authority stated in its most recent Official Statement to prospective bondholders:

During the five fiscal years ended June 30, 2004, the Net Revenues of the Authority were not sufficient to permit the payment to the municipalities of the full amount of contributions in lieu of taxes and to provide for the full amount of the electric energy sales set aside, due to the payment by the Authority of certain obligations under the 1974 Agreement, including deposits into the 1974 Sinking Fund.²³

Therefore, due to the restrictive covenants contained in the 1974 Trust Indenture that sets forth the terms and conditions under which the Authority is allowed to issue long-term bonds, the Authority was not permitted to pay in full the amounts it was otherwise required to pay in lieu of taxes during each of the five fiscal years that ended on June 30, 2004. The Authority does not state the amount of this shortfall. Yet, as we have demonstrated in Tables 15 and 16 above, during that same five year period the Authority “recovered” from its clients the full amount it was obligated to pay in lieu of taxes instead of the lower amount it actually paid.

In short, the Authority, a self-regulated, vertically-integrated monopoly, has been consistently overcharging its clients to recover not only costs associated with its purchase of fuel and electric power, but also payments that as a matter of public policy it is required to make in lieu of taxes. To add insult to injury, PREPA has “recovered” from its clients the full amount it was obligated to pay in lieu of taxes instead of the lower amount it actually paid, a practice that raises questions about the legality of the Authority’s conduct.

PREPA’s organic Act authorizes PREPA to charge only *reasonable* rates for its electric services. The determination of whether or not a certain practice is *legally* reasonable is, in general, a question of fact that courts analyze taking into account the totality of the circumstances and the context which surrounds the facts of the case before them. However, while the term “reasonable” can be extremely elastic and could allow for a multiplicity of interpretations, to argue that, in light of the specific circumstances under which PREPA operates in the context of the Puerto Rican economy, it is reasonable to allow PREPA to recover costs which it has not actually paid certainly, in our view, stretches the concept beyond its rational limit. In other words, it is quite probable that this practice could be found to be unreasonable in a court of law. If this practice is found to be unreasonable, then it would also be illegal because the Act authorizes PREPA to charge only “reasonable rates.”

However, regardless of the legality of this practice, we must conclude that it is certainly abusive, if not outright exploitative. Indeed, it represents a massive and completely unjustified transfer of wealth, to the tune of \$586,832,000 during the five fiscal years that ended on June 30, 2004, from the working people of Puerto Rico to the Puerto Rico Electric Power Authority.

²³ PREPA, *Official Statement of the Puerto Rico Electric Power Authority*, prepared in connection with the issuance of \$993,450,000 of Power Revenue Bonds and Power Revenue Refunding Bonds, March 24, 2005, p.41

Chapter Summary – In this chapter we have seen how a self-regulated, vertically-integrated, tax-exempt monopoly with the ability to recover all its costs from its customers, still manages to actually lose money. Indeed, PREPA’s financial performance, as measured by various profitability, liquidity and leverage ratios is substantially below par. In addition, its operations, the principal source of profitability, are grossly inefficient as is evidenced by the following measures:

- Low employee productivity, in terms of both number of customers served and electricity sold;
- High total operations and maintenance expenses, both in terms of KWh sold and on a per customer basis;
- High accounting, customer service, administrative and general expenses per customer; and
- High percentage of energy that is lost or otherwise unaccounted for.

In short, the conditions in the Puerto Rico electricity market indicate it is ripe for restructuring.

III. The Restructuring of Electricity Markets

Introduction – During most of the 20th century, customers had no choice with regard to its electricity provider. Customers had to purchase electricity from the utility that held the monopoly, either private or public, for its supply in the area where these customers were located. In most cases, these utilities were vertically integrated and controlled the entire infrastructure for generating, transmitting and distributing electric energy to these captive consumers.²⁴

This market structure came into question during the post-oil shock period in the late 1970s and early 1980s. During this period, which witnessed the large-scale deregulation of many Western market economies, many economists argued that the monopoly status of electric utilities removed the incentive to operate efficiently and encouraged unnecessary investments. Furthermore, these economists asserted that prices would be lower and the economy as a whole would benefit if the supply of electricity became the object of market discipline rather than monopoly regulation or government policy.

This shift in the view of the role of the state in economic activity converged with technological advances that for the first time allowed the separation of the production and trading of electricity from the operation and ownership of the utility network. In fact, some analysts have argued that the analytical separation of ownership of the utility network from the provision of supplied over that network was “the great innovation of the post-oil shock period.”²⁵ The idea was to limit regulation to the core natural monopoly network and introduce competition of the services supplied over the network. This concept of vertical separation has changed forever the way the electric power industry operates.

Restructuring: What is it? – Delivered electric power is a bundle of many services. These include transmission, distribution, frequency control and voltage support, as well as generation. The first two deliver the power while the second two maintain power quality, other services provide reliability. Each service requires a separate market and some require several markets. This raises many questions about which services *should* be deregulated and which *should not*.²⁶

In general, the restructuring of electricity markets involves three inter-related processes. First, restructuring requires the *partial deregulation* of the electric power market to allow new producers to enter the generation market and to permit them to sell that power over the regulated network.

²⁴ Daniel Kirschen and Goran Strbac, *Fundamentals of Power System Economics*, (West Sussex, England: John Wiley & Sons, Ltd., 2004), p.1.

