

RESEARCH PAPER



1998-2008

A New Look at Puerto Rico's
Electricity Sector

Everything which might cause doubt about the wisdom of the government or create discontent will be kept from the people. The basis of unfavorable comparisons with conditions elsewhere, the knowledge of possible alternatives to the course actually taken, information which might suggest failure on the part of the government to live up to its promises or to take advantage of opportunities to improve conditions—all will be suppressed.

–Friedrich A. von Hayek,
The Road to Serfdom

Sergio M. Marxuach
Director for Policy Development
Center for the New Economy
San Juan, Puerto Rico
January 2009

Executive Summary

In August of 2005, the Center for the New Economy (CNE) published a research paper entitled “Restructuring the Puerto Rico Electricity Sector”. In that report we noted that the Puerto Rico Electric Power Authority (PREPA) suffered from various financial and operating inefficiencies that should be corrected as soon as possible. In this update we find, unfortunately, that most of those deficiencies are still present three years later:

- PREPA, 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 \$39 million during fiscal year 2007. This fact, by itself, speaks volumes about the state of management at PREPA.
- The company keeps pouring billions of dollars into old technology. According to its most recent five-year capital improvement program, it plans to invest over \$900 million in production plant, mostly to retrofit aging oil-based generators.
- During fiscal year 2007, PREPA generated less cash, it took longer to actually recover amounts owed to it by its clients, and it also took longer to pay its suppliers than in 2006.
- Remarkably, accounts receivable from government and municipalities increased from \$265 million in 2006 to \$316 million in 2007, an increase of \$51 million, or 19%.
- In terms of its operations, PREPA is substantially less efficient than its U.S. counterparts and it underperforms in virtually every area of operations.
- The amount of energy lost and unaccounted for has increased by 23% since 2003 and PREPA actually loses 14% of its product along its transmission and distribution system, a rate that is 3.3 times the average loss rate for government-owned utilities in the United States. The estimated monetary value of energy lost and unaccounted for during the period between 2003 and 2007 is \$2.29 billion. To put these losses in perspective, PREPA’s total energy lost and unaccounted for in 2007 exceeded the total amount of energy consumed (in KWhs) in Bolivia or in Nicaragua during the entire year of 2006.
- Consumers are being overcharged for the purchase and generation of electricity due to the way the energy purchase and fuel adjustment charges are calculated by PREPA. In fact, PREPA is charging customers for the purchase and generation of more energy (in KWh terms) than they actually consume during any given month.

Finally, given global developments regarding climate change, it appears that PREPA’s business model is unsustainable. In the near future it will face significant pressure to reduce its dependence on oil; cut back on its consumption of other non-renewable fossil fuels, such as coal and natural gas; decrease its overall carbon footprint; and move towards and adopt renewable fuels for the generation of electricity. To the extent the government of Puerto Rico and PREPA start working on this transition now, while they still have time to control the pace of events, the less painful the process will be for all involved.

I. Introduction

Three-and-a-half years ago the Center for the New Economy (CNE) published a research paper entitled “Restructuring the Puerto Rico Electricity Sector”. In that work we emphasized that the availability of high quality, reliable, and cost efficient electric power was of strategic importance for the future economic development of Puerto Rico. The intervening years have only further highlighted this strategic imperative as we have seen oil prices climb to an all-time high price of \$147 per barrel; thousands of manufacturing jobs have left Puerto Rico due, at least in part, to high energy costs; and electricity consumers have been hit with double-digit increases in their monthly power bill precisely as Puerto Rico is undergoing a deep economic recession.

In addition, the last three years have witnessed the emergence of a consensus on the damage caused by climate change and the need to curb emissions of greenhouse gases (GHG) over the next thirty or forty years. In 2008, candidates to the U.S. presidency announced their intention to implement a strict cap and trade system in the United States to limit and then lower GHG emission levels; while financial institutions announced they will submit financing requests for coal-based power plants to a heightened level of due diligence. All of this means that the Puerto Rico Electric Power Authority (PREPA), as the largest emitter of carbon dioxide in the island, will be forced to rethink its business model—currently 99 per cent based on fossil fuels—within the next decade or so.

The objective of this work, then, is twofold. First, we update our previous analysis of PREPA’s finances and operations. PREPA, unfortunately, continues to operate as a self-regulated monopoly with the capacity to fully pass all its costs to its customers. Thus, according to economic theory, it has no incentives whatsoever to streamline its operations. Our analysis, we are sorry to say, confirms what economic theory predicts all along. Second, we provide a brief analysis of recent work on the climate change crisis and lay out some of the implications for Puerto Rico in general and for PREPA in specific.

Finally, a brief note on methodology. For this report we have relied primarily on data from two sources. First, we have used data set forth in the Official Statement issued by PREPA in connection with its offering of \$697,345,000 Power Revenue Bonds, Series WW, dated June 18, 2008. The content of the Official Statement is subject to certain disclosure and antifraud provisions of the federal securities laws and regulations. In particular, Rule 10b-5, issued pursuant to section 10(b) of the Securities Exchange Act of 1934, provides, among other things, that *“it shall be unlawful for any person... (b) to make any untrue statement of a material fact or to omit to state a material fact necessary in order to make statements made, in light of the circumstances under which they were made, not misleading... in connection with the purchase or sale of any security.”* Therefore, we assume the Official Statement is true, accurate, and complete in all material respects. Second, we have extracted information from PREPA’s audited financial statements for the years ended June 30, 2007 and 2006, which we also assume are true, accurate, and complete in all material respects.

The analysis and interpretation of such data is, of course, our own.

II. Analysis of the Puerto Rico Electric Power Authority

Electricity Consumption Trends – Between June 30, 2003 and June 30, 2007, the average number of clients served by the Authority increased from 1,401,301 in 2003 to 1,452,529 in 2007. This increase represents a compound annual growth rate (CAGR) of 0.90%. Electric energy sales to those customers, measured in gigawatt hours, increased from 19,887 GWh in 2003 to 20,672 GWh in 2007. This increase represents a stagnant growth rate of 0.97%. During this period, therefore, PREPA’s electric energy sales increased at the same growth rate as its customer base.

