

# Closing the Electricity Supply-Demand Gap

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THE WORLD BANK  
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Energy and Mining  
Sector Board

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# Closing the Electricity Supply-Demand Gap

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and Gary Stuggins**

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## ACRONYMS AND ABBREVIATIONS

ADB	Asian Development Bank	ICS	Interconnected system
AKP	Justice and Development Party (Adalet ve Kalkınma Partisi)	IEA	International Energy Association
ANEEL	National Electricity Regulatory Agency (Brazil) (Agência Nacional de Energia Elétrica)	IFI	International financial institution
ASEAN	Association of Southeast Asian Nations	IMF	International Monetary Fund
ATC	Aggregate technical and commercial (losses)	IPP	Independent power producer
BGN	New Bulgarian lev (on July 5, 1999, the “old” lev, BGL, was redenominated thus: BGN 1 = BGL 1,000)	KfW	Reconstruction Credit Institute (Kreditanstalt für Wiederaufbau)
BOO	Build-own-operate	LPC	Lithuanian Power Company
BOT	Build-operate-transfer	LPG	Liquefied petroleum gas
BPC	Botswana Power Corporation	MAE	Commercial market operator
CBEM	Common Baltic Electricity Market	MMEWR	Ministry of Minerals, Energy and Water Resources (Botswana)
CDE	Compañía Dominicana de Electricidad	NDP	National Development Plan (Botswana)
CDEE	Compañía Dominicana de Empresas Eléctricas	NEK	Nationalna Električeska Kompania EAD (Bulgaria)
CEE	Central and Eastern European (countries)	OECD	Organisation for Economic Co-operation
CHP	Combined heat and power	OYAK	Turkish military pension fund
CPI	Consumer price index	PEEPA	Public Enterprises Evaluation and Privatisation Agency (Botswana)
CRI	Cash recovery index	PPA	Power Purchase Agreement
CRISIL	CRISIL India Ltd.—an Indian credit rating agency associated with Standard and Poor’s of the United States	PPCL	Pragati Power Company Limited (Delhi)
DERC	Delhi Electricity Regulatory Commission	PRA	Blackout Reduction Program (Programa de Reducción de Apagones)
DPC	Delhi Power Company	PSA	Power sales agreement
DTL	Delhi Transmission Company Limited	REDI	Regional Economic Development Initiative
DVB	Delhi Vidyut Board (a state-owned vertically integrated power utility)	SAPP	Southern African Power Pool
EBRD	European Bank for Reconstruction and Development	SCS	Self-contained system
EEA	Ethiopian Electricity Agency	SEB	State electricity board
EMRA	Energy Market Regulatory Authority (Turkey)	SFR	Self-financing ratio
ESW	Economic and Sector Work	STEM	Short-Term Energy Market
EU	European Union	TEAS	Electricity Generating and Transmission Corporation (Turkey)
EUAS	State electricity generating company (Turkey)	TEIAS	Turkish Electricity Transmission Company
EVN	Electricité du Vietnam	TETAS	Electricity Trading and Contracting Company (Turkey)
GCE	Electric Energy Crisis Management Board (Câmara de Gestão da Crise de Energia Elétrica)	TL	Old Turkish lira
GDP	Gross domestic product	TOOR	Transfer of operating rights
GNI	Gross national income	UEAP	Universal Electrification Access Programme
ICRA	ICRA Limited—an Indian credit rating agency associated with Moody’s of the United States	UCTE	Union for the Co-ordination of Transmission of Electricity
		U.S. cent	1 U.S. cent = \$0.01
		VAT	Value added tax
		WTO	World Trade Organization

## UNITS OF MEASURE

GJ	Gigajoule
GVA	Gigavoltampere
GWh	Gigawatt-hour
Hz	Hertz
km	Kilometer
kV	Kilovolt
kVA	Kilovoltampere
m	Meter
MVA	Megavoltampere
MVAR	Megavoltampere-reactive
MW	Megawatt
MWh	Megawatt-hour
Tcf	Trillion cubic feet
TJ	Terajoule
toe	Tons of oil equivalent
TWh	Terawatt-hour
V	Volt
VA	Voltampere



## FOREWORD

The investment needs of the electricity sector in the developing countries are immense and growing. The recent surge in oil prices will make the costs of investments even higher. In this context, the goals of this brief study are timely: to seek to identify the factors that enable some countries to succeed in closing the supply demand gap, as well as the factors that inhibit progress in some other countries. The case study approach covering representative samples of the developing countries that was adopted in this study enables the reader to understand the identified factors in their context and makes the lessons operationally relevant. We hope this proves useful to World Bank Group staff, as well as the authorities in the developing member countries.

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January 2007





## 1. OVERVIEW

The International Energy Association (IEA) has estimated that the developing countries would need an annual investment of \$160 billion through 2010, \$185 billion thereafter through 2020, and \$210 billion in the following decade through 2030.<sup>1</sup> Even on an optimistic basis, the identifiable sources are likely to fund about 50 percent of these needs, thus leaving a large investment gap. Unless ways are found to fill this gap substantially, rotating blackouts and limited access to electricity will hamper economic growth and the achievement of Millennium Development Goals.

Although this study does not seek quantitative solutions on how much of this gap would be filled in which countries and in what time frame, it builds on nine country case studies that are representative of several country typologies reflecting the diversity of the World Bank group client base. It also seeks to identify some of the key underlying factors that must be addressed to enable utilities and countries to manage demand and mobilize the needed resources to augment supplies from public, private, and commercial sources to bridge the supply-demand gap.

Successes in attracting sustainable investments are highlighted, and attempts are made to identify the key determinants for such success. The impediments that have been encountered and methods by which they were overcome are also highlighted. Cases in which the investments did not prove sustainable are also included, and reasons for such failure are highlighted. Although the full text of all nine case studies will be published on the World Bank website, the present document highlights and discusses the more important among the lessons drawn from them:

*Lesson 1: The importance of the rule of law and enforcement of contracts and property rights.* Whether the services are provided by the public sector or private sector, greatest benefit to the society and sustainability of the sector results only when the rule of law prevails and property rights are respected and contract obligations are enforced.

*Lesson 2: The need for internal generation of surplus cash after meeting all operational expenses and debt service adequate to meet at least the equity requirements of the system expansion projects.* Utilities which manage to achieve this, generally manage to raise the rest of the needs as debt and manage to keep the demand and supply in balance.

*Lesson 3: The importance of good governance and transparency.* Good governance and transparency at the state level and at the corporate level are the keys to the reform efforts to make the sector financially sound and attract foreign and domestic investors to meet the investment needs.

*Lesson 4: The importance of the role of third parties in promoting reform.* Benign third party (such as European Union (EU) or World Trade Organization (WTO) accession, participation in regional markets, international financial institutions (IFIs) and credit rating agencies) interest and involvement provide political motivation to pursue sector reform, increase transparency, enable meaningful disclosure and thus promote investment. Continuity of the IFI involvement through the long drawn out reform process is necessary and IFIs should not be content with short duration interventions. The IFIs could play a role in low income countries similar to that of credit rating agencies and build up a standardized client risk database both to facilitate the use of appropriate vehicles and instruments and to help the international investing community to invest in such countries.

*Lesson 5: The need for demand management, optimal generation planning, and electricity trade.* Demand management, optimal generation planning, and electricity trade across the countries, along with joint investments, can significantly reduce the volume of incremental investment needs.

*Lesson 6: The importance of the role of the private sector and of meeting the increased demands it makes on the state.* Private sector has an important role to play in closing the investment gap in many countries, but association of private sector makes far greater demands on the quality and sophistication of governance. The enhancement of the capacity of the governments in this regard should be the focus of IFIs.

*Out of the investment needs of \$160 billion, about 30 percent can be expected to be generated by the internally generated cash surplus.* Private investments and IFI assistance—if they maintain the present low levels—would provide another 12 percent and 3 percent, respectively, leaving a gap of about 55 percent. Efficiency improvement, demand management, optimal general planning, and trade could be used to moderate the volume of investments needed.

<sup>1</sup> These estimates by the World Bank staff are expressed in 2006 dollars and are based on IEA estimates expressed in 2001 dollars and making suitable adjustments for universal access to electricity. Throughout the text, \$ and dollars are used to denote U.S. dollars, and cents is used to denote U.S. cents (1 cent is equivalent to \$0.01).

*Filling this gap would call for a substantial improvement of the factors, such as good and transparent governance, adherence to the rule of law, respect for private property, and contracts.* These factors underlie successful commercialization of the sector, demand management, mobilization of private and public sector resources, supply augmentation, and trade. Among other things, this situation highlights the catalytic role of the financial and advisory assistance by IFIs and using such assistance to promote policies not only to improve sector operational efficiency, stabilize internal cash generation, and to attract substantially higher levels of commercial financing and private investment, but also to improve the underlying factors mentioned above.

## 2. CONTEXT AND BACKGROUND

*Together with basic health and education services—as well as physical infrastructure such as roads, railways, ports, and telecommunications—provision of reliable electricity supply is crucial to economic development. Surveys indicate that investors assign a high priority to the reliable supply of electricity at reasonable prices. Reliable electric supply fosters growth by enabling productivity gains in the industrial and service sectors and is an equally important input to support health and education.*

*In the developed economies, the entire population has access to electricity, and the electricity industry—organized on a self-sustaining basis—functions in a market milieu. It operates increasingly on a competitive basis, where possible, and the remaining monopoly segments are subject to independent regulation. The operating entities, whether in the private or public sector, function on a financially sound basis and are able to raise or access the resources needed for system expansion to meet incremental demand.*

*In many developing economies, these conditions do not prevail. In the least developed and low-income economies, access to electricity is limited, and the low income level of consumers often does not enable the utilities to cover fully the cost of supply, let alone generating surpluses to finance system expansion. The power sector must compete with other multiple essential demands for the scarce government funding. Access to international debt and equity markets is practically nonexistent, except in the context of limited official development assistance that is being provided by the IFIs and the donor community. In other developing economies, political and institutional constraints inhibit the evolution of financially sound power sector.*

*The consequences of inadequacy or failure in the power sector are serious. At worst, the population would not be able rise beyond the subsistence standard of living, and the failing power sector would retard the movement of the poor countries towards the Millennium Development Goals for poverty alleviation, health, and education.*

*The IFIs, including the World Bank Group have a major role in enabling the developing economies to ensure sustainable provision of electricity services to their people at acceptable levels of quality and reliability and especially*

*in promoting appropriate and timely investments in the sector, and helping the economies to access the resources needed for such investments.*

*Based on the estimates made by the IEA in its World Energy Outlook (2003) and adjusting them for 2006 price levels, as well as for universal access to electricity, Bank staff have estimated that the annual investments in the power sector of the developing economies would be of the order of \$160 billion until 2010, would rise to \$185 billion per year during 2011–20, and further to \$210 billion in the following decade.<sup>2</sup> This has to be considered in the context of the following:*

- Private sector investments in the power sector of developing countries declined from \$47 billion in 1997 to \$14 billion in 2004.<sup>3</sup>
- Economic growth in Asia accelerated subsequent to the currency crisis of 1997.
- Africa has been experiencing its fastest economic growth rate in the last two decades.
- Developing economies as a group have been experiencing consistent economic growth during the last few years.
- Sharp increases in oil prices have been driving all energy prices upwards globally and have been seriously affecting the oil-importing economies.
- The IFIs and the donor community have been providing a considerably lower level of support to the power sector since the early 1990s in the belief that private capital flows would take up the consequent slack.

*Even assuming (somewhat optimistically) that 30 percent of the investment needs (or \$48 billion) would come from the net internally generated cash of the utilities and that the annual private flows and IFI assistance would remain at 12 percent (or about \$19 billion) and 3 percent (or about \$5 billion), respectively, the investment gap in the power sector would be of the order of \$94 billion (or about 55 percent of the total requirements).*

<sup>2</sup> This compares with an earlier estimate of investment needs of \$138 billion per year (including maintenance needs) or about 1.63 percent of their GDP during 2005–10 made by Marianne Fay and Tito Ypes (2003) using a regression model covering 147 countries and data set covering the period 1960–2000.

<sup>3</sup> There has been a revival of private sector investment interest in 2005 and 2006, especially on the part of domestic and regional investors, as opposed to the conventional “strategic investors.”

*Unless ways are found to fill this gap, electricity access rates will remain low in poorer countries, and reliability and quality will fail in other developing economies, which will result in rolling blackouts and brownouts that seriously inhibit their economic growth prospects and degrade the environment.*

### 3. SCOPE AND COVERAGE OF THE STUDY

The present paper is a follow-up document to the *Operational Guidance note, Public and Private Sector Roles in the Supply of Electricity Services (World Bank 2004)*. It focuses on the investment challenges facing developing economies. Nine countries were chosen from Asia (2), Africa (2), Europe and Central Asia (3) and Latin America and Caribbean (2) regions for preparing case studies. The case studies provide information on the status of the sector in these countries and highlight their experience in succeeding or failing to close the supply-demand gap in the past.<sup>4</sup> This paper seeks to highlight the best-practice examples drawn from these nine case studies, which could possibly be replicated in similar circumstances in other economies. The analysis focuses not so much on quantitative investment issues in a given time frame, as on the underlying factors that must be addressed to enable the countries to manage demand and mobilize resources to bridge the supply-demand gap on a continuous basis.

The basic details of the nine cases are summarized in table 1.

Botswana and Ethiopia represent countries that have low levels of electricity access and low levels of saturation with an urgent need to focus on increasing access. Bulgaria and Lithuania represent countries in which the entire population has access to electricity and only a modest demand growth is forecast. They also represent

cases of present excess capacity that is utilized to export electricity. They will face capacity replacement problems when their nuclear units are shut down in accordance with their agreements with the EU. By contrast, Delhi and Vietnam (low-income economies) represent cases of relatively high population access that still face high rates of demand growth driven by rapid economic growth from a low base. Brazil and Turkey (middle-income countries) face a situation of excess capacity arising from an unanticipated downturn of their economies at the beginning of the present decade. Both had built substantial generation capacities with the significant participation of foreign investors in the sector. The Dominican Republic represents a unique typology, since it has considerable excess capacity in relation to its demand and a high degree of foreign private investor participation in the sector, yet finds itself unable to provide reliable service to the people and the economy. Except for Botswana and Ethiopia, all countries have notable participation in the sector by foreign and local private investors in different forms. Thus, the case studies provide a range of typologies of developing economies.

**TABLE 1. Basic Details of the Nine Countries Selected for Case Study**

COUNTRY	GDP PER CAPITA (\$)	POPULATION (MILLION)	ELECTRICITY ACCESS RATIO (%)*	INSTALLED GENERATION CAPACITY (MW)	PEAK DEMAND (MW)	ANNUAL LOAD GROWTH IN THE PAST (%)	FORECAST ANNUAL LOAD GROWTH (%)
Botswana	4,840	1.7	28	132	400	8.8	5.7
Brazil	3,000	177.0	95	> 82,500	>70,000	6 to 7	5.2
Bulgaria	3,109	8.0	100	12,310	6,900	Close to 0	1.0 to 1.8
Delhi, India	1,000	14.0	93	1,000	3,500	5.2	5.0
Dominican Republic	2,400	9.0	88	3,600	1,900	7.5	2.0
Ethiopia	112	73.0	14	792	468	5.0	>5.0
Lithuania	6,454	3.4	100	6,570	1,952	Close to 0	2.5 to 3.5
Turkey	4,114	71.7	100	36,856	23,199	9	8.3 to 6.4
Vietnam	480	82.0	90	11,340	8,300	15	15

\*This represents the percentage of the population with access to electricity.

<sup>4</sup> The case study from India covers only the Delhi Electricity Board rather than the whole country. Others are Botswana, Brazil, Bulgaria, the Dominican Republic, Ethiopia, Lithuania, Turkey, and Vietnam.





## 4. KEY LESSONS AND BEST-PRACTICE EXAMPLES

*The important lessons and best-practice examples that have emerged from a review of these nine case studies are discussed below. Boxes 1–6 in lessons 1–6 below discuss the implications of each corresponding lesson for World Bank Group staff and business activities.*

### **Lesson 1. The Importance of the Rule of Law and Enforcement of Contracts and Property Rights**

*Operating the existing sector assets with high efficiency according to industry norms is the first important step in bridging the gap between supply and demand. Reduction of technical and commercial losses, efficient metering and billing of consumption, and efficient, timely, and full collection of the bills are the fundamental responsibilities of any utility whether operated by the public sector or private sector. Since it is normally difficult in many developing countries to separate the technical from the commercial losses, the efficiency aspect is expressed as a cash recovery index (CRI) (as in the Dominican Republic) or as aggregate technical and commercial (ATC) losses (as in Delhi). CRI is a product of two ratios: (a) the billing ratio or the ratio of electricity actually billed in gigawatt-hours to the electricity input into the system in gigawatt-hours and (b) the collection ratio or the ratio of actual cash collected to the amount billed in money terms. ATC losses are expressed as  $[1 - \text{CRI}]$ .*

*In order to achieve the industry norm of a CRI of about 88–90 percent, the utility must function in an environment of respect for property rights and contractual obligations, where theft of power by tampering with the meter or by other means is defined as a criminal offense punishable by deterrent penalties, and where the utility would be free to disconnect and deny service to those who do not pay the bills or who indulge in theft of power. Ensuring payment discipline, punishing power theft, and effectively implementing bankruptcy laws and speedy debt recovery mechanisms are all important responsibilities of the government. Most countries may have laws that respect private property and contractual obligations, and frown on power theft; but enforcing mechanisms (prosecuting systems, court systems, and adjudicating systems) may be weak, time-consuming, inefficient, corrupt, or subject to political interference. The rule of law involves both having the right laws in place and enforcing them fairly and effectively. The experience in Delhi and the Dominican Republic brings out the significance of this issue.*

*The Dominican Republic has had a culture of nonpayment—“la cultura de no pago”—and a belief that electricity was a “free public good” for over 40 years. Theft of power was rampant, and the threat of disconnection was nonexistent both because of the constraints to the utility in disconnecting delinquent customers and the ease with which such customers reconnected themselves to the system even if the utility succeeded in disconnecting them. The CRI fell to a very low average level of 43 percent in 1999. The government privatized the distribution companies in 1999 in an effort to improve the situation. Although the two private investors managed to raise the index to about 62–69 percent in the next two years, they could not sustain this level in the absence of the rule of law and the failure of the government to enforce the laws. Low levels of cash recovery led to higher tariffs, which increased the incentive to steal power and evade bill payment in a vicious cycle. Thus, with the highest tariff in the region (about 14 cents/kWh), the sector had no cash to pay for the fuel for power generation, and the country faced rolling blackouts, despite the generating capacity being far in excess of demand. By 2004 the CRI had fallen to 35 percent, 46 percent, and 51 percent in the three distribution companies.*

*In 2001–02, Delhi had ATC losses as high as 57.2 percent in one distribution area and 48.1 percent in the remaining two distribution areas. Privatization was carried out with the specific objective of reducing these losses in a five-year time frame. The new private owners have succeeded in bringing the ATC losses down to the level of 50.1 percent, 40.6 percent, and 33.8 percent, respectively, in the three areas in three years (actually ahead of the agreed schedule), and they are confident that they can reduce them further to 40 percent, 31 percent, and 30 percent—or even lower—within the next two years.<sup>5</sup> What helped in the process was not merely improved corporate governance of the three distribution companies, but also the timely payment by the government of its own dues and the noninterference by the government in disconnection cases. To accelerate progress further, the companies are persuading the government to constitute dedicated special prosecutors and courts to speed up the disposal of cases related to power thefts.*

*On the whole, the CRI was higher and the sustainability of the sector better in those countries that had relatively consistent adherence to the rule of law. The record of*

<sup>5</sup> This corresponds to a CRI of 60 percent, 69 percent, and 70 percent for the next two years.

Ethiopia and Vietnam in this respect, despite their low income status, is noteworthy. Bulgaria and Lithuania have made great advances in this regard in the context of their EU accession efforts. Turkey had high rates of losses arising from theft in the eastern and southeastern parts of the country, which perhaps reflected the level of interference on the part of local officials in the electricity business or the lower efficiency levels of the state-owned distribution units, or both.

*Fair and effective justice systems and arbitration systems to enforce the rule of law, property rights, and contract obligations are essential for reducing the business risk and for attracting private sector investment to the sector.* From this perspective, Brazil had been spectacularly successful in receiving foreign and domestic private investment. Bulgaria and Lithuania had also been able to attract foreign private investment for their sector needs with relative ease. Turkey and Vietnam received significant private investment, although most of it was based on sovereign guaranteed “take or pay” contracts for the outputs. Delhi attracted domestic private investments in the context of international bidding among qualified investors. Vietnam is also encouraging domestic investors, and its equity sales relating to power assets are directed mostly to domestic investors. The domestic investors, on the whole, have a greater level of risk tolerance, since they have a better appreciation of the degree of risk and confidence in their ability to manage them. The Dominican Republic is an exception in that it received substantial foreign private investment for power generation based on sovereign guaranteed “take or pay” contracts with high power prices mostly in a nontransparent manner through direct negotiations. The macroeconomic problems and lack of consistent rule of law have actually made these investments highly risky

and nonfunctional, and have left the country to suffer from continued rolling blackouts.

## **Lesson 2. The Importance of Generating Internal Cash for Investment**

*Of the possible sources for meeting the power utility’s incremental investment needs (to rehabilitate existing assets, replace retiring assets, or acquire new assets needed for meeting incremental demand), the most important one is the internally generated surplus cash after meeting all its operational expenses and debt service needs.* Power sector investments, especially in the public sector, generally call for an equity investment of 30–40 percent of the total cost—the remaining 60–70 percent being largely financed by long-term debt. Thus, most successful utilities traditionally aim to secure internally generated cash surplus at least equivalent to 30–40 percent of the incremental investment needs. Such funding expressed as a ratio of the annual investment needs is commonly referred to as the self-financing ratio (SFR). To even out the lumpiness of power sector investments and to avoid large annual fluctuations in tariffs, annual investment needs are typically averaged over three or five years (usually one or two previous years, the current year, and one or two following years) for purposes of the calculation of this ratio. Achievement of an SFR of 30–40 percent is a function of a range of efficiency factors, including (a) least-cost planning and construction, and efficient operation of the system to minimize costs; (b) securing cost-reflective tariffs; (c) efficient billing and collection; and (d) prudent borrowing that matches the maturity of debts with the average useful life of the assets and hedging for foreign exchange risk. Most of the successful

### **BOX 1. Implications of Lesson 1 for World Bank Group Staff**

The sustainability of power sector investments can be achieved mainly in the context of the country’s consistently adhering to the rule of law and impartially enforcing property rights and contract obligations. Justice and arbitration systems, debt recovery systems, and bankruptcy laws need to be adequate, impartial, and effective. Often, operations may have to be carried on during periods of transition when the country is actively moving toward this objective. In such cases, the ring-fencing of the specific Bank operation from the prevailing political and legal culture of the country provides some protection from fiduciary risks. However, problems encountered in the Dominican Republic demonstrate that even well-designed projects can be prone to problems if the broader reform agenda is not adequately addressed.

Perhaps the best policy is to present the experience of successful economies (in deriving optimal benefits from investments through adherence to the rule of law and good governance) in seminars and training sessions funded under technical assistance. It is important for the Bank staff to maintain support for a broad-based reform agenda, using a multisector approach. Accelerating power sector reforms ahead of some of the more fundamental reforms concerning the rule of law and respect for private property has often proved counterproductive. Particular focus on broad-based judicial reforms that support an improved investment climate, capital market reforms, and a disciplined approach to publicly owned assets is important for the success of power sector reforms.

utilities covered by the case studies (Botswana, Brazil, Bulgaria, Ethiopia, Lithuania, Turkey, and Vietnam) had SFRs at or exceeding this range. Financially sound utilities with good SFRs would be able to raise debt financing from domestic commercial debt markets, as well as from IFIs and export credit agencies. Depending on the country's credit rating, they may be able to access the international commercial sources as well. In the event of the country seeking private participation, the terms would be more attractive in relation to dealings with such financially sound utilities. The better terms obtained for build-operate-transfer (BOT) cases in Vietnam and build-own-operate (BOO) cases in Turkey (for example, in comparison with those obtained in the Philippines or Indonesia) attest to this. Further the high net cash flow, as evidenced by high SFRs, makes the privatization of the utility easier, and it makes their valuation higher and able to fetch attractive privatization receipts, as attested by the experience of Brazil, Bulgaria, and Lithuania.

*An important element outside the control of the utility in achieving this ratio is the timely adjustment of the tariffs to adequate levels.* The role of the government in enabling such price adjustments in a manner that is fair both to the consumers and the utility, either by itself or through a regulatory body (allowing it to have adequate independence), is a critical success factor for the financial sustainability of the sector. Bulgaria, Brazil, Delhi, Lithuania, and Turkey have independent regulatory bodies. In Ethiopia and Vietnam, the regulatory body is either a part of the relevant ministry, or the government gives final tariff approval. The regulatory body in the Dominican Republic was initially a part of the Ministry of Commerce and Industry and later became an autonomous body with its members being appointed by the president, and subject to ratification by the congress. Its independence is largely theoretical. In Botswana the government decides on tariffs proposed by the power company. The record of Bulgaria in adjusting tariffs to minimize cross-subsidies and reach cost-reflective levels in the last three years is especially noteworthy. Delhi still has a long way to go to reach cost-reflective tariffs and eliminate sector subsidies. The record of the governments of Botswana, Ethiopia, and Vietnam in relation to tariffs is also noteworthy. The Dominican Republic proves that even the highest tariffs in the region are of no consequence when poor governance and corruption inhibit sector operational efficiency and even its sustainability.

*In Botswana and Ethiopia, access to electricity is very low and the internally generated cash surplus of the existing utility cannot be expected to be adequate to finance the large system expansions to provide access to the rest of the country.* Even when the costs of such grid expansion are met from government grants or equity, the financial health of the utility is strained, since the new areas tend to have poor load density and poor load factors for a number of years. Thus, the pace of grid expansion must be phased to avoid a significant dilution of the financial health of the utilities. In respect of countries where the area and population without access to electricity are several times larger than those with access, what is needed is the ushering in of multiple new organizations in the private or public sector to cover different parts of the country if universal coverage must be achieved within a reasonable time frame. The IFIs and the donor community may have an important role in enabling such increased electricity access in low-income countries, such as Ethiopia.

*In large markets, such as in Brazil, Turkey, and Vietnam, the sheer volume of incremental demand is so large that several players are needed to meet it.* Thus they focus on creating a range of generating companies financed by foreign and domestic public or private enterprises, creating competitive markets at least at the wholesale level. In Brazil 27 percent of the generating capacity is in the private sector. This share is expected to rise to 44 percent when the plants under construction are completed and when the plants for which concessions have been given materialize in the next three or four years. In Turkey 41 percent of the generating capacity is in the private sector. In Vietnam the capacity owned by independent power producers in 2005 was about 22 percent of the country's total installed power generation capacity. Several new independent power producers (either under BOT or other types of arrangements) are constructing new generation capacities.

*Even in such reformed multiple agency power systems, the transmission and distribution network entities performing monopolistic functions (and therefore subject to regulation) need to meet SFR targets, since these systems constantly need investments to rehabilitate, reinforce, and upgrade system components to meet incremental demand reliably.* Network loss reduction through such investments has a critical impact on system reliability and generation needs.

## BOX 2. Implications of Lesson 2 for World Bank Group Staff

Bank staff need to have a clear focus on the ability of the utility or the sector to generate a net internal cash surplus (after meeting all operation expenses and full debt service obligations) that is adequate to meet at least the equity requirements of the system expansion as it provides the basis for institutional viability and investment planning. Such a focus enables an analysis of both efficiency aspects relating to load forecasts, system planning and operation, and pricing (tariffs). This approach would be valid even after sector unbundling and reform, especially in respect of regulated segments. An analysis of the limitations of utilities with good SFRs that are still unable to meet the needs of system expansion would trigger sector reform to usher in new players and investors to handle the incremental investments.

## Lesson 3. The Importance of Good Governance and Transparency

*Good governance and transparency are the two critical ingredients for enabling the sustainability of the sector operations, creating confidence among potential investors, attracting and sustaining reputable domestic and foreign investors, and ensuring successful sector outcomes.<sup>6</sup> Aspects of good governance include the following:*

- Recognition of the sector problems and needs in all their dimensions and configurations, and their impact on sector policies.
- Full and consistent ownership of the program designed to overcome the problems and meet the needs (through all its political vicissitudes).
- Transparency in all transactions to enable meaningful accountability.
- Oversight (without interference or micromanagement) to ensure that sector agencies provide services to customers at acceptable levels of quality and reliability.

*Elements of good governance are seen in the case of Delhi where the government displayed great political will and resolutely adhered to its reform program involving distribution privatization to reduce ATC losses and improve the quality of service through all the opposition faced by the reform program in a democratic milieu.*

The privatization involved writing down the asset values based on “business valuation” and undertaking innovative bidding on the basis of the extent of the ATC loss reduction the bidder commits to achieve in a five-year time frame. Although the continuity of the same political party and the same chief minister in power was a great help, the chief minister on occasion had to overcome reservations from her own party. Largely because of the disciplined

leadership provided by the government, the new private sector owners are succeeding in reducing losses even below the agreed targets.