²⁵ David M. Newberry, *Privatization, Restructuring, and Regulation of Network Utilities*, (Cambridge, MA: MIT Press, 2001), p.3.

²⁶ Stoft, *Power System Economics*, supra, n.4, at 17.

Second, restructuring entails the opening of the electricity market to *competition*, at a minimum, in the power generation sector for sale in a deregulated wholesale market. Transmission and distribution services, due to their characteristics, generally continue to operate under a regulated monopoly structure.

Third, restructuring *could* involve, but *does not require*, the *privatization* of government-owned electricity assets. As we will explain below, research indicates that countries that have enacted proper regulatory regimes and introduced competition in the electricity sector have experienced greater efficiency gains than countries where only privatization has been undertaken.

In end, however, the decision to privatize state assets will inevitably reflect deeper *political* and *cultural* characteristics of society, as will the institutions that evolve in response to those factors. Economies with different *institutional endowments* have evolved different solutions, notably in the form of ownership, and some have been considerably more successful than others.²⁷

Range of Restructuring Models – There is a wide range of possible electric utility restructuring models. For the sake of brevity, we will only describe three of the many possible options. Model 1 sits at one extreme of the spectrum. In this model, the existing industry is supplemented with the competitive acquisition of all new generating plants.

Model 2 is an intermediate restructuring option that creates a fully competitive wholesale generation sector. Under this model, all generation would be subject to competition regardless of vintage.

Model 3 is a fully competitive retail and wholesale model. All generation services would be competitive from the generation to the retail consumption level. In this model only the transmission and distribution system would continue to have any form of regulation.²⁸ All three models are discussed further below.

Model 1: New Generation Competitively Acquired – Under this model existing generation and all transmission and distribution continue to be owned and operated by the existing incumbent utility. All new generation is added by independent power producers (IPPs) and sold to the existing utility who then sells the electricity in the retail market. Generation is subject to competitive bidding and is sold to the single buyer under a long-term contract.

In this model customers are captive and hence there is a significant role for an independent regulatory commission. The role of the regulator would be to create competitive conditions for the acquisition of new generation.

²⁷ Newberry, *Privatization, Restructuring, and Regulation*, supra n. 25, p.3.

²⁸ The Regulatory Assistance Project, *Best Practices Guide: Implementing Power Sector Reform*, prepared for the Office of Energy, Environment and Technology of the United States Agency for International Development, (Montpelier, VT, 2000), p.2.

Other important conditions for the proper functioning of this model include clear and enforceable contracts with creditworthy buyers. Competitive generation in this model continues to rest on the enforceability of the underlying power sales contracts. If contract enforceability or the creditworthiness of the buyer is in doubt, other forms of credit guarantees will be needed.

This model has been an initial step for most countries that have restructured their power sector. Consequently, this model may be particularly appropriate for countries that are just beginning to consider industry restructuring and have a need to attract additional capital to meet growing electricity needs. It allows for competition to be introduced incrementally into an existing system. It provides new sources of private capital and a wider range of options for the purchasing utility than may otherwise have been the case. Risk can be distributed fairly between utilities and developers under the terms of the contracts. The greatest weakness of this model is that it fails to provide generating efficiencies in existing generating plants.²⁹

Model 2: Fully Competitive Wholesale Model – Under this model, all generation, new and existing, is competitive and generation receives market prices. The utility becomes a transmission and distribution (T&D) company. There should be no affiliation between the utility and generators. The utility in this model continues to be the sole buyer of power and the sole retail seller. The utility is a monopoly and is regulated by an independent regulatory commission.

The regulatory role includes regulation of transmission and distribution (T&D) prices and services as well as oversight of the utility's purchasing decisions. A significant regulatory role in this model is to create the institutions and rules needed for an efficient generation market. This model is particularly valuable because of the very powerful incentives it can create for the efficient operation and expansion of the generating sector. It can be very effective in reallocating risks in an efficient and fair fashion. It can also be very effective at raising capital and allowing in-country capital to be used for other purposes including the upgrading and expansion of the transmission and distribution systems.

Some of the issues to be addressed, if this model is pursued, include price volatility and market design to give reasonable incentives to add capacity when needed. Also, the transition may provide countries with an opportunity to sell existing plants for prices that exceed their existing book value. The increased revenue can be used for a wide variety of purposes.

Market prices for existing generation has generally taken the form of long-term contracts, sometimes called vesting contracts. Many countries, including the UK, have used this model as intermediate step on the way to full retail competition. Countries that have created competitive wholesale markets, including the US, UK, Canada, Australia, and New Zealand have experienced the need to continually monitor the

²⁹ *Id.* at p.3.

functioning of the market to make corrections to solve operational and market power issues. This has become a vital role of the regulatory commissions. Notwithstanding the need for continual improvements, the wholesale markets have performed reasonably well.³⁰

Model 3: Full Retail Competition – Under this model the utility is no longer the single buyer. The utility provides the transmission and distribution system. It has an obligation to connect, but not an obligation to serve. Customers buy generation services from the supplier of their choice.

The regulators' focus under this model will be on establishing market structures and market institutions which can assure the greatest level of competition and the greatest level of choice for customers, including prices, service quality, and consumer protection. There is no economic regulation of the generation sector. Regulation ensures open access, reasonable and competitive conditions and generally protection against monopoly power of buyers and sellers.