Table 1

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

	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>CAGR</u>
Average Number of Clients	1,401,301	1,419,602	1,438,699	1,450,227	1,452,529	0.90%
% Change Prior Year	-	1.31%	1.35%	0.80%	0.16%	
Electric Energy Sales (GWh)	19,887	20,260	20,507	20,620	20,672	0.97%
% Change Prior Year	--	1.88%	1.22%	0.55%	0.25%	
Electric Energy Revenues (\$MM)	\$2,508.758	\$2,600.268	\$3,038.110	\$3,708.938	\$3,670.966	9.98%
% Change Prior Year	--	3.65%	16.84%	22.08%	-1.02%	
GNP(\$MM)	\$47,479.4	\$50,708.7	\$53,752.4	\$56,732.9	\$58,712.4	5.45%
% Change Prior Year	--	6.80%	6.00%	5.54%	3.49%	
Energy Revenues/GNP	5.28%	5.13%	5.65%	6.54%	6.25%	

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

As shown in Table 1 above, PREPA’s revenues in connection with sales of electric energy grew at a CAGR of 9.98%. Revenues, therefore, increased at a rate that was 10.3 times the rate of growth of electricity sales. The higher growth rate in 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 are passed on to clients through a separate charge included in electric service rates.

Putting these statistics in the context of the Puerto Rican economy, we note that the rate of growth exhibited by PREPA's revenues was 1.8 times higher than the 5.45% growth rate of Puerto Rico's GNP (in nominal terms) during the period under analysis. Furthermore, PREPA's 16.84% and 22.08% revenue growth rates during 2005 and 2006, respectively, were substantially higher than the 6.00% and 5.54% nominal growth rates of Puerto Rico GNP during those same years.

Total PREPA energy revenues during the period under analysis consistently accounted for around 6% of Puerto Rico's 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 PREPA charged its commercial clients, which account for only 8.97% of its clients, a total of \$1,666,358,000 in 2007, an amount equal to 45.39% of PREPA's revenues and to 2.84% of total Puerto Rico GNP during that year. 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.

Residential Consumption – Residential clients accounted for 90.70% of total clients, 35.04% of energy sales and 34.66% of energy revenues during fiscal year 2007. During the period from fiscal year 2003 through fiscal year 2007, the average number of residential clients increased by 47,083, from 1,270,371 in 2003 to 1,317,454 in 2007.

This increase represented a CAGR of 0.91%, which is essentially the same as the 0.90% compound annual growth rate in the overall average number of clients during that period. The fact that 90 per cent of clients accounted for only 35 per cent 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 under analysis, however, energy sales to residential clients decreased by 36 GWh, from 7,280 GWh in 2003 to 7,244 GWh in 2007. This increase represented a CAGR of -0.12%, which is significantly lower than the 0.97% compound annual growth rate of total electric energy sales during that period.

During that same period, electric energy revenues from residential clients increased by \$404.7 million, from \$867.68 million in 2003 to \$1,272,389,000 in 2007. This increase represented a CAGR of 10.04%, which is 1.01 times higher than the 9.98% growth rate of total energy revenues during the period under analysis. This rate of growth is explained largely by higher fuel and purchased energy costs that are included in customer rates.

Revenues from the residential client segment were one of the leading drivers of revenue growth. Furthermore, as we show in Table 2 below, the 10.04% growth rate in residential revenues was 1.65 times the 6.08% CAGR of total consumer expenditures in Puerto Rico during the 2003-2007 period. In other words, consumer spending for electric power grew at close to twice the rate of overall consumer spending during this four year period.

Table 2

Electric Energy Revenues and Personal Consumption						
Fiscal Years Ended June 30,						
	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>CAGR</u>
Electric Energy Revenues (\$MM)	\$2,508.758	\$2,600.268	\$3,038.110	\$3,708.938	\$3,670.966	9.98%
% Change Prior Year	--	3.65%	16.84%	22.08%	-1.02%	
Residential	\$867.684	\$897.965	\$1,066.419	\$1,284.641	\$1,272.389	10.04%
% Change Prior Year	--	3.49%	18.76%	20.46%	-0.95%	
Personal Consumption Expenditures (\$MM)	\$40,973.4	\$43,396.0	\$46,535.4	\$49,467.8	\$51,889.4	6.08%
% Change Prior Year	--	5.91%	7.23%	6.30%	4.90%	
Residential Electricity Costs/PCE	2.12%	2.07%	2.29%	2.60%	2.45%	

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

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 weather conditions. 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. Table 3 below sets forth the five-year generating capacity and peak load projections used by PREPA in its most recent bond offering.

Table 3

Projected Generation Capacity and Load Growth						
Fiscal Years Ending June 30,						
	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>CAGR</u>
(in MW, except percentages)						
Dependable Capacity	5,365	5,865	5,865	5,865	5,865	2.25%
Peak Load	3,546	3,529	3,548	3,588	3,636	0.63%
Reserve Margin	1,819	2,336	2,317	2,277	2,229	5.21%
Dependable Reserve Margin %	51.30%	66.19%	65.30%	63.46%	61.30%	

Source: PREPA Official Statement

According to PREPA, it expects its capacity to increase by 500 MW, or 9.31%, within the next fiscal year. Spread over the period between 2008 and 2012, this increase is equivalent to a CAGR of 2.25%. The forecast for peak load growth, however, is only 0.63% per year due mostly to the recessionary state of the Puerto Rican economy, which is expected to last for at least two more years. Therefore, the dependable reserve margin is expected to increase significantly, from 51.3% in 2008 to 61.3% in 2012.¹

Capital Expenditures – During the five fiscal year period ending June 30, 2012, the Authority plans to make \$2.13 billion in capital expenditures, of which \$904.38 million, or 42.40%, will be spent in production plant, \$522.13 million, or 24.48%, will be spent in transmission facilities, \$417.62 million, or 19.58%, will be spent in distribution facilities and \$288.72 million, or 13.54%, will be spent in other plant and equipment.

Table 4

Projected Capital Improvement Program							
Fiscal Years Ending June 30,							
(\$000)	2008	2009	2010	2011	2012	Total	%
Capital Improvements							
Production plant	\$360,344	\$185,328	\$126,650	\$102,270	\$129,790	\$904,382	42.40%
Transmission	\$133,213	\$104,638	\$109,449	\$87,616	\$87,223	\$522,139	24.48%
Distribution	\$110,105	\$80,489	\$76,392	\$72,813	\$77,823	\$417,622	19.58%
Other	\$35,255	\$75,551	\$73,403	\$48,327	\$56,185	\$288,721	13.54%
Total	\$638,917	\$446,006	\$385,894	\$311,026	\$351,021	\$2,132,864	
Financing Sources							
Internal Funds	\$20,550	\$59,565	\$37,143	\$17,395	\$31,094	\$165,747	7.77%
Borrowed Funds	\$618,367	\$386,441	\$348,751	\$293,631	\$319,927	\$1,967,117	92.23%
Total	\$638,917	\$446,006	\$385,894	\$311,026	\$351,021	\$2,132,864	

Source: PREPA Official Statement

¹ PREPA, *Official Statement of the Puerto Rico Electric Power Authority*, prepared in connection with the public offering of \$697,345,000 of Power Revenue Bonds, Series WW, June 18, 2008, p. 23.