*The situation in the Dominican Republic provides a sharp contrast.* Sector reforms initially attracted significant levels of private investment, although many of the BOT contract awards were made in a nontransparent manner. Lack of political will to continue the reform, poor governance, extensive corruption, lack of transparency, ill-designed subsidy schemes, and high tolerance of the culture of nonpayment have resulted in the sector continuing to face relentless rolling blackouts and failing to provide any reliable service, despite extensive private sector investments and high tariffs. The two distribution companies owned by Union Fenosa of Spain were renationalized in a totally nontransparent manner.<sup>7</sup>

*Turkey’s early set of BOT contracts were awarded in a nontransparent manner.* The power reform process in Turkey experienced delays and setbacks caused by a lack of shared vision and cooperation among those committed to reform and those opposed to reform in sections of bureaucracy, the utilities, and some consumer groups. Ambiguities in the constitution and the rulings of the Constitutional Court and the stance of Administrative Court (Danistay) hindered the implementation of the reform program. Distribution privatization that had been delayed for several years is finally being undertaken on the basis of giving selected private investor operating rights for 49 years and not on the basis of outright sale of assets, as originally envisaged. By contrast, Vietnam’s attempts to attract private sector investment seems to be successful on account of the consistent and shared vision of the government and the utility and the coordinated functioning of the government and the utility complementing each others’ skill sets. Stability of policies and transparency of transactions also seem to enable Vietnam to secure attractive terms.

<sup>6</sup> See also World Bank (2006) for a fuller discussion of this aspect.

<sup>7</sup> Union Fenosa owned 50 percent of the equity and was given managerial control at the time of privatization.

*Bulgaria and Lithuania represent cases of sharply improving governance and transparency in the context of their EU accession efforts, thus ensuring successful sector outcomes.* The autonomy and leadership of the Lithuanian regulatory body, coupled with sustained political support for reform, greatly facilitated sector reform. Bulgaria was able to privatize its distribution assets on attractive terms and secure private investment for some of the new generation needs.<sup>8</sup> The Bulgarian power utility and its subsidiaries enjoyed considerable operational autonomy and good corporate governance. The government tended to monitor and evaluate their performance over time and across the legal entities through the credit ratings they managed to secure from international credit agencies from time to time. Brazil managed to maintain good governance and continuity of the substance of reform in a pragmatic manner, despite changes in the administration. Its efforts at creating new institutions and enabling them to function with autonomy and competence have contributed to its spectacular success in attracting and sustaining massive foreign private investments in the sector.

*Botswana represents a case of good, clean, and transparent governance, where the government gives the utility full operational autonomy and monitors its performance through rates of return on net revalued assets, and provides funds for phased rural expansions.* The utility was thus able to attain high standards of efficiency and profitability at an average tariff of about 5.2 cents/kWh and fully succeed in its mission to provide least cost and reliable service to its customers during the last two decades or more. The government is considering putting in place a performance contract between the utility and the Public Enterprises Evaluation and Privatization Agency.

*Ethiopia, by contrast, provides good governance by close control and supervision of the power utility.* Its eight-member Board includes three important cabinet ministers, two ministers of state (slightly lower in rank than a cabinet minister), and a senior official of the Ministry of Infrastructural Development. It is chaired by the most senior among the three cabinet ministers. The utility was well run and remained (at an average tariff of about 5.3 cents/kWh) profitable with good SFR, debt service ratio, and with good levels of liquidity. Its system losses are contained at 20 percent, and its receivables are equivalent to less than 40 days' sales. Government policy had maintained continuity for more than 15 years; at the same time, both the government and the utility had been receptive to the needed changes.

Rapid system expansion to cover the vast areas without electricity access could dilute its financial soundness, unless tariffs are raised further and its debts restructured. More practical solutions may lie in the direction of creating a plurality of small utilities clustered around the scattered potential load centers, preferably privately owned and with freedom to have tariffs different from national tariffs to cover differing costs of supply in each such utility. As load density and load factors develop to a reasonable level, the interconnection among these utilities would become economic.

Effective communication of the objectives and rationale for specific reform efforts prior to and during their implementation to all the affected parties and the people in general is an important component of good governance. Managing expectations and making people understand that successes cannot be achieved overnight in reform efforts are critical tasks. This adds to the transparency and also helps the government make improvements based on meaningful public reaction. It helps to influence public perception and create and maintain support for the reform efforts. It has been pointed out that in the case of Delhi's privatization of distribution, better and more timely communication efforts on the part of the government and the new owners of distribution systems would have contributed to a higher level of public support for the privatization transaction and a better appreciation of the post-privatization performance of the companies. A successful example of effective communication greatly assisting implementation is provided by the Brazilian experience in power rationing during the 2001–02 power shortage.

#### **Lesson 4. The Importance of the Role of Third Parties in Promoting Reform**

*The reforms that are needed to enable the power sector to become financially sustainable and capable of attracting investments from domestic and foreign private entrepreneurs are often politically difficult, especially in democratic countries with multiparty systems.* Political opposition generally tends to delay and defeat the ruling party's reform efforts, which call for unwavering adherence to the reform program despite temporary setbacks. An external stimulus is often known to create a national consensus that overcomes the partisan approach and enables such unwavering focus on reform.

<sup>8</sup> According to Transparency International (2005), the Corruption Perception Index of Bulgaria improved from 2.9 in 1998 to 4.0 in 2005 on a scale of 1 to 10 (10 being corruption free). Its composite score of six governance indicators (voice and accountability, political stability, government effectiveness, regulatory quality, rule of law, and control of corruption) improved from -0.06 in 1998 to +0.21 in 2004 in a scale of -2.5 to +2.5 (the latter score of +2.5 being the best governed). (See the World Bank websites on governance indicators listed under References.)

### *BOX 3. Implications of Lesson 3 for World Bank Group Staff*

Good governance and transparency at the state and corporate levels are the keys to the reform efforts to make the sector financially sound and to attract foreign and domestic investors to meet the investment needs. Technical assistance to review the existing governance mechanisms and identify and implement improved mechanisms, both at the state and corporate levels, need to be considered and given priority. Country Assistance Strategy (CAS), Regional Economic Development Initiative (REDI), and Economic and Sector Work (ESW) work need to focus on these issues and attempt evaluation of the situation in the country in a manner comparable over time and, if possible, across similarly placed countries in the regions.

*In the case of transition economies, such as in Bulgaria and Lithuania, and also in the case of Turkey, the prospects of accession to the EU acted as the powerful external stimulus. Lithuania had recently become part of the enlarged EU. Bulgaria is a candidate for accession in 2007, and Turkey is a candidate for accession in the subsequent round. The desire to become part of the EU enabled these countries to overcome party differences and arrive at a national consensus and muster the necessary political will to put through reform programs, which often involved difficult decisions and called for stern political will. The EU directives on electricity and gas, and the detailed review and monitoring by the European Commission of reform progress in adopting the EC *acquis communautaire* and the implementing directive had proven effective in facilitating electricity and gas sector reform. The various chapters of EU accession dealt with a wide range of issues related to public policy and public administration, as well as conformity of the policies and institutional arrangements with EU standards as a condition of accession. The EU review in terms of each chapter had greatly helped these countries to upgrade their governance systems, institutional arrangements and levels of transparency.*

*Involvement of IFIs, such as the World Bank and the European Bank for Reconstruction and Development (EBRD), complemented the external assistance and oversight function of EU and facilitated transition. The desire for accession to the WTO has also provided for such motivation in some countries, including Vietnam. The desire to join the Association of Southeast Asian Nations (ASEAN) and its common market was also one of the factors motivating reform in Vietnam.*

*Similarly, the involvement of such IFIs as the World Bank and the regional multilateral development banks (either by themselves or in concert with IMF programs) has salutary effects on governance and transparency, and facilitates sector reform through their advisory, monitoring, and evaluation functions in conjunction*

*with their lending operations. This was evident in the cases of Bulgaria, Ethiopia, Lithuania, Turkey, and Vietnam. Reform efforts proceed for several years in any country, so an important issue in this regard is to ensure continuous involvement and dialogue during the entire period and not to resort to one-time interventions of short duration. Short-lived interventions may help to deal with a specific problem and provide socially justified and urgently needed funds for helping the poor, but generally they have the effect of diverting the attention and focus of the government away from the medium-term pursuit of serious sector reform. By contrast, the experience with the Dominican Republic proves that despite such involvement on the part of IFIs, a country can slide back on reform and good governance and surprise the donor community with opaque renationalization deals.*

*The case studies also show that international and national credit rating agencies can perform a useful function in monitoring and evaluating the performance of the utilities and the sector. They have the relevant expertise and analytical skill, and they look at performance from the perspective of the market and the financiers. The government and the utilities get the benefit of evaluation by a neutral, highly competent, and impartial outside agency. The use of such agencies tends to greatly improve the disclosure standards of the utilities by imposing discipline and consistency in financial reporting. Experience in Bulgaria, Brazil, Lithuania, and Turkey indicates that when the government expects the utility to secure its debts from commercial sources, the exposure of the utilities to such evaluations by international rating agencies is entirely benign. Such rating exercises provide an internal compulsion and motivation for the utilities to improve their efficiency and financial performance to secure better ratings. Better ratings improve their access to debt markets and the terms of their borrowings. In Bulgaria many public enterprises entered into a spirit of competition and strove to beat other enterprises in this ratings game with excellent beneficial results.*

*In India, the Ministry of Energy and the Power Finance Corporation have commissioned the national credit rating agencies (ICRA and CRISIL) to undertake an annual rating exercise of all state electricity boards (SEBs) and their unbundled utilities. Interestingly, in the first full exercise carried out in 2004, Delhi Electricity Board came out on top of the list on account of the efficacy of the sector reform. The CRISIL rating system used 100 parameters that covered all areas of utility operation and government-utility interface, as well as matters related to business, financial, and regulatory risk.*

*A similar approach to standardizing the evaluation of performance and the creditworthiness of power companies in low-income countries as a resource for all IFIs and the donor community would be helpful. An appropriate set of benchmarks could be established for this client base that would be useful for the lenders and investors by clarifying the level of risk in the power sector of each country. Such risk profiling would also be instructive in determining the appropriate level and approach to public-private partnership programs. High-risk countries would resort to public sector ownership and management of the utilities or management of the government-owned utilities by private management contractors. Both cases would call for instruments in which the risk is largely borne by the government. The lower-risk countries could resort to concessions, divestiture, and IPPs, and could use instruments where the risks are borne largely by the investors or where they are equitably shared.*

### **Lesson 5. The Importance of Demand Management, Generation Planning, Electricity Trade, and Joint Investments**

*Demand management, optimal generation planning, and trade and joint investments are three of the practical tools for moderating the incremental investment needs of individual countries. The case studies show that demand*

*management measures had proven effective in resolving supply crises. The serious supply shortages in Brazil between May 2001 and February 2002—and the effective manner in which the supply crisis was managed—showed the huge potential for energy efficiency and energy saving in the economy. The manner of managing the crisis by relying on pricing and quota trading mechanisms has turned out to be among the best practices in power rationing internationally. A serious supply shortage emerged early in 2001 as a result of poor rainfall in successive years and consequent reduction in hydro output, as well as delays in the construction of new thermal power-generating capacity. Exhortations for voluntary load reduction did not prove fruitful. The government then took emergency rationing measures under which consumers were given quotas—generally about 80 percent of past consumption. Consumption above the quota was penalized by electricity prices substantially higher than normal rates, which generally reflected the marginal cost of energy in the wholesale market (along with a threat of disconnection for continued violation). Nonresidential consumers could trade their quotas to others at market prices. Formal auctions of quota entitlements were held. Poorer residential consumers were given bonuses if their actual consumption went lower than 20 percent of the base line consumption. The use of such market mechanisms, rather than rolling blackouts, averted a great deal of economic loss to the country and, more importantly, reduced the demand by an aggregate 20 percent. It also triggered the habit of energy saving and led to the replacement of old appliances and equipment with cost- and energy-efficient ones. Although rationing ended by the end of February 2002, the demand did not reach the earlier levels even in 2003. When the delayed generation capacities materialized, there was actually excess capacity in relation to somewhat stagnant or lagging demand.<sup>9</sup> More important than anything else, this episode demonstrated clearly the potential for economic energy saving in the Brazilian economy.<sup>10</sup> India also had been successful in using the*

#### **BOX 4. Implications of Lesson 4 for World Bank Group Staff**

**Staff needs to be alert to the opportunities of benign third-party interest (such as EU or WTO accession, and participation in regional markets and credit-rating agencies) and make the best use of them to further sector reform and promote investment. Based on the analogy of EU experience, staff could also focus on influencing regional cooperation organizations to evolve uniform sector reform guidelines for their member countries to adopt. Staff should also focus on continuity of the IFI involvement through the lengthy reform process and not be content with interventions of short duration. The World Bank and other IFIs could play the role equivalent to that of credit-rating agencies in low-income countries and build up a standardized client risk database both to facilitate the use of appropriate vehicles and instruments and to help the international investing community invest in such countries.**

<sup>9</sup> OECD 2005, chapter 3.

<sup>10</sup> Considering that Brazil has generation capacities exceeding 82,500 MW and energy generation of exceeding 350 TWh, the potential for savings at 20 percent is huge.

### BOX 5. Implications of Lesson 5 for World Bank Group Staff

Demand-side management, optimal generation planning, promoting electricity trade, and joint investments in generation can greatly help to moderate the volume of investment needs for system expansion and make the task of closing the demand supply gap a little easier. Brazil's experience indicates that demand management is best organized based on economic incentives and economic penalties. Resorting to trade and joint investments may reduce the cost of meeting incremental demands, and staff should be alert to the possibilities in this regard. Economic and sector studies focusing on such possibilities would be the nonlending instruments to formulate such regional trade arrangements and foster institutional changes needed to promote trade. Lending instruments and guarantees would come in handy to facilitate construction of transmission links and other physical facilities needed to enable trade.

pricing mechanism to achieve real time load management, promote grid discipline, and improve the quality of supply in the national and regional grids.<sup>11</sup>

*Demand management efforts, however, should be used not only as a quick fix to address crisis situations, but also in a systematic and comprehensive manner to improve energy-use efficiency and energy conservation on a permanent basis.* Brazil is pursuing such energy-use efficiency projects. Such energy efficiency efforts would be most relevant in transition economies, such as in Lithuania and Bulgaria, that have excessive per capita electricity consumption in relation to their per capita gross domestic product (GDP). These countries do have programs that focus on this aspect, although with less spectacular results. The IFIs may have an important role in strengthening these efforts.

*The Dominican Republic's efforts to handle electricity shortages provided a stark contrast to the efforts of Brazil based on economic incentives.* The Blackout Reduction Program (PRA) of this country was intended to ensure supply to the areas believed to contain the poorer sections of the population in the context of power shortages, and rolling blackouts actually exacerbated the problem, since prices were heavily subsidized and meters were removed. Theft of power increased, and collections did not improve. Thus, wasteful consumption was fostered, which further worsened the shortage situation.

*Optimal generation planning can reduce investment costs of the capacity addition program.* Reliance on all hydro systems reduces reliability of the systems and adds substantially to the system capital costs. This was found to be the case in Brazil, Ethiopia, and Vietnam and, to some extent, in Turkey in the earlier years. Balancing the system with a mix of hydro and thermal units improves

system reliability and moderates system capital costs. Realizing this, these countries in the last few years have focused on increasing the thermal generation capacity. Unit sizes also have a major effect on system capital costs. The large nuclear units in Bulgaria and Lithuania create the need for large system reserves, which are costly. Transmission tariffs in Bulgaria tend to be high, since the transmission company also owns this expensive reserve capacity with little energy generation.

*Electricity trade among utilities within or across countries reduces costs relating to reserve margins and incremental investment, as well as energy and operating costs of supply entities, depending on the country circumstances.* It also leads to improved reliability of the participating systems. Even more importantly, it helps to overcome the problems of uneven energy resource endowments and load distribution across contiguous provinces and countries.

*Botswana was able to reduce substantially its energy costs by relying on imports from South Africa.* It has also been able to postpone investment in additional capacity for several years now. Ethiopia plans interconnections with Sudan, since the latter has a large thermal generation base. This will improve the reliability of the Ethiopian system, which is predominantly hydro, and will enable Ethiopia initially to meet a part of its base load and move its storage hydro units to meet peak demand in a least-cost manner and later even to export peaking capacity to Sudan.<sup>12</sup>

*Delhi relies on imports from the northern regional grid of India and operates its system with only modest installed capacities.* Bulgaria and Lithuania are able to get better returns from their nuclear assets by substantial export of power to adjoining countries. The evolution of the South East European Regional Energy Market would make the trading arrangements more attractive for

<sup>11</sup> The provincial government-owned electricity boards (SEBs) in India buy power from central government-owned generating companies (CGGs) through the Power Grid Corporation of India. Under the availability-based tariff system, the price of electricity consists of a capacity charge, an energy charge, and a charge for unscheduled interchange (UI). The scheduled dispatch is on the basis of implied contracts between the SEBs and CGGs. The UI charge is based on the frequency of the grid at the time of such interchange. Thus, the UI charge when the frequency falls to 49 Hz is 3.8 times the UI charge for supply at 50 Hz. Further, the charge falls to zero when the frequency exceeds 50.5 Hz. SEBs are thus compelled to manage their loads better in order to avoid very high UI charges.

<sup>12</sup> Peaking power fetches a much better price than base load energy.



Bulgaria. Completion of the Baltic Electricity Transmission Ring and related arrangements would enable Lithuania to diversify its electricity exports to solvent customers, as well as to secure better prices.

*Turkey had been meeting a part of its shortages in the past through imports from Bulgaria. It is making arrangements to become part of the Union for the Co-ordination of Transmission of Electricity (UCTE), so that it can become a part of the large European electricity market and be in a position to market electricity from its multiyear storage hydroelectric stations for the daily peak requirements of the Western countries at attractive prices.<sup>13</sup>*

*Brazil also makes use of imports from adjoining countries to meet the demands, especially in its various isolated systems. Joint investment in the Itaipu Hydroelectric Power Station by Brazil and Paraguay has been of immense economic benefit to both countries in meeting their demands.*

*Vietnam imports electricity from the Yunan and Guangxi Provinces of China and is making significant transmission investments to increase the level of imports. The Asian Development Bank (ADB) and the World Bank Group are promoting Greater Mekong Regional Cooperation initiatives under which Vietnam is considering electricity imports from Cambodia and Laos, and for this purpose it is strengthening the relevant transmission links. Vietnamese companies are investing in BOT projects in Laos, among other things, to secure the import of power from Laos to Vietnam.*

### **Lesson 6. The Importance of the Role of the Private Sector and of Meeting the Increased Demands It Makes on the State**

*Although the governments of the developing economies have a substantial responsibility in ensuring that supply-demand balance is achieved on a continuous basis in*

*the electricity sector (so as not to inhibit economic growth), the public sector in most countries cannot possibly do it alone without participation from private investors, especially in the context of such enormous investment needs. Government's responsibilities toward the attainment of Millennium Development Goals and the need to alleviate poverty have placed immense demands on the scarce public revenues, and the prioritization of the demands on public revenues has become urgent. Inevitably such prioritization would involve allocation of investment responsibilities to the private sector for all commercial goods and activities that the government does not need to do and that the private sector is well equipped to handle. Although providing access to electricity to the population in the areas not yet electrified could possibly be regarded as a public good and a responsibility of the state, continuous provision of electricity for consumption is clearly a commercial activity that the state can shed to, or share with, the private sector. Structural changes to the power sector that involve the unbundling by function (generation, transmission, distribution, supply, and trading) to varying extents, depending on the size and country circumstance, to enable the entry of private investors have thus become necessary. The experience in most of the case studies clearly illustrates the evolution of this line of thought.*

*Initially private sector entry into generation took the form of BOT and BOO types of contracts, in which the vertically integrated state-owned utility gave a "take or pay" contract for the full output covered by sovereign guarantee. This was done extensively in Brazil, the Dominican Republic, and Turkey, and to a much smaller extent in Bulgaria and Vietnam. Experience in these countries showed that in the early years, the transactions were opaque (based on private negotiations), and the resulting contracts had very high electricity prices and allocated a majority of the risks (market, exchange, dispatch, fuel price, and payment) on the government. These transactions have created large contingent liabilities to the governments. BOT and BOO contracts obtained in the later years based on competition and transparent procedures tended*

#### **BOX 6. Implications of Lesson 6 for World Bank Group Staff**

Given the growing demands on the state revenues, it will be advantageous to help governments devise ways appropriate for the country circumstances to help associate private investors meet the supply-demand gap in the power sector. Based on the experience of many developing economies in the last 15 years, staff need to impress on the governments the greater and more sophisticated demand that such association would make on the governments for improved governance. Technical assistance, as well as economic and sector work, should focus on the improvement of the capacity of the government to handle this responsibility.

<sup>13</sup> The time difference between Turkey and the major demand centers in Western Europe also helps Turkey in this regard.

to have reasonable electricity prices and resulted in contracts with a much fairer allocation of the various risks among the parties. The BOT and BOO contracts in Bulgaria and Vietnam, and the BOO contracts of Turkey serve as examples of this type.

*Contracts with durations of 20 years or more, however, tended to create problems when the sector was sought to be unbundled to introduce competition.* Increasingly, private sector entry in generation is desired in the form of merchant plants assuming increasing market and dispatch risk and competing in the wholesale market for dispatch. This is broadly the case in Brazil nowadays, where periodic energy auctions reduce the market risk for the investors. In most EU accession countries (including Bulgaria and Lithuania), a regulated market for captive consumers and a competitive market for eligible consumers coexist. The latter is expected to cover all but the residential consumers in a few years and ultimately all the consumers. In this environment, private investors in generation tend to have negotiated long- and medium-term supply contracts with eligible consumers (including distribution entities) to reduce their market risk.

*Private investors are reluctant to invest in generation and face the market risk.* In the absence of evidence of a credible revenue stream, these investors have trouble raising debt financing. To overcome this problem, in 2004 Brazil adopted the novel method of energy auctions to promote a form of forward contracts for electricity needs of the distribution companies to serve their captive consumers. Such auctions would be held a few years in advance of the forecast delivery. Thus, the auction held in 2004 for about 40 GW was for firm deliveries starting in 2006, 2007, and 2008. The next auction, to be conducted soon, will be for deliveries in 2009 and 2010. The bidders should have decided on sites and should have secured environment licenses. The installation and operational business licenses can be secured after the auction. The prices obtained in such competitive auctions would be allowed as “pass through” in full by the regulator in determining retail tariffs. Armed with such contracts, entrepreneurs are expected to secure finance and bring the generation capacities on schedule.

*Bulgaria, Brazil, Lithuania, and Turkey are moving to a market model in which there will be coexistence of an expanding competitive segment and a gradually contracting regulated segment.* There will also be a coexistence of the public sector (some multipurpose

hydro, nuclear, and some reserve capacity units) and private sector (all other forms) in generation, largely public sector–owned transmission—and mostly privately owned or operated (based on concessions) distribution. The regulated segment would cater to the needs of captive consumers with consumptions below the threshold prescribed for the “eligible consumers.” Eligible consumers would secure their supply in the competitive segment. Delhi and the Dominican Republic follow a simpler form of the single buyer model, while Botswana and Ethiopia do not as yet have any private sector investment involvement.

*Privatization of generation and distribution assets proved successful in Brazil, Bulgaria, and Lithuania as a function of the competitive and transparent procedures that were adopted, the quality of the governance provided by the state, the structure of the sector, and the credibility of regulatory arrangements.* Privatization of the distribution segment in Delhi was characterized by the innovative method of bidding that focused on the reducing ATC losses and writing down the asset values based on a business valuation methodology. Vietnam does not plan to privatize its power assets through outright sale. Rather, it sells minority equity shares (in phases) to recoup the money locked up in those assets. Turkey has had constitutional and legal problems in privatizing its distribution systems and, after long delays, has decided to transfer the operating rights for a period of 49 years on the basis of competitive bidding.

*Although privatization is no panacea, private sector investment is both desirable and unavoidable in the context of widening the investment gap in the power sector.* The private provision calls for a greater and more sophisticated role and governance from the state to ensure competition and prevent anticompetitive behavior, so as to enable independent and fair regulation and ensure the accountability of the regulators. The state must reduce the country risk to the foreign investors through the adoption of prudent exchange rate, trade and investment regimes, and sound macroeconomic policies. It must usher in sound financial, banking, and insurance systems and promote credible stock exchange and company law administration. Brazil’s case illustrates the possible need for the state to take the lead in making demand forecasts and force the distributors toward forward contracts to promote timely generation investments to ensure system reliability and maintain the supply-demand balance. Thus, privatization is not an easy solution or a substitute for weak and corrupt

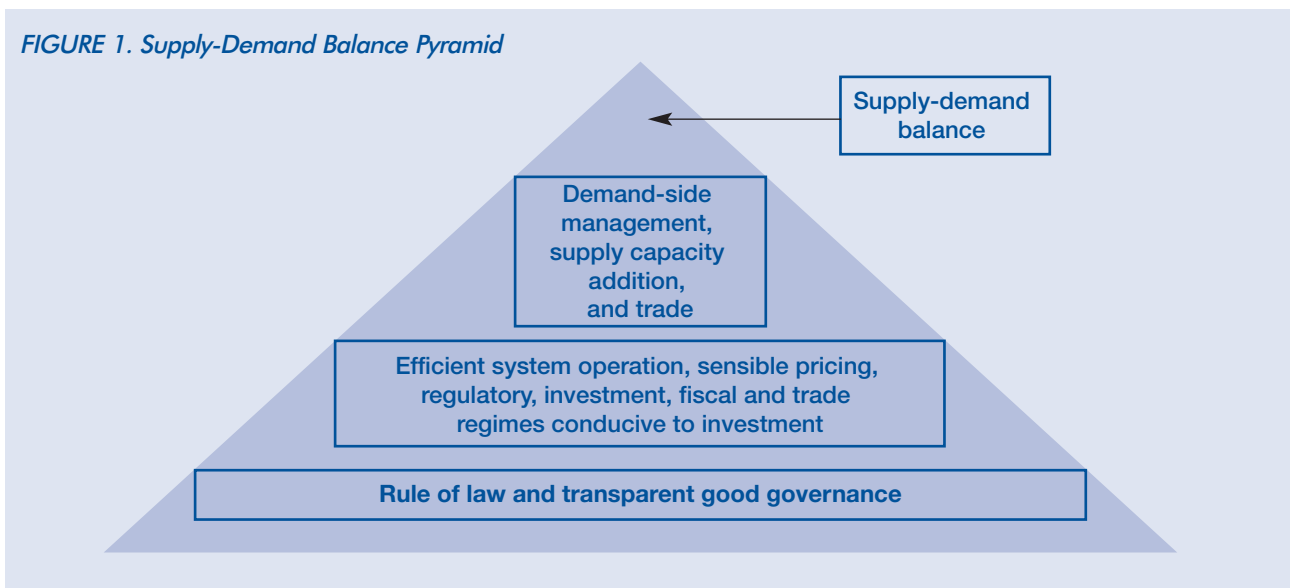
government ownership of the sector. It is suitable only for the strong and well-governed states.<sup>14</sup> When this is not the case, privatization is merely exchanging one form of incompetence for another, as was illustrated clearly in the case of the Dominican Republic.

### Conclusions and the Role of the Bank

*Closing the supply-demand gap in the electricity sector is not a one-time exercise, since systems in balance today may go out of balance in a few years.* It calls for a constant and ceaseless effort. Supply must increase to keep pace with demand growth, while at the same time avoiding a buildup of excess capacities. Demand management must supplement prudent supply augmentation, and trade must be effectively used (where possible) to fully exploit available excess capacities or to meet shortages arising in the context of delays in commissioning new capacities or where imports make better economic sense than creating new domestic generation capacities. These ceaseless efforts must be made on a solid foundation of efficient system operation and economically sensible pricing through competition or transparent regulation. Investment regimes, fiscal and trade regimes, and sector regulatory regimes (including network access) must be conducive to attracting private investments. All of this has to rest on the bedrock of the rule of law and transparent good governance (see figure 1).

*Figure 1 is an ideal “construct.” Such a combination of ideal conditions may not prevail in all economies at all times.* To the extent actual conditions approximate the ideal, the supply demand balance would be more within the reach. To the extent the actual conditions deviate from the ideal, supply-demand gap would widen. Turkey, Vietnam, and Brazil achieved better results, each emphasizing different elements to make conditions in their country closer to the ideal. Vietnam focused on efficiency of operations and pricing. Its approach to governance and rule of law was good enough to enable the utility to collect its revenues and run an efficient and financially sound operation. Turkey focused on certain types of private investment and created substantial excess capacities. Brazil’s recent experience emphasized spectacular demand management through pricing mechanisms. Still their successes are fragile. Capacity shortages are already emerging in Vietnam. Forecast demand growth in Vietnam is so large that it has to adjust to independent regulatory regimes and attract substantial private investment to meet future demand. For this its governance practices and adherence to rule of law have to be upgraded, and there is evidence of that happening already. Brazil’s system of energy auctions remove market risks and promote private investment in generation and may thus prove a hedge against anticipated capacity shortfall a few years later. Turkey which is likely to face capacity shortages toward the end of the decade is yet to figure a way to ensure that desirable types of private investment would flow in generation without increasing the government’s contingent liabilities. Medium term options under consideration include capacity incentive mechanisms to promote the evolution of capacity markets complementing the energy markets.

FIGURE 1. Supply-Demand Balance Pyramid



<sup>14</sup> As Rene Prud'homme (2004) puts it, "Privatization is a desirable goal at the end of a long and arduous road."