This model has been implemented in many countries including the UK, Norway, and parts of the US, Australia, and Canada.³¹

The Restructuring Experience in the United States – Since the passage of the Energy Policy Act in 1992, it has been the policy of the federal government of the United States to restructure its wholesale electricity markets.³² In general, regulation has been reduced and more competition has been introduced in the U.S. electric power markets. In addition, rules require that wholesale competitors have open access to and non-discriminatory pricing of transmission, which is still normally owned and operated by monopoly utilities.

In response to wholesale market competition reform, many states began to end retail generation monopolies in 1996. As of September 2002, the National Conference of State Legislatures (NCSL) considered 21 states plus the District of Columbia to have begun restructuring their retail electric markets. In most cases these states have adopted multi-year transition plans to move from monopolized to competitive retail generation markets. We must note, however, that there exists a great amount of diversity among the states regarding the restructuring of their electricity markets. In general, most have opted for either model 2 or model 3 described above, while others have adopted hybrids of these two models.

What has been the experience in the United States with respect to the restructuring of electricity markets?³³

³⁰ *Id.* at p.4

³¹ *Id.*

³² Citizens for Pennsylvania's Future, *Electricity Competition: The Story Behind the Headlines: A 50-state Report*, September 2002, p. 1.

³³ All the information on electricity rates is from the Citizens for Pennsylvania's Future Report, *supra* n.31.

- During the 1996-2001 period, rates for residential customers remained the same or decreased in constant dollars in all 22 retail-restructured states including DC, and stayed the same or decreased in nominal (current) dollars in 16 of them.
- During the same period, seven retail-restructured states cut their residential rates by 20% or more, while three non-restructured states cut residential rates by that much.
- In constant dollars, 10 states cut residential retail rates by 20% or more. Of these, seven are retail-restructured: Arizona, Connecticut, Delaware, Illinois, Maryland, New Jersey and Ohio. By comparison, three non-retail restructured states cut rates by 20% or more: Kansas, Missouri, and Nebraska. The retail-restructured state of Illinois cut residential rates by more than 30%.
- Meanwhile, rates for commercial customers decreased in constant dollars in 19 of the 22 retail restructured states including DC, and are down in nominal dollars in 16.
- In constant dollars, 11 states cut commercial rates by 20% or more. Of these, four are non-retail restructured and seven are retail restructured. The four non-retail restructured states that cut commercial rates by 20% or more are: Arkansas, Kansas, Minnesota, and Missouri. The seven retail restructured states to cut commercial rates by 20% or more are Arizona, Connecticut, Delaware, Illinois, Maryland, New Jersey, and the District of Columbia.
- Arkansas and Illinois were the only states to cut commercial rates by 30% or more.
- In terms of industrial rates, rates for industrial customers decreased in constant dollars in 16 of the 22 retail-restructured states including DC, and decreased in nominal (current) dollars in eight states.
- A total of four states cut industrial rates in constant dollars by 20% or more: Alaska, Delaware, Illinois and North Dakota. Of these four, Delaware and Illinois are retail restructured.
- Delaware was the only state to cut industrial rates by more than 30%, although Illinois, with a 29.8% reduction in industrial rates, came close.

Therefore, the restructuring experience in the United States has been, by and large, a positive one, with customers in several states enjoying substantial reductions in the price they pay for their electricity.

A Brief Note on the California Energy Crisis – Opponents of restructuring usually cite the example of the California energy crisis of 2000-2001 to point out the alleged dangers of restructuring and to advocate for the return to the “safe harbor” of vertically integrated utilities. According to a paper prepared by several professors at the Institute of Management, Innovation, and Organization at the University of California, Berkeley, the crisis had its origins in mistakes and miscalculations at the time the electricity sector was restructured.

Two structural flaws, in specific, stand out. First, utilities were encouraged to divest a substantial portion of their generation, while being blocked by California regulations from entering into long-term contracts. Therefore, the utilities were forced to procure their unmet needs on the spot market where prices are extremely volatile. Second, as a result of political pressures, California froze retail rates at low levels and banked on low wholesale prices to support a profit margin high enough to enable utilities to pay off historical, uneconomic investments.³⁴

This market structure worked relatively well for two years. However,

...[in] May 2000, wholesale prices soared, due to rising demand, higher natural gas prices, lower imports from other states and strategic behavior by suppliers. Fixed retail prices blocked conservation efforts by insulating consumers from market pressures and reduced consumer incentives to turn to competitive retailers. The heavy reliance on spot market purchases, combined with demand that was unresponsive to prices, helped drive prices higher.³⁵

The California crisis, therefore, was caused by factors peculiar and intrinsic to the regulatory model adopted in that state and by timid politicians, who favored wholesale competition but froze prices at the retail level. It can be reasonably argued, then, that the crisis was not caused by too much deregulation in too short a period of time, but rather by *not deregulating enough* at the time the restructuring of the electricity markets took place. It is true that unprincipled energy traders engaged in “strategic”, some would say criminal, behavior that contributed to the price spikes, but the fact remains that it was faulty regulation *ab initio* which allowed them to engage in this type of behavior.

In short, there are plenty of lessons to be gathered from the California story, but there is nothing in the California experience that points to the restructuring process itself, as opposed to its specific California variation, as the principal culprit for the crisis. There is also no reason to believe a similar crisis will occur in another jurisdiction, unless, of course, that jurisdiction happens adopt the same faulty regulatory regime initially adopted by California.