Of the total \$2.1 billion in capital expenditures, \$1.96 billion, or 92.23%, will be financed with borrowed funds, while \$165.74 million, or 7.77%, will be financed with internally generated funds. This financing structure is in explicit contravention of the recommendation made by PREPA's Consulting Engineers, who have recommended that PREPA increase the internal funding level for its capital expenditures to approximately 25%.² While the Authority does not disclose the criteria for evaluating its capital investments, it would be particularly interesting to find out what are the arguments in favor of retrofitting Soviet-era, fossil fuel generation plants with the proceeds of long-term debt that will be paid by future generations of customers.

This tendency for incurring massive capital expenditures in outmoded technology may be explained, at least in part, by the Averch-Johnson thesis. This thesis states that traditional regulation biases a regulated firm toward more capital-intensive modes of production. The reason is that the cost-plus nature of the regulation distorts incentives in the use of capital and other inputs because with a guaranteed fixed rate of return on capital it has an extremely powerful reason to choose excessively capital-intensive production process or for building peak-load capacity whose unit costs far exceed what a competitive firm may offer. In sum, this proclivity to use capital excessively relative to other inputs will prevent cost minimization efforts from taking place.³

What we may be witnessing at PREPA, with respect to its capital improvement program, is a particularly strong form of the Averch-Johnson effect. One of the implications is that even if PREPA drastically reduces its dependence on petroleum as a fuel to generate electricity its production costs would still be much higher than those of a competitive firm due to the strong built-in incentives to choose excessively capital-intensive processes.

Energy Lost and Unaccounted for – One of most worrisome trends we uncovered through our analysis of PREPA operations is the increase in the amount of energy lost and unaccounted for. As shown in Table 5 below, net electric energy generated and purchased has increased from 22,641 GWh in 2003 to 24,062 GWh in 2007, an increase of 1,421 GWh, or 6.27%. At the same time, however, electricity losses and energy unaccounted for increased from 2,754 GWh in 2003 to 3,390 GWh in 2007, an increase of 636 GWh or 23.09%. To put these losses in perspective, PREPA's total energy lost and unaccounted for in 2007 exceeded the total amount of energy consumed in Bolivia (3,385 GWh) or in Nicaragua (2,929 GWh) during the entire year of 2006. Indeed, the amount of electricity PREPA lost during 2007 alone exceeded the amount consumed in some 93 countries around the world.⁴

² PREPA, *Official Statement*, *supra* n.1 at p. 27.

³ James C. Bonbright, Albert L. Danielsen, and David R. Kamerschen, *Principles of Public Utility Rates*, Second Edition, (Public Utilities Reports, Inc., Arlington, Virginia, 1988), p. 356-357.

⁴ United States Central Intelligence Agency, *World Factbook 2008*, Rank Order Table – Electricity Consumption.

Table 5

**Energy Lost and Unaccounted For
Fiscal Years Ending June 30,**

	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>% Change</u>
Net electric energy generated and purchased (GWh)	22,641	23,015	23,378	23,754	24,062	6.28%
Losses and unaccounted for (GWh)	2,754	2,755	2,871	3,134	3,390	23.09%
% lost and unaccounted for	12.16%	11.97%	12.28%	13.19%	14.09%	
Average revenue per KWh (\$)	\$0.1261	\$0.1283	\$0.1481	\$0.1799	\$0.1776	40.84%
Monetary value of energy losses	\$347,279,400	\$353,466,500	\$425,195,100	\$563,806,600	\$602,064,000	73.37%

Source: PREPA Official Statement; CNE Analysis

The increase in the amount of energy lost is equal to 44.76% of the increase in net electric energy generated and purchased during this period. In other words, close to half of the increase in energy production during this period was lost or unaccounted for. Furthermore, energy losses amounted to 14% of total electricity production in 2007, a rate that is 3.3 times the average loss rate for publicly-owned utilities in the United States. How can a business be successful if it losses 14% of its product between the production line and delivery to its customers?

The monetary value of this lost and unaccounted for electricity has jumped from \$347 million in 2003 to \$602 million in 2007, an increase of \$255 million, or 73%. Part of this increase has been driven by the increase in the price of oil, which produced a 40.8% increase in the average cost of every KWh sold by PREPA during the period under study. Nonetheless, this rate of energy losses is worrisome for various reasons.

First, it is indicative of worsening operating conditions, especially in the transmission and distribution network. Second, these energy loss rates are what economists call dead weight losses, or, simply put, massive social waste. The estimated value of energy lost and unaccounted for during the period between 2003 and 2007 is \$2.29 billion. Finally, it begs the question of who bears these losses in the final instance. Given that PREPA is a self-regulated monopoly the answer is that these losses are passed on to the consumer in one way or another.

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.

At first glance, it is clear that PREPA's financial performance for fiscal year 2007 was utterly deficient, especially for a self-regulated monopoly. According to the Authority's Management's Discussion and Analysis included in its audited financial statements for the fiscal year ended June 30, 2007, the following were among PREPA's financial highlights for that year:

- The Authority's net assets decreased by \$39.8 million (or 7.8%) and increased by \$16.4 million (or 3.3%) as a result of operations during fiscal years ended June 30, 2007 and 2006, respectively.
- Operating income was \$370.9 million and \$403.0 million for the fiscal years ended June 30, 2007 and 2006, representing an 8 per cent decrease and a 13.9 per cent increase when compared to the previous fiscal year, respectively.
- Operating expenses decreased by \$3.6 million and increased by \$623.1 million for fiscal years ended June 30, 2007 and 2006, representing a 0.1 per cent decrease and a 23.2 per cent increase, when compared to previous fiscal years.

In plain English, 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 \$39.8 million for the fiscal year ended June 30, 2007.

Analyzing PREPA's financial statements we find that its financial performance was below par in virtually every area during fiscal year 2007. Total assets increased \$823.57 million, or 11.10%, from \$7,418,111,000 in 2006 to \$8,241,690,000 in 2007. However, total liabilities, increased \$863.35 million, or 12.50%, from \$6,906,927,000 in 2006 to \$7,770,282,000 in 2007. Accordingly, the equity (net assets) of the Authority decreased \$39.77 million, or 7.78%, from \$511,184,000 in 2006 to \$471,408,000 in 2007.