*The power sector entities in Botswana (clearly) and Ethiopia (generally) have succeeded in getting better results by focusing on pricing as well as on investment and operational efficiency within the limited areas of the country in which they operate. However, providing access to electricity to the remaining areas, which are several times larger than their very limited operational areas, is well beyond their control. While they could hope to interest private investors in such electrification, the process is likely to be long drawn out. The provision of access to electricity to the remaining population in such countries may have to be handled by the public sector, though consumption subsidies could hope to be avoided. International aid could accelerate the process to some extent.*

*Bulgaria and Lithuania, which managed their supply-demand balance well, based among other things on their substantial nuclear generation capacity. Some of their nuclear units have already been shut down, and some more are due for shutdown fairly soon. When this happens, they would need additional capacity. By and large they should be able to manage the change, as forecast demand growth is moderate, and as both countries have adopted sector reforms, pricing and regulatory improvements, and have created conditions conducive for continued private sector interest in investment in the context of their EU accession.*

*Delhi's courageous move to privatize its distribution segment and create and support an independent regulatory regime has clearly accelerated the pace toward achieving a supply demand balance in not too distant a future, especially in the context of its ability to trade in the region and the investment regimes in the country favoring private investment in generation. Success would depend on a continuation of the present political commitment to reform and securing public support.*

*The Dominican Republic represents a sad case of deviation from most of the ideal conditions with unsurprising and unflattering results.*

*The clear lesson emerging from the case studies is that while it may not be possible to reach the ideal set of conditions in all countries and at all times, serious attempts to reach them have a good correlation to the extent of success in closing the supply-demand gap. Short to medium term plans and strategies may have to be evolved based on country circumstance to reach those ideal conditions, at least partially, if not substantially. The implementation of such plans should help fill the gap to a large extent.*

*Given the huge investment needs and the large investment gap, there could be a case for some increase in the level of IFI assistance to the sector from the present low level (of about 3–4 percent). The World Bank has recently increased the share of the energy and water sectors in the total annual Bank lending. Hopefully all the other IFIs would adopt a similar approach. In this context the IFIs should be prepared to lend to the electricity sector, more than in the recent past. The increased lending or guarantee assistance could be used effectively for operational efficiency improvements, demand management, optimal generation planning, promotion of regional trade and joint investment initiatives (all of which would reduce the incremental investment needs) as well as in promoting policies which will stabilize internal cash surplus generation of existing utilities and provide attractive structure and environment for the flow of private investments. Such IFI lending would focus on “public good” aspects of the sector such as regulation, market design, transmission access and competition as well as on strengthening of transmission and distribution networks and dispatching arrangements to enable competition. Funding could also focus on assets with very long life (such as hydroelectric dams and reservoirs) in respect of which the maturity of commercial financing cannot match the useful life of the asset. Further, the IFI lending would have to continue to be highly selective and catalytic in nature and mobilize much larger sums of funding from sources, not otherwise accessible to the utility or the country. Finally the IFI lending has to be conditioned on securing substantial sector reforms and governance improvements to make the sector operation efficient and sustainable.*

*Special focus of the technical assistance operations would be on (a) promoting transparency, information flows, and adequacy of financial and technical disclosures; (b) enabling the evolution of appropriate benchmarks for operational and investment norms; and (c) upgrading the capacity of the governments to handle the demand for improved and alert governance that enhanced private participation would call for.*

## CASE STUDY A: BOTSWANA

*Botswana is a large country (600,370 square kilometers) with a small population of 1.68 million (as of the 2001 census). More than four decades of peace and economic growth have created one of the success stories of Africa. Since independence from the British in 1966, Botswana has graduated from the status of a low-income country to that of a middle-income country with a GDP per capita of \$5,000. Although Botswana's economic outlook remains strong, the country is threatened by AIDS, because infection is widespread even among skilled and well-educated members of the workforce. Hitherto, the main driver for economic growth has been diamonds, although the government is now pursuing a policy of diversification of the economy to reduce its reliance on the extraction of minerals.*

### Overview

*Electricity supply in Botswana is provided by the Botswana Power Corporation (BPC), a parastatal established in 1974. BPC is generally well managed and has achieved strong growth in both sales and numbers of consumers. In recent years, however, costs have escalated; in particular, staff costs have increased at more than 20 percent per year since 1998. Electricity is supplied by the 132 MW Morupule coal-fired power station and increasingly by low-cost imports from South Africa. The availability of low-cost imports has allowed BPC to defer the construction of additional generating capacity and to maintain stable electricity tariffs in nominal terms (reduced in real terms) for the last 10–15 years.*

*The government supports rural electrification through the funding of grid extensions and basic distribution infrastructure within the villages supplied. It also guarantees loans provided by BPC to cover connection costs. BPC funds distribution extensions within the villages, along with the cost of connections. However, in spite of the financial support provided for rural electrification, the take-up rate remains low in some villages. The issue of increasing access appears to be principally one of affordability and sustainability, rather than a lack of investment. There appears to be a risk that further substantial progress in increasing access may be hampered, unless these factors are addressed, possibly through a lifeline element in the domestic tariff.*

*BPC is profitable, has low borrowings, and regularly pays dividends to the government. It has low system losses; billing and revenue collection is good; and almost 50 percent of its capital investment over the past seven years has been funded from retained earnings.*

*The electricity sector in Botswana has not experienced an investment gap on the basis of its planned development in recent years. The main issue does not appear to be one of an investment gap, but rather of affordability of electricity by lower-income households in both urban and rural areas. Although access remains relatively low—at about 28 percent in 2003—substantial progress has been made since the early 1990s when it was only 11 percent.*

*The following are the noteworthy elements of the Botswana experience:*

- Noninterference on the part of government in the affairs of BPC.
- A strong and well-managed economy, which created a favorable environment for the electricity sector.
- An enlightened and flexible approach adopted by BPC and government over the policy of electricity imports has resulted in a reduction in the real tariffs with no loss of reliability of supply.
- The government has provided strong financial support for the rural electrification program, the implementation of which has been well managed by BPC.
- A low level of consumption of electricity by low-income households may be more a function of affordability than a function of inadequate electricity sector investment.
- Increases in BPC's operating costs, in particular staffing costs, are being addressed by an internal restructuring of BPC into separately accountable business units.
- BPC must take into account the impact of the HIV/AIDS pandemic on its management and technical strength.
- BPC's success has been achieved with virtually no involvement of the private sector, other than in the design and construction of system extensions.

This case study was prepared by the consulting firm Power Planning Associates Ltd., United Kingdom ([www.powerplanning.com](http://www.powerplanning.com)). It has been edited slightly for consistency of presentation of all case studies.

The currency equivalents in this study were based on the exchange rate as of March 2005: Pula 1.0 = \$0.22. The fiscal year is April 1 to March 31. N.B. A 12 percent devaluation of the pula against the basket of currencies to which it is pegged was announced on May 31, 2005, after the report was drafted.

*Botswana has increased access to electricity—from 11 percent of the population in 1993 to 28 percent by 2003—and is considered unique, certainly in Sub-Saharan Africa, in that this increase in access has been funded without recourse to large external financing and with a substantial proportion of the funding generated internally by the wholly government-owned BPC.* This has also been achieved without significant private sector involvement in the power sector. Botswana does not therefore have a power sector investment gap in terms of its current and planned investments, and it has managed to fund its expansion primarily from internally generated funds. The report also discusses whether the low (if increasing) level of access is the result of insufficient investment or is more an issue of affordability, given that the BPC is charged by law to conduct its affairs on a sound commercial basis.

### **Economic Background**

*Botswana is landlocked and has borders with Namibia, South Africa, and Zimbabwe. About 80 percent of the population lives in the eastern part of the country.* The country has indigenous coal reserves, but no hydro resources or petroleum reserves, and all the country's petroleum product requirements are imported—mostly from South Africa. The country has good road infrastructure.

*More than four decades of peace, stability, and enlightened democratic government have created one of the economic successes of Africa.* During the three decades following independence from the British in 1966, Botswana achieved an annual rate of growth of 9 percent, which has made it one of the fastest growing economies in the world. Since 1996, the rate of growth has slowed. The principal driver for this growth has been diamonds, which have been successfully exploited since 1971. Government revenues depend heavily on the export of diamonds, which account for 82.5 percent of export receipts and 50 percent of government revenues (2003). Botswana's other principal exports are copper, nickel, soda ash, and beef. The country also has a small, but rapidly growing, tourism industry, which is now the country's second largest foreign exchange contributor, earning \$240 million per year and accounting for 10 percent of GDP.

*The formal employment sector is divided at 61 percent private (including parastatals) and 39 percent government.* Unemployment is about 53 percent based on the formal (paid) employment sector and 24 percent if the informal

employment sector is included. The principal activities in the formal employment sector are wholesale/retail (24 percent), construction (17 percent), manufacturing (17 percent), hotels/restaurants (8 percent), and mining (5 percent).

*Although Botswana's economic outlook remains strong, the devastation that AIDS has caused threatens to destroy the country's future.* In 2001 Botswana had the highest rate of HIV infection in the world with 350,000 of its 1.68 million people infected. In 2002 with the help of international donors, Botswana launched an ambitious national campaign to tackle the problem by providing assistance so that those infected could get access to antiviral drugs. The program, however, is costly, and health spending is rising rapidly as a result. The government budget for the HIV/AIDS program in 2005/06 is P 650 million. HIV/AIDS remains the single biggest threat to the country, since infection is widespread even among skilled and well-educated members of the workforce.

*Botswana is a member of the Southern African Development Community (SADC), which was initially formed in 1980 as a loose alliance of nine majority-ruled states.* In 1992 SADC achieved legal identity with the signing of the Declaration and Treaty by the heads of states of the current 13 member countries. SADC headquarters is in Gaborone.

*The currency of Botswana is the pula. From independence in 1966, Botswana continued to use the South African rand until 1976 when the pula was introduced.* The pula is linked to a basket of currencies, including the South African rand and the currencies within the Special Drawing Rights (SDR). Since it was introduced, the pula has generally traded at a premium against the rand. The government has devalued the pula at various times to control domestic inflation and maintain the competitiveness of the country's exports. The most recent devaluation of 7.5 percent occurred in February 2004. Botswana offers attractive incentives to foreign investors. All exchange controls were ended in 1999. Botswana currently has an "A" credit rating with both Moody's and Standard and Poor's.

### **The Legal System**

*Botswana's legal system is based on a written constitution that contains a bill of rights that guarantees everyone fundamental human rights and freedoms without regard to ethnic origin, religion, or sex.* Since independence in

1966, Botswana has had an impressive record of observance of the rule of law, and its citizens have generally enjoyed the rights and freedoms guaranteed by the constitution.

*Botswana is a parliamentary republic.* Parliament consists of the House of Chiefs (a largely advisory body comprising 15 members, 8 of whom are tribal chiefs, 4 of whom are elected subchiefs, and 3 of whom are members selected by the other 12 members), plus the National Assembly (with 61 seats, 57 members are directly elected by popular vote, and 4 are appointed by the majority party). Elections are held every five years: the last election was in 2004.

*The judiciary comprises the High Court, Court of Appeal, and Magistrates' Courts (one in each of the nine districts).*

*The government is in the process of introducing a new Companies Act in order to "...remove bureaucratic restrictions that prevent all firms, both private and public, from operating efficiently and profitably."* There is currently no Competition Law, although the government intends to introduce legal provisions for competition and regulation.

### **The Business Environment**

*The business environment in Botswana is open and relatively free from bureaucracy.* Companies are required to register in accordance with the Companies Act and obtain a license, a process that normally takes four weeks. The government is intent on diversifying the economy and has been focusing on manufacturing, tourism, information and communications technology, and financial services.

*Investment in manufacturing has been limited because of the size of the local market and long supply routes, the limited raw materials produced in Botswana, and the price of electricity, which is higher than in South Africa, Botswana's principal trading partner.* Since the government established the Botswana Export Development and Investment Authority (BEDIA) in 1997, it has attracted 20 companies with total employment of 4,400 in various sectors of the economy. Manufacturing companies enjoy tax incentives, including the duty-free import of machinery and equipment, and exemption from sales tax on imported raw materials, provided the products are for export. The corporation tax rate—at 15 percent—is one of the lowest in the region.

*Tourism has been growing rapidly and has been driven by Botswana's strict conservation policies and diverse wildlife.* Tourism is now the second largest foreign exchange contributor after mineral production. *The government is promoting Botswana as a regional hub for communications and as a financial services center.* The Botswana International Financial Services Centre has been established as a cross-border financial services center.

*The government has used its flexible exchange rate policy to control inflation and to act as an automatic stabilizer to absorb fluctuations in the terms of trade.* Although the pula is nominally linked to the rand and the European Exchange Rate Mechanism (ERM) currencies, the government has devalued it from time to time in order to protect its trade and prevent overheating of the economy, thereby helping to create a stable business environment.

*Botswana is also considered to be relatively free from corruption.* A recent survey of perceived corruption covering more than 150 countries worldwide ranked Botswana at 31st overall the least corrupt country in Africa, ahead of South Africa in 44th place and Namibia at 54th place.<sup>2</sup>

### **The Current Economic Situation**

*GPD growth was 5.7 percent in 2004, equal to the average value recorded over the previous six years.* GDP per capita (in current prices) has grown from P 13,700 (\$3,000) in 1999 to P 22,700 (\$5,000) in 2004. In dollar terms, economic growth has been particularly strong over the past two years because of the weakness of the dollar. In the past, Botswana generally ran budget surpluses because of revenues from the mining industry. However, in four out the past six years, there has been a small budget deficit, principally from increasing recurrent expenditures. Key economic indicators are shown in table A-1.

*Annual inflation has moderated in recent years, averaging just under 8 percent, in line with the current government target and compared with more than 10 percent annual inflation during the first half of the 1990s.*

Government long-term debt is extremely low by developing country standards. In absolute terms, it has remained fairly constant in recent years (at about P 2.4 billion) but, expressed as a percentage of GDP, long-term debt fell from 11 percent in 1999 to 5 percent in 2004.

<sup>1</sup> Republic of Botswana (2000), p. 17.

<sup>2</sup> University of Passau and Transparency International (2004).

**TABLE A-1. Economic Indicators, 1999–2004**

INDICATOR	FISCAL YEAR*					
	1999	2000	2001	2002	2003	2004
GDP current prices (P billion)	21.5	24.9	28.6	31.9	36.7	39.9
GDP growth current prices (%)	6.6	15.8	14.9	11.5	15.0	6.8
GDP growth constant 1999 prices (%)	4.1	6.6	8.5	2.1	7.8	5.7
GDP per capita (P)	13,700	15,600	17,400	19,000	21,300	22,700
GDP per capita (\$)	2,970	3,070	2,990	3,010	4,330	4,840
Budget balance (P billion)	-1.4	+1.5	+2.5	-0.96	-1.4	-0.08
Budget balance (% of GDP)	-6.5	+6.0	+8.7	-3.0	-3.8	-0.2
Annual inflation (%)	7.8	8.5	6.6	8.0	9.2	7.0
Long-term debt (P billion)	2.4	2.4	2.4	2.9	2.2	2.0
Long-term debt (% of GDP)	11.1	9.6	8.4	9.1	6.0	5.0

\*Government fiscal years ending March 31.

Source: Bank of Botswana.

### The Economic Outlook

Although the economic position remains good, a number of important challenges face the country. Government expenditure has been increasing rapidly, and the economy is exposed to the vicissitudes of the international diamond and metals markets. An important element of current government policy is to diversify the economy and to privatize parastatals where this makes sense. This policy is set out in National Development Plan (NDP) 9<sup>3</sup>. The important elements of the program are combating HIV/AIDS and unemployment, reducing poverty, diversifying the economy, reforming the public sector reform, and introducing financial discipline.

*Combating HIV/AIDS is taking a large and increasing share of government expenditure, and the medium- and long-term impact on the economy through the depletion of the workforce is potentially catastrophic.* Botswana is not hiding from the AIDS problem, though; the President is personally leading the campaign to fight the disease.

The key strategy of the government is to promote budget sustainability and increased private sector development targeted at sustainable economic diversification. The forecast GDP growth during the period is 5.5 percent per year. The major economic indicators resulting from the government's base case scenario for the NDP 9 period are shown in table A-2.

*The government recognizes that its development plan is vulnerable to natural disasters, such as droughts and outbreaks of animal disease, and to external shocks, including the price of diamonds, and has therefore developed alternative scenarios.* The government's optimistic and pessimistic scenarios for the economy forecast the budget and balance of payments surpluses and deficits by the end of the plan period in table A-3.

*Under the optimistic scenario, the budget surpluses generated would be plowed back into development expenditure, thus raising GDP growth from 5.5 percent to 5.7 percent, whereas under the pessimistic scenario the country's balance of payments and reserves would be significantly worsened.* In this case, the current expenditure would have to be scaled back to bring it into balance with revenue.

### Current Issues in the Power Sector

*Specific government policy objectives for the power sector are as follows:*

- Achieving a balance between electricity imports and local generation.
- Improving electricity sector efficiency.
- Increasing access to electricity.

<sup>3</sup> Republic of Botswana 2003.



**TABLE A-2. Major Economic Indicators—Base Case Scenario**

INDICATOR	FISCAL YEAR*					
	2004	2005	2006	2007	2008	2009
Real GDP constant prices, 1993/94 (P billion)	19.3	20.5	21.8	22.9	24.1	25.3
GDP growth (%)	5.1	5.9	6.6	4.9	5.0	5.4
Employment growth rate (%)	5.4	5.0	5.2	5.8	5.8	5.7
Government share—employment (%)	37.1	36.2	35.2	34.1	33.0	31.9
Investment (% of GDP)	26.9	29.1	30.7	31.5	32.1	31.9
Balance of payments (P million)	413	201	1,078	534	46	-86
Reserves (months of imports)	30.0	27.8	26.5	25.1	23.6	22.0
Budget balance (P million)	102	136	162	137	76	303
Budget balance (% of GDP)	-6.5	+6.0	+8.7	-3.0	-3.8	-0.2
Reserves (\$ bn)	6.8	6.8	7.0	7.1	7.1	7.1

\*Government fiscal years ending March 31.

Source: NDP 9, Ministry of Finance and Development Planning model.

**TABLE A-3. Forecast of Surpluses and Deficits in the Budget and Balance of Payments**

SCENARIO	BUDGET SURPLUS (P MILLION)	BALANCE OF PAYMENTS SURPLUS (P MILLION)
Base	303	-85
Optimistic	302	1,657
Pessimistic	-1,520	-1,835

- Improving the commercial operations of the electricity supply industry.

*The extent to which these policies have been addressed is discussed in the following sections of the report.*

*Specific measures that have been identified to achieve these objectives are as follows:*

- Expansion of the existing 132 MW Morupule Power Station, including retaining sufficient financial reserves in BPC to finance this expansion.
- Procurement of power from regional markets (the Southern African Power Pool (SAPP) and the Short Term Energy Market (STEM)) to achieve a least-cost mix of supply.
- Extension of the electricity network, particularly to targeted rural electrification projects.
- Introduction of a new regulatory authority, and use of innovative pricing structures.

### **The Electricity Sector**

*Various aspects of the electricity sector are discussed in this section.*

#### **Structure of the Sector**

*The BPC was established under the Botswana Power Corporation Act 1974 as a wholly government-owned corporation with responsibility for the generation, transmission, distribution, and supply of electricity in Botswana. The act requires BPC to conduct its affairs on a sound commercial basis and, to this end, tariffs are reviewed periodically to ensure they are cost-reflective. The responsibility for BPC within the government is held by the Ministry of Minerals, Energy and Water Resources*

(MMEWR). During the past 30 years, BPC has managed high growth in electricity supply in the country. Since 1990 electricity sales have increased at an average annual rate of 6.7 percent (from 1,021 GWh in 1991 to 2,366 GWh in 2004), and the number of consumers has grown at an average annual rate of 13.7 percent (from 23,000 in 1991 to 123,000 in 2004).

### Generation

*Morupule is BPC's sole major power station.* The station—with a capacity of 132 MW from 4x33 MW units—is located at Palapye about 300 km north of Gaborone. Coal for the station is obtained from the nearby Morupule colliery, which was acquired recently by Anglo-American of South Africa. The first three units were commissioned in 1986 and the fourth unit in 1989. A second station located in the mining town of Selebi Phikwe was decommissioned in 1996; most of its staff were offered alternative employment at Morupule.

*Although Morupule has been well maintained and is in reasonably good condition for a station of its age, it has a relatively high unit generating cost.* BPC has benefited in recent years from surplus capacity in South Africa and currently purchases more than 70 percent of its electricity requirements from Eskom, and to a lesser extent from the SAPP's STEM, at a substantially lower price than it can generate at Morupule. However, the contract with Eskom expires in 2007, and Eskom has not yet given any commitment on future supplies.

*Morupule Power Station has been in service for almost 20 years.* The units are relatively small and inefficient, and the technology is becoming outdated with consequential difficulty in obtaining spare parts. However, the station has performed reasonably well in recent years. Morupule has generally operated as a base load station with imports making up the balance of the demand. The average station plant factor has been 82 percent since 1997, which compares favorably with other coal-fired stations in the region.

*The cost of generation from Morupule is relatively high because of the age and size of the units and the measures used to reduce water usage in the power station, which adds to the auxiliary consumption and therefore the "sent-out" cost per kilowatt-hour.* In 2004 the average cost of generation at Morupule was 3.4 cents/kWh sent out, compared with the cost of electricity imports of 1.6 cents/kWh.

### Transmission and Distribution

*The BPC transmission system mainly covers the eastern part of the country with radial lines feeding mining and other small towns and rural electrification schemes, as shown in figure A-1.* The 220 kV transmission system linking Gaborone and Francistown with Morupule Power Station was constructed at the same time as the power station. The 220 kV system was subsequently extended to Orapa to service the DEBSWANA diamond mine. BPC has three 132 kV cross-border feeders that import power to Gaborone from South Africa. In addition, there is a 220 kV cross-border link between Francistown and the Zimbabwe Electricity Supply Authority (ZESA) system at Bulawayo (Zimbabwe).

*In March 1998, the Phokoje 400/220 kV substation near Selebi Phikwe was commissioned, which strengthened the BPC system considerably and provided enhanced opportunities for electricity imports.* Phokoje is tied into the 400 kV line that was constructed to link the Eskom system at Matimba to the ZESA system at Insukamini near Bulawayo.

*Other small isolated systems in the south, west, and north of the country are fed by cross-border supplies from Namibia, South Africa, Zambia, and Zimbabwe.*

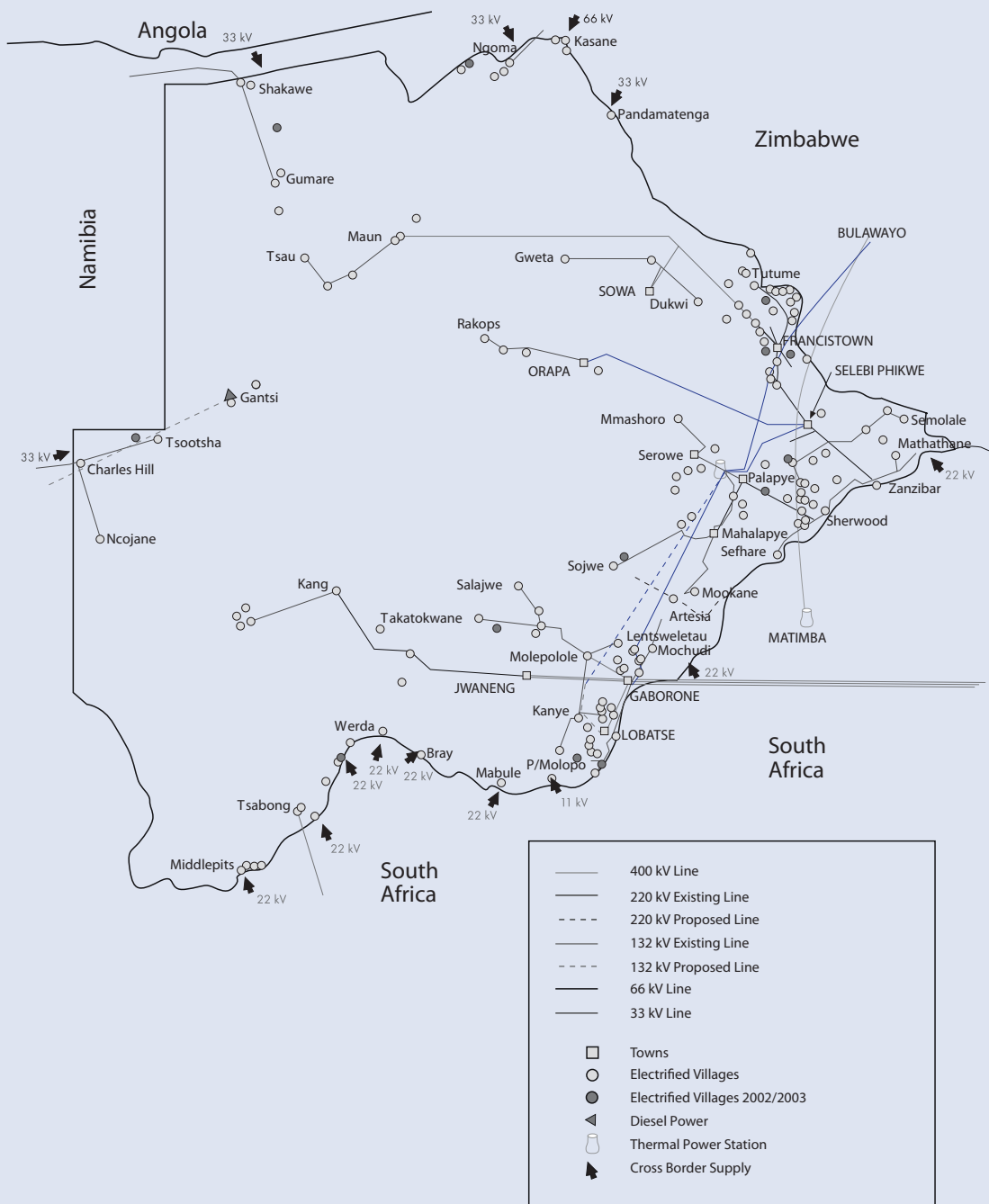
### Rural Electrification

*Rural electrification is an important aspect of government policy, and BPC is the implementing agent for this both in the short and in the long term.* This has been achieved by setting up a separate Rural Electrification division with a small staff whose sole responsibility is for implementation of the village electrification schemes planned by the MMEWR.

*At present, the policy is for the costs to be shared between rural electrification customers, the government, and BPC, with BPC in theory not exposed to losses on rural electrification.* Although there is an expectation that on-grid and off-grid solutions should be integrated, much of the focus to date has been on electrification through grid extension.

*The number of rural consumers now exceeds those in urban areas.* During the three year period, 2000–03, rural connections increased by 26,598 (78 percent), compared to an increase in urban consumer connections of 8,714 (20 percent). This has been achieved through a combination of government funding, careful planning

FIGURE A-1. National Electricity Grid of Botswana



Source: BPC 2003.

by the MMEWR, and strong project management by BPC. All the new system expansion work is undertaken by private contractors that are managed by BPC.

*In order to improve take-up of supply, the government's Rural Electrification Collective Scheme was reviewed in April 2000, which allowed for a decrease in up-front connection costs from 10 percent to 5 percent and repayment over 15 years rather than 10 years. The revision of the Rural Electrification Collective Scheme benefited more than 18,000 consumers during the NDP 8 period (FY1997–2003).*

*Once connected, consumers pay the standard BPC tariff, which does not include a lifeline element. All rural electrification consumers are provided with a prepayment meter. Vending stations have been established in local shops, or similar public places, with the vendor retaining 5 percent of the revenue collected. The objective is that no consumer should be further than 5 km from the nearest vending station.*

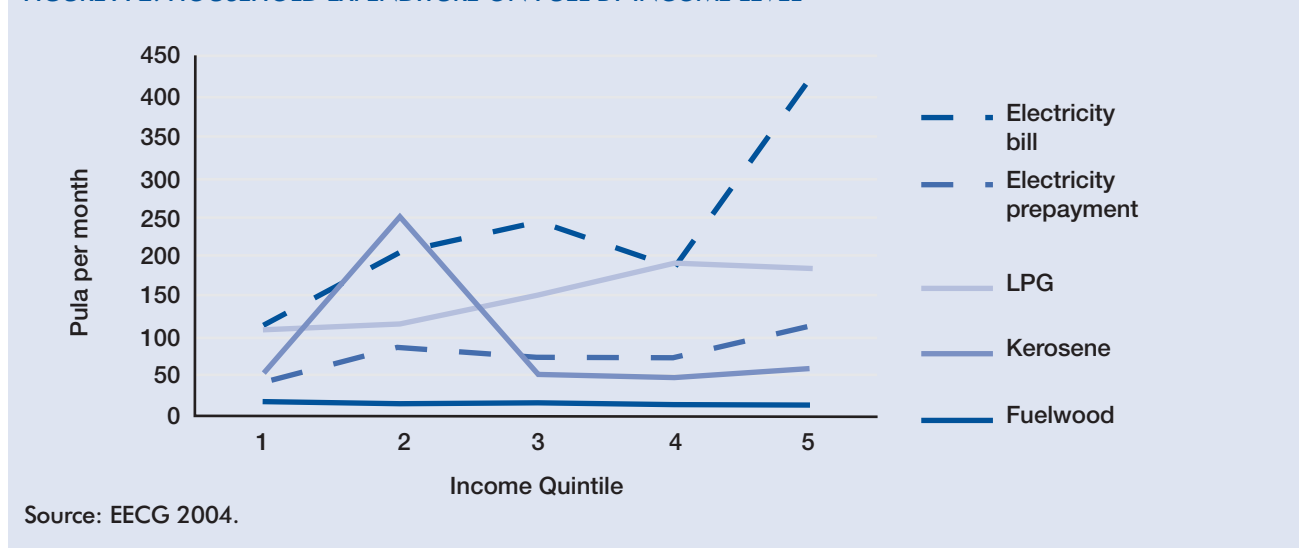
*One of the key problems with the grid village electrification schemes has been low take-up rates. Take-up remains low in many villages in spite of government subsidies covering the costs of bringing supplies to the villages (including the basic distribution systems in the villages), a standard costing method used to calculate the consumer connection costs, and generous terms payment offered under the Rural Electrification Collective Scheme. In some*

villages, the connection rate has been less than 20 percent up to 10 years after electrification, as compared with BPC's target of 25 percent of domestic consumers taking supply in the first year.