The Restructuring Experience Abroad – Although the United States has been a leader in efforts to introduce competition into several formerly regulated industries, including telecommunications, banking and transportation, it has not been an early mover in opening retail electricity markets to competition. Numerous other countries, including, among others, Argentina, Australia, Bolivia, Canada (Alberta), Chile, Colombia, New Zealand, Norway, Peru and the United Kingdom, have initiated restructuring toward more open markets, sometimes including customer choice of electricity suppliers.³⁶

The approaches to reform have varied across countries, as more than 600 private electricity projects, accounting for investment of US\$160 billion, reached financial

³⁴ Institute of Management, Innovation and Organization at the University of California, Berkeley, *Manifesto on the California Electricity Crisis*, January 2001, p. 3.

³⁵ *Id.*

³⁶ Timothy J. Brennan, Karen L. Palmer, and Salvador A. Martínez, *Alternating Currents: Electricity Markets and Public Policy*, (Washington, DC: Resources for the Future Press, 2002), p. 33.

closure in 70 developing economies in the 1990s alone.³⁷ These projects “were implemented under schemes ranging from management contracts, to divestitures of state assets, to greenfield facilities under build-operate-own (BOO), build-operate-transfer (BOT), and build-operate-own-transfer (BOOT) schemes.”³⁸ Therefore, it is quite difficult to compare the restructuring experience across countries, which exhibit different legal frameworks, diverse political and policy preferences, and great variation in economic and institutional endowments.

A team of UK economists, however, was able to examine the effects of privatization, competition, and regulation in the electricity sector, using a panel data set covering 51 developing countries, for the period from 1985 to 2000. The performance indicators they used were net electricity generation per capita, installed generation capacity per capita, net electricity generation per employee, capacity utilization and electricity prices. Their principal findings were as follows:

- *Competition* appears to bring about favorable effects in terms of service penetration, capacity expansion, labor efficiency and prices charged to industrial users.
- The effects of *privatization* or having an *independent regulator*, by themselves, were, however, inconclusive, except for capacity utilization, which appears to be improved by privatization.
- By contrast, the co-existence of the two reform measures (privatization and having an independent regulator) did seem to be correlated with greater electricity availability, more generation capacity and higher labor efficiency.³⁹

The authors, in short, found significant benefits to be associated with the introduction of competition, privatization and regulatory reform in the electric power market. However, they did not address the critical policy question of whether there is an optimal sequencing of the reforms. After all, while it may be the case that each of the reforms—privatization, regulation and competition—is desirable, there is rarely a country that has felt able to introduce all three measures simultaneously.⁴⁰

The same authors proceeded to study the effects of the sequencing of reforms using a panel dataset of 25 developing countries which had privatized electricity generation in the period from 1985 to 2001. The primary performance indicators used in the study as dependent variables were net electricity generation per capita, installed generation capacity per capita, electricity generation to average capacity, and net generation per employee. Their principal findings were as follows:

³⁷ Yin-Fang Zhang, Colin Kirkpatrick and David Parker, *Electricity Reform in Developing Countries: An Econometric Assessment of the Effects of Privatisation, Competition and Regulation*, Centre on Regulation and Competition, Institute for Policy Development and Management, University of Manchester (Manchester, United Kingdom, October 2002), p.2.

³⁸ *Id.*

³⁹ *Id.* at p.24.

⁴⁰ Yin-Fang Zhang, David Parker and Colin Kirkpatrick, *Competition, Regulation, and Privatisation of Electricity Generation in Developing Countries: Does the Sequencing of the Reforms Matter?*, Centre on Regulation and Competition, Institute for Policy Development and Management, University of Manchester (Manchester, United Kingdom, September 2004), p.3.

- The results suggest that subjecting generators to *competition* ahead of *privatization* reduces and may even remove monopoly incentives to restrict output.
- The study also found that the establishment ahead of *privatization* of an *independent regulator* reduces monopoly effects on output.
- Supporting evidence was also found with regard to the beneficial effects of reform sequencing on capacity expansion. Specifically, the regression results suggest that putting a *regulator* in place, in advance of *privatization*, provides private investors with more confidence to invest and expand capacity.
- In terms of capacity utilization, the study found that having an *independent regulator* and introducing *competition* before privatization brings about increases in capacity utilization.
- With regards to labor productivity, the results of the study were inconclusive due to data limitations.⁴¹

In short, this study found that having an *independent regulator* before *privatizing* electricity generation is associated with higher electricity availability and more generating capacity; while introducing *competition* before undertaking *privatization* in electricity generation appears to bring about favorable effects in terms of service penetration, capacity expansion, capacity utilization and capital productivity.⁴²

While additional research is needed to fully validate these empirical results, it does seem that the sequencing of reforms does matter. The initial policy implications are that setting up an independent regulator and introducing competition should both be undertaken before commencing any privatization process.

Chapter Summary – The experience with restructuring in the United States and in other countries has produced generally satisfactory results in terms of prices and capacity expansion. On the other hand, it is clear that the reform of electricity markets is a complex process and it appears that undertaking single reforms, in particular privatization alone, may produce undesirable policy results. Nonetheless, it seems that the benefits associated with restructuring in terms of service penetration, capacity expansion, labor efficiency and prices charged to industrial users tend to outweigh the costs associated with the restructuring process.