Operating revenues decreased \$35.69 million, or 0.96%, from \$3,716,082,000 in June 2006 to \$3,680,390,000 in June 2007. However, operating income decreased \$32.07 million, or 7.96%, from \$403,018,000 in 2006 to \$370,945,000 in June 2007.

Table 6 below shows some selected financial indicators of the Authority:

Table 6				
PREPA Selected Financial Indicators				
Fiscal Years Ended June 30,				
(in \$000, except percentages)	<u>2007</u>	<u>2006</u>	<u>Change</u>	<u>% Change</u>
Current Assets	\$1,251,347	\$1,064,175	\$187,172	17.59%
Total Assets	<u>\$8,241,690</u>	<u>\$7,418,111</u>	\$823,579	11.10%
Current Liabilities	\$1,344,914	\$1,294,207	\$50,707	3.92%
Long-Term Debt	<u>\$5,764,412</u>	<u>\$4,870,184</u>	\$894,228	18.36%
Total Liabilities	<u>\$7,770,282</u>	<u>\$6,906,927</u>	\$863,355	12.50%
Net Assets (equity)	<u>\$471,408</u>	<u>\$511,184</u>	-\$39,776	-7.78%
Operating Revenues	\$3,680,390	\$3,716,082	-\$35,692	-0.96%
Operating Income	\$370,945	\$403,018	-\$32,073	-7.96%
Net Interest Expense	<u>\$296,209</u>	<u>\$286,742</u>	\$9,467	3.30%
Change in Net Assets	<u>(\$39,776)</u>	<u>\$16,396</u>	(\$56,172)	-342.60%
Operating Cash Flow	<u>\$350,112</u>	<u>\$485,789</u>	-\$135,677	-27.93%
Selected Financial Ratios				
Return on Assets	3.11%	4.09%	--	--
Return on Equity	-8.44%	3.21%	--	--
Operating Income/Operating Revenues	10.08%	10.85%	--	--
Profit Margin Ratio	-1.08%	0.44%	--	--
Leverage Ratio	17.48	14.51	--	--
Current Ratio	0.93	0.82	--	--
Quick Ratio	0.70	0.60	--	--
Operating Cash Flow/Current Liabilities	26.03%	37.54%	--	--
Long-Term Debt Ratio	92.44%	90.50%	--	--
Debt-Equity Ratio	94.28%	93.11%	--	--

Source: PREPA Audited Financial Statements 2007; CNE Analysis

Meanwhile, net interest expense increased \$9.46 million, or 3.30%, from \$286,742,000 in June 2006 to \$296,209,000 in June 2007. The bottom line result was that the Authority's net income decreased by \$56.17 million, or 342.60%, from \$16.39 million in June 2006 to a loss of \$39.77 million in June 2007.

Perhaps more troublesome is the reduction in the amount of cash generated from operating activities, which decreased \$135.67 million, or 27.93%, from \$485,789,000 in June 2006 to \$350,112,000 in June 2007. 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 17.48 in June 2007, a significant increase from 14.51 in June 2006;
- Long-term debt ratio, measured as total long-term debt divided by total long-term debt plus equity, of 92.44% in June 2007, which is slightly higher than the 90.50% reported for June 2006; and a
- Debt-equity ratio, measured as total liabilities divided by total liabilities plus equity, of 94.28% in June 2007, which is also higher than the 93.11% reported in June 2006.

In terms of profitability, PREPA's return on assets for fiscal year 2007, defined as net income plus interest expense divided by total assets, was 3.11%, down from 4.09% for fiscal year 2006. While its return on equity for fiscal year 2007, defined as net income divided by equity (net assets), was -8.44%, a substantial decrease from the 3.21% return obtained for fiscal year 2006.

PREPA's operations were also significantly less effective in generating income during fiscal year 2007 when compared to operations for fiscal year 2006. Its profit margin, measured as net income (change in net assets) divided by total revenues, experienced a significant decline, from 0.44% in June 2006 to -1.08% in June 2007.

In terms of liquidity, as of June 30, 2007, PREPA's current liabilities exceeded current assets by \$93.56 million, for a current ratio, defined as current assets divided by current liabilities, of 0.93, a slightly better coverage than the 0.82 registered in June 2006. At the same time, cash flow from operations was sufficient to cover only 26.03% of current liabilities in June 2007, a significant deterioration from the 37.54% coverage of current liabilities registered in June 2006.

How does the Authority's financial performance compares with that of other U.S. public utilities? Table 7 below sets forth this comparison using a set of ratios developed by the American Public Power Association (APPA).

Table 7
Comparison of PREPA's Financial Performance with U.S.
Public Utilities

2004

	U.S.	
Revenue per KWh (cents per KWh)	<u>Median</u>	<u>PREPA</u>
All Customers	6.50	12.83
Residential Customers	7.20	12.24
Commercial Customers	7.00	13.94
Industrial Customers	5.20	10.85
Debt to Total Assets	0.28	0.70
Operating Ratio	0.86	0.76
Current Ratio	2.32	0.91
Net Income per Revenue Dollar	\$0.041	-\$0.009
Uncollectible Accounts per Revenue Dollar	\$0.002	\$0.014

Source: American Public Power Association --
Selected Financial and Operating Ratios of Public
Power Systems, 2004 Data; CNE Analysis

During 2004 PREPA reported significantly higher revenues per KWh when compared to the median revenues reported by U.S. public utilities. However, PREPA was substantially less profitable as its counterparts in the United States. That year, the Authority reported a loss of \$0.009 per each revenue dollar while the median publicly-owned power producer in the United States reported 4.1 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 2004 was 70%, or 2.5 times the 28.0% 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 .91, which is substantially less than the 2.32 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 1.4 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 2004.