*The two key issues are affordability of the tariff, since all domestic consumers pay the same tariff, and the connection cost. Costings for a recent project to electrify 14 villages indicate a connection cost to be paid by the consumer of P 5,000 (\$1,100), of which 5 percent is required as an up-front payment. In addition, the consumer has to pay for internal house wiring and electrical appliances. This is unlikely to be affordable for lower-income households. The results of a recent household survey in Botswana that was carried out for the World Bank indicate clearly the problem of affordability with the lowest-income households in the first quintile paying P 42 (\$9) per month for prepayment consumers and P 116 (\$26) per month for those with credit meters (see figure A-2).<sup>4</sup> The income ranges of the quintiles are shown in table A-4.*

*As expected, expenditure on electricity increases with income—with the increase more marked among consumers with credit, as opposed to prepayment, meters. The sharp increase in expenditure on electricity for those on credit meters between the fourth and fifth quintiles probably reflects the shift to electricity for cooking. This is also accompanied by a small downward shift in expenditure on liquefied petroleum gas (LPG).*

**FIGURE A-2. HOUSEHOLD EXPENDITURE ON FUEL BY INCOME LEVEL**



<sup>4</sup> EECG 2004.

**TABLE A-4. Household Income Quintiles**

QUINTILE	INCOME (PULA)	\$ EQUIVALENT
1	0–249	0–55
2	250–449	55–99
3	450–799	100–177
4	800–1,479	177–328
5	1,480 and above	328 and above

Source: EECG 2004.

The increase in fuelwood expenditures between the first and second quintiles is probably a result of low-income urban households having to buy fuelwood rather than gather it themselves.

### Commercial Practices

*BPC's billing and collection record is good with meters generally read and bills sent out on time.* In rural areas, prepayment meters are used rather than credit meters. Collection rates are good, averaging 97.5 percent, with accounts receivable at 45 days.

*BPC has expanded the number of customers at high rates in recent years.* Since 1997 the number of customers has doubled from 60,023 to 122,625, equivalent to an annual rate of increase of 12.6 percent. The corresponding increase for domestic customers has been even higher at 13.2 percent. It is believed that this record is unsurpassed by any other electricity utility in Sub-Saharan Africa in recent times. Domestic connections have averaged almost 10,000 per year during the past six years with a large proportion in rural areas.

*However, staff numbers and costs have also risen steeply—by 4 percent per year and more than 20 percent per year respectively during the past six years—compared to inflation, which has averaged about 8 percent during the same period.* In terms of the ratio of customers per employee, BPC fares unfavorably in comparison with many electricity utilities in the region. Some of this increase is caused by the need to keep up the needs of the rapidly growing customer base. BPC is also not alone in experiencing pressure on salaries. Public sector salaries have increased by an average of 15 percent recently as a result of a new pay structure.

*Another factor that affects staff numbers is HIV/AIDS. It is clear that this will have a substantial impact on BPC's ability to undertake key areas of business activity in the future.* A program of anonymous testing has been undertaken, covering some 75 percent of the workforce. The results indicate that one-third of BPC staff tested positive. BPC commissioned a study to measure the impact of HIV/AIDS in the workplace and used the results as input to develop a long-term strategy. BPC has also launched a Special Benefit Fund to assist employees who may wish to enroll in an Anti-Retroviral Therapy program. It is understood that some key employers in Botswana are deliberately overstaffing by up to 20 percent in an attempt to maintain critical skills. Therefore, maintaining adequate management and technical skills is a fundamental challenge for BPC.

### Operational Efficiency

*BPC system losses, including both technical and nontechnical losses, have averaged 10.3 percent of energy sent out or purchased during the period since 1997.* This figure indicates that there is no significant problem with nontechnical losses as is the case with utilities in many developing countries, since technical losses for the BPC transmission system should be expected to fall in the range of 2–3 percent, plus 5–7 percent for the distribution system. A contributing factor to BPC's relatively low losses is the large proportion of mining load that is supplied at high voltage, thus eliminating medium-voltage and low-voltage distribution losses. BPC's loss figures compare favorably with other utilities in the region, including South Africa.

*The reliability and quality of supply have been good over the years.* BPC does not regularly publish statistics on the reliability and quality of supply, although its target is to restore supply within four hours for high-voltage faults.

In its 2000 annual report (BPC 2000), BPC stated that supply availability to customers remained high at above 99.97 percent. Anecdotal evidence also suggests that supply to all classes of consumer is generally reliable and of good quality, although there is some evidence of low voltage in a few urban areas. In addition, commercial and industrial consumers do not generally feel the need to install back-up diesel generators.

### Financial Status

*BPC is in a very healthy financial state.* The corporation is profitable and has benefited from the deferment of Morupule extension, which has allowed substantial capital reserves to be accumulated. As a result, net long-term debt has been decreasing; it decreased from P 329 million (\$73 million) in 1998 to P 205 million (\$45 million) in 2004. Debt service has also been falling; it fell from P 47.1 million (\$10.4 million) to P 25.9 million (\$5.7 million) during the same period.

*Operating profit has averaged P 70 million (\$16 million) during the past seven years and net profit P 148 million (\$33 million), primarily because of a substantial increase on interest earned on accumulated reserves.* BPC's primary

performance target is the rate of return on net revalued assets. The target rate increased from 5 percent in 1998, 1999, and 2000 to 6 percent in 2001 and 2002, and 6.5 percent in 2003 and 2004. The target rate was achieved in five out of the last seven years, as shown in table A-5.

*The falling self-financing ratio is a result of the heavy investment in rural electrification that has taken place in recent years.* BPC has contributed substantially to the investment cost of the rural electrification schemes, particularly since 2000.

*Two areas of concern are the rapidly increasing staff costs and the average cost of electricity purchases.* Staff costs increased from just over 20 percent of operating income in 1998 to over 30 percent in 2004. During the same period, the cost of imported electricity as a proportion of BPC's total operating costs increased from 29 percent to almost 34 percent.

BPC's financial performance measured by the rate of return on revalued assets is excellent and is believed to be one of the best performances among Sub-Saharan African utilities.

**TABLE A-5. Financial Performance of BPC**

INDICATOR	UNIT OF MEASURE	FISCAL YEAR*						
		1998	1999	2000	2001	2002	2003	2004
Operating income	P MILLION	278.9	311.2	361.9	411.9	449.7	537.9	593.3
Operating profit	P MILLION	58.8	53.9	74.0	87.9	56.1	93.2	66.6
Net profit	P MILLION	95.7	89.5	127.6	165.3	135.8	214.8	206.0
Dividends	P MILLION	8.7	8.7	8.7	8.7	8.7	8.7	90.0
Debt service	P MILLION	47.1	59.0	69.8	47.8	41.3	39.5	25.9
Cash flow	P MILLION	110.7	124.8	154.3	163.0	175.5	267.1	198.2
Debt service ratio	TIMES	3.6	3.0	3.2	5.6	6.1	8.3	12.7
Self-financing ratio	%	187	311	195	271	284	204	100
Current ratio	TIMES	4.5	5.0	5.5	5.4	4.5	4.0	3.8
Return on net revalued assets	%	6.5	6.0	7.7	7.7	4.8	7.6	5.3
Staffing costs/operating income	%	21.3	23.1	22.0	24.0	28.4	29.0	30.5
Staffing costs/net assets	%	4.3	4.6	4.5	4.9	5.6	6.4	6.8
Power purchased/operating costs	%	29.0	27.2	26.0	28.3	22.7	27.4	33.9

Source: BPC 1998–2004.

## Electricity Tariffs

Although tariffs proposals are prepared by BPC, they are subject to approval by the government. One of BPC's key performance targets is the overall level of tariffs. For the last 10 years, BPC has had a target of maintaining increases in tariffs to below 50 percent of the rate of inflation, and has succeeded in this without jeopardizing its business. There are a number of reasons for this achievement, including rapid and sustained load growth, a good payment and collection record by consumers (including government consumers), and access to relatively cheap electricity imports from South Africa and through the SAPP's STEM. The availability of cheap imports has allowed BPC to defer the extension of Morupule, thereby building up substantial financial reserves that were earmarked for the extension. These reserves have, in turn, generated substantial revenue for BPC in the form of interest payments.

Tariff increases in the past 10 years (since 1995) have been limited to 5 percent in February 1999, 5 percent in July 2002, and 6 percent in March 2004. Over this period inflation as measured by the Consumer Price Index (CPI) has been 115 percent, as compared to a 17 percent

total increase in tariff in current prices. Thus, in real terms, electricity prices in Botswana have declined substantially over the past 10 years.

The current tariff schedule is set out in table A-6. The table reflects the 6 percent across-the-board increase that was implemented in March 2004.

The revenue per kilowatt-hour sold for each primary consumer group is shown in table A-7. The mining sector accounted for 45.5 percent of total electricity sales and 33.6 percent of sales revenue in 2004.

The average price of electricity has remained essentially constant in nominal terms in recent years. Figure A-3 shows the price of electricity measured in terms of the average revenue per kilowatt-hour sold since 1998. In nominal pula terms, the price has increased by 17 percent, whereas in dollar terms, the price in 2004 was the same as it was in 1998, and lower than in 1994.

No significant cross-subsidies exist between the main tariff groups, with the exception of government consumers (except water pumping), which pay significantly more

**TABLE A-6. BPC Electricity Tariffs**

ITEM	HOME	SMALL BUSINESS	MEDIUM BUSINESS	LARGE BUSINESS	GOVERNMENT	WATER PUMPING
Monthly fixed charge	P 8.58 (\$1.9)	P 20.82 (\$4.6)	P 20.82 (\$4.6)	P 20.82 (\$4.6)	P 20.82 (\$4.6)	P 20.82 (\$4.6)
Energy charge (per kWh)	P 0.3089 (8 cents)	P 0.3089 (7.1 cents)	P 0.1643 (3.6 cents)	P 0.1482 (3.3 cents)	P 0.4153 (9.2 cents)	P 0.3268 (7.2 cents)
Monthly demand charge (per kW)	0	0	P 39.34 (\$8.7)	P 37.03 (\$8.2)	0	0

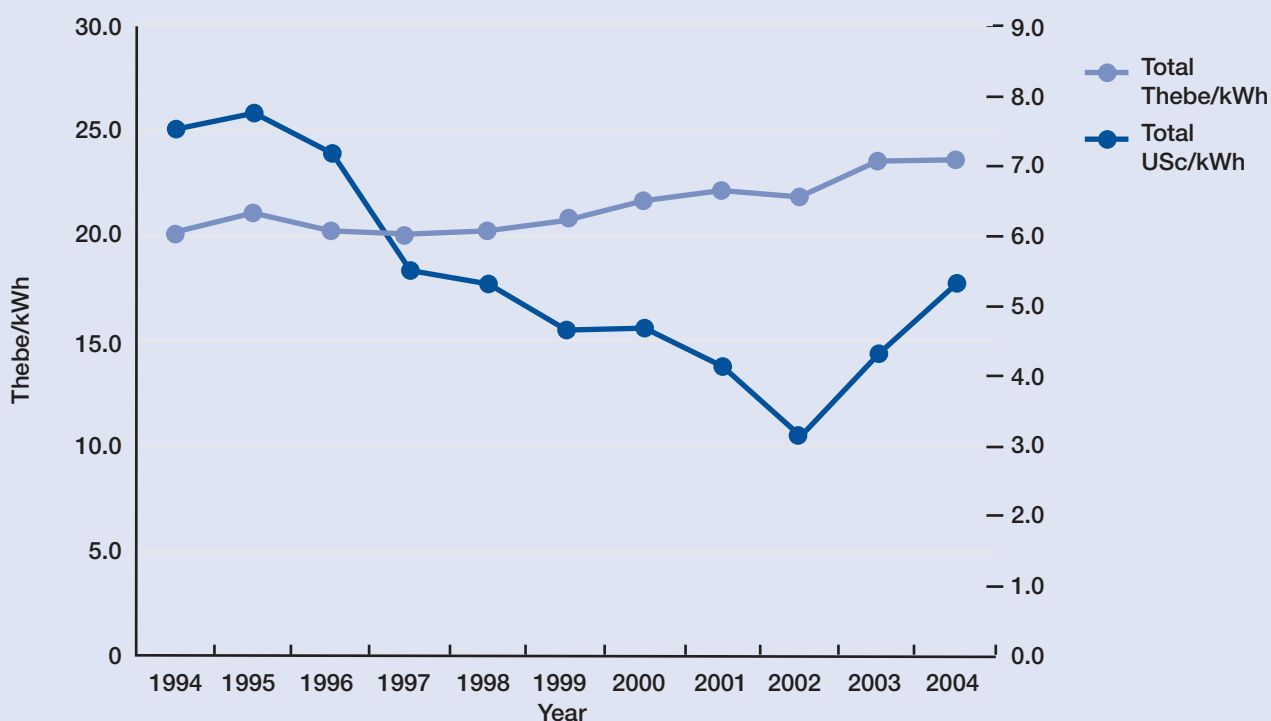
Source: BPC.

**TABLE A-7. Revenue per Kilowatt-Hour Sold by Consumer Group**

CONSUMER CATEGORY	THEBE/KWH	EQUIVALENT CENTS/KWH
Domestic	27.5	6.1
Commercial	26.6	5.9
Mining	17.7	3.9
Government	36.4	8.1
Total	23.6	5.2

Note: 100 thebe = 1 pula.  
Source: BPC 2004.

FIGURE A-3. AVERAGE PRICE OF ELECTRICITY SOLD BY BPC, 1993/94–2003/04



Note: 100 thebe = 1 pula.

Source: Bank of Botswana and BPC data.

than the cost of supply as a form of direct subsidy to BPC. As discussed earlier in the section on Rural Electrification, the absence of a lifeline tariff or other form of direct subsidy in the domestic tariff means that electricity is not affordable by most low-income households, and is a key factor in the low take-up of supply in some villages that have been connected to the grid.

### Investment

As discussed in the previous section, BPC's capital investment requirements have been reduced in recent years because of the deferment of Morupule extension. However, there has been significant investment in the transmission and distribution systems to meet the very high growth in customer numbers. A large proportion of this capital investment has been self-financed through BPC's retained earnings and interest on investments. Capital investment during the period 1998–2004 is shown in table A-8.

During the past seven years, an estimated capital expenditure of P 631 million had been incurred. It was financed by the government (48 percent), BPC (47 percent) and a loan from the European Investment Bank (5 percent). The government portion was expended principally on rural electrification. In addition, the government provides guarantees on the consumer connection fees, which are funded under the Rural Electrification Collective Scheme over periods of up to 15 years.

BPC's present long-term debt is P 204.8 million, of which 29 percent is pula denominated and 71 percent foreign currency denominated. The principal foreign currencies are the dollar, Japanese yen, euro, and the South African rand. The government bears a portion of the foreign exchange liability on BPC's long-term debt equal to P 34.7 (2004). The debt is divided between the Government of Botswana, the European Investment Bank, the Nordic



**TABLE A-8. Capital Expenditure and Work in Progress**

FISCAL YEAR	P MILLION	\$ MILLION
2004	198.8	44.7
2003	130.7	23.9
2002	61.9	8.9
2001	60.3	11.2
2000	79.3	17.1
1999	40.1	9.0
1998	59.3	15.6
Total	630.4	130.4

Source: BPC 1998–2004.

Investment Bank/Fund, the Reconstruction Credit Institute (KfW), and the Japanese Overseas Economic Cooperation Fund. Most of the overseas funding is onlent to BPC from the government. Interest rates on the long-term debt vary widely between 0.75 percent and 13.75 percent. BPC has successfully managed its foreign currency exposure by taking out hedging contracts.

*BPC is presently planning an extension to Morupule Power Station and has recently completed a full feasibility study of the project assisted by international consultants. The study has recommended the construction of two additional generating units each of 100 MW capacity. The consultants estimate that the earliest feasible commissioning date for the extension is 2009. It is understood, however, that no decision has been made as yet to proceed with the extension project.*

*The required investment cost is estimated to be of the order of \$300 million (P 1,360 million), up to half of which BPC expects to fund from its financial reserves, which stood at P 1,080 million (\$240 million) as of March 31, 2004. It is understood that the option of bringing in a strategic partner to oversee the implementation of the project has been considered by the government, but no decision has yet been made. The most likely option is that the balance of the funding will be raised by government and onlent to BPC.*

## *Evolution of Supply and Demand*

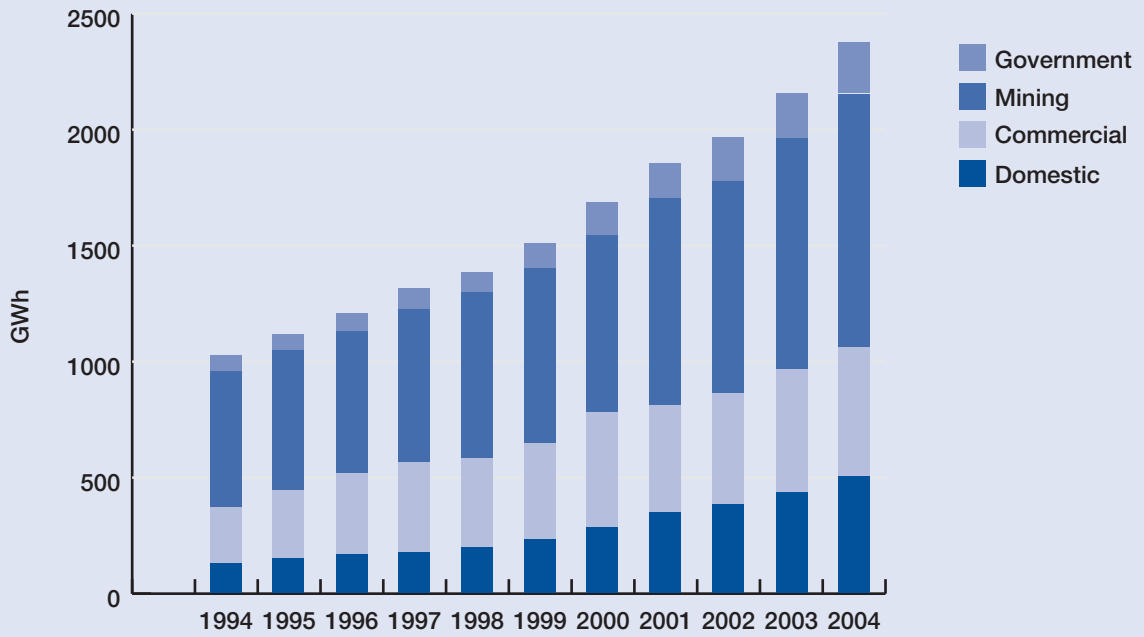
### *Electricity Demand*

*The growth in electricity demand in Botswana has mirrored the growth in the economy; electricity sales have increased by 130 percent during the past 10 years, equivalent to an average annual rate of growth of 8.8 percent, as shown in figure A-4. Significantly different growth rates have been experienced among the consumer categories. Domestic consumer demand grew at 14.9 percent, followed by government consumption (12.3 percent), commercial consumers (9 percent), and mining industry (6.3 percent).*

*As a result, the domestic share of total sales increased substantially from 12 percent in 1994 to almost 21 percent in 2004, whereas the mining sector share decreased from 57 percent to 46 percent, as shown in figure A-5.*

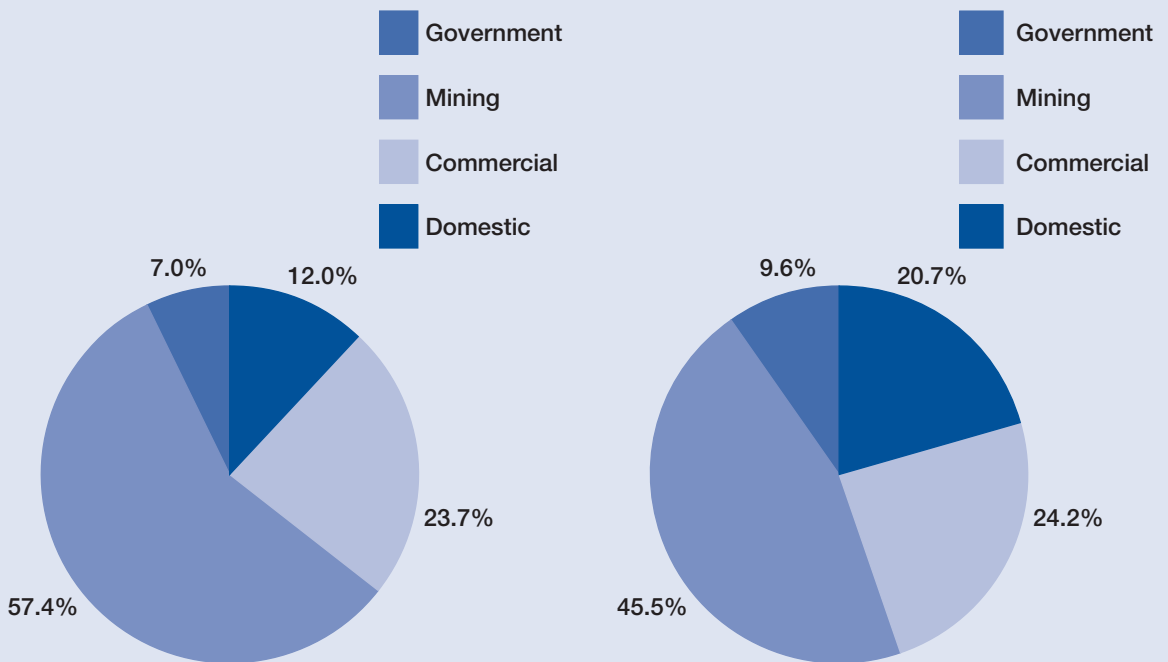
*Growth in consumer numbers has been equally strong, with increases from 37,000 in 1994 to almost 123,000 in 2004, equivalent to an annual rate of growth of 12.6 percent. Most of the growth has come from the domestic sector. The number of domestic consumers has more than doubled in the past six years from 50,700 to 103,000. Many of the new connections are a consequence*

FIGURE A-4. BPC ELECTRICITY SALES, 1993/94–2003/04



Source: BPC data.

FIGURE A-5. SECTOR SHARES OF BPC SALES, 1994 AND 2004



Source: BPC data.

of the government support to the village electrification program (see the section on Rural Electrification). In March 2004, domestic consumers accounted for 87.2 percent of the total number of consumers.

*System peak demand has grown more or less in line with energy demand, doubling during the past nine years—from under 200 MW in 1995 to almost 400 MW in 2004.* The system load factor is high, at about 75 percent, reflecting the large component of continuous processing mining load. The very high growth in domestic consumption has not had a noticeable impact on the system load factor. The load factor fell between 1998 and 2002, but rose again in 2003 and 2004. Details are shown in figure A-6.

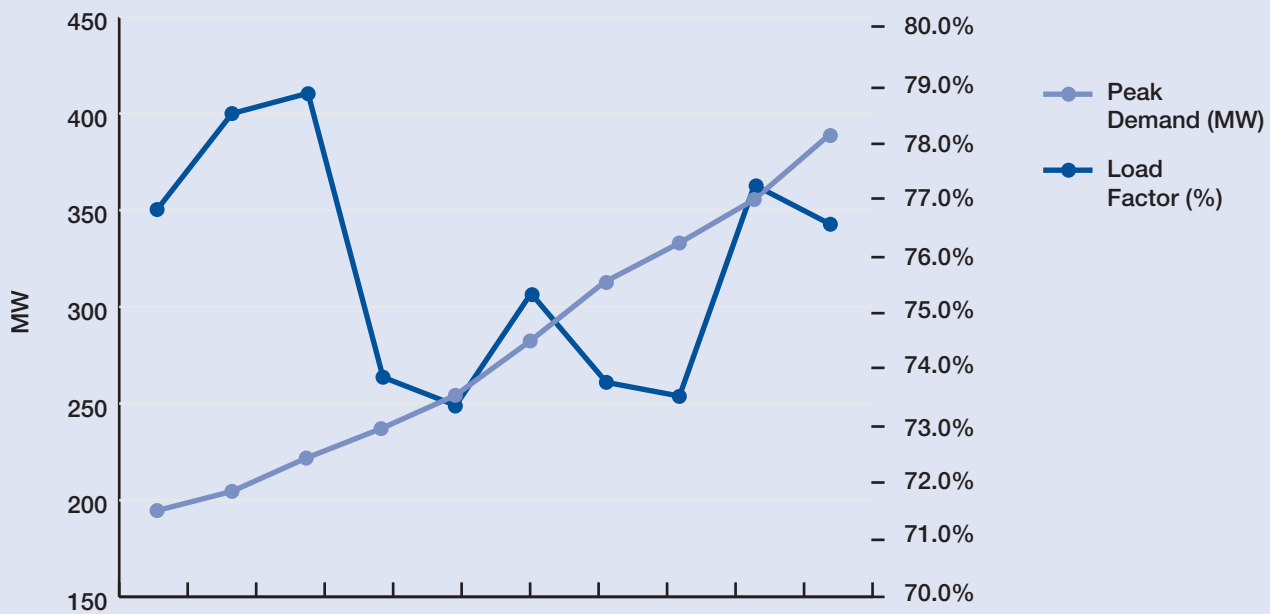
*System losses have decreased, indicating that investments in the transmission and distribution system made by BPC have kept pace with the large increases in the number of consumers.* The decrease in losses also indicates that the BPC management of nontechnical losses is good and that there are no significant problems with theft and other unauthorized uses of electricity. Details of system losses since 1991 are shown in figure A-7.

### Generation and Imports

*As discussed in the previous section, BPC has become increasingly reliant on imports during the past 15 years and currently produces less than 30 percent of its electricity requirements.* The principal reasons for this are as follows:

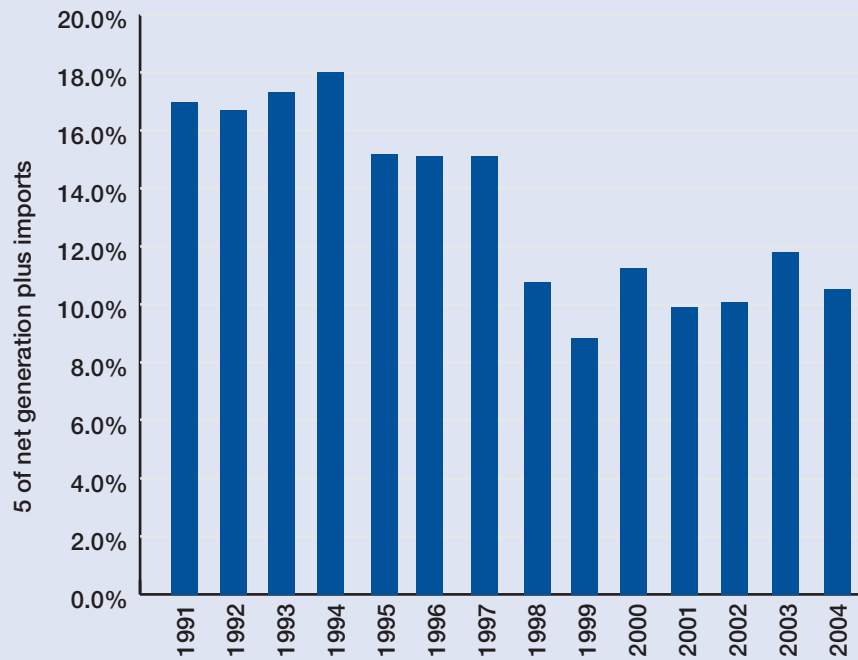
- *A surplus of generation is available in the region—and in particular in South Africa where a number of large coal-fired stations were mothballed because of the lower-than-expected level of economic growth in the 1990s.* As a result, Eskom was willing to enter into relatively long-term firm export contracts with its neighbors—Botswana Lesotho, Mozambique, Namibia, Swaziland and, more recently, Zimbabwe.
- *The price at which Eskom was willing to sell electricity to its neighbors was based on the short-term marginal cost of large, baseload, coal-fired power stations, which made it extremely attractive to countries such as Botswana with smaller, less-efficient sources of generation.* The 2004 average price paid by BPC for imports was 1.6 cents/kWh as compared to the cost of generation at Morupule of 3.4 cents/kWh.

FIGURE A-6. BPC SYSTEM INDICATORS, 1995–2004



Source: BPC data.

FIGURE A-7. SYSTEM LOSSES, 1991–2004



Source: BPC data.