In the case of Puerto Rico, we have already demonstrated the gross inefficiencies and the high costs associated with the current vertically-integrated system. Therefore, it seems to us that Puerto Rico stands to achieve significant gains from restructuring its electricity sector. We will examine this option in the next chapter.

⁴¹ *Id.* at p. 28.

⁴² *Id.* at p. 30.

IV. A Proposal to Restructure the Puerto Rico Electricity Market

Introduction – As we have seen above, the restructuring of electricity markets is a complex process that can take many guises. In this section we set forth an outline of how one variant of the electricity reform process could work in the Puerto Rican context.

Step 1: Create an Independent Electricity Regulatory Commission – The creation of the proper regulatory and institutional framework is a key gating issue in the reform process. A properly set up regulatory commission is necessary to impose a variety of economic regulations on the incumbent utility. The functions and responsibilities of a regulatory commission include:

- Rate or tariff setting;
- General regulatory rulemaking;
- Utility system resource planning;
- Environmental impacts of resource utilization;
- Consumer protection;
- Maintenance of the utility’s financial integrity;
- Assuring high system reliability; and
- Utilization of appropriate tools to assure that utility management is given the proper set of incentives.

In order to carry out these functions, a good regulatory commission should have the following characteristics:

- Independence from the political process;
- Independence from the regulated enterprise;
- A broad mandate to protect the public interest;
- Technical expertise in the operations and business of the regulated enterprise; and
- Continuing monitoring and enforcement of rules and orders.

In the case of Puerto Rico, the Commonwealth’s Energy Affairs Administration, which is currently considered a candidate for elimination, should be re-chartered and given the authority, power and functions to regulate the Puerto Rico electricity market. The commission could be financed by electricity users. We estimate that a \$1 fee per month per client could generate annual revenues in excess of \$15 million.

It is particularly important that the new commission be as independent as possible from the central government. Therefore, commissioners should be appointed to 6-year terms. Ideally, the new commission would have representatives from government, unions, consumers, private power producers, and from private sector commercial, industrial and environmental organizations. In addition, the commission should have its own, independent technical staff.

Step 2: Internal Restructuring of PREPA – This step consists of separating the generation and T&D assets into separate corporate entities. Our proposal is to keep PREPA as the holding company of three new subsidiaries. One of these would hold the transmission and distribution network, which we hereinafter refer to as “PREPA T&D”, and the other

two, which we generically refer to as “PREPA Genco 1” and “PREPA Genco 2”, would each hold about 50%, or roughly 2,200 MW, of PREPA’s existing generation capacity. The idea is to start separating the assets and operations of the generation plants from the assets and operations of the transmission and distribution plant in preparation for the liberalization of the market.

Step 3: Commence Vertical Restructuring – This step consists of two sub-steps:

- **Spin Off PREPA Genco 1 and Genco 2 as Cooperative Enterprises Owned by Their Respective Workers** – This transaction could be financed through long-term credit obtained from credit unions (*cooperativas de ahorro y crédito*) and with equity capital from large insurance cooperatives and from the PREPA employees’ pension plan. Once the spin-off is executed, Puerto Rico would have four independent power producers (AES, EcoEléctrica, Coop Genco 1 and Coop Genco 2).
- **Issue Regulations Governing Generation and Transmission and Distribution Activities** – These regulations are necessary to control the activities of PREPA T&D, which would act as a wholesale purchasing agent on behalf of its clients. It will purchase electric power wholesale from the four IPPs in operation. It will then sell that electric power retail to its customers. At this stage of the process, the model does not discover a cost-reflective price in the same way that a free market does. However, it has the advantage of introducing some competition between generators without the expense of setting up a competitive market.

Step 4: Wholesale Competition – At this stage of the restructuring process, all generation, new and existing, is competitive and generation receives market prices. PREPA becomes a transmission and distribution (T&D) company. There should be no affiliation between PREPA and the generators. PREPA in this model continues to be the sole buyer of power and the sole retail seller, subject to regulation by the independent regulatory commission.

Step 5: Set up the Market Operator (MO) and the Independent System Operator (ISO) – These are the key players in the evolution towards a free retail market. The MO typically runs a computer system that matches the bids and offers that buyers and sellers of electrical energy have submitted. It also takes care of the settlement of the accepted bids and offers. This means that it forwards payments from buyers to sellers following delivery of energy. The ISO has the primary responsibility of maintaining the security of the power system. It is called independent because in a competitive environment, the system must be operated in a manner that does not favor or penalize one market participant over another. An ISO would normally own only the computing and communication assets required to monitor and control the power system. In addition, the ISO also is responsible for running the market of last resort, that is, the market in which load and generation are balanced in real time.

Step 6: Retail Competition – At this stage of the process the sale of energy to all consumers is decoupled from the operation, maintenance and development of the distribution network. Retailers then compete to perform this energy sale activity.

Retailers buy electrical energy on the wholesale market and resell it to consumers at the retail level. Retailers do not have to own any power generation, transmission or distribution assets. Once competitive markets have been established, the retail price no longer has to be regulated because small consumers can change retailer when they are offered a better price. Implementing this model, however, requires considerable amounts of metering, communication and data processing. Finally, the cost of the transmission and distribution networks is still charged to all their uses. This is done on a regulated basis.

Chapter Summary – In this chapter we have presented an outline of one of the many possible models for restructuring the Puerto Rico electricity sector. Given that this is a complicated undertaking, we would expect the entire process to unfold over a period between 5 and 10 years. Similar restructuring processes have been undertaken elsewhere with great success, so this type of restructuring lies well within the realm of the possible. All that is needed to make this happen in Puerto Rico is good planning and the will to do it.