Table 8

PREPA Cash, Accounts Receivable and Payable
Fiscal Years Ended June 30,

(in \$000, except percentages)	<u>2007</u>	<u>2006</u>	<u>% Change</u>
Cash from Customers	\$3,635,637	\$3,578,114	1.61%
Cash paid to suppliers and employees	<u>\$3,285,525</u>	<u>\$3,092,325</u>	6.25%
Net Cash Flow -- Operating Activities	<u>\$350,112</u>	<u>\$485,789</u>	-27.93%
Accounts Receivable			
Government & Municipalities	\$316,620	\$265,882	19.08%
Residential, Industrial & Commercial Clients	\$460,387	\$428,954	7.33%
Recoveries FAC under (over) billed	(\$38,989)	(\$7,995)	387.67%
Unbilled Services	\$186,077	\$168,055	10.72%
Commonwealth Subsidy	\$18,980	\$18,980	0.00%
Miscellaneous accounts and others	<u>\$23,978</u>	<u>\$18,855</u>	27.17%
Subtotal	<u>\$967,053</u>	<u>\$892,731</u>	8.33%
Allowance for Uncollectible Accounts	(\$88,228)	(\$58,821)	49.99%
Recovery from insurance companies	\$109,261	\$0	
Accrued Interest on Investments	\$6,481	\$3,449	87.91%
Other Non-Current Receivables	<u>(\$98,577)</u>	<u>(\$75,006)</u>	31.43%
Net Accounts Receivable	<u>\$895,990</u>	<u>\$762,353</u>	17.53%
Accounts Payable and Accrued Liabilities	<u>\$749,044</u>	<u>\$645,525</u>	16.04%

Source: PREPA 2007 Audited Financial Statements; CNE Analysis

If we analyze PREPA's cash, accounts receivable and accounts payable we find the following:

- As we noted above, PREPA's cash flow from operations decreased by \$135 million, or 27.93% between 2006 and 2007.
- Accounts receivable from government and municipalities increased from \$265 million in 2006 to \$316 million in 2007, an increase of \$51 million, or 19.08%.

- Accounts receivable from residential, industrial, and commercial clients increased by \$32 million, or 7.33%, from \$428 million in 2006 to \$460 million in 2007.
- The allowance for uncollectible accounts increased by \$29 million, or 50%, from \$58 million in 2006 to \$88 million in 2007.
- Net accounts receivable increased by \$133 million, or 17%, from \$762 million in 2006 to \$895 million in 2007.
- Accounts payable and other accrued liabilities, on the other hand, increased from \$645 million in 2006 to \$749 million in 2007, an increase of \$104 million, or 16%.

Therefore, during fiscal year 2007, PREPA generated less cash, it took longer to actually recover amounts owed to it by its clients and took longer to pay its suppliers than in 2006.

In summary, PREPA was significantly less profitable during fiscal year 2007 when compared to fiscal year 2006, as it reported a \$39 million loss, and its financial position became a little bit more leveraged and slightly less liquid when compared to fiscal year 2006. 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. 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 2007 and contains data for 2004. Table 9 below sets forth the U.S. median for nine operating ratios for public power producers and compares PREPA's performance against these standards.

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 184 customers. This average is only 60% 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 1.74 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 highly inefficient in both power production and in the maintenance of its operations.

Table 9

Comparison of PREPA's Operational Performance with U.S. Public Utilities
2004

	<u>U.S.</u> <u>Median</u>	<u>PREPA</u>	<u>PREPA/</u> <u>U.S</u>
Customers per Non-Generation Employee	307	184	60.09%
Total O&M Expense per KWh Sold	\$0.056	\$0.098	174.18%
Total O&M Expense per Customer*	\$327	\$443	135.61%
Total Power Supply Expense per KWh Sold	\$0.0460	\$0.0733	159.44%
Purchased Power Cost per KWh	\$0.0430	\$0.0696	161.87%
Accounting, Customer Service & Sales Exp. per Customer	\$46.00	\$64.64	140.52%
Admin. & General Exp. Per Customer	\$115.00	\$117.41	102.09%
Energy Loss %	4.20%	11.97%	285.01%
System Load Factor	57.10%	78.63%	137.70%

Source: American Public Power Association -- Selected Financial and Operating Ratios of Public Power Systems, 2004 Data; CNE Analysis; *Excluding Power Supply Expense

PREPA's total O&M expense (excluding power supply costs) per customer equals \$443 per customer, which is 1.3 times higher than the \$327 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 7.3 cents per KWh sold, which 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 and customer service expenses.

In terms of purchased power costs per KWh, we find that PREPA's costs, on a per KWh basis, equaled 6.9 cents, which was 1.6 times higher than the 4.3 cents per KWh that the median U.S. power producer paid in 2004. 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 \$64.64 per customer, which was 1.4 times higher than the \$46 per customer spent by the median U.S. power producer. In addition, administrative and general expenses per customer at PREPA were \$117.41 per customer, or 1.02 times the \$115 per customer spent by the median U.S. publicly-owned utility. These two ratios could be indicative of 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 11.97% 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 2004 the PREPA operated with a system load factor of 78.6%, which is 1.3 times higher than the 57.1% 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).⁵

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.

In summary, PREPA's workers are less productive than their counterparts in the United States, in terms 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 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.

⁵ PREPA, *Official Statement*, *supra* n.1, p. 21.

Table 10

Basic, Fuel Adjustment, and Purchased Energy Charges						
Fiscal Years Ended June 30,						
(\$000)	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>CAGR</u>
Basic Charges	\$1,134,794	\$1,140,277	\$1,157,262	\$1,165,961	\$1,183,862	1.06%
Fuel Adjustment	\$994,406	\$970,972	\$1,329,073	\$1,868,542	\$1,778,198	15.64%
Purchased Energy	\$379,558	\$489,019	\$551,775	\$674,435	\$708,906	16.90%
Total	\$2,508,758	\$2,600,268	\$3,038,110	\$3,708,938	\$3,670,966	9.98%

Source: PREPA Official Statement

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.

The purpose of the fuel and purchased energy charges is to allow PREPA to recover the fuel costs associated with the generation of energy, as well as the costs associated with purchasing electricity from the co-generators. There are, however, several problems with the formulas for calculating these charges. First, in most jurisdictions the fuel adjustment charge is used only “in periods of highly fluctuating fuel costs.”⁶ In Puerto Rico, however, the fuel adjustment charge is a permanent and automatic feature of PREPA’s billing structure. This rate structure “alters the incentives of the regulatee, causing enhanced inefficiency and higher production costs a la Averch-Johnson effect on fuel as it encourages its own use.”⁷

Second, the formulas include an 11% surcharge that is used by PREPA to subsidize certain services to municipalities and low-income customers. Why are municipalities subsidized this way is a mystery. However, increasing everyone’s electricity bill to do so appears to be a terribly inefficient way of achieving this policy objective.

Third, there is a problem, in our opinion, in the way the charges are calculated. In order to explain this we will use a hypothetical example. Our hypothetical client is billed by PREPA for consuming 1,000 kWh during the last month. However, when this consumer looks at the charges portion of the bill, he notices that he is being charged \$42.26 (\$0.042264 per kWh) for 1,000 kWh of purchased electricity and \$180.72 (\$0.180724 per

⁶ Lowell E. Alt Jr., *Energy Utility Rate Setting*, (2006), p. 89.