- In the mid-1990s, Eskom wished to construct a 400 kV interconnector with Zimbabwe. By permitting the construction of this line across its territory, Botswana obtained an agreement for the construction of a 400/220 kV substation to tap into the line at Phokoje near Selebi Phikwe, thereby increasing both the capacity and reliability of its imports from South Africa and other SAPP member countries. Up until the commissioning of Phokoje, BPC was reliant on substantially lower-capacity 132 kV interconnectors with South Africa.

With the above circumstances, BPC had a strong incentive to import electricity to meet its strongly growing demand, and the government allowed BPC to continue to expand its imports year by year. BPC was able to benefit further from the increasing reliance on imports, since it was able to defer the construction of the planned additional generating capacity at Morupule. The retained earnings that had been earmarked for the extension were invested, which then earned substantial additional revenue for the utility. This policy has served Botswana well and has not led to any deterioration in supply reliability.

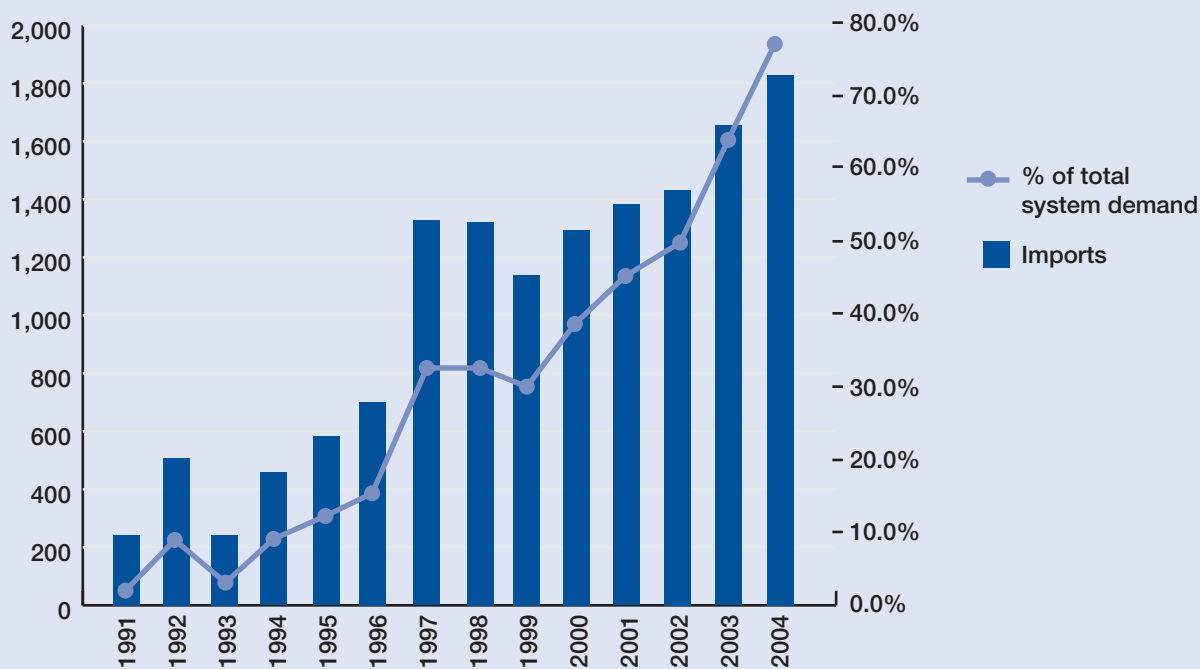
As a consequence of the availability of firm low-priced imports, Botswana has moved from a position of being virtually self-sufficient in the production of electricity to

relying on imports to supply more than 70 percent of its demand. Up to the early 1990s, BPC had two operational coal-fired power stations that met virtually all the demand. The old Selebi Phikwe Station was shut down in March 1996. In the same year, BPC signed a new agreement with Eskom of South Africa to provide firm imports until 2003 at rates that were substantially lower than BPC's cost of generation at Morupule. The new agreement coincided with an increase in imports of more than 100 percent in that year, from 392 GWh in 1996 to 812 GWh in 1997. Imports have continued to rise to meet the rapidly growing demand and by 2004 had reached 1,915 GWh, equivalent to 72.5 percent of the demand, as shown in figure A-8.

The government decided to defer the development of Morupule extension, and BPC's contract with Eskom was extended in 2000 to cover the period up to 2007. The contract was renegotiated in 2001 with the opening of the SAPP's STEM to allow BPC to purchase up to 25 percent of its imports from the open market.<sup>5</sup> Although BPC has continued to increase imports from Eskom, the surplus generating capacity in the region—and in particular in South Africa—is now expected to be used up within the next five years. Furthermore, Eskom has not given any assurances to BPC on imports beyond 2007 covering either quantum or price.

<sup>5</sup> The SAPP STEM started trading on April 24, 2001. In 2003, 720 GWh was traded on the STEM with a value of \$3.6 million, an average price of 0.5 cent/kWh.

FIGURE A-8. ELECTRICITY IMPORTS, 1991–2004



Source: BPC data.

In 2003 BPC initiated a full feasibility study on a project to extend the capacity of Morupule Power Station. The study recommended the construction of two additional generating units each of 100 MW capacity. The consultants estimated that the earliest feasible commissioning date for the extension is 2009.<sup>6</sup> It is understood, however, that no decision has been made as yet to proceed with the extension project.

Meanwhile, the government has also been considering the development of a large coal-fired power station for export to address the impending regional capacity shortage and the new SAPP competitive electricity market.

As discussed in the section on Electricity Tariffs, the availability of cheap imports from South Africa and through the SAPP's STEM has served the electricity consumers of Botswana well. The average price of electricity sold in Botswana during the past 10 years has only increased by a total of 17 percent compared with inflation of 115 percent, and in dollar terms the price in 2004 was the same as in 1998, as shown in figure A-3.

### Future Balance of Supply and Demand

The most recent comprehensive load forecast for the BPC system was made in early 2004 by the consultants undertaking the feasibility study for the extension to Morupule Power Station.<sup>7</sup>

Differing approaches were considered in forecasting the demand of the various consumer sectors. In view of the importance of the mining sector in Botswana, the forecast for this group was based on discussions with the major customers. Sales to the mining sector represent 47 percent of the total sales (2002/03 figures), and the forecast showed a modest increase in 2005 from the commissioning of the Mupane Gold Mine, with further increases in 2008 (because of the doubling of demand at Tati Nickel).

Demand for the commercial and government sectors was based on a regression analysis of historical data, assuming that the relationship between sales to this sector and government GDP is unchanged in the future.

<sup>6</sup> The completion may now be later in view of the time that has elapsed since the consultants submitted their report.

<sup>7</sup> PB Power 2004.

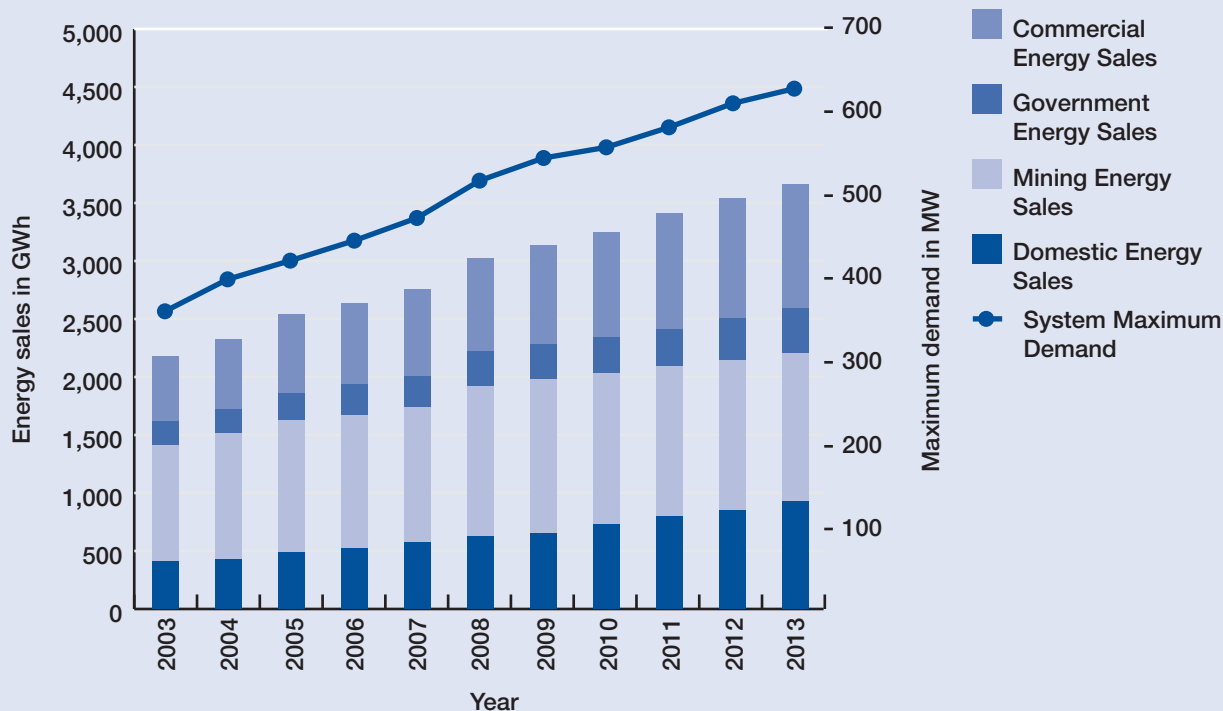
The forecast for domestic sales was based on the number of connections and the specific consumption per connection. Forecasts of the numbers of future households were derived (based on population growth and number of people per household). The former was estimated using a least-square, time-dependent logarithmic curve fit, and the latter on a second-order polynomial. This gave an estimate of the potential number of customers. Specific consumption for the domestic sector is forecast to fall as the electrification program continues to roll out and the proportion of lower-income customers increases. A regression analysis using data from the last five years was used to identify this trend. However, no account was taken of the substantial impact of HIV/AIDS on the population.

The overall forecast of future demand is shown in figure A-9.

The forecast shows the demand increasing from 360 MW in 2003 to 626 MW in 2013, an average annual growth rate of 5.7 percent. System losses are assumed to decline from 12 percent to 10 percent over the period. Sales growth for the various consumer sectors vary quite widely, as shown in table A-9.

The future demand growth is expected to be met by the Morupule extension and imports from SAPP member countries. BPC expects to fund at least 50 percent of the estimated P 1,360 million (\$300 million) capital cost of the Morupule extension from its reserves.

FIGURE A-9. ELECTRICITY DEMAND FORECAST FOR THE BPC SYSTEM, 2004–13



Source: PB Power 2004.

TABLE A-9. Forecast Growth Rates of Sales by Sector, 2003–23

(%)	DOMESTIC	COMMERCIAL	MINING	GOVERNMENT	TOTAL
2003–13	8.3	6.9	2.7	6.2	5.4

Source: PB Power 2004.

## Government Strategy and Sector Reform

*The basic strategy of the government is to run the public sector entities efficiently and enable private sector participation prudently where necessary and feasible.*

### Privatization Policy

*The Government of Botswana has never adopted a policy of nationalization of private sector companies, nor has it created parastatal manufacturing companies. It has, however, created at various times a number of development banks, public utilities, transport enterprises, and an agricultural marketing board. Botswana has about 30 parastatals. The stated policy for public enterprises is that they should be managed and made to perform along commercial lines.*

*The available data indicates that nonfinancial public enterprises in Botswana account for about 6 percent of GDP, whereas their share of employment is slightly less than 6 percent. However, their share of investment exceeds 15 percent.*

*One of the first steps in the implementation of the government's privatization policy is to incorporate public enterprises, giving them an appropriate financial structure, and making them subject to the provisions of the Companies Act.<sup>8</sup>*

*The government has created an autonomous public entity—the Public Enterprises Evaluation and Privatisation Agency (PEEPA) to oversee the process. Although government provided the initial capital for PEEPA, it is an autonomous organization run on commercial principles. The main functions of PEEPA are as follows:*

- Effective monitoring and evaluation of the performance of parastatals.
- Advice on the commercialization and privatization processes.
- Management of the implementation of the commercialization and privatization processes.

*To date, the telecommunications industry has been restructured and the mobile telephone market opened to competition. A bidding process was undertaken and two licenses awarded. Botswana Telecommunications (BTC), the previous parastatal and holder of the monopoly in Botswana, did not win one of the licenses and, as a*

*result, suffered financial hardship because of the new competition. Air Botswana is to be offered for sale. However, the transaction is being delayed by government as a result of the present unfavorable environment in the aviation industry. It is expected that 45 percent of the shares will be sold to a strategic investor, 10 percent distributed to employees, and the remaining 45 percent either sold to Botswana citizens or retained by government.*

### Private Sector Participation in the Electricity Sector

*Private sector participation in the electricity sector in Botswana has been considered, but as yet not implemented. In a recent study commissioned by MMEWR, four strategic options for the electricity supply industry were identified:<sup>9</sup>*

- *Improving governance:* Where the structure and ownership of BPC are left as they are, but where governance mechanisms are improved, primarily through a performance contract between PEEPA and BPC.
- *Privatization of BPC:* Where BPC is privatized as a vertically integrated entity, possibly with an obligation to invest in Morupule Expansion if this proves viable.
- *Private generation:* Where BPC's generation activities are separated and sold, with an obligation to invest in Morupule Expansion, if viable.
- *Competition:* Where large customers in Botswana are given the option to import power and pay a wheeling charge to BPC.

*As an interim measure, the MMEWR is proposing to adopt the first option whereby BPC will enter into a performance contract with the government that will be administered by PEEPA, pending the establishment of an electricity regulator. A recently completed study commissioned by PEEPA recommended the establishment of a combined electricity and water regulatory body.<sup>10</sup>*

*The 2004 Energy Master Plan refers to possible privatization of BPC.<sup>11</sup> However, as yet the government has not made a decision to go ahead with privatization. To date the involvement of the private sector in the electricity sector has been limited to the following:*

- All system design and construction activity, which is outsourced to private contractors by BPC.

<sup>8</sup> Botswana Power Corporation Act, CAP 74:01.

<sup>9</sup> Power Planning Associates 2003.

<sup>10</sup> Shaw Stone and Webster 2005.

<sup>11</sup> MMEWR 2004.

- The supply of electricity in Ghanzi, a remote town in the western part of the country, through a performance-based contract between BPC and a private contractor. The contract was successful, but is due to terminate once BPC has completed the construction of a transmission line to supply Ghanzi from the Namibian grid. It is interesting to note that the government is not currently planning to extend the operation of remote electrification schemes in other parts of Botswana to private contractors.

### **The Impact on the Government Budget**

*The principal impact of the electricity sector on the government budget in recent years has been in the provision of direct funding for village electrification. The government meets the total cost of providing supplies to villages, including the cost of a skeletal distribution system within the village. During the period 1997–2002, the government provided P 305 million (\$68 million) in direct funding to rural electrification.*

*The government has also provided loans and onlending of development loans from bilateral and European funding agencies. According to BPC's 2004 annual report, the corporation's long-term borrowings are P 204.8 million (\$45.4 million) comprising government direct lending (25 percent), government onlending (41 percent), and Nordic and European Investment Bank lending (34 percent).*

*BPC is by no means the largest recipient of government lending. BLC Ltd., the partly government-owned copper-nickel mine at Selebi Phikwe, the Botswana Housing Corporation, Botswana Telecommunications Corporation, and the Water Utilities Corporation have a total indebtedness to the government of about P 1.9 billion (\$0.42 billion), or almost 70 percent of total government lending.*

*The government also has irredeemable capital (equity) in BPC of P 145.6 million (\$32 million). BPC normally pays a dividend to the government of 6 percent of the irredeemable capital equivalent to P 8.7 million (\$11.9 million), but in 2004 declared an additional special dividend of P 81.3 million (\$18 million). BPC is currently exempt from taxation.*

*A value added tax (VAT) was introduced in July 2002, which replaced the 10 percent sales tax. The VAT at the current rate of 10 percent is applicable to sales of*

*electricity, but it does not appear from BPC's accounts that there is any net payment to the government of revenue raised through the VAT.*

*BPC has been able to meet its debt commitments since it was established in 1974. There has been no write-off of its debt to the government, and much of its capital investment program has been funded from revenues. It is only the major capital projects, such as Morupule Power Station in the 1980s and the Phokoje 400 kV substation project in the 1990s that have needed external funding either directly to BPC or to the government and onlent to BPC. Principally because of the deferment of the Morupule extension project, BPC's long-term debt has diminished in recent years and currently stands at P 205 million (\$45 million). BPC also has a low debt-to-equity ratio of 0.21.*

*In summary, BPC has not been a drain on government finances and, apart from the government's capital contributions to rural electrification, BPC has been a net contributor to the government budget.*

### **The Impact on the Economy of Botswana**

*As a land-locked country, Botswana struggles to attract foreign investment. The principal export earning sectors of the economy are minerals and livestock, and there is a small but rapidly growing tourism industry. Botswana's indigenous energy resources include coal and solar energy. The country does not have exploitable oil and gas reserves, although there is some prospect for the exploitation of coal-bed methane.*

*Coal is used for electricity generation at Morupule, and the power station helps to sustain coal production at the adjacent colliery that recently passed from government to private ownership. The use of coal is not widespread in other sectors of the economy.<sup>12</sup> All Botswana's liquid and gaseous fuels are imported by road and rail, almost entirely from South Africa, which is also Botswana's most important trading partner, accounting for 80 percent of trade. A recent study concluded that the export of coal was not economically viable because of the long land transport distances to the available ports.<sup>13</sup> Neighboring countries, including South Africa, Zambia, and Zimbabwe, all have their own coal reserves. However, the government is considering the construction of a major coal-fired power station primarily for export to take advantage of the trading opportunities that are expected as the surplus of generating capacity in the region comes to an end and the new SAPP competitive regional electricity market is developed.<sup>14</sup>*

<sup>12</sup> Surveys conducted by EEGC consultants in a study for the World Bank carried out in 2004 showed that less than 1 percent of rural households used coal (EEGC 2004).

<sup>13</sup> MMEWR 2002.

<sup>14</sup> It is understood that SAPP is about to place a contract for the implementation of the electricity market trading platform.

<sup>15</sup> The completion may now be later in view of the time that has elapsed since the consultants submitted their report.



*The combination of the long distances to markets and the lack of local raw materials have made it difficult to attract foreign investment in manufacturing into Botswana.*

*Botswana enjoys membership of the Southern African Customs Union (SACU), a free trade area that also shares customs revenues. The other members are Lesotho, Namibia, South Africa, and Swaziland. Southern African Development Community membership also brings the benefit of access to customs-free trade in internally manufactured goods.*

*In addition, Botswana enjoys privileged access to European markets through the Cotonou Convention and to U.S. markets through the Africa Growth and Opportunities Act (AGOA) trade initiative passed by the United States in 2000 that provides duty-free access to the United States for various African exports, including manufactured goods.*

*The Botswana Confederation of Commerce Industry and Manpower (BOCCIM), Botswana's trade and employment organization, which also has representation from the mining industry, has an important concern over the price of electricity that is reported to be a major constraint in attracting foreign investment into Botswana. Although this may be true in manufacturing or minerals processing where the price of energy represents a large proportion of operating costs, electricity costs are not a significant issue for the diamond industry in Botswana. However, the cost of electricity is a major issue for BCL, a nickel/copper producer based at Selebi Phikwe. BCL enjoys a special tariff from BPC, which is linked to metal prices. Outside the minerals processing sector, it is clear that there are other constraints in attracting manufacturing industry that may be of greater significance than electricity prices.*

*The high price of electricity in the early 1990s was a critical concern to the government. For this reason, BPC was permitted to take advantage of the availability of relatively cheap electricity imports from South Africa and through the SAPP's STEM. However, the Eskom contract comes to an end in 2007, and BPC has not yet been able to obtain commitments on future supplies and prices. The capacity surplus in South Africa is expected to be used up between 2007 and 2010, and the South African government is already inviting proposals to construct new generating capacity.*

*At the same time, SAPP is about to implement a competitive regional electricity market. Once the market is established, it should provide a better pricing*

mechanism for electricity in the region that should send signals to investors and consumers alike. In the short term, BPC is expected to make a decision to go ahead with the construction of an extension to Morupule Power Station for completion by 2009.<sup>15</sup> This project will allow the balance between electricity generated within the country and imports to be restored, making Botswana less vulnerable to external factors over which it has little control. Taken together, the expected increase in the price of electricity imports from South Africa and the construction of Morupule extension are expected to have a significant impact on electricity prices in Botswana, which will be felt by all consumers. This will have to be carefully managed by both the government and BPC in order to minimize the impact on the economy and in particular the urban and rural poor, many of whom cannot afford electricity even at today's prices.

### **Government Policy**

*The government is intent on diversifying the economy of Botswana, which to date has been largely built upon diamonds and other minerals. The revenues from the exploitation of these minerals have been spent wisely on housing, health, education, and expansion of public services. The government realizes that the country cannot rely on expanding mineral production in the future and must therefore diversify the economy. This diversification, including the reduction of unemployment and measures to combat the HIV/AIDS pandemic are the key elements of the current development plan (NDP 9), which started in FY2004.*

*Government policy is to diversify investment into any profitable and sustainable sector of the economy. Investment is particularly encouraged in manufacturing, in tourism and its infrastructure, in the "knowledge economy," and in financial services, through the new International Financial Services Centre. The country generally enjoys harmonious industrial relations, and the basic level of education is good. However, as mentioned in a previous section, manufacturing faces difficulties in view of long distances from markets and in sourcing raw materials. However, Botswana does offer attractive tax incentives to encourage foreign direct investment.*

*Concerning the parastatals, the government has a policy of privatization where it makes commercial sense to do so. In respect of BPC there is currently a drive to promote greater commercialism through the establishment of a performance contract that would be initially managed by the privatization agency (PEEPA) until such time as an electricity regulator is*

<sup>14</sup> It is understood that SAPP is about to place a contract for the implementation of the electricity market trading platform.

<sup>15</sup> The completion may now be later in view of the time that has elapsed since the consultants submitted their report.

established. The government does not seem to have a strong desire to privatize BPC, although consideration is being given to possible private sector involvement in future generation projects.

### **The Legal Environment**

*The following legislation will have to be reviewed and revised to facilitate the implementation of the privatization of parastatals, and in particular prior to any privatization of BPC:*

- A Companies Act that reflects the current business and regulatory environment. The new act is currently before parliament.
- Legislation or other authorization to enable the full or partial transfer of BPC ownership and assets to the private sector.
- A Competition Law that will define the power rights and responsibilities of both monopolistic and competitive entities. The Competition Law will include an act to establish the powers and functions of the regulator. In particular, it has been proposed that a combined electricity and water regulator should be established.

### **Successes and Lessons**

*The electricity sector in Botswana has managed high growth in sales, averaging 8.8 percent per year overall since 1991, including 15.2 percent per year growth in sales to the domestic sector. This has been achieved without excessive recourse to borrowing. BPC's long-term debt has been decreasing in recent years from P 329 million (\$73 million) in 1998 to P 205 million (\$45 million) in 2004. The government has funded 25 percent of BPC's current long-term borrowing from its own budget; the balance has come from direct external loans (34 percent) and external loans onlent by the government (41 percent).*

*BPC has played its part and has delivered notable achievements. The key successes include the following:*

- Managing the very high growth in both electricity access and sales. Access has increased during the past 10 years from about 11 percent in 1993 to 28 percent in 2003, the majority of which has benefited rural households.

- Earning a rate of return on revalued assets of 6.7 percent on average during the past 10 years.
- Significantly reducing tariffs in real terms. Tariffs have risen only by 17 percent during the past 10 years compared to inflation of 115 percent.
- Reducing system losses to about 10 percent of net generation plus imports.
- Funding almost 50 percent of capital investment during the past seven years from operating revenues and interest on investments.

As discussed in this report, the electricity sector in Botswana has not experienced an investment gap on the basis of its planned development in recent years. The positive messages that can be taken from the performance of the electricity sector in Botswana may be summarized as follows:

- *Creation of a strong and well-managed economy* built on diamonds and other minerals extraction has provided favorable conditions within which the electricity sector has operated. BPC's successful performance is also due in no small measure to the government's sound management of the economy, allowing reasonable returns to be made on investments.
- *Lack of interference on the part of government in the affairs of BPC*—coupled with a recognition, enshrined in the 1974 BPC Act, that electricity tariffs should be set along commercial lines—has allowed BPC to operate profitably while reducing tariffs in real terms.
- *Tariffs reflect the cost of supply.* There is virtually no cross-subsidy from commercial-industrial consumers to domestic consumers.
- *An enlightened and flexible approach adopted by BPC and the government over the policy on imports of electricity.* By taking advantage of the relatively cheap electricity that was available over the past 10 or so years, BPC has managed to keep tariffs stable in current terms (substantially reduced in real terms) and at the same time has accumulated more than P 1 billion (\$0.22 billion) of reserves that were earmarked for the development of the country's next power generation project—an extension to Morupule Power Station.

- *Government direct funding for rural electrification* has allowed substantial progress to be made in increasing access to electricity in rural communities. The government has contributed more than P 300 million (\$66 million) of direct investment in rural electrification, P 31 million (\$7 million) was raised from the European Investment Bank, and a further P 295 million (\$65 million) was funded by BPC out of retained earnings from its operations and investments.
- *Implementation of rural electrification* has been generally well managed by BPC. This has been achieved by setting up a separate rural electrification division with a small staff whose sole responsibility is for implementation of the village electrification schemes.
- *Outsourcing of the detailed design and construction of the distribution systems* to the private sector has allowed BPC to manage the system extensions and connections required to meet the high growth in consumer numbers.
- *BPC's staffing costs.* There is some concern over the rapid increase in BPC's staffing costs in recent years, both in staff numbers and costs. Staff numbers have increased by almost 4 percent per year, and total staffing costs have increased by more than 20 percent per year for the past six years, compared to inflation averaging 8 percent per year. Although some increase in staff numbers is understandable in order to meet the rapidly growing customer base, the government has made it known that it wishes to improve the efficiency of the parastatals. The intention is to implement a performance contract with BPC to improve efficiency. The government has no firm plans to privatize BPC at present. BPC has responded to the government's move by carrying out a major internal restructuring that involves dividing its business into a number of individually accountable strategic business units, each of which would be performance driven. It has also put in place a program to combat the effects of the HIV/AIDS pandemic on the technical and management strength of BPC.

*A few areas of concern in the sector remain:*

- *Affordability of electricity by low-income households* is a concern, although this appears to be an issue of affordability of electricity by lower-income households rather than a lack of investment. In spite of the rapid increase in access, less than 30 percent of households in Botswana have an electricity supply. Although this is higher than most Sub-Saharan African countries, it is well below South Africa (70 percent) and Ghana (48 percent). In spite of the funding provided by the government for rural electrification and extended payment terms available to domestic consumers, there is a question of the affordability of electricity by lower-income households, since there is no lifeline element in the domestic tariff. This issue of affordability is manifested in very low take-up rates on some village electrification schemes. There appears to be a risk that further substantial progress in increasing access may be hampered, unless this issue is addressed.



## CASE STUDY B: BRAZIL

### Economic Background

*With a population of about 179 million, Brazil had a per capita gross national income of about US\$3,060 in 2004. About 22 percent of the population was below the national poverty line.<sup>1</sup> Throughout the 1990s, Brazil had been fighting the battle to stabilize its economy, tame the inflation, and reduce the economy's vulnerability to external shocks.*

*Its annual GDP growth rate averaged at 0.3 percent during 1990–93, 3.4 percent during 1994–98 and 2.1 percent during 1999–2001 broadly in line with or exceeding the regional average. Since 1994 Brazil had used a crawling exchange rate band as a nominal anchor for managing exchange rate volatility. During 1994–98 major privatizations and banking and financial sector reforms were pursued. However, in 1998 the economy faced an overvalued exchange rate and the need for substantial public sector borrowing. Both made the economy vulnerable to external shocks.*

*In 1998 the country faced a major currency crisis. In January 1999 the crawling exchange rate band approach was abandoned, and an inflation targeting approach came to be used. With tight fiscal controls, some stability and a growth rate of 4.5 percent in 2000 was achieved. During 2001–02 the shocks faced by the economy included a major domestic energy crisis, slowing of the world economic growth, increased risk aversion for investments in emerging markets, higher oil prices after September 2001, Argentina's debt default, and market jitters preceding the presidential election. These events resulted in a rapid depreciation of the Brazilian currency (real), high inflation, and lower rates of growth. A high volume of external debts and the heavy burden of debt servicing became a major concern. Growth fell to less than 1.5 percent in 2001, public debt rose to 60 percent of GDP, and the value of the Brazilian currency fell by half in relation to the dollar.*

*The government entered into a standby credit agreement for US\$30 billion with the International Monetary Fund (IMF) in September 2002, which involved tight fiscal controls to attain primary fiscal surpluses, prudent debt management, enhanced credibility of inflation targeting, and maintenance of the floating exchange rates. This resulted in notable successes. Inflation fell from 12.5 percent to 5.7 percent during 2002–05. GDP grew at 4.9 percent in 2004. Although it slowed down to 2.3*

*percent in 2005, it is expected to recover to 3.5 percent in 2006. The value of the real appreciated back to the level of R 2.1 to \$1.00. The country's exchange reserves also reached \$54 billion. Brazil prepaid its IMF obligations in 2005 and is now repaying several other foreign debts. Sovereign spreads fell from 2,400 basis points in 2003 to 220 basis points by April 2006.*

### The Power Sector in Brazil<sup>2</sup>

*The power sector in Brazil plays a major role in supporting the development of a country with 179 million inhabitants and with a GDP higher than US\$600 billion (as of 2004). The sector serves more than 50 million customers, corresponding to about 95 percent of the country's households, who have access to reliable electricity. Demand for electric power has increased during the last 20 years from 70 to 300 TWh and continues to show high growth potential. Throughout the 1990s, electricity demand grew at a steady 6–7 percent per year.*

*The industrial sector represents the largest consumer group. Historically, income elasticity of demand has been about 1.6, which implies a significant expansion of the power sector to support the country's continued growth. The high income elasticity is also indicative of the potential for demand management and the need to choose a less energy-intensive growth path.*

*Brazil's electricity market is by far the largest in South America. Its power consumption is more than double the combined consumption of Argentina, Bolivia, Chile, and Uruguay. Its installed capacity is about 80 GW, making it comparable to Italy and the United Kingdom, but with a much larger transmission network. At 70,000 km of high-voltage (230 kV and above) transmission lines, the Eletrobrás high-voltage system dwarfs those of many power systems, including those of the National Grid (6,000 km) of the United Kingdom, and ENEL (10,000 km) of Italy.*

*Brazil is extremely dependent on hydroelectric generation capacity in meeting its electricity demand. About 80 percent of the country's electricity, and 88 percent of what is fed into the national grid, is from hydroelectric generation. More than 25 percent (around 75 TWh per year) in fact comes from a single hydropower generation source, the massive Itaipu facility located between Brazil and Paraguay. Itaipu's installed generation capacity has*

The original draft of this case study was prepared by Luiz T. A. Maurer. Venkataraman Krishnaswamy subsequently incorporated some additional information and edited the case study for consistency with the other case studies.