V. Principal Findings and Recommendations

Principal Findings

1. PREPA supplies virtually all of the electric power consumed in the Commonwealth of Puerto Rico and works as a vertically integrated utility. As of December 31, 2004, the Authority served approximately 1.4 million clients and had utility plant totaling approximately \$8.3 billion, including \$2.4 billion of production plant in service and \$3.2 billion of transmission and distribution plant in service all based on original cost. Its production facilities, together with two private co-generation facilities with long-term power purchase agreements with the Authority, have a dependable generating capacity of 5,365 megawatts.
2. In terms of size, with \$2.6 billion in revenues and 9,966 employees, PREPA is the second largest Puerto Rican company after Popular, Inc., which reported \$2.59 billion in revenues and 10,640 employees in 2003, if we take into account government-owned public corporations. Furthermore, out of 2,010 publicly owned utilities in the United States, PREPA ranks 1st by electric energy revenues, 2nd in terms of customers, and 5th in terms of total energy sales.
3. During the period from fiscal year 2000 through fiscal year 2004, the average number of clients served by the Authority increased from 1,344,907 in 2000 to 1,419,602 in 2004. This increase represents a CAGR of 1.36%. Electric energy sales to those customers, measured in gigawatt hours, increased from 18,145 GWh in 2000 to 20,260 GWh in 2004. This increase represents a moderate CAGR of 2.79%. Thus, during this period PREPA's electric energy sales increased at twice the growth rate in its customer base.
4. PREPA revenues in connection with its sales of electric energy grew at a CAGR of 6.99% during the same period. Revenues, therefore, increased at a rate that was 2.5 times the rate of growth of electricity sales. The higher growth rate in energy revenues, relative to the growth of energy sales, is explained to a large extent by the increase in the cost of fuel and power purchased by the Authority, both of which costs are passed on to clients through a separate charge included in electric service rates. We also note that the rate of growth exhibited by PREPA revenues was 1.4 times higher than the 4.98% CAGR in Puerto Rico GNP during the four-year period under study.
5. Total PREPA energy revenues during the 2000-2004 period consistently accounted for around 5% of Puerto Rico GNP, which gives an indication of the relative size and importance of the Authority in the context of the Puerto Rican economy.
6. Revenues from energy sales to residential clients were the leading driver of revenue growth for PREPA, as they grew faster than revenues from any other client segment during this period. Furthermore, the 9.12% growth rate in residential revenues was 2.08 times the 4.38% CAGR of total consumer expenditures in Puerto Rico during the 2000-2004 period. In other words,

consumer spending for electric power grew at twice the rate of overall consumer spending during the 2000-2004 period.

7. Revenues from commercial clients, which account for only 9.00% of PREPA's clients, equaled 2.33% of total Puerto Rico GNP in 2004. This statistic lends credibility to some of the complaints voiced by representatives of the commercial sector in Puerto Rico regarding the high cost of electricity.
8. Electric energy sales to commercial clients increased by 1,194 GWh, from 7,206 GWh in 2000 to 8,400 GWh in 2004. This increase represented a CAGR of 3.90%, which is 1.3 times higher than the 2.79% compound annual growth rate of total electric energy sales during that period. Demand from commercial users was the leading driver of load growth during this four year period, as the rate of growth of sales to commercial clients outstripped the growth of energy sales to other client segments.
9. While the total number of industrial clients served by PREPA *decreased* by 15.45% and industrial consumption of energy *did not grow at all* between 2000 and 2004, revenues from industrial clients nonetheless *increased* at a compound annual rate of over 3%. This statistic lends credibility to some of the complaints voiced by representatives of the manufacturing sector in Puerto Rico regarding the high cost of electricity for industrial purposes.
10. PREPA's financial performance for fiscal year 2004 was quite dismal. The Authority's net assets decreased by \$24.3 million (or 4.5%) and increased by \$52 million (or 10.6%) as a result of operations during fiscal years ended June 30, 2004 and 2003. Operating income was \$371.8 million and \$411.5 million for fiscal years ended June 30, 2004 and 2003, representing a 9.7 percent decrease and an 11.9 percent increase when compared to fiscal years 2002-2003 and 2001-2002, respectively. And operating expenses increased \$131.5 and \$303.7 million for fiscal years ended June 30, 2004 and 2003, representing a 6.3 and 16.9 percent increase, when compared to previous fiscal years.
11. In terms of profitability, PREPA's return on assets for fiscal year 2004, defined as net income plus interest expense divided by total assets, was 3.74%, down from 4.98% for fiscal year 2003. At the same time its return on equity for fiscal year 2004, defined as net income divided by equity (net assets), was -4.66%, a substantial decrease from the 9.62% return obtained for fiscal year 2003.
12. In terms of liquidity, as of June 30, 2004, PREPA's current liabilities exceeded current assets by \$81.23 million, for a current ratio, defined as current assets divided by current liabilities, of 0.91, a slightly better coverage than the 0.87 registered in June 2003. At the same time, cash flow from operations was sufficient to cover only 34.5% of current liabilities in June 2004, a significant deterioration from the 48.4% coverage of current liabilities registered in June 2003.
13. During 2003 PREPA reported significantly higher revenues per KWh when compared to the median revenues reported by U.S. public utilities. However, PREPA was only 59% as profitable as its counterparts in the United States. The

Authority reported 2.08 cents of net income per revenue dollar while the median publicly-owned power producer in the United States reported 3.50 cents of net income per revenue dollar.