⁷ Bonbright, Danielsen, and Kamerschen, *Principles of Public Utility Rates*, *supra* n. 3, p. 369.

kWh) for the fuel used to generate 1,000 kWh of electricity.⁸ That is, he was charged for the purchase and generation of a total of 2,000 kWh when he only consumed half that amount.

Table 11
Demonstration of Duplicated Charges

	Actual Method	Revised Method
Consumption (KWh)	1,000	1,000
Fixed Charge	\$3.00	\$3.00
First 425KWh (at \$0.0435)	\$18.49	\$18.49
Remainder (at \$0.0497)	\$28.58	\$28.58
Purchased energy charge	(\$0.042264 x 1,000 KWh) \$42.26	(\$0.042264 x 300 KWh) \$12.68
Fuel adjustment charge	(\$0.180724 x 1,000 KWh) \$180.72	(\$0.180724 x 700 KWh) \$126.51
Total	\$273.05	\$189.26
Average cost per KWh	\$0.27	\$0.19

It appears to us that these charges should be pro-rated according to how much electricity PREPA actually purchased and generated during the billing period. As shown on Table 11 above, assuming PREPA purchased 30% and generated 70% of all the electricity it sold during the past month, then logic tells us that our client should be charged for 300 kWh (30% of 1,000) of purchased electricity and for the fuel used to generate 700 kWh (70% of 1,000) of electricity.

Using the same rates that were applied before, this means our hypothetical client should have been charged \$12.68, not \$42.26, for purchased electricity and \$126.51, not \$180.72, in fuel charges for the generated electricity. Avoiding this duplication in the charges, would reduce the total monthly bill from \$273.05 to \$189.26, a reduction of \$83.79, or 30.69%.

Finally, the fuel adjustment and purchased energy charges allow PREPA to comply with the rate covenant imposed by the Authority's bondholders. According to the trust indenture summary included as Appendix I to PREPA's most recent Official Statement, "the Authority covenants that it will at all times fix, charge and collect reasonable rates and charges for the use of the services and facilities furnished by the System so that Revenues will be at all times sufficient to pay the Current Expenses of the System and to provide an amount at least equal to 120% of the aggregate Principal and Interest Requirements for the next fiscal year on account of all outstanding Power Revenue Bonds." Given that the Base Rate charged by PREPA has not changed since 1989, the only way it can satisfy the debt service coverage requirement for an ever increasing debt burden is through the fuel adjustment and purchased energy charges. This is yet another

⁸ These were the actual fuel and purchased energy charges applied to the author's electricity bill for the period between July 15 and August 13, 2008.

incentive for the intensive use of debt in the financing of the Authority as all costs are passed along to and borne by the consumer.

III. Climate Change and its Implications for Puerto Rico

On July 17th, former Vice President Al Gore called for the United States to adopt the goal of producing all of the nation's electricity "from renewable energy and truly clean, carbon-free sources" within ten years. This objective, said Gore, is achievable but would nonetheless "represent a challenge to all Americans, in every walk of life." He also proposed a bold policy idea to jumpstart this transformation: taxing carbon dioxide production and reducing payroll taxes accordingly. An approach that he neatly summarized in one sentence: "we should tax what we burn, not what we earn."⁹

Mr. Gore's daring call for action is the latest salvo in the ongoing debate regarding climate change. After years of often angry give and take, the scientific evidence, according to Sir Nicholas Stern (Lord Stern of Brentford), former Chief Economist at the World Bank and author of the Stern Review: *The Economics of Climate Change*, "is now overwhelming: climate change presents very serious global risks, and it demands an urgent global response."¹⁰

The scientific consensus appears to be that the risks of climate change can be substantially reduced if greenhouse gas levels in the atmosphere can be stabilized at between 450 and 550 parts per million (ppm) carbon dioxide equivalent. Today's level, according to James Gustave Speth, Dean of the School of Forestry and Environmental Studies at Yale, is 430ppm and it is rising at more than 2ppm per year.¹¹

So, there is growing agreement on what the broad outlines of the world's response to climate change should be—a path of emissions cuts that stabilizes carbon and other greenhouse gases in a way that minimizes the risks of damage from rising temperatures. The Stern Review proposes a 2050 target of 20 gigatons (billions of tons) of carbon dioxide equivalent to achieve stable greenhouse gas levels of 500ppm with no overshoot. McKinsey & Company, in a recent report, estimates this target represents a 64 per cent cut relative to 2008 emissions of 55 gigatons of CO₂ equivalent and a 76 per cent cut relative to a "business as usual" baseline emissions forecast of 85 gigatons of CO₂ equivalent by 2050.¹²

The key to achieving this objective, according McKinsey, lies in increasing the "carbon productivity" of the economy, which is defined as the amount of GDP produced per unit of carbon equivalents emitted. According to their estimates, carbon productivity must increase from approximately \$740 of GDP per ton of CO₂ equivalent today to \$7,300 of

⁹ New York Times, *Gore Calls for U.S. to Use Renewable Energy by 2018*, July 18, 2008.

¹⁰ *Stern Review: The Economics of Climate Change*, Executive Summary, p. i.

¹¹ James Gustav Speth, *The Bridge at the Edge of the World: Capitalism, the Environment, and Crossing from Crisis to Stability*, (Yale University Press: New Haven, CT, 2008), p. 29.

¹² McKinsey & Co., *The Carbon Productivity Challenge: Curbing Climate Change and Sustaining Economic Growth*, June 2008, p. 10.

GDP per ton of CO₂ equivalent by 2050 in order to stabilize atmospheric greenhouse gases at a level that would limit the adverse consequences of climate change. This change is comparable in magnitude to the labor productivity increases achieved during the Industrial Revolution. The difference lies in the timeframe. The tenfold increase in labor productivity was achieved over 125 years; the “carbon revolution” needs to be achieved in only 42.

McKinsey has developed a cost curve for abating 27 gigatons of CO₂ equivalent per year by 2030, a key milestone for stabilizing all atmospheric greenhouse gases by 2050. According to this analysis, a significant portion of abatement, approximately 7 gigatons, can be achieved through savings in energy costs through the use of more efficient technologies, such as fluorescent lighting and more fuel-efficient vehicles.

Second, McKinsey calculates that the world can achieve the 27 gigatons per year abatement required by 2030 for a marginal cost of €40 per ton.

Third, if the world were to adopt the abatement options now currently available, the annual cost to society would be between €500 billion and €1,100 billion in 2030, or 0.6 to 1.4 per cent of that year’s projected global GDP. So, the economics of climate change are quite feasible.