<sup>1</sup> This section draws heavily from World Bank 2003a, 2003b, and 2006.

<sup>2</sup> Parts of this case study were adapted from Lock (2005) and Charles River Associates (2005).

recently been increased from 12.6 GW to 14.0 GW. Of the 80 GW of total installed power generation capacity in Brazil, only 4.6 GW is from gas-fired power plants, 4.8 GW from fuel- or diesel-fired facilities, 2.1 GW from nuclear generators, and 1.4 GW from coal-fired plants. Electricity imports are also relatively small, with 5.5 GW coming from 2.2 GW from Argentina, Paraguay (comprising its share of Itaipu), 50 MW from Uruguay, and 200 MW from Venezuela.

*Capacity addition had traditionally lagged behind demand growth.* For example, between 1991 and 1994, demand grew at 2,500 MW per year, while generation and transmission capacity expanded by only 1,100 MW per year.<sup>3</sup> In 1999 forecasters estimated that about 27,000 MW of capacity additions would be required over the next decade, requiring close to US\$38 billion in new investment—most of it in new gas-fired thermal power plants and the gas pipelines to supply them.<sup>4</sup> Even prior to the 2001 energy crisis, Brazil had blackout episodes that reflected a strained system operating close to its technical limits.

*The availability of abundant sources of hydroelectric power is beneficial for Brazil in that it reduces the country's overall generation costs relative to countries with more diverse supply mixes.* Hydropower is also more environmentally friendly in many respects than most thermal generation.

*However, this dependence on hydropower makes Brazil particularly vulnerable to supply shortages in low rainfall years, especially when consumer and industrial demand is strong and increasing.* Experts have warned for years that Brazil's electricity supply mix is inherently volatile and that it needs to diversify its sources to avoid major seasonal supply shortages. The 2001 crisis vividly demonstrated Brazil's perennial vulnerability to drought caused by an excessive dependence on hydropower and the country's low reserve margins. That, of course, could and did present an enormous opportunity to the developers of nonhydropower plants to use Brazil's not insignificant oil, gas, and coal reserves, to the extent they were available, to expand and diversify power generation.<sup>5</sup>

*In fact, for almost 20 years Brazil has been on the radar screen of private sector investors, independent power producers (IPPs), and those interested in power sector*

*reform.* In fact, Brazil has been one of the largest recipients of private capital investment in its power sector, exceeding those in other major markets, such as in China, India, and the Philippines.<sup>6</sup> New capital was, to a large extent, the result of a market-driven power sector model conceptualized and partially implemented in the late 1990s.

### **Power Sector Reform Efforts: A Roller Coaster?**

*Power sector reform in Brazil was not smooth and linear.* It faced many ups and downs, and twists and turns, and tried to adapt based on experience.

#### **The State-Dominated Model**

*Until the early 1990s, the power sector in Brazil was basically in government's hands.* Despite its success in buttressing the development of the sector in the 1970s, the state-ownership model was on the verge of collapse in the late 1980s. Tariffs were heavily subsidized, and the sector had a cumulative revenue shortfall of about US\$35 billion. About 15 large hydro plants had their construction delayed or stalled because of the lack of money for investments. There were complaints about the inefficiency and corruption in the construction of large plants. Several efforts in the 1980s were made to arrest the deterioration, but they were too cosmetic to produce any meaningful results. Those reforms did not challenge the underlying assumption (in the existing sector structure) of having the state in the driver's seat, under the vertically integrated model, and holders of private capital were understandably too skeptical to make significant investments in the power sector.

#### **Paving the Road for Reform**

*Although the precise triggers for reform initiatives are often debated in Brazil, one can certainly trace the current reform initiatives to a major commitment by the administration of President Cardoso in the mid-1990s to carry out a fundamental restructuring of Brazil's electricity sector.<sup>7</sup>* The first steps involved amendments to the concession legislation to allow the participation of private capital on a competitive, level playing field. Also, in preparation for a sustainable reform, important steps were taken to improve the economics of the power

<sup>3</sup> From de Martino Jannuzzi 2004.

<sup>4</sup> Although Brazil has huge untapped hydro potential (estimated at 170,000 MW), most of the attractive hydropower resources have already been developed, and high environmental and social costs, together with the difficulty of great distances between power plants and load centers have made likely the need for large additions in fossil energy supplied power sources.

<sup>5</sup> According to the *Oil and Gas Journal*, Brazil has 10.6 billion barrels of proven oil reserves, and 8.8 trillion cubic feet of natural gas reserves. In addition, it imports substantial quantities of gas from Argentina and Bolivia. Its recoverable coal reserves exceed 11.1 billion tons. Its hydroelectric potential exceeds 170,000 MW.

<sup>7</sup> President Cardoso had two terms. The first one was from 1995 to 1998, and the second one was from 1999 to 2002. He was then succeeded by President Lula da Silva whose term is from 2003 to 2006.

sector by reducing its liabilities and by establishing a new tariff system designed to provide incentives for efficiency. Proper legislation and economic feasibility of the sector as a whole were recognized as important prerequisites for a sustainable restructuring effort in the making.

### **The Reforms in the 1990s**

*The blueprints and initial implementation steps of the power sector reform were carried out by the so-called RE-SEB project, initiated in 1996 under the administration of President Cardoso.<sup>8</sup> It was based on analytical inputs and on experiences in other countries that were adjusted to the specifics of the electricity sector in Brazil.<sup>9</sup> The objective of the reform was to establish a comprehensive effort to build a more competitive power sector, creating a level playing field for private sector participation. At the same time, and running on a parallel track, momentum was gaining for privatization of state-owned assets, including, among other things, state-owned utility companies. As a result of this effort, today about 85 percent of the distribution sector and 25 percent of generation are in private hands. Privatization of existing transmission assets did not occur, but practically all the expansion of the transmission network has been carried out by private capital. For many, the amount of capital attracted to the sector, either through privatization or greenfield investments, is a testimonial to the success of power sector reform in the late 1990s.*

*One of the first steps of this reform was the establishment in 1996 of ANEEL (Brazil's National Electricity Regulatory Agency), the federal agency established as a quasi-independent regulatory body charged with overseeing the electricity sector. Although ANEEL's precise role had been evolving as the restructuring of the sector evolved over the previous 10 years (under two successive administrations), and although some changes in its role and functions are still contemplated, the essence of its independence had been preserved throughout.*

*Then, under a new law enacted in 1998, the Cardoso Administration took the major restructuring steps of establishing an independent operator of the national transmission system (ONS) and a commercial market operator (MAE). Because of delays in implementing the market rules and some contractual disputes, MAE could become fully operational only during the 2001 rationing episode, and its first energy settlement could take place only in 2003.*

*The remarkable results of attracting new capital to the power sector, both in terms of privatization and greenfield projects, have been attributed to the above-mentioned market-driven reforms.<sup>10</sup> Under the Cardoso Administration, some existing state-owned generation capacity was successfully privatized. As a result, some foreign investors, including Tractebel, AES, Prisma Energy, El Paso, Duke, became significant bulk power producers in Brazil. In addition, many local investors, including industrial groups, large customers, utilities, and pension funds heavily invested in the power sector. Some companies (Tractebel, El Paso, and Duke) had a clear strategic direction of being operators in the generation segment. Others, such as Enron (gas and electricity) and AES (generation and distribution) tended to look for opportunities for vertical integration. A third group of companies, including EdF, Endesa, and Chilectra, focused on distribution business segment. Institutional investors participated in many segments of the business, but a majority of their investments went toward the distribution segment. International transmission companies, such as Enel, many construction companies, and equipment manufacturers participated in the concessions for transmission expansion. The merits of the reform started to be challenged in 2001 when Brazil experienced a major electricity supply crisis brought on by, among other things, a severe drought, which demonstrated concerns about its heavy dependence on hydroelectricity. The administration had to implement a significant power rationing program throughout Brazil, the results of which were decidedly mixed. Partly in response to this energy supply crisis, the Brazilian government is currently in the midst of a significant new institutional and regulatory reform effort, which is revisiting most of the market-driven reforms that took place in the late 1990s.*

*In 1999 when the impending power shortage was foreseen, the Cardoso Administration attempted to address the expected shortfall through stepped-up efforts to increase private investment in the electricity sector. An aggressive Priority Thermal Power Program (PPT) was launched to construct more than 40 gas-fired thermal plants on a fast-track basis. However, an ongoing reform process, still with gaps and regulatory flaws, was not able to attract this urgently needed capacity on time, and the crisis became unavoidable.*

<sup>8</sup> RE-SEB is an acronym for Restructuring of the Electric Sector in Brazil.

<sup>9</sup> Paixão 2000.

<sup>10</sup> World Bank research (Kessides 2004) indicates that Brazil received US\$31.6 billion in foreign investment in the power sector between 1990 and 1999; the next highest recipient was China at US\$19 billion.

Only a few of the gas-fired thermal power plants under the 1999 PPT program have actually been completed by 2003. Eight more were expected to go on line in 2004. Their cumulative generation capacity, however, will be relatively small. Most other PPT projects have either been cancelled or have stalled because of licensing and other regulatory uncertainties. The contraction in demand by about 20 percent achieved under the energy rationing program and the consequent emergence of excess generation capacity may also have contributed to these decisions.

### **The 2003–04 Reforms**

In January 2003, the new administration led by President Luiz Lula da Silva (Lula) came to power on a platform that included criticism of the electricity sector reform efforts of the previous administration of President Cardoso. This political change, combined with fallout from the 2001 drought, also led to an initial apparent reversal of the Cardoso Administration's reforms. During his campaign, President Lula had put together a comprehensive alternative reform plan, challenging some of the fundamental principles of the earlier power sector reform in Brazil and worldwide, denying the possibility of having competition and independent production in a system that (in his opinion) should be, because of its own nature, fully regulated. The proposed model included some elements, such as the establishment of a single buyer, the end of the role of independent producers, reregulation of the generation business on a cost-plus basis, and not allowing competition in the market and other similar features. At first, it seemed to be a setback toward the old days of regulation and government control in the 1980s. The efforts to privatize the generation sector (initiated by the previous administration) stalled. The Lula Administration, generally opposed to privatization, stopped the pending privatizations of three major generation subsidiaries of the massive state-owned utility, Eletrobrás, which today controls nearly half of Brazil's installed capacity and most of the nation's transmission lines.

Much of the ongoing review of the policies of Cardoso Administration, commenced in 2003 by Brazil's Energy Minister, Dilma Rousseff, focused on the fallout of the 2001 energy crisis. That has led in the short term to a greater government role in supply expansion. Notably, the goals of the new model focused predictably on reliability of supply and stabilization of prices for consumers.

However, contrary to the initial expectations, the model actually followed by the new administration overtly seeks to attract long-term private investment to the sector, heavily relies on competition for the market, as well as increases the level and scope of retail competition.<sup>11</sup> All of the previously created institutions, such as the regulator, the system operator and the market administrator were preserved and in some cases their functions strengthened. A new company, called EPE, was created, with the specific mission of developing an integrated long-term planning for the power sector in Brazil.<sup>12</sup> To some extent, the actual model followed was very different from the one put together during President Lula's political campaign.

Contrary to the initial public perception that private sector entry into the generation business would be stopped, it is now expected that most of the generation expansion will be funded by private capital. Table B-1 illustrates the point, showing a breakdown of existing and future plants by size and technology. Currently, about 27 percent of the generation assets are in the hands of private investors. Considering the plants under construction, as well as the concessions and licenses already granted by ANEEL, this figure is expected to grow up to 31 percent in the medium term and to reach almost 44 percent over 5–6 years. Even if the possibility of privatization of existing generation assets is overruled, private capital participation in the generation business will likely represent 50 percent of the installed capacity in the years to come.<sup>13</sup>

### **Energy Auctions**

One of the landmarks of the model followed by the Lula Administration (the 2004 model) is the establishment of energy auctions as the primary procurement mechanism for distribution companies to acquire energy to serve their captive consumers. This measure helped in the creation of competition in the power sector, as well as addressed some of the market imperfections observed in the past. It was observed in the past that distribution companies did not contract energy in the forward market as aggressively as they should have. They claimed, among other reasons, that the regulatory benchmarks for passing through the cost of energy to their captive customers were artificially low, and that therefore they would run the risk of not being able to pass through to their customers the full cost of energy purchase, had they contracted more aggressively. Although this is true, it is also true that distribution companies did not look at the consequences of not

<sup>11</sup> A comparison between the 1990 model, model proposed by President Lula and the one really implemented in 2004 is shown in Annex B-1.

<sup>12</sup> Having an institution solely responsible for planning (IDESE) was also a recommendation in the previous model. However, it never came to fruition.

<sup>13</sup> Privatization is less likely for federally owned generators, but possible for state- (province-) owned, vertically integrated utilities, such as Copel, Cemig, and CEEE.



**TABLE B-1. The Role of the Private Sector in Power Generation**

EXISTING POWER PLANTS				PLANTS UNDER CONSTRUCTION				AUTHORIZATIONS OR CONCESSIONS GRANTED			
	Public	Private	% private		Public	Private	% private		Public	Private	% private
<b>Hydro</b>				<b>Hydro</b>	310	5,874	95.0	<b>Hydro</b>	435	3,318	88.4
320–6,300 MW	46,093	8,705	15.9								
40.4–264 MW	2,130	3,344	61.1								
8.8–37 MW	278	609	68.7								
Small hydro	250	593	70.3		12	219	94.8		15	1,289	98.8
<b>Nuclear</b>	1966	0	0	<b>Nuclear</b>	0	0		<b>Nuclear</b>			
<b>Coal</b>	466	995	68.1	<b>Coal</b>				<b>Coal</b>		2,359	100.0
<b>Natural gas</b>	600	2,151	78.2	<b>Natural gas</b>	1,638	5,219	76.1	<b>Natural gas</b>	500	11,306	95.8
<b>Fuel oil</b>	520	415	44.4	<b>Fuel oil</b>				<b>Fuel oil</b>			
<b>Diesel</b>	1,732	1,117	39.2	<b>Diesel</b>				<b>Diesel</b>		23	100.0
<b>Biomass</b>	0	1,540	100.0	<b>Biomass</b>				<b>Biomass</b>	3	110	97.3
<b>Wind</b>	1.3	17.5	93.1	<b>Wind</b>				<b>Wind</b>	0	3,337	100.0
<b>Total</b>	54,036	19,487	26.5	<b>Total</b>	1,650	5,438	76.7	<b>Total</b>	518	18,424	97.3
<b>Total with plants under construction</b>					55,686	24,925	30.9				
<b>Total with plants under construction and authorized</b>									56,204	43,349	43.5

contracting. In the absence of a mature market, very few generators would be willing to construct a new plant without having most of the energy fully contracted. In sum, distribution companies did not contract, and expansion did not occur.<sup>14</sup>

*Auctions of capacity from “new” generation undertakings (whether or not they already have secured concessions or licenses) will be held three to five years in advance of delivery dates.* The idea is to ensure that the totality of future expansion needs, under the watchful eye of the Ministry of Mines and Energy, is met; and that plants are built only after they have won bids in energy auctions and are guaranteed long-term contracts.

*Auctions for “existing” undertakings will occur a few years in advance of forecasted delivery.* Distributors who have not achieved the guaranteed 100 percent supply requirement in the first instance will have the opportunity to true up (up to

1 percent of) their supply requirement through “adjustment auctions” to be conducted several times a year, leading to short-term (up to two-year) contracts.

*In order to avoid delays in auction winners coming on line, environmental studies and reports, as well as the preliminary environmental licenses, must be obtained in advance of auctions, with installation and operational licenses to follow in due course.* The ongoing obligation for environmental compliance will remain on the entrepreneur.

*Generally, distributors will be able to pass through supply acquisition costs to end users, but they will be subject to new limits linked to the costs of acquisition in the auctions.* Thus, the energy auctions provide a type of “market” test of the “prudence” of energy purchases by the distribution companies.

<sup>14</sup> The problem is more complex, but a market failure is clearly involved in the decisions of distribution companies. They knew that if collectively none of them contracted, the result would be a shortage of supply, which actually occurred. In a perfect market model, distributors being short of energy in a period of shortage (very high prices) is a risk that none of them should be willing to bear. However, they appeared to know (or had a strong feeling) that if things went sour (for example, leading to a major crisis calling for rationing), a bailout from the government would be inevitable. They did not trust the market signals and behaved in a way that contributed to the rationing crisis.

*The first auction was carried out in December 2004. It is usually referred to as the “Mega-Auction” because of the sheer volume of electricity traded, even on a worldwide basis. Contracts for a total of about 40 GW were traded. The auctions were for eight-year energy contracts for firm delivery starting in 2006, 2007, and 2008. Contracts for delivery starting in 2009 and 2010 will be carried out soon.*

### **Uncertainties Related to the 2004 Model**

*Despite the new model’s maintaining some of the basic pillars of the competitive power sector developed in the late 1990s and fixing some of its flaws, the Lula Administration’s efforts were viewed with skepticism by the investors, who believed that, based on President Lula’s campaign and on the ideology of his party, some radical changes were about to take place. Those radical changes never materialized and as a result of Minister Rousseff’s effort, a more robust model was put in place, where the government does have a stronger role to play in areas that the current government views as market failures and which contributed to the rationing crisis (for example, the lack of capacity expansion because of the lack of a mandatory contracting mechanism). Despite the more favorable and positive outcome, numerous regulatory changes and surprises tend to scare investors and exacerbate the existing level of uncertainty regarding the future of the power sector. The jury is still out. It is not certain to what extent the 2004 model will indeed lead to new investments and attract some of the major international players. The present excess generating capacity situation in Brazil is likely to last for two or three years more. Since power generation plants take two or three years to construct, this is the time to make commitments for new plants. Flaws in the existing model, if any, will have repercussions three years down the road.*

### **Fallout of the Shortage—Building Nega-Watts into the System**

*In 2001–02 Brazil faced one of the most serious energy crises experienced in the history of its power system. The crisis led to a stringent power rationing regime and had a significant impact on the national approach to power policy, planning, and regulation.*

*The crisis remains a defining moment in the development of the Brazilian power sector. As with most crises, it was the result of several intersecting trends, with a serious drought and lack of timely investments being the most important. In the Brazilian power system, in which 85*

*percent of the generation capacity is hydroelectric, the sequence of a few years drier than usual is generally considered the immediate cause of the crisis. Delays in the commissioning of several new generation plants under construction and transmission problems in the third circuit from Itaipu hydropower plant (the largest hydropower facility in the world) accounted for about a third of the energy deficit. Regulatory uncertainties concerning the pass-through of the full power purchase costs by the distribution companies are believed to have discouraged them from offering Power Purchase Agreements (PPAs) for future supplies to the prospective investors in new generation. Although the 1997 reforms attracted considerable investor interest in the power sector the new investors dragged their feet in the absence of such PPAs and new capacities did not materialize in the time frame envisaged. The resulting energy shortages were sought to be met by drawing down the multiyear storage reservoirs, and reservoir levels reached such dangerously low levels that supply would not last beyond four months.<sup>15</sup>*

*Despite dwindling hydro reserves, the government did not take any firm action until a lack of rainfall in 2000 and 2001 made it clear that drastic demand reduction schemes would be necessary to avoid extended blackouts. Although sophisticated trading systems were set up as part of the reform effort, they were largely useless at stimulating investment in new capacity. The crisis demanded more drastic interventions.*

*After the failure of two voluntary demand reduction campaigns, the government created the Electric Energy Crisis Management Board, known as the GCE, in June 2001. The full board was chaired by President Cardoso, and GCE was granted special powers that superseded those of ANEEL and MAE. Among these powers was the authority to set up special tariffs, implement compulsory rationing and blackouts, and bypass normal bidding procedures for the purchase of new plant and equipment.*

*The government’s handling of the shortage sent out some important price signals to customers, largely positive. Rejecting the more commonly used and easier-to-implement solution of rolling blackouts, the government opted for a quota system. The quota for the consumers was based on historical and target consumption levels, with penalties for exceeding quotas, bonuses for consumption well below the prescribed level, and some freedom for the large users to trade their quotas in a secondary market. This heavier reliance on market signals worked—and the government’s goal of reducing*

<sup>15</sup> See chapter 4 on Brazil in Maurer, Pereira, and Rosenblatt (2005) for a more detailed discussion of the causes and results of the Brazilian power crisis.

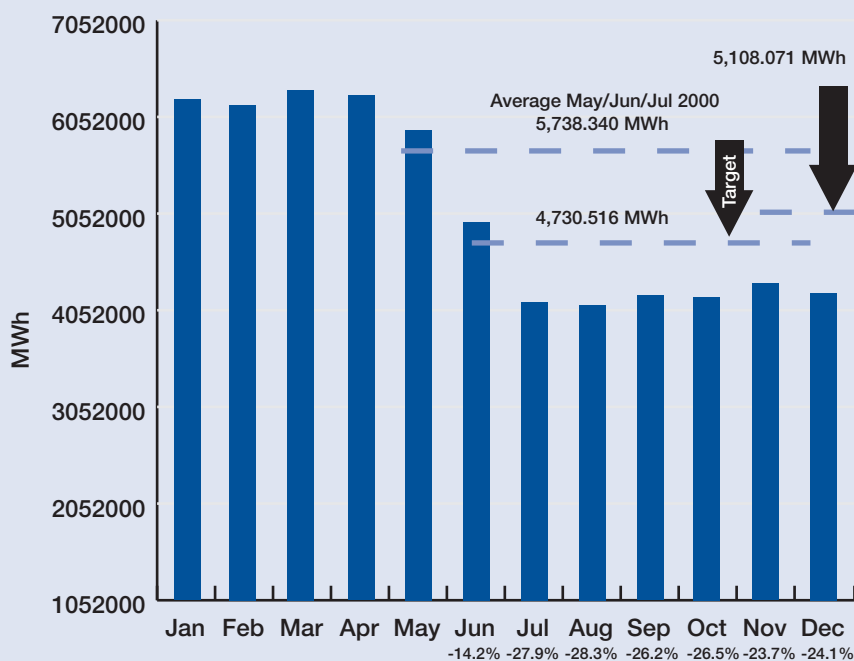
historical consumption levels by at least 20 percent for an eight-month period was essentially realized. The anticipated dire economic impact (such as GDP reduction and unemployment) was by and large avoided, and a major long-term benefit—a significant long-term conservation impact, especially on residential consumption—was achieved, thus leaving more room for increased industrial consumption.<sup>16</sup>

*Ironically, the need for rationing—a form of compulsory demand-side management—proved the efficacy of many standard demand-side management and energy efficiency market intervention strategies, especially customer awareness building, promotions, and incentive schemes to influence customer behavior.* The government’s decision to adopt a semivoluntary quota system rather than a totally involuntary rolling blackout scheme was highly successful, yielding energy savings of up to 25 percent for residential consumers, 15–20 percent for industrial consumers, and 10–25 percent for commercial consumers. The success of this decision demonstrated the viability of engaging the demand side in the process of saving energy.

*Figure B-1 shows the rather extraordinary results of rationing in the country. Year-on-year monthly usage fell more than 25 percent for a sustained period—well below the government’s rationing target for the sector. The demand response to the rationing efforts were so successful that the government was obliged to pay out more than US\$200 million in bonuses to residential, industrial, and commercial customers who met and exceeded their demand reduction goals.<sup>17</sup> The sheer efficacy of grassroots and universal customer engagement in implementing power sector policy was brilliantly demonstrated during the crisis.*

*The government also undertook drastic interventions on the supply side by mounting a program for contracting emergency generation capacity. Proposals for 117 generating units with total capacity of 4,000 MW were submitted, and bids totaling 2,100 MW of new thermal capacity were accepted. The average contract price in respect of these emergency generation units (which included barge-mounted diesel-fueled units and other similar options), amounted to about US\$100/MWh, which was nearly three times the price commanded by the quotas trading in auctions at that time.*

**FIGURE B-1. RESULTS OF RESIDENTIAL ENERGY SAVINGS DURING THE 2001 POWER CRISIS**



<sup>16</sup> Ninety-one percent of households reduced consumption; and two years later, two-thirds of them were still saving on prior consumption. Annual consumption growth rates, pre-estimated at over 4 percent, still hover in the 1–2 percent range.

<sup>17</sup> Maurer, Pereira, and Rosenblatt (2005).

*Both generators and distributors were financially hard hit by the power crisis. With the 20 percent reduction in consumption, revenues of the distributors came down by 20 percent. They were thus unable to cover their fixed costs. In respect of generators, the risk-sharing mechanism that pooled the generator production shortfall risk of all generators together meant that they were charged for production shortfalls at spot prices that were much higher than their contract rates. Only after extensive government brokering was agreement reached on a series of tariff increases that would allow distributors to recover their revenue shortfalls and generators to recoup their spot market payments over a period of six years.*

*The financial position of the distributors was also weakened by the concurrent and continuing devaluation of the real. From January 1, 1999, through December 31, 2001, the real fell in value by 92 percent against the dollar. From January 1, 2002, through June 24, 2002, the real fell in value by another 20.3 percent. Thus, during the period of 42 months, the amount of reais equivalent to a dollar rose from 1.2 to 2.8 or by 133 percent.<sup>18</sup>*

*Customers were hit hard as well. In addition to the threat of rolling blackouts (which never materialized) the average price of electricity skyrocketed 140 percent in nominal terms between 1995 and 2002—twice the increase in the IPCA consumer price index over the same period.<sup>19,20</sup> The combination of the rationing and price increases led to a significant reduction in total use and use by sector which continues to date. After peaking at 310,000 GWh in 2000, sales fell 10 percent in 2001 and stayed flat through 2002. Forecasts for both GDP and electricity growth rates stand only at 2 percent over the short term, down considerably from the 6 percent growth rate of the early to mid-1990s.<sup>21</sup>*

*The legacy of the power crisis and its effects on the future of energy efficiency in the country are mixed. On the supply side, the crisis created more barriers to future demand-side management and energy efficiency efforts, because distributors are averse to any further reduction in their revenue and are not interested in undertaking new, discretionary activities. On the demand side, the crisis provided incentives for all customer groups for investments in energy conservation and efficiency. Furthermore, prices remain high for all consumers, since the bill for all the new capacity and the financial hangover from the crisis need to be paid for. Continued high prices are likely to create new opportunities for investment in energy efficiency.*

*In addition, the immediate outcome of the rationing was a lesser need for new investment in the sector in the short term. However, the most remarkable consequence of the crisis was that, by the end of 2002, when the President Lula took office, about 8,500 MW of surplus assured energy were available in the country, making a supply crisis during his administration unlikely. About half of the surplus capacity is usually attributed to the expansion of the power sector during the rationing period, and the other half is attributed to the energy rationalization and efficiency gains, which persist to the present (nega-watts).<sup>22</sup> In sum, efforts on the demand side were able to create a virtual capacity of 4,000 MW, helping the country bridge the supply demand gap in a very economical way.*

### **Attracting Capital and Power Sector Reform**

*Despite all the criticism about the reforms of 1990s and subsequent mid-course corrections, they produced remarkable results in attracting capital. The power sector reform in late 1990s conveyed to the investors the country's serious intention to attract private capital, and showed industry experts and investors worldwide a consistent regulatory roadmap to do so. Brazil received about US\$56.7 billion in private capital between 1990 and 2003. That represents more than 20 percent of the total private capital invested in the power sector of the developing countries worldwide. The next highest recipient was China with US\$22 billion (table B-2). Brazil was very fortunate that the timing of privatization of its assets coincided with a window of opportunity in the late 1990s, where international investors had funds and commitment to expand their operations abroad. As one commentator put it, it was a time of great exuberance, unlikely to occur again any time soon.*

*One of the criticisms about the capital flow into the Brazilian power sector was that most funds were used for the acquisition of existing state-owned assets, as opposed to promoting expansion of the power sector through capacity additions. If all the money had been invested in greenfield projects, some critics contend, rationing could have been avoided. Although this statement has some elements of truth, the proceeds from privatization helped to reduce the country's foreign debt and created fiscal space for new investments in social areas. It is also worth noting that, despite two-thirds of the capital being used for privatization, Brazil still ranks number one in terms of capital invested in new, greenfield assets, as shown in table B-2.*

<sup>18</sup> The depreciation of the real reached its lowest point during President Lula's election to about R 4.00 to the dollar. It has since appreciated again to R 2.7 to the dollar, bringing relief and financial stability to the distribution companies.