14. When compared to the largest five U.S. publicly-owned utilities, in terms of electric energy revenues, PREPA's workers were found to be the least productive, in terms of MWh sales per employee, in this peer group. Furthermore, by this metric, PREPA, with 2,093 MWh sold per employee, is only 71% as productive as the next closest power producer in the group, the Los Angeles Department of Water and Power, which sold 2,939 MWh per employee.
15. On average, the Puerto Rican energy customer paid 12.61 cents per KWh in 2003, which equals 169.9% of the average rate of 7.42 cents per KWh paid by the average customer in the United States.
16. PREPA's workers are less productive than their counterparts in the United States, both in terms of MWh sold per worker and of customers served per employee. In addition, PREPA substantially underperforms its U.S. counterparts in terms of O&M expenses per KWh sold and in terms of O&M expense per customer. PREPA also reports significantly higher administrative, accounting, customer service, general and sales expenses per customer when compared with mainland public power producers. These higher ratios seem to be indicative of the existence of a relatively larger administrative and support staff at PREPA.
17. Since 2000, the amount recovered by PREPA through the fuel adjustment charge paid by its customers has consistently exceeded the amount actually spent on fuel by PREPA. In recent years, this amount of this overcharge has exceeded \$100 million. The cumulative overcharge since 2000 equals the staggering sum of \$439.6 million.
18. Just like in the case of the fuel adjustment charge, we note that since 2000, the amount recovered by PREPA through the purchase power charge paid by its customers has consistently exceeded the amount actually spent on purchased power by PREPA. In recent years, this amount of this overcharge has exceeded \$50 million. The cumulative overcharge since 2000 equals the sizeable sum of \$147.2 million.
19. The Authority, a self-regulated, vertically-integrated monopoly, has been consistently overcharging its clients to recover not only costs associated with its purchase of fuel and electric power, but also payments that as a matter of public policy it is required to make in lieu of taxes. To add insult to injury, it has recovered from its clients the full amount it was obligated to pay in lieu of taxes instead of the lower amount it actually paid. This practice represents a massive and completely unjustified transfer of wealth, to the tune of \$586,832,000 during the five fiscal years that ended on June 30, 2004, from the working people of Puerto Rico to the Puerto Rico Electric Power Authority.
20. The experience with restructuring in the United States and in other countries has produced generally satisfactory results in terms of prices and capacity

expansion. On the other hand, it is clear that the reform of electricity markets is a complex process and it appears that undertaking single reforms, in particular privatization alone, may produce undesirable policy results. Nonetheless, it seems that the benefits associated with restructuring in terms of service penetration, capacity expansion, labor efficiency and prices charged to industrial users tend to outweigh the costs associated with the restructuring process.

21. In the case of Puerto Rico, we have demonstrated the gross inefficiencies and the high costs associated with the current vertically-integrated system. Therefore, it seems to us that Puerto Rico stands to achieve significant gains from restructuring its electricity sector.

Recommendations to Government

Short-Term – Within Two Years

A. Require PREPA to Stop the Recovery of the Payments in Lieu of Taxes – The recovery of these payments is not justified as long as PREPA remains a government-owned corporation. In addition, at a time when the people of Puerto Rico face increases in water rates, road tolls, the prices paid for milk and coffee and in the tuition at the University of Puerto Rico, the elimination of this abusive practice would result, *ceteris paribus*, in a reduction of 11% in the average electricity invoice.

B. Establish a Rebate Program to Return the \$586,000,000 that PREPA has Unduly Recovered from Its Clients – The Authority should also be required to return the excess amount it has recovered from its clients through the fuel adjustment charge and the purchased power charge. The internalization of these costs would be a powerful deterrent to similar abuses in the future. We understand that this is a material amount of money that could not possibly be rebated over a short period. Therefore we propose that PREPA establish a rebate program to return to its clients the overcharge over a period of four years.

C. Establish an Independent Regulatory Commission – As we explained in chapter IV, the creation of an independent regulatory commission is one of the most important issues in the restructuring process. We suggest that the Commonwealth's Energy Affairs Administration, which is currently considered a candidate for elimination, should be re-chartered and given the authority, power and functions to regulate the Puerto Rico electricity market. The commission could be financed by electricity users. We estimate that a \$1 fee per month per client could generate annual revenues in excess of \$15 million. In the alternative, part of the rebate amount to be returned by PREPA could be used to finance the new regulatory commission.

D. Require PREPA to Source All its Power Generation Needs in the Private Sector – PREPA should, as a matter of public policy, stop building new generation capacity. All new installed capacity should be owned and operated by private firms which enter into long-term contracts with the Authority.

Medium Term – within 5 Years

A. Carry Out PREPA's Internal Restructuring – This consists of separating the generation and T&D assets into separate corporate entities. Our proposal is to keep PREPA as the holding company of three new subsidiaries. One of these would hold the transmission and distribution network, and the other two would each hold about 50%, or roughly 2,200 MW, of PREPA's existing generation capacity. The idea is to start separating the assets and operations of the generation plants from the assets and operations of the transmission and distribution plant in preparation for the liberalization of the market.