On the policy side, according to the Stern Review, three elements are essential for successful carbon mitigation: (1) establishing a carbon price, through tax or trading and regulation; (2) providing incentives to support the development and adoption of low-carbon technologies; and (3) removing barriers to behavioral change, such as lack of information, high transaction costs, and behavioral inertia. This is where politics may hinder the process, as the costs of abatement will be incurred within the next few years, while the benefits will be realized only in the long term.

In the United States, however, legislation has already been proposed to achieve some of these goals and there is a growing expectation that a national climate change policy will be enacted within the next five years to limit or tax the release of carbon dioxide. Examples of recently introduced legislation include the Global Warming Pollution Reduction Act (Sen. Jeffords), which seeks to reduce emissions to 80 per cent below 1990 levels in 2050; and America’s Climate Security Act (Sens. Lieberman and Warner), which seeks to reduce emissions to 70 per cent below 2005 levels by 2050.

Indeed, the first mandatory U.S. inter-state carbon trading system opened for business on September 25, 2008, with the auction of carbon permits to power stations.¹³ The Regional Greenhouse Gas Initiative is a ten-state cooperative effort to reduce greenhouse gas emissions from electric power generation. It covers fossil fuel-fired electric power plants 25 megawatts or greater in size (approximately 225 facilities region wide) operating in Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire,

¹³ *Financial Times*, Wednesday, September 24, 2008.

New Jersey, New York, Rhode Island, and Vermont. The objective is to reduce CO₂ emissions in the region 10 per cent below 2009 levels by 2011.¹⁴

In addition, President Barack Obama has promised to implement a cap-and-trade program that would radically curb U.S. carbon emissions—cutting emissions by 80 per cent relative to 1990 levels by 2050. This approach (a cap-and-trade program) has already proven remarkably successful in reducing sulfur dioxide emissions (which contribute to acid rain) in the United States, at a reasonable cost, while preventing an estimated 10,000 premature deaths and 14,500 cases of chronic bronchitis.

The expectation that Congress will impose national limits on carbon emissions prompted several U.S. financial institutions in February of 2008 to adopt guidelines, known as the Carbon Principles, to assess carbon-related environmental risk in the financing of new electricity generation. These guidelines, currently adopted by Bank of America, Citibank, Credit Suisse, JPMorganChase, Morgan Stanley, and Wells Fargo, require that when those institutions evaluate the financing of new fossil fuel generation they “assess project economics and financing parameters” through an “Enhanced Due Diligence Process to identify potential risks posed by the recognized cost of CO₂ emissions and to seek to address those risks in the financing.”

At a minimum these procedures require bankers and their lawyers to ask potential borrowers some probing questions about carbon-related environmental risk and liability. Thus, we can expect to see some energy projects, at least those at the margin, failing to obtain bank financing due to environmental concerns. More importantly, the adoption of these guidelines marks the beginning of fully pricing environmental externalities into the cost of electricity production. Eventually all power producers will have to make radical changes to their business models.

What does this entail for Puerto Rico? First, it is clear that business as usual is not an option. Puerto Rico’s long free ride regarding carbon emissions is likely to come to an end soon. Both government and the private sector will need to take into account the future cost of their pollution in their budgeting and strategic planning.

Second, early movers are likely to be winners. As the world adopts strict restrictions on CO₂ emissions, those countries and companies that rapidly adapt to the new regime stand to make the largest gains, both in terms of the environment and economics. To the extent that Puerto Rico fails to adapt, it will stagnate.

Third, it appears that PREPA’s business model is unsustainable. Its current energy strategy, which consists in “diversifying” its generation capacity to one-third oil, one-third natural gas, and one-third coal, is not environmentally viable. Implementing a strategy that leaves Puerto Rico 99 per cent dependent on fossil fuels not only goes against the global trend, it is also stubbornly foolish as it guarantees that PREPA will not be able to comply with future emission controls. Furthermore, given the adoption of the Carbon Principles by major U.S. banks, such a strategy probably will not be financially

¹⁴ Regional Greenhouse Gas Initiative, *Executive Summary*, p. 1.

viable within the next ten or fifteen years. Finally, PREPA is bound to comply with its rate covenant requiring debt service coverage of 120%. How will it satisfy this requirement if its fuel base is not diversified and it cannot obtain financing for new fossil fuel generation? Unable to comply with CO₂ standards and without access to easy financing, PREPA will go the way of the Dodo, unless it takes drastic corrective action.

IV. Policy Recommendations

We live forward, but we can only think backward.
–Søren Kierkegaard

Kierkegaard's quotation above is an apt description of the way the Puerto Rican government regulates public utilities. While we live in the 21st century, at a time of incredible advances in technology, our politicians and policymakers, as well as PREPA's management and labor unions, appear to have learned nothing nor forgotten anything over the last sixty years and all seem to be stuck with outdated mental schemes developed in the 1940s. At this point in Puerto Rico's economic development path it is imperative that we discard these anachronistic modes of thinking. In order to jumpstart that process, we make the following policy recommendations:

- A. *Eliminate the Requirement to Make Payments in Lieu of Taxes* – Imposing this obligation on PREPA, which raises electricity prices for every user in the island, is simply irrational. These payments, which go mostly to pay subsidies for municipalities, are not justified now that municipalities get a share of the sales and use tax. In addition, at a time when the people of Puerto Rico face increases in the cost of living, the elimination of this abusive practice would result, *ceteris paribus*, in a reduction of 11% in the average electricity invoice.
- B. *Establish an Independent Regulatory Commission* – The creation of an independent regulatory commission is one of the most important steps to improve PREPA's performance. This commission would, among other things: (1) safeguard the best interests of the Puerto Rican consumer; (2) establish, review, and revise electricity tariffs on an annual basis; (3) approve PREPA's capital investment plans; (4) promote the transition to renewable energy technologies at PREPA; and (5) oversee the overall operations of the company.
- C. *Require PREPA to Source All its New 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.
- D. *Implement Measures to Increase Transparency in the Management of the Authority* – Too much of what happens at PREPA is conducted behind closed doors. Management should be required to open to public scrutiny the Authority's capital investment plans, its technology selection processes, and its strategic planning. In addition, PREPA should be subject to public disclosure rules, such as publishing a quarterly report on its operations and financial performance.