<sup>19</sup> IPCA stands for *Índice Nacional de Preços ao Consumidor Amplo* (or Broad National Consumer Price Index).

<sup>20</sup> Instituto Nacional de Eficiência Energética 2003.

<sup>21</sup> Bourdaire 2003.

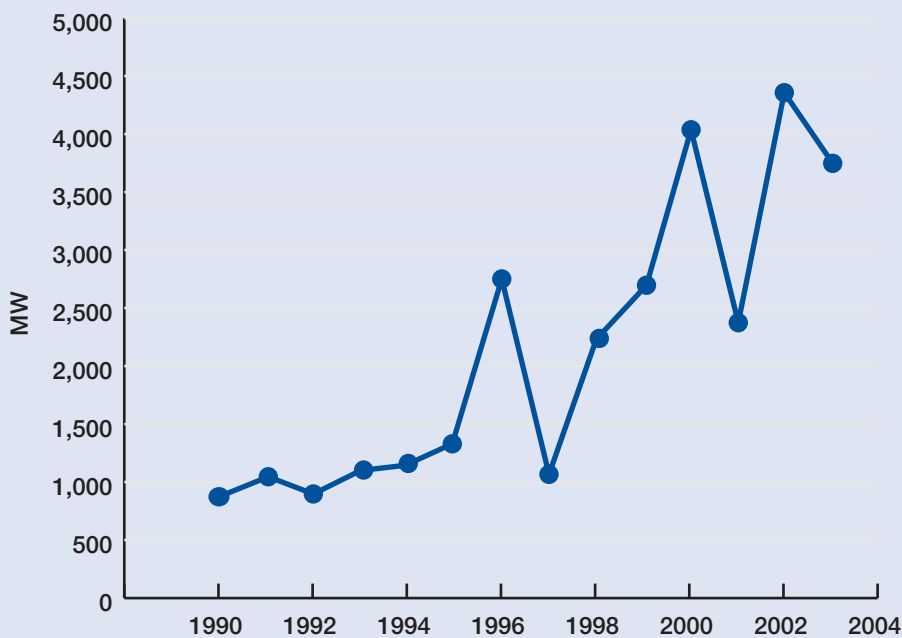
<sup>22</sup> Nega-watt refers to the volume of watts of energy saved through such methods as demand-side management.

**TABLE B-2. Private Investments in the Power Sector, 1900–2003**

COUNTRY	TOTAL INVESTMENTS	PERCENTAGE WORLDWIDE	GREENFIELD AND CONCESSIONS	DIVESTITURE
Brazil	56,672	21	17,689	38,983
Argentina	25,988	10	16,861	5,455
China	22,316	8	12,610	1,604
Philippines	14,214	5	12,126	563
India	12,688	5	10,547	188
Malaysia	11,120	4	8,525	2,595
Indonesia	10,737	4	8,098	2,176
Thailand	10,274	4	6,765	19,223
Others	105,865	39	67,171	38,677
Worldwide total	269,874	100	160,392	109,464

Source: World Bank (2004). Total investments include divestiture, greenfield, management contracts, concessions, and leases. Column 4 excludes leases and management contracts.

**FIGURE B-2. ANNUAL GROWTH IN CAPACITY ADDITIONS**

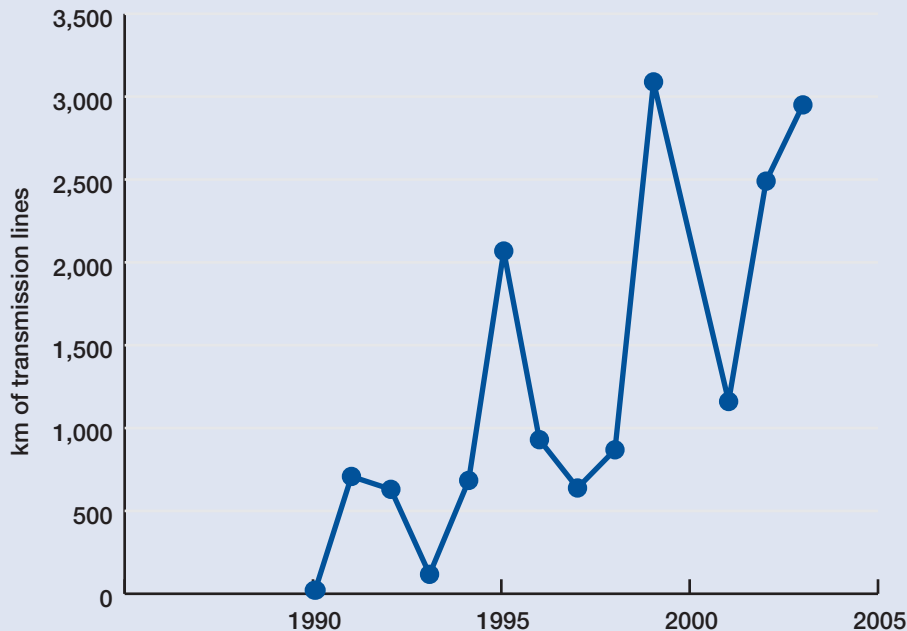


Power sector reform had a remarkable impact on the flow of capital indeed. The average investment in the electricity sector from 1984 until 1996 was about \$500 million per year. The investment increased to \$8.3 billion per year in the period from 1997 until 2003. The average annual installed capacity addition until 1995 was about 1,100 MW. Annual capacity addition jumped to 3,100 MW as a result of the reform (see figure B-2).

The power sector reform also had an important effect on the expansion of the transmission system. Investments from 1990 until 1995 in the “Basic Grid” expanded at a rate of about 700 km per year.<sup>23</sup> From 1996 onward, this figure jumped to almost 1,800 km per year, as shown in figure B-3. This was a direct result of a BOO model put in place, whereby the investor was granted a relatively stable stream of revenues for the duration of

<sup>23</sup> “Basic Grid” basically includes transmission assets operating at 230 kV and above.

FIGURE B-3. ANNUAL INCREASES IN THE LENGTH OF TRANSMISSION LINES



the concession (20 years). Important new investments were treated as separate projects and a specific concession put for bid. The winner was the one offering the lowest tariff to provide the transmission services. The independent system operator decides which transmission system reinforcements or expansions are necessary. So far, there is no merchant transmission in Brazil.

*As already mentioned, most of the distribution sector was privatized. Very high premiums were paid in the acquisition of state-owned distribution companies, for most distribution companies, as shown in figure B-4.<sup>24</sup>*

*New owners of those distribution companies invested significantly (after privatization) to improve the quality of service and to support the needs of a growing market. They also worked to reduce theft, nonpayments, and technical losses, and to foster energy efficiency. The distribution business benefited significantly from this new infusion of private capital.*

*Quality of service improved significantly in the privatized distribution companies, as can be seen from table B-3, which summarizes the System Average Interruption*

*Frequency Index (SAIFI) and System Average Interruption Duration Index (SAIDI) for the Brazilian distribution systems for the period 1996–2004.<sup>25</sup>*

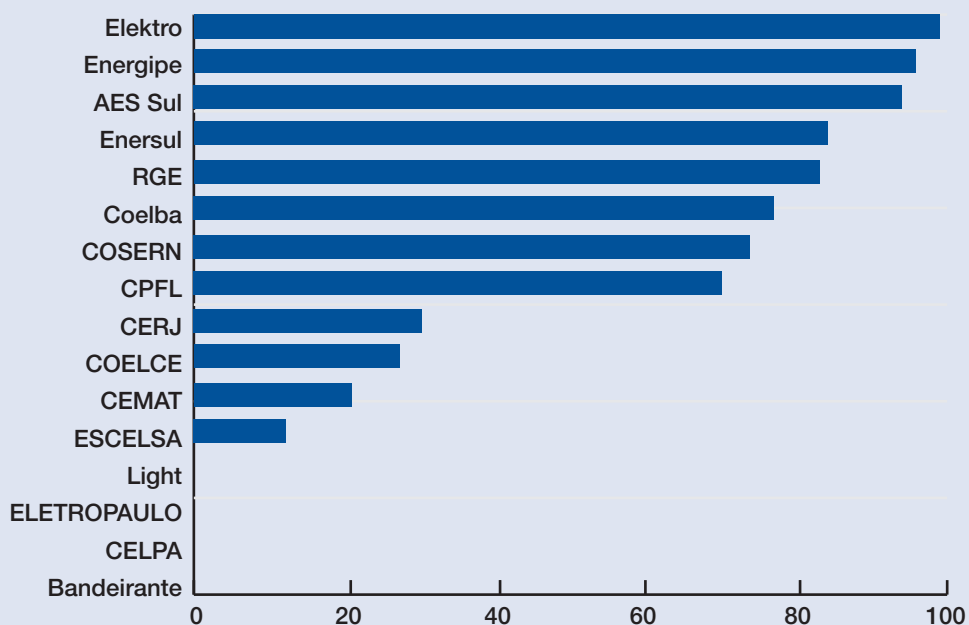
*In general, the reforms created a very robust and solid environment for attracting new investments and for building an efficient power sector. Many of the reform elements need to be preserved as key components of a long-term, sustainable reform. Some of its most positive results of the reform process are summarized in box B-1.*

*Nothing, however, guarantees that the model adopted by Brazil so far will be successful or sustainable in the years to come. Neither is it guaranteed that the model adopted by Brazil in the 1990s can be replicated in countries that are now considering restructuring their power sectors. The regulatory system still has many gaps and flaws that will need to be addressed and that will require new mid-course corrections. The perception that further changes are necessary creates more uncertainty among investors.*

<sup>24</sup> The premium were above the minimum price published by the government as part of the auction process.

<sup>25</sup> SAIFI is the average number of times that a customer's service is interrupted in a year. It is calculated by summing the number of customers affected by each event and dividing it by the total number of customers in the system. SAIDI is the average duration in hours a customer's service is interrupted in a year. It is calculated by summing up the restoration time of each interruption event times the number of customers affected for each event and dividing the result by the total number of customers in the system. The lower the index numbers are, the better is the reliability and quality of service.

FIGURE B-4. PREMIUM OVER MINIMUM PRICE IN DISTRIBUTION PRIVATIZATION (PERCENT)



Source: ABRADÉE 2002.

TABLE B-3. Improvement in Service Quality

YEAR	SAIFI (NUMBER)	SAIDI (HOURS)
1996	21.91	26.09
1997	21.68	27.19
1998	19.86	24.05
1999	17.59	19.85
2000	15.29	17.44
2001	14.56	16.57
2002	14.84	18.07
2003	13.10	16.63
2004	12.12	15.80

Source: Website of ANEEL: [www.aneel.gov.br](http://www.aneel.gov.br).

Less money is available now in the international market, and it is unlikely to have a new great window of opportunity any time soon. Investors, on the other hand, are more skeptical and risk averse. Shareholders were hurt—partly because of the government’s failure to fulfill their promises, and partly because of the exuberance that led to questionable investments. Investors will be more cautious in the future. No significant premiums should be expected. The competition for international capital, now much more scarce, will be more intense.

Governments have to work harder to reduce regulatory risk (and the perception thereof) in order to attract new capital. Reduction of risk will possibly entail a larger role for the state as a buyer, planner, or guarantor. To some extent, the pendulum has swung back from the days of irrational exuberance. Many investors in Brazil did take some extra regulatory risk in the expectation that regulatory gaps would be fixed later either by the invisible hand or by the investors’ own influence over the regulatory compact. Such risks are unlikely to be taken now or in future.

### BOX B-1. Results of the Reform Process

The reform process created a competitive business model for generation in which 10,000 MW of hydro concessions were granted, and 19,000 MW of generation plants were commissioned in five years. Cost and time of construction were significantly reduced with private participation. Following are some of the most positive results of the reform process:

- Consolidation of a business model for power system operation similar to the most advanced pools in the United States—"centralized least cost, security constrained dispatch," carried out by an independent operator.
- Creation of a new business model in transmission—12,600 km of high-voltage lines and 23 GVA in substations were built, mostly by the private sector.
- Creation of a wholesale energy market—now in full operation.
- Privatization of 85 percent of distribution and 25 percent of generation with significant improvements in quality of service—timing of privatization coincided with the greatest availability of capital in the world market.
- Electrification of 500,000 rural households.
- Successful management of an eight-month, countrywide rationing program that reduced consumption by 20 percent, using market signals and no blackouts—with 8,500 MW of surplus capacity available at the end of 2002.
- As a mid-course correction in 2004, establishment of a sound energy auction mechanism as the primary procurement of energy for distribution companies to serve their captive customers at the least cost possible.

Boards of the investing companies will be keeping a close watch over the investments being made by their managers, who in turn will be extra cautious, so as to avoid such risks. The government now has a greater responsibility to tie up all the loose ends of the regulatory framework to minimize regulatory risks.

*Probably the biggest question hanging over Brazil's power sector, certainly from the perspective of the private investor, is whether the reform program, initially instituted in the mid-1990s, will remain essentially on track and what level of stability can be assumed in the basic power sector model, and in the legal-regulatory regime implementing it. Put another way, will the Lula Administration's negative stance on privatization during the elections resurface; or will the pragmatic, if hands-on, approach to the path of the reforms the new government took initially be sustained? The indications are that it may be the latter.*

*Another of the challenges is whether the new "hands-on" or "top-down" approach of government to the sector, evident in the 2004 reforms and the actions of the last two years, will require a far more rules-oriented control of the sector, or whether the more traditional approach of leaving discretion with the regulator will be retained. If the latter, and if the discretions are to be exercised by the Ministry of Mines and Energy rather than by a sufficiently independent ANEEL, the issue of undue politicization of the process would arise and call for remedial action.*

*One major positive factor for Brazil that is not true for many less developed countries attempting sector reform and instituting new regulatory regimes, is the already high electric penetration rates at the distribution level—covering over 90 percent of the population. The tariff regime and payment discipline had ensured broadly commercially viable distribution segment.<sup>26</sup> That may have been one good building block for greater levels of private investment and management in Brazil. One of the greatest barriers to the sustainability of many of the major IPP investments in the 1990s in countries, such as India, was the enormous disparity between the economic terms of bulk power IPP contracts and the tariff and collection regimes faced by the distribution entities. The financially strapped distribution entities could not hope to recover the bulk power costs from end-use consumers.*

*Brazil has presented, for at least a decade, an enticing but perhaps frustrating opportunity, both for private investors and for power sector and regulatory reformers. Whether the 2004 reforms are another step (in a not always clear but apparently inexorable process) toward the opening up of Brazil's power sector to competition and private enterprise, or just another episode in a vacillating trail of failed reform initiatives, the next year or two may provide an answer.*

<sup>26</sup> The average retail tariff per megawatt-hour for the country rose from R 74.47 in 1996 to R 108.50 by 2000 and further to R 244.81 in January 2006. The residential tariff at R 295.29 was about 50 percent higher than the industrial tariff at R 195.20. At the exchange rate of R 2.1 to the U.S. dollar prevailing in April 2006, the average retail tariff in 2006 amounted to 11.66 cents/kWh (ANEEL website and World Bank 2006).



## ANNEX B-1. Basic Characteristics of the New Model for the Power Sector

FEATURE	TODAY	LULA'S CAMPAIGN	NEW MODEL
Industry structure	Proposed verticalization of G, T, D, and C, partially implemented—missing D and C.	Deverticalization not an issue.	Prohibits cross-ownership and self-dealing. Separation between D and C postponed. State companies challenging restrictions.
Trading arrangements	Multiple buyers and sellers.	Single buyer responsible for buying and selling all energy.	“Soft single buyer” (pool) allocating contracts and coordinating auctions, but no title for the energy. Contracts outside the pool are allowed (IPPs and free customers).
Primary nature of contracts	Bilateral, of financial nature.	To be transferred to single buyer, possibly physical.	As today.
Generation pricing	Vesting contracts = regulated. New contracts = freely negotiated for IPPs and auction for public generators.	All generation to have regulated prices.	Freely negotiated if outside the pool. Result of a competitive process (auction) if within the pool.
Status of generation	New = IPP. Old gradually moving from public service toward IPP as plants are privatized.	All generation must be public service.	Status remains as today. However, if energy from public service generators is sold via competitive auction, status becomes irrelevant.
Operation of the power system	Independent system operator, security constrained, least cost centralized dispatch.	Change trading arrangements to allow optimal operation of the power system. Trading arrangements interfere in the optimal dispatch.	As today, but government intends to appoint most independent system operator executives.
Retail competition	To be reduced below 3 MW in 2003—proposed 1 MW.	Allowed only for large customers.	Delayed the reduction in the threshold.
Tariff to large customers	Subsidized. Idea to gradually eliminate cross-subsidies as initial contracts expire, reflecting a commodity cost of US\$30/MWh. Unbundle D and C to give visibility.	Reduce cross-subsidies immediately.	Idea is still to eliminate cross-subsidies, but special deals being cut with large customers at US\$20/MWh.

Note: G, T, D, and C stand for generation, transmission, distribution, and electricity trading. Contracts between G and D are de facto capped at the normative value for pass-through purposes. “Today” represents 2004 or early 2005.



## CASE STUDY C: BULGARIA

### Economic Background

With an area of 111,000 square kilometers, a population of about 8 million, and per capita income of about \$8,260 in 2004 (on the purchasing power parity basis), Bulgaria is already a member of the North Atlantic Treaty Organisation (NATO) and is poised for EU accession in January 2007. In 2002 the EU declared Bulgaria as having a fully functioning market economy.<sup>1</sup> By June 2004, the country had closed all the EU accession negotiation chapters.<sup>2</sup>

The contraction of the GDP, which started in 1989 (following the collapse of the communist regime), continued until 1996–97 when the country experienced a serious economic crisis. Reforms undertaken in that context helped to revive growth. The annual growth rate had been between 4 percent and 5 percent during the last several years and reached 5.6 percent in 2004. Still the GDP in 2004 was about 90 percent of that in 1989. In 2005 the growth rate was believed to have been of 5.5 percent. Annual rates of inflation that reached well over 1,000 percent by 1996 came down to a little lower than 4 percent by the end of 2004. The fiscal deficit of 10.5 percent of the GDP in 1996 came down to near 0 percent in 2003 and became a fiscal surplus of 1.8 percent of GDP in 2004. A level of 1.0 percent surplus is expected in 2005. Public debt as a percentage of GDP came down to 40.9 percent in December 2004.

Introduction of the new local currency and Currency Board arrangements for the exchange rate regime (pegging the Bulgarian currency, the lev, to the German mark initially, and later to the euro) adopted in July 1997 resulted in the stability of the exchange rate over the last several years.<sup>3,4</sup> The Currency Board arrangement will continue until 2010, when the euro will be adopted as the currency. Unemployment (which remained high at 18 percent of the active labor force in 2000–02) came down to 13.5 percent in December 2003 and 12 percent by the end of 2004.

The credit rating of the country had been revised upward several times in the past and stood in 2004 at BBB (Standard and Poor's and Fitch Investment in 2004). Foreign direct investment inflows were at \$1.4 billion or

7 percent of the GDP in 2003 and are expected to exceed \$2.0 billion in 2004, reflecting largely the success in the privatization of energy and telecommunication entities. The average per capita income of Bulgaria in 2004 at purchasing power parity was about 30 percent of the (enlarged 25-member) EU average.<sup>5</sup> About 13 percent of the people were believed to be living below the poverty line in 2003.

### Energy Resources

Energy resource endowments of Bulgaria are modest, and the economy is dependent on imports of nuclear fuel, oil, natural gas, and good-quality coal to meet 70 percent of its energy needs. Its proven reserves of crude oil are about 15 million barrels, its proven natural gas reserves are estimated at 0.2 trillion cubic feet, and its hydroelectric potential in its Danube River basin, Aegean Sea drainage basin, and the Black sea drainage basin is equally modest. The only significant indigenous energy resource is the low calorific value (and high sulfur and high ash) brown coal and lignite. Estimated reserves of lignite are about 3 billion metric tons, nearly 50 percent of which is considered proven. Reserves of sub-bituminous coal are about 200 million metric tons. At current and expected production rates, the coal and lignite reserves should last for about 40–50 years.<sup>6</sup> The country is also believed to have a significant wind energy potential, which is in the initial stages of being exploited for power generation.<sup>7</sup>

### Power Sector Dimensions and Characteristics

At the end of 2003, the total installed power generation capacity in Bulgaria amounted to 12,310 MW, consisting of 2,880 MW (or 23.4 percent) of nuclear, 2,730 MW (or 22.2 percent) of hydroelectric, and 6,700 MW (or 54.9 percent) of the conventional thermal capacity using lignite, coal, or gas as fuel. The nuclear units and lignite-fired thermal plants handled the base load. Other thermal plants handled the intermediate load, while the hydro units handled the peak load and also helped to regulate system frequency and voltage.

This case study was written by Venkataraman Krishnaswamy

<sup>1</sup> Private sector share of the GDP exceeded 65 percent.

<sup>2</sup> However, the European Commission would monitor closely the ongoing reforms and if the target dates are not met, the accession could be delayed by a year (Transition Report 2004, EBRD, p. 110).

<sup>3</sup> The new lev was equal to 1,000 old leva.

<sup>4</sup> The prevailing rate on January 19, 2005, was \$1 = BGN 1.4976 (the new lev).

<sup>5</sup> World Bank 2005, p. 24.

<sup>6</sup> There are slightly lower estimates by the government in the context of studying the new nuclear option. These numbers are from USDOE 2005.

*The nuclear plant at Kozlodui consisted of four units of 440 MW each, commissioned in the late 1970s and early 1980s, and two units of 1,000 MW each, commissioned in 1987 and 1991. On account of safety considerations, the first two units were shut down permanently at the end of 2002. The remaining two 440 MW units are scheduled to be shut down by the end of 2006. Meanwhile, safety upgrades for them, as well as the two 1,000 MW units, are being undertaken. The construction of a 600 MW nuclear unit was started in late 1980s at Belene, but was suspended in 1990 after spending \$1.5 billion. Proposals to complete the construction of the plant and commission it by 2008 at an estimated cost of \$2–3 billion are being pursued.<sup>8</sup> More than 75 percent of the thermal plants are in the age group of 21–35 years or older. Most of the combined heat and power (CHP) plants are even older. Hydro units are limited by variations in water flows. Because of this, the available capacity was reported at 9,500 MW in 2003.*

*The peak demand of the system occurs in winter; it was 6,717 MW on February 13, 2003. The average winter peak is of the order of 6,000 MW, and the average summer peak is of the order of 4,000 MW. The system load factor in 2003 was 62 percent.<sup>9</sup> In 2006 the domestic peak demand reached 6,900 MW on January 24, while the system was also exporting 1,300 MW. The system reserve was at a comfortable level of 1,300 MW.<sup>10</sup>*

*The total energy generated in 2003 amounted to 42,500 GWh, of which 40 percent came from nuclear, 36 percent from thermal units fired by indigenous fuels, 16 percent from thermal units fired by imported fuels, and 8 percent from hydroelectric units. At the wholesale market level, the total sales amounted to 35,054 GWh consisting of 24,095 GWh for the distribution companies, 5,510 GWh for the 93 high-voltage consumers buying directly from the wholesale market, and 5,449 GWh of net exports to Greece, Turkey, and the Balkan countries. Net exports were in the range of 5,000–7,000 GWh during the previous three years. In 2004 gross generation was slightly less at 41,586 GWh, and exports were slightly more at 5,901 GWh. In 2005 exports may have exceeded 7,600 GWh.*

*Domestic demand is forecast by the utility to grow through 2020 at the average annual rate of 1.8 percent. Other observers believe that the average annual growth rate*

*may be closer to 1.0 percent.<sup>11</sup> Generation investments envisaged for the future are mostly for new capacity to compensate for the closure of four 440 MW nuclear power units at Kozlodui, and for the rehabilitation or replacement of the old thermal units, and partly for meeting the incremental demand. With the closure of the nuclear units, competitively priced export surplus would come down notably.*

*The transmission system consisted of 750 kV (85 km), 400 kV (2,266 km), 220 kV (2,650 km), and 110 kV (9,511 km), and the total transformer capacity in the 277 substations amounted to 30,249 MVA. The Bulgarian system is interconnected at various voltage levels to the adjoining systems of Greece, Macedonia, Moldova, Romania, Serbia, and Turkey, and had been a part of the South East European electricity market (known as UCTE Zone II). Recently it became a part of the Union for the Co-ordination of Transmission of Electricity (UCTE) covering most of the Western Europe, through the synchronization of the first and second zones of UCTE. Dispatch function is handled by a national dispatch center and four regional dispatch centers. They all have supervisory control and data acquisition (SCADA) systems, and the national dispatch center has real time on-line control of the generation and transmission. They are supplemented by 25 district distribution control centers also equipped with SCADA systems.*

*The distribution system uses medium-voltage lines at 20 kV, 10 kV, and 6.3 kV and low-voltage lines at 380 V and 220 V. It covers the whole country and connects 100 percent of the households. It was organized until recently into seven distribution companies, which were grouped into three larger ones for privatization.<sup>12</sup> They supply electricity mostly to low- and medium-voltage consumers. Most of the high-voltage consumers buy directly from the transmission grid. The total number of consumers handled by the distribution companies in 2002 was 4.473 million, of whom 10.92 percent were classified as commercial and the rest residential. In terms of electricity sales, however, the share of residential consumers (50.2 percent) was higher than that of the commercial consumers (49.8 percent). The distribution companies bought 23,943 GWh of electricity in 2002 and sold 18,564 GWh. The system losses at the distribution level thus amounted to 5,379 GWh or 22 percent of the input into the system.<sup>13</sup>*

<sup>8</sup> Completion of this plant may take a much longer time. The first unit may not be ready until 2012.

<sup>9</sup> NEK 2003 and 2004.

<sup>10</sup> *Energy in East Europe*, Issue 82 dated February 3, 2006.

<sup>11</sup> See South East European Generation Investment Study by Price Waterhouse Coopers and Atkins International. See also *Energy in East Europe, Country Supplement 2006*.

<sup>12</sup> A small eighth distribution company called Zlatni Pyasaatsi covers an area of 30 square kilometers, and has 480 industrial and 5 residential customers. It seems to have been privatized much earlier (Koutintchev 2003).

<sup>13</sup> See *Energy in Eastern Europe*, Issue 44 dated July 23, 2004, pp. 9–11.

The losses were highest at 31.4 percent in the Sofia region, whereas they were lowest at 19.1 percent in Sofia. The distribution companies had 12,828 employees, which indicated a customer-to-employee ratio of 349 and a sales-to-employee ratio of 1.447 GWh.<sup>14</sup>

*All the consumers are metered, although about 70 percent of the meters are older than 20 years and need replacement.* These distribution companies together had total revenue of BGN 1,462 million in 2002 from electricity sales and accounts receivables of BGN 239 million, which indicated an accounts receivable level equivalent to 1.9 months' sale.<sup>15</sup> Their accounts payable to suppliers at BGN 170 million was at a lower level of 1.16 months' sales.

## Electricity Tariffs

*Government policy has been to have a uniform consumer tariff for electricity across the country.* The differences in cost levels of the different distribution companies are balanced by differentiation in the bulk supply tariffs charged to them by Nationalna Elektricheska Kompania EAD (NEK), the single buyer and seller in the market. This policy is subject to review and revision in the context of sector restructuring and privatization. The tariffs vary among consumer categories (residential, nonresidential, and municipal) by days (working day or holiday or weekends), and by the time of use (daytime, nighttime, and peak hours). Residential tariffs, which used to be subsidized heavily by nonresidential consumers, are being adjusted upward to reduce the cross subsidy. The EBRD's Transition Report 2004 (EBRD 2004) reports that the residential tariff in Bulgaria of about 5.0 cents/kWh is about 105 percent of the nonresidential tariff, indicating the significant reduction in cross-subsidy already achieved and the scope for further improvement in this respect.<sup>16</sup> In 2002 the weighted average electricity tariff in Bulgaria at 4.11 cents/kWh was believed to be 55 percent of the long-run marginal cost (LRMC) and compared with OECD country tariff level of about 11.2

cents for residential and 5.5 cents for industrial consumers.<sup>17</sup> Substantial tariff improvements took place since then under the three programmatic loans of the World Bank provided during 2003–05. In order to achieve the cost recovery level and to eliminate the cross-subsidy, the residential tariffs were raised by 20 percent in July 2002, 15 percent in July 2003, and by a further 10 percent in July 2004, while maintaining the tariffs for industries and other nonresidential consumers at the levels notified in January 2000. The present end-user tariff per kilowatt-hour for high-voltage, medium-voltage, and low-voltage industrial consumers appears to be 6.2 cents, 6.9 cents, and 8.3 cents, respectively. The rate for high-voltage consumers during holidays and weekends is slightly lower at 5.7 cents/kWh. Compared to this, the rate per kilowatt-hour for residential consumers seems to be 6.5 cents for the first 75 kWh, 8.7 cents for the next 50 kWh and 10.22 cents for consumption exceeding 125 kWh /month.<sup>18</sup>

*The State Energy Regulatory Commission established in 1999 and strengthened by the energy law of 2003 (Republic of Bulgaria 2003) is responsible for the regulation of electricity tariffs.*<sup>19</sup> It regulates (a) the prices at which the state-owned and other generation entities (with public supply obligations) sell electricity to the single buyer (NEK); (b) the prices at which the single buyer sells electricity to the distribution companies and high-voltage consumers; (c) the prices charged by the distribution companies to the end consumers; and (d) the transmission charges. The regulation of generation tariffs, which would consist of capacity and energy charges, would be based on approved rates of return, whereas the distribution tariffs would follow a revenue cap regime incorporating the pass-through of purchased power cost and the elimination of cross-subsidies. Presently the nuclear plant sells electricity to NEK at 1.19 cents/kWh. Other generating units sell to NEK at prices in the range of 2 cents to 4 cents/kWh.<sup>20</sup> Transmission tariffs have been nearly doubled to the level of BGN 11.8/MWh (excluding value added tax (VAT)), and this is believed to be a reason for the reluctance of eligible

<sup>14</sup> See also Ministry of Energy and Energy Resources 2004.