B. Spin-off PREPA's Generating Capacity as Cooperative Enterprises Owned by Their Respective Workers – This transaction could be financed through long-term credit obtained from credit unions (cooperativas de ahorro y credito) and with equity capital from large insurance coops. Once the spin-off is executed, Puerto Rico would have four independent power producers (AES, EcoEléctrica, Coop Genco 1 and Coop Genco 2).

C. Issue Regulations Governing Generation and Transmission and Distribution Activities – These regulations are necessary to control the activities of PREPA, which would act as a wholesale purchasing agent on behalf of its clients. It will purchase electric power wholesale from the four IPPs in operation. It will then sell that electric power retail to its customers.

D. Initiate Wholesale Competition – At this stage of the restructuring process, all generation, new and existing, is competitive and generation receives market prices. PREPA becomes a pure transmission and distribution (T&D) company. There should be no affiliation between PREPA and the generators. PREPA in this model continues to be the sole buyer of power and the sole retail seller, subject to regulation by the independent regulatory commission.

Long-Term – 7 to 10 Years

A. Set up the Market Operator (MO) and the Independent System Operator (ISO) – These are the key players in the evolution towards a free retail market. The MO typically runs a computer system that matches the bids and offers that buyers and sellers of electrical energy have submitted. It also takes care of the settlement of the accepted bids and offers. The ISO has the primary responsibility of maintaining the security of the power system. In addition, the ISO also is responsible for running the market of last resort, that is, the market in which load and generation are balanced in real time.

B. Initiate Retail Competition – At this stage of the process the sale of energy to all consumers is decoupled from the operation, maintenance and development of the distribution network. Retailers then compete to perform this energy sale activity. Retailers buy electrical energy on the wholesale market and resell it to consumers at the retail level. Once competitive markets have been established, the retail price no longer has to be regulated because small consumers can change retailers when they are offered a better price.

Conclusion

The rationale for the current structure of the Puerto Rico electric energy system was that a government monopoly was necessary to undertake the massive electrification of the island. The guiding premise in 1941 was that ownership and operation of the electricity system would result in the maximization of “social welfare”. The government of Puerto Rico, essentially, decided to use its coercive power to finance the large amount of sunk capital needed to electrify the island without requiring the assurance of a future return from PREPA.

The problem is that utility *networks* are classic natural monopolies; they generate rents that are fought over by different interest groups. According to the interest group theory of regulation, these interest groups have different bargaining power, depending on their costs of organizing and the benefits of manipulating outcomes and they will intervene to redistribute benefits to their group at some additional inefficiency cost. Groups that are likely to be favored are those with benefits that are large relative to organizational costs, particularly those organized around production (managers, workers, labor unions, and suppliers) rather than consumers.

Policy interventions in this environment are likely to be biased in favor of some groups at the expense of others, and at some extra costs in deadweight losses. Therefore, policy outcomes may bear little relationship to the best possible outcome that a benevolent dictator might choose in the “public interest” and they certainly need not minimize efficiency losses.

PREPA, as a government-owned monopoly, generates significant rents, which are not distributed to shareholders because there are none. How are these rents apportioned in Puerto Rico? Well, just as predicted by the interest group theory of regulation that we describe above, it is clear that several different special interest groups have benefited at the expense of the general population:

- Bondholders are the first discrete special interest group. PREPA has over \$4.5 billion in outstanding debt (\$9.4 billion if we count interest payable) and its bondholders have a senior claim on its assets and revenues.
- Second, it is clear that some PREPA workers have benefited disproportionately, as demonstrated by the high ratios of general and administrative expenses to customers served.
- Third, it is clear that some suppliers also benefit from the current arrangement. For example, PREPA spent in excess of \$2 billion in capital improvements during the 2000 – 2004 period. Of that amount, \$651.7 million were spent in production plant, generally retrofitting plants built in the 1950s and 1960s. What criteria were used to analyze these investments?
- Fourth, the Authority provides a significant subsidy to a large segment of the Puerto Rican population. We should note, however, that this characteristic is not unique to Puerto Rico, as a common component in the function of state-owned electricity firms is to provide basic electric service to as many individuals

as possible at prices that may be below the incremental cost incurred, especially for residential consumers.

The people of Puerto Rico are the great loser in all of this, as it has witnessed the capture of the state-owned public power company by special interest groups which use their relative power to appropriate for themselves the monopoly rents generated by PREPA. In addition, PREPA has generated large deadweight losses, which are the product of high electricity prices and high operating costs.

While it is extremely difficult to measure these deadweight losses, we can reasonably assert that they amount at least \$586 million which is the amount PREPA's customers been overcharged over the last five years in order for PREPA to recover the payments in lieu of taxes it is statutorily required to make.

Therefore, we can confidently state that PREPA is no longer fulfilling its statutory mission of promoting the economic development and the general welfare of the island. In fact, the current state of affairs has accelerated the deterioration of our competitive position as an industrial site and contributed to the weakening of our productive economic base.

In our view, a thorough restructuring of the Puerto Rico electric energy system along the lines set forth in this paper is necessary to reignite and jumpstart the growth rate of the Puerto Rican economy. While we recognize that the reform of electricity markets is a complex process, it appears to us that Puerto Rico stands to achieve significant gains from restructuring its electricity sector, specifically in terms of capacity expansion, labor efficiency and prices charged to commercial and industrial users. What is missing is the collective will to do it.

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