- E. Develop Benchmarks to Increase Accountability* – Since there are no shareholders at PREPA, the agency is not held to account for its performance to anybody. It is imperative that PREPA be subject to a rigorous set of performance benchmarks in areas such as generation costs per KWh; availability and forced outage rates; and client service (time to process and address complaints), among others.
- F. Provide the Correct Set of Incentives* – As long as PREPA remains a government monopoly insulated from competition it will be necessary to regulate it so that it operates in an efficient manner. The current regulatory structure, which allows PREPA to pass along all its costs to the consumer, is a recipe for inefficiency and waste. In the alternative, the government of Puerto Rico should try implementing performance-based regulation. The most common form of performance-based regulation in the monopoly context is known as “price cap” regulation. With price caps, the regulator sets an initial price and then specifies in advance how that price would change during a period of years, according to a formula known as CPI-X, taking into account inflation (which would increase prices) and expected productivity gains (which would reduce costs). The regulated firm is then free to decide how best to cut costs and innovate to make money, taking market prices as given. Because prices are fixed in advance, rather than falling if costs fall, any dollar the regulated firm saves, it keeps. This restores the incentive to be efficient that conventional cost-of-service regulation impedes.¹⁵

V. Conclusions

In our 2005 report we noted that PREPA suffered from various financial and operating inefficiencies that should be corrected as soon as possible. Unfortunately, most of those deficiencies are still present three years later.

On the financial side of the ledger, we find that PREPA, a self-regulated monopoly, finished fiscal-year 2007 with a net income loss of \$39 million. This fact, by itself, speaks volumes about the state of management at PREPA.

Second, PREPA keeps pouring billions of dollars into old technology. According to its most recent five year capital improvement program, it plans to invest over \$900 million in production plant, mostly to retrofit aging oil-based generators. The company has never made a full accounting to the Puerto Rican people, who are technically its “shareholders”, of its capital spending priorities nor has it provided any explanation or the rational basis for its technological investment decisions.

Third, during fiscal year 2007, PREPA generated less cash, it took longer to actually recover amounts owed to it by its clients and it also took longer to pay its suppliers than in 2006.

¹⁵ 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. 84.

Fourth, in terms of liquidity, as of June 30, 2007, PREPA's current liabilities exceeded current assets by \$93.56 million, for a current ratio, defined as current assets divided by current liabilities, of 0.93, a slightly better coverage than the 0.82 registered in June 2006. At the same time, however, cash flow from operations was sufficient to cover only 26.03% of current liabilities in June 2007, a significant deterioration from the 37.54% coverage of current liabilities registered in June 2006.

Fifth, PREPA was significantly less profitable during fiscal year 2007 when compared to fiscal year 2006, as it reported a \$39 million loss, and its financial position became a little bit more leveraged and slightly less liquid when compared to the previous fiscal year. In addition, PREPA's financial performance in terms leverage, liquidity and profitability was also substantially below that of its U.S. counterparts.

In terms of its operations, PREPA is substantially less efficient than its U.S. counterparts and it underperforms in virtually every area of operations under consideration. PREPA's workers are less productive than their counterparts in the United States, in terms of customers served per employee. Furthermore, 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 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.

In addition, the amount of energy lost and unaccounted for has increased by 23% since 2003 and PREPA actually loses 14% of its product along its transmission and distribution system. This rate of energy losses is worrisome for various reasons: (1) it is indicative of worsening operating conditions, especially in the transmission and distribution network; (2) these energy loss rates are indicative of massive social waste—the estimated value of energy lost and unaccounted for during the period between 2003 and 2007 is \$2.29 billion; and (3) it begs the question of who bears these losses in the final instance.

In our view, consumers are being overcharged for the purchase and generation of electricity due to the way the energy purchase and fuel adjustment charges are calculated by PREPA. In fact, PREPA is charging customers for the purchase and generation of more energy (in KWh terms) than they actually consume during any given month.

Finally, given the direction the world is moving with respect to the issue of climate change, it appears that PREPA's business model is unsustainable. Over the next ten to fifteen years it will face significant political and financial pressure to: (1) reduce its dependence on oil; (2) cut back on its consumption of other non-renewable fossil fuels, such as coal and natural gas; (3) decrease its overall carbon footprint; and (4) move towards and adopt renewable fuels for the generation of electricity. To the extent the government of Puerto Rico and PREPA start working on this transition now, while they still have time to control the pace of events, the less painful the process will be for all involved.

References

- Alt, Lowell E., Jr. *Energy Utility Rate Setting*, 2006.
- American Public Power Association. *2007-08 Annual Directory and Statistical Report*, American Public Power Association, Washington, DC, 2007.
- American Public Power Association. *APPA Advanced Public Utility Accounting Manual*, American Public Power Association, Washington, DC, 2003.
- Bonbright, James C., Albert L. Danielsen, and David R. Kamerschen. *Principles of Public Utility Rates*, Second Edition, Public Utilities Reports, Inc, Arlington, VA, 1988.
- Brennan, Timothy J., Palmer, Karen L., and Martínez, Salvador A. *Alternating Currents: Electricity Markets and Public Policy*, (Washington, DC: Resources for the Future Press, 2002).
- Kirschen, Daniel and Strbac, Goran. *Fundamentals of Power System Economics*, (West Sussex, England: John Wiley & Sons, Ltd., 2004).
- McKinsey & Co. *The Carbon Productivity Challenge: Curbing Climate Change and Sustaining Economic Growth*, June 2008.
- Newberry, David M. *Privatization, Restructuring, and Regulation of Network Utilities*, (Cambridge, MA: The MIT Press, 2001).
- Puerto Rico Electric Power Authority. *Audited Financial Statements and Supplemental Information for the Years Ended June 30, 2007 and 2006 with Report of the Independent Auditors*, 2008.
- Puerto Rico Electric Power Authority. *Official Statement of the Puerto Rico Electric Power Authority*, prepared in connection with the public offering of \$697,345,000 Power Revenue Bonds, Series WW, dated June 18, 2008.
- Puerto Rico Electric Power Authority. *Official Statement of the Puerto Rico Electric Power Authority*, prepared in connection with the public offering of \$993,450,000 Power Revenue Bonds, Series RR, and Power Revenue Refunding Bonds, Series SS, dated March 24, 2005.
- Regional Greenhouse Gas Initiative. *Overview of RGGI CO₂ Budget Trading Program*, 2008.
- Speth, James Gustav. *The Bridge at the Edge of the World: Capitalism, the Environment, and Crossing from Crisis to Stability*, Yale University Press, New Haven, CT, 2008.

Stern, Nicholas. *Stern Review on the Economics of Climate Change*, Her Majesty's Treasury, London, England, 2006.

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

United States Central Intelligence Agency, *World Factbook 2008*.