<sup>15</sup> The average tariff realized at the distribution level in 2002 appears of the order of BGN 0.08/kWh (or 5.3 cents/kWh). The government's plan was to raise average price per kilowatt-hour by 15 percent in 2003 and by 10 percent in 2004 to reach the level of about BGN 0.11 or 7.3 cents/kWh by end 2004.

<sup>16</sup> In most OECD countries, the residential tariff is double that of the industrial tariff (see EBRD 2004, pp. 60–61).

<sup>17</sup> See also Government of the Republic of Bulgaria (2002), p. 10, which indicates that the average household tariff in October 2001 at BGN 0.067 was about 80 percent of the cost of supply at low voltage.

<sup>18</sup> These rates are for those with single register meter without the use of Time of use and converted using the exchange rate of \$1 = BGN 1.4976. Most high-voltage, medium-voltage, and low-voltage industrial users have time-of-use meters with two or three registers, and they pay different rates for peak, off-peak daytime, and off-peak nighttime use. Many residential consumers also have time-of-use meters with different rates for daytime and nighttime use ([www.doe.bg](http://www.doe.bg)).

<sup>19</sup> Later the State Energy Regulatory Commission became the State Energy and Water Regulatory Commission.

<sup>20</sup> Recently, the regulatory body approved a five-year PPA between the generating company owning Maritsa East II thermal plant and the single buyer at about BGN 27.61/MWh or 1.84 cents/kWh of energy and BGN 11.36/MW or \$7.59/MW of capacity (see Energy in East Europe, Issue 46 dated September 3, 2004).

buyers to conclude direct supply contracts, even with such a low-cost supplier as the nuclear plant.<sup>21</sup> By October 2005, the regulator had revised the transmission tariff downward to BGN 9.31/MWh.

*During the mid-1990s, social protection for the poorer segment of the population in the context of rising electricity prices was sought by issuing energy vouchers to the means-tested poor families.*<sup>22</sup> These vouchers could be used to buy coal, electricity, or heat, and the energy companies would get the value of such sales reimbursed by the government. Because of the administrative difficulties of identifying the eligible families, such social protection was later offered through the use of a two-block tariff. Under this arrangement, the tariffs for the first block of 75 kWh of daytime consumption per month throughout the year and for the first block of 50 kWh of the nighttime consumption during the five months of heating period would be frozen at the 2001 level, and price increases would apply only to the higher level of consumption.<sup>23</sup> This arrangement was expected to expire in 2004. In the tariff revision of July 2004, the size of the block has been slightly altered, but the principle continues.<sup>24</sup> It would appear that the regulator may continue the arrangement until 2007.<sup>25</sup>

### Sector and Market Structure

*Nationalna Elektrieska Kompania EAD (NEK) was established in November 1991 as a fully state-owned vertically integrated utility responsible for generation, transmission, and distribution in the entire country.* It functioned in that role during the entire decade. Although it was operating a well-planned and well-run power system, it ran into problems because of the economic challenges and crises faced by the country, it overcame them through disciplined and enlightened governance and, by and large, it managed to maintain the adequacy, quality, and reliability of supply. During economic downturn, generation and consumption declined, notably in the industrial segment. Many state-owned industries accumulated large arrears to the power utility. The patient, disciplined, and enlightened manner in which the utility overcame this nonpayment problem has been adequately documented in Krishnaswamy (1999).<sup>26</sup>

*Essentially NEK worked closely and patiently with its large industrial consumers, arranging export orders for them, escrowing the export receipts, and recovering electricity dues as a primary charge from the escrowed amounts.* It also used its extensive network of financial contacts and superior credit ratings to arrange for financial accommodation to its large customers to enable them pay their electricity dues. The disconnection threat was effectively used in respect of smaller and residential consumers, and collection efficiency reached close to 100 percent by 1998 and has remained in the healthy range of 90–100 percent since.<sup>27</sup> With the help of donor agencies, it also succeeded in getting its electricity tariffs raised by the government to keep pace with the high rates of inflation and rising costs, although the tariffs could not fully catch up with full costs. The necessary minimum capital investments were financed partly by the limited internal cash and mostly by government equity or by government-guaranteed debt raised from bilateral, multilateral, and commercial sources. The need for reaching fiscal balance limited the capacity of the government to inject fresh equity and provide guarantees for new loans to meet the financing needs of the sector to rehabilitate the existing generation, transmission, and distribution system and build new generation capacities to replace the retiring units. The high level of technical losses in the network urgently called for large investments.

*Thus, toward the late 1990s, it became necessary to initiate electricity sector reforms to enable private investment, introduce possible competition in generation, provide at least for the major consumers the right to choose their suppliers, and promote renewable and environment-friendly sources of power supply.* The Bulgarian power system is well interconnected to all adjoining systems and is a key player with significant power export interests in the UCTE II synchronous Balkan electricity market, which was in the process of being integrated with the main UCTE I synchronous zone of Western Europe.<sup>28</sup> The country's policies were also driven by the desire for early EU accession and conformity with related EU energy and environment directives.

*By the year 2000, the distribution enterprises had been separated from NEK, which became responsible for the generation, transmission, and sale of electricity to the*

<sup>21</sup> See *Energy in East Europe*, Issue 48 dated October 1, 2004, p. 13. The generators have been given only a limited quota for such bilateral contracts. The quota of the nuclear plant is 200 GWh for 2004. An appeal has been made to the Supreme Administrative Court against the transmission tariff decision.

<sup>22</sup> This covered about 10–11 percent of the house holds in the country with an income of lower than 150 percent nationally defined basic minimum income. In addition, electricity sales to households were exempt from the levy of VAT at that time.

<sup>23</sup> This is only for consumers who are not customers of district heating companies. See Government of the Republic of Bulgaria (2002), p. 11.

<sup>24</sup> Improvements to the social protection arrangements in the context of rising electricity prices through reforms to the lifeline blocks and strengthening of winter energy benefits program were made under the three programmatic loans of the World Bank during 2003–05.

<sup>25</sup> See the regulator's statement in *Energy in East Europe*, Issue 49 dated October 15, 2005, p. 14.

<sup>26</sup> Krishnaswamy (1999), pp. 58–65.

<sup>27</sup> Even after NEK became a single buyer, its accounts receivable seems to be the equivalent of about 55 days' sales.

<sup>28</sup> This has since been achieved, and Bulgaria is now a full member of UCTE.

seven newly formed distribution companies. A new energy law was envisaged to enable further sector unbundling and the desired restructuring of the sector. Anticipating this, in the next stage, all thermal power units except the Maritsa East 3 (four units of 210MW each) were separated from NEK and set up as joint stock companies. The nuclear plant at Kozloduy was also set up as an IPP. The ownership and responsibility for rehabilitation and operation of Maritsa Iztok 3 TPP (including the installation of flue gas desulfurization (FGD) equipment) was given in April 2003 to a joint venture in which Enel of Italy and Entergy of the United States had 73 percent of the shares and NEK had 27 percent of the shares. This was the first major project without sovereign guarantees. NEK had the responsibility for the operation of the hydro units, as well as for transmission and dispatch systems, and for acting as the single buyer of all power generated in Bulgaria and selling it to the distribution companies, to high-voltage consumers connected to the grid, and for exports.

*Under the new energy law, which was passed in 2003 (Republic of Bulgaria 2003), a seven-member State Energy Regulatory Commission was created to carry out the sector regulation. Its financial autonomy and regulatory independence was considerably enhanced. Its decisions could be appealed against only in the courts, and could not be revised under the administrative system.*

*A market structure was adopted in which a large regulated market and a small (but gradually expanding) liberalized market could coexist. The generating companies (most of them fully state owned) had public supply obligations and therefore sold their generation to NEK at regulated prices. The thermal plants were given quotas (believed to be about 20 percent of their generation) for direct sales to eligible customers on the basis of negotiated prices. The threshold for being an eligible customer was set at an annual consumption level of 100 GWh in July 2003 covering 18.9 percent of the market. It was lowered to 40 GWh in July 2004, raising the liberalized market share to 22 percent. In July 2006, the threshold was lowered further to 9 GWh. The threshold would be revised downward further every year to enable full liberalization of the market by July 2007. Given the delays in the actual opening of the market, this target may take much longer to realize. Since most residential consumers and a range of other low-voltage consumers are expected to remain as captive consumers of the distribution utilities, the regulated market is expected to continue to exist even after 2007. The regulator has the authority to determine*

the percentage of output (of any IPP), which must be supplied to the single buyer at regulated prices. The system is dispatched largely on the basis of bilateral contracts (long-term and short-term) and a small balancing market for the real-time balancing of supply and demand.

*The energy law also revised the prevailing regime for bidding for new and upgraded energy facilities by permitting freer entry into the business. Investors willing to construct such new power plants could do so without having to go through the bidding procedure, which was to be held only in respect of the new generation units considered vital for maintaining Bulgarian energy balance. The sector and market structures are largely like those of other countries acceding to the EU and would conform to the EU directives.*

*During 2005, accounting separation among the three key functions of NEK—namely, (a) hydro power generation, (b) transmission (including dispatch) and system control, and (c) electricity trading—was implemented, to enable a further restructuring of NEK to separate these functions fully to achieve greater transparency and objectivity. The reform efforts in this direction are expected to reduce the risk premium in the supply chain.*

*Until recently NEK was a company with four distinct roles: (a) transmission operator (operating and maintaining the transmission network); (b) system operator (providing system dispatch instructions, performing the commercial functions of real time balancing of the market); (c) wholesale public supplier in the regulated segment of the market (mostly under long-term Power Purchase Agreements (PPAs)), including export-import monopoly; and (d) some electricity generation. In early 2006, NEK was legally split into NEK EAD (a holding company) and EPSO (a wholly owned subsidiary of NEK EAD). EPSO will handle the functions of transmission operator and system operator, while NEK EAD will handle the other two functions. Criticisms have been voiced to the effect that this could open the door for direct supplies from NEK EAD to large enterprises adversely affecting the operations of the privatized distribution companies.*

### **Private Investment**

*As a result of the sector restructuring, privatization of generating and distribution assets had become possible. All the seven distribution companies were grouped into three large packages with good economies of scale and*

67 percent of the shares in each were offered for sale, using Bank Paribas as the advisor, and adopting transparent bidding processes among eligible international bidders. By July 2004 the winning bids were selected and by September 2004 the privatization contracts were initiated. Eon Energie of Germany and CEZ of the Czech Republic bought the shares in the North Eastern and Western packages of distribution companies, while EVN of Austria bought the shares in the third South Western package of distribution companies. The total privatization receipts amounted to €693.9 million valuing the enterprises at more than €1 billion or above €230 per customer.<sup>29</sup> The buyers cannot sell or transfer their shares to anyone without the approval of the government until 2008. Further, the government was not obliged to give any contractual undertakings on the future regulatory framework. The remaining shares in the three distribution companies are expected to be sold by the government in the Bulgarian stock exchange for expected sales proceeds exceeding €1.0 billion. CEZ reported that in the first year of its operation of the distribution companies, it invested €33 million, connected 13,050 new consumers, and reduced technical and commercial losses in the system by 10 percent compared with the previous year.<sup>30</sup>

*In the generation segment, the first case related to AES of the United States, which obtained the right to build, operate, and own the replacement plant for Maritsa Iztok 1 plant in 2001. The new plant will have two units of 335 MW each and will use the local lignite. The investment had been delayed because of the changing fortunes of AES, which has recently announced that it will arrange for finance and commence construction soon. The 15-year PPA signed in June 2001 between NEK and AES has been revised to reflect today's realities (including a 14 percent reduction in the electricity prices agreed earlier). AES will provide 30 percent of the cost as equity, and debt for the remaining 70 percent of the cost had been arranged. The World Bank Group will be providing a guarantee through MIGA. The first unit is scheduled to go on stream in the spring of 2009 and the second within six months thereafter.*

*The second case relates to the rehabilitation (including the provision of flue gas desulfurization) of all units in Maritsa Iztok 3 thermal power plant (840 MW) by a joint venture among ENEL of Italy, Entergy of the United States, and NEK. This is scheduled for completion by 2009.*

*RWE of Germany is believed to be close to deciding on investing in Maritsa Iztok 2 thermal power plant (1,450 MW) and in the related the brown coal mines rehabilitation and development.*

*Since the beginning of 2001, NEK has had 69 hydro plants with a total capacity of 2,755 MW. Of these, 39 smaller hydropower plants with a total capacity of 166 MW have been privatized by the end of 2003 to foreign and local bidders in auctions or through competitive bidding. At the end of 2003 NEK had only 39 hydro units with a total capacity of 2,589 MW. The Privatization Agency had also initiated the sale by auction of the Petrochan hydropower cascade (16.66 MW) with November 3, 2004, as the closing date.<sup>31</sup> Also 7 out of a total of 21 CHP plants had been privatized.*

*Attempts to privatize three large thermal power plants at Varna (1,260 MW), Bobov Dol (630 MW), and Russe (400 MW) did not prove as smooth and speedy as in distribution privatization.<sup>32</sup> Credit Suisse First Boston was engaged as privatization advisor in July 2004 for the privatization of three large thermal power plants. Single-stage bidding was carried out in December 2004 among eligible bidders, who should have owned and operated 1,000 MW of capacity and sold annually 2 TWh of energy for the last three years. They should also have a minimum capital of €500 million. They should also have rating of B+ from Standard and Poor or B1 from Moody's. The bidders can bid for a 100 percent stake or lower in any or all of the three plants. The buyers will not be given a guaranteed market or even a five-year PPA. Eleven bidders showed interest, and four (CEZ of Czech Republic, PPC of Greece, Enel of Italy, and Rao Inter of Russia) submitted firm bids. However, for a variety of reasons, the highest bids (Rao Inter for Varna and Russe and PPC for the third) were later not pursued by the government or withdrawn by the bidders.<sup>33</sup> After a long delay, negotiations were held for the sale of Varna to the second highest bidder CEZ and its bid accepted in March 2006 after it had agreed to raise its offer from €192 million to €206 million. The sale of the other two plants has not yet been decided upon.*

*Remaining thermal plants are due for privatization in the next couple of years. Pending this, they are being rehabilitated, and the foreign entities handling the rehabilitation are expected to have a great interest in them when they are offered for privatization.*

<sup>29</sup> *Energy in East Europe*, Issue 44 of July 23, 2003; Issue 47 of September 17, 2004; and Issue 48 of October 1, 2004.

<sup>30</sup> *Energy in East Europe*, Issue 82 dated February 3, 2006.

<sup>31</sup> *Energy in East Europe*, Issue 47 dated September 17, 2004.

<sup>32</sup> The generating company owning Varna has been accorded a credit rating of Ba3 by Moody's, because of its low-cost generation and strong credit metrics that have enabled it to compete effectively—even in the competitive market. This is better than that of NEK itself.

<sup>33</sup> The PPC bid was not pursued because the miners wanted the mine and the Bobov Dol plant to be sold together. The government insisted, contrary to the bidding conditions, that no one bidder could buy more than one plant, and this enabled Rao-Inter to withdraw its bids. In any case, it had quoted prices double that of the next best bidder.



## Evaluation

*On the whole, Bulgaria adopted a conservative approach and a practical and sensible sequence of sector reforms. It did not rush headlong into sector unbundling and competitive electricity markets, as did some of the other countries in the region, while the economy was in serious crisis, and when nonpayment problem was severe. It focused instead on retaining the vertically integrated sector structure and improving the governance, efficiency, and performance of the utility (NEK). Its macroeconomic efforts to reduce inflation, stabilize the economy, and revive growth were conducive to the recovery of the sector. Its major focus on liquidating loss making public sector units and privatizing public sector industrial and commercial enterprises had a major and favorable impact on the power sector. The legal framework unambiguously allowed the electricity supplier to disconnect supply and deny service to those who do not pay the utility bills.*

*As noted earlier, NEK focused on operating its well-planned system optimally, reducing losses, improving collections through cooperative methods of working with large customers, and maintaining its liquidity and financial viability, while continuing to meet all solvent demands at an acceptable quality of service. Its metering, billing, and collection procedures were efficient, and it also managed to secure tariff increases to keep pace with inflation. It managed to achieve and maintain technical and financial soundness of operations adequate to raise significant financial resources from a range of multilateral, official, and commercial sources to meet its urgent capital expenditure needs, although most of them were based on government guarantees. Its financiers included the World Bank, EBRD, European Investment Bank, Russian Foreign Trade Bank, Citibank, Export Import Bank of Japan, Euratom, CSFB, Société Générale of France, Raiffeisen Bank, Bank of Austria, Fortis, Österreichische Kontroll Bank, and others.*

*An important aspect of the governance is continuity and reasonable tenures for key management personnel. The utility enjoyed reasonable autonomy combined with management accounting internal control and audit procedures, which were periodically updated. The government encouraged to utilities to secure good ratings from independent rating agencies, such as Standard and Poor, Moody's, and Fitch. This brought in internal compulsions and motivation to improve efficiency and performance.*

*Unlike in many other countries in the world, the government of Bulgaria did not rush to give a spate of BOT contracts to the private sector with onerous and government-guaranteed PPAs when government resources available for the power sector became scarce. Only one such contract to AES was given for replacement units of Maritsa Iztok 1 plant with a 15-year PPA. This PPA has also been revised to reflect current realities.*

*Sector unbundling and reforms to the market structure were done cautiously and carefully in stages after proper planning. The new law had given the regulatory body reasonable financial autonomy and regulatory independence. The creation of the single-buyer model for the market and its gradual liberalization through the mechanism of eligible buyers will enable the country a smoother change over from monopoly to competitive market. The choice of a system dispatch based largely on bilateral contracts and residually on a balancing market is also a wise and practical one. The use of the country's desire for EU accession as the driver for reform was also wise and practical.*

*Asset sales of the power sector appear to have been handled until recently by the country's Privatization Agency with competence, care, transparency, speed, and a concern to secure optimal privatization receipts.<sup>34</sup> Units to be privatized are allowed to achieve reasonable efficiencies resulting in acceptable levels of net cash flows, before privatization, since the buyer values the unit not on the basis of historical or revalued cost of acquisition, but on the basis of present and future net cash flows. Privatization advisors are engaged and asset sales are carried out using auctions or international competitive bidding among eligible bidders. The government has been successful in privatizing distribution and generation assets without giving any state-guaranteed PPAs or even without contractual guarantees of the future regulatory regime. The primary reason for this is not merely the reasonable and sound sector policies, but the government's focus on enacting new and modern laws relating to accounting, audit, financial system supervision, insolvency, and on reforms relating to civil service, judicial systems, and fight against corruption. The EBRD's (2004) Transition Report 2004 classifies the Bulgarian insolvency legislation as one with a high level of conformity with international practice.*

<sup>34</sup> However, the experience in the attempts to privatize generation assets had been characterized by delays, ambivalence, and lack of internal cohesion within the Bulgarian government.

*Business entry has been made hassle-free with one-stop service centers for administrative services and the adoption of the “silence is consent” principle, under which if an entrepreneur does not receive any response from the government within 30 days of his request, he is free to assume the consent of the government for his request. Tax regimes have been made favorable for business with corporate tax rate at 15 percent at the end of 2004. International accounting standards were adopted throughout the country by the end of 2005. The improved sovereign ratings of the country achieved through prudent macroeconomic management is, of course, a major contributing factor the success.*

*Bulgaria is a country in which the entire population has access to the electricity grid. Because of the contraction in demand during the decade of transition, it also had surplus generation capacity. Its demand until 2020 is expected to increase at only about 1 percent per year. The investment burden in such countries is not as onerous as in low-income large countries in which only a small percentage of the population has access to electricity.*

*Nonetheless, to keep the system operating on a sustainable basis at acceptable service quality levels, a great deal of investment is needed in all three segments. Decommissioning costs of the nuclear units, rehabilitation costs of existing old generation assets, costs of new units to replace the retiring units and to meet incremental demand, as well as to seize export opportunities in the European power market, must be met. Considerable investments are also needed to complete the Belene nuclear plant. Transmission and distribution networks also call for significant investments for reinforcement, rehabilitation, and expansion.*

*Consistent and disciplined governance thus far had enabled the government to design a reform program, own it through its vicissitudes, and bring the sector to a state in which the future investment burden would be handled largely by the private sector. Deviation from the disciplined governance could derail the efforts at any time. The handling of the bids for the privatization of the three large thermal plants is a case in point. Inconsistency in policy and practice led to the withdrawal or cancellation of attractive bids. Some of the ministers are hinting at partial reintegration of the sector to create “national champions” to compete in the European market. NEK still does not seem to have fully adjusted to the concept of domestic competition, and it may have a stance more appropriate for a “national champion.” The independence of the regulatory body may yet prove fragile. Although in the recent past the government facilitated commendably a rapid upward adjustment of residential tariffs to minimize cross-subsidies, there are always rising costs and the temptation to protect the residential consumers against rises in tariffs. Continued, consistent, and disciplined governance is the only solution to stick to the reform path and complete it.*

*Most of the government stance and policies are generally replicable in other countries, but in Bulgaria the desire to accede to the EU was the key driver for reform, since it was powerful enough to overcome partisan political differences in a democratic milieu. In countries where this is not the case, it is not clear from where the primary motivation for reform will come.*

## CASE STUDY D: DELHI ELECTRICITY BOARD, INDIA

### Dimensions and Characteristics of the Power Sector

The national capital territory of Delhi in India has a population of about 14 million and an area of 1,483 sq km. Despite its small area, like any other state in India it has its own elected provincial legislature and a state government.<sup>1</sup> It also had its own electricity board (a state-owned vertically integrated power utility) commonly known as the Delhi Vidyut Board (DVB).

During FY1995–2001 peak demand grew by 50 percent from 1,898 MW to 2,670 MW. During the same period, the energy supplied increased from about 12 TWh to 17.4 TWh. In FY2002 DVB had peak demand of about 2,900 MW and an electricity consumption of about 18.5 TWh.<sup>2</sup> The peak demand grew to about 3,500 MW in 2004 and is forecast to grow to 5,075 MW by 2010. It was a supply-constrained system with a load factor of about 73 percent and a shed load estimated at about 3 percent of the supply.

Although DVB's own generation capacity is modest, it is entitled to a formally allocated share of the capacity and energy from the thermal, nuclear, and hydropower stations of the power generating companies owned by the central government.<sup>3</sup> However, it has to purchase the allocated capacity and energy from those companies at tariffs regulated by the Central Electricity Regulatory Commission. DVB also buys power from the power systems of the adjoining states. Thus in FY2002, while DVB's own gross generation was about 2,660 GWh (or about 14 percent of the total energy needed), it purchased power amounted to 16,405 GWh. In 2004 its own gross generation amounted to 17 percent of the total energy needs of Delhi.<sup>4</sup>

Unlike other states in India, Delhi's rural population, which is less than 7 percent of the total population, is insignificant. According to the 2001 census Delhi had a total of 2.4 million households—more than 93 percent of which had electricity service. Among all states, Delhi had one of the highest literacy rates at around 82 percent. Its per capita gross national product in FY2002 was in excess of US\$1,000. All over India

extremely low tariffs and unmetered power supply to the Agricultural pumps had proved to be a serious and intractable problem. The Delhi power system does not face this problem, since it had very few agricultural consumers; sales to them represented a little over 1 percent of total sales.

*Per capita annual electricity consumption in Delhi at 1,321 kWh in FY2002 was significantly higher than in most other states.* The total number of consumers reported was about 3.35 million and households had a share of 38.6 percent of total sales, followed by industries (37.8 percent), governments, street lights and other miscellaneous loads (16.1 percent), and agriculture (1.2 percent).<sup>5</sup> The consumption needs (that is, energy generated and purchased) had been growing at an average annual rate of 5.2 percent during FY1999–2002 and were expected to grow at about 5 percent per year for the next several years. Tariff levels were not adequate to meet the cost of supply (average revenue per kilowatt-hour in FY2002 was Rs 2.99 or 6.4 cents compared to the average cost of supply estimated at Rs 4.70), and the tariff structure did not reflect the structure of supply costs to various categories of consumers (average tariff per kilowatt-hour for households was about Rs 1.51 compared to the average tariff for industrial consumers at Rs 4.28).<sup>6</sup>

### Status of the Power Sector in 2002

*As in the case of many state electricity boards (SEBs), DVB was also a chronically inefficient and financially unsound entity.* Its transmission and distribution losses were reported in the range of 45–50 percent of the total available energy (net generation plus net imports) during the period FY1999–2002. Metering, billing, and collection functions were highly inefficient, theft of power was extensive, and the conversion of distributed electricity into actually collected cash revenues was unsustainably low. Accounts receivables of DVB by the end of 2002 exceeded Rs 20 billion (US\$440 million or equivalent to about 6.5 months' sales). DVB had a total of 24,100 employees handling the sale of 18.5 TWh and dealing with 3.35 million customers (139 customers per employee). DVB was unable to cover its high cost of operation and

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<sup>1</sup> Provinces in India are called states. India is a union of such states.

<sup>2</sup> In India FY2002 denotes the financial year commencing on April 1, 2001, and ending on March 31, 2002.

<sup>3</sup> It was estimated at 994.5 MW in FY2002 (websites of DVB and the Delhi government, DVB).

<sup>4</sup> Data relating to 2004 is from *Power in Asia*, Issue 412, dated September 20, 2004.

<sup>5</sup> Because of extensive unauthorized consumption, the actual number of consumers was believed to be much higher. The number given here is from the Planning Commission (2002). Most other sources give numbers between 2.5 million and 2.75 million.

<sup>6</sup> This is based on the information from the Planning Commission (2002). (See also the annexes relating to the SEBs in the Planning Commission website: <http://planningcommission.nic.in>.)

was making losses to the extent of about Rs 11 billion a year (US\$244 million). Cash losses were met by a combination of delayed payments to suppliers, postponement of investments, nonservicing of liabilities relating to the government, and cash injections by the government. Subsidy to cover the operations of DVB became a significant amount in the state budget.

*Investments in transmission and distribution that were urgently needed to rehabilitate and reinforce the systems to meet the growing demand could not be made. Supply became highly unreliable and load shedding frequent, even when the power available in the grid was adequate to meet the demand, mostly because of transformer failures, line faults, and network limitations.*

*Agitation by the angry public forced the state government to work out a sector reform program, the principal aims of which were to improve speedily the quality and reliability of supply and to stop in a reasonable time frame the endless need for the public resources to subsidize the inefficient operation of DVB. Public pressure for improving the quality of service was the main driver of reform. The government came to the conclusion that the best way of raising resources for the distribution system was to curb the losses through improved governance to be provided by private sector participation, both as a majority owner and operator of the distribution system. Privatization was thus perceived as the preferred route to improve the quality of service and for raising resources needed for such improvement.*

### **Restructuring of the Power Sector**

*Toward the later part of the 1990s, the Government of India had also come to realize the great urgency and importance of focusing reform efforts on the distribution segment of the electricity industry, since it had the highest concentration of sector inefficiencies, such as technical and commercial system losses, theft, poor metering, billing, and collections which had the effect of raising the cost of supply and more than halving the revenue base of the utilities. Distancing service providers from government through mechanisms, such as unbundling, corporatization, and privatization and introducing independent sector regulation*

were considered the appropriate methods of overcoming the lack of commercial discipline in the sector. The private sector with its profit orientation could provide appropriate management to enforce commercial discipline across the organization, and stabilize and improve the revenue base of the sector. To enable such participation, the Government of India enacted the Electricity Regulatory Commission (ERC) Act in 1998 to provide for independent sector regulation, including tariffs at the national level. Later it enacted the new Electricity Act 2003 to enable the restructuring of SEBs by function, corporatization of the unbundled entities and commercialization of their operations. This new law also provided for the establishment of the state-level electricity regulatory commissions. Meanwhile, several states had established state electricity regulatory commissions (SERCs) either by enacting their own laws or by using the enabling provisions under the ERC Act of 1998.

*The Government of Delhi had formulated its sector restructuring strategy in early 1999 and the Delhi Electricity Regulatory Commission (DERC) was set up in May 1999 under the central legislation and became operational by the end of that year.<sup>7</sup> In October 2000 the Delhi government issued the Delhi Electricity Reforms Ordinance, which by March 2001 came into force as the Delhi Electricity Reforms Act of 2000. The restructuring proposed involved the unbundling of DVB into two generation companies, a transmission company, and three distribution companies.<sup>8</sup> In addition to its transmission and dispatch responsibilities, the Delhi Transmission Company Limited (DTL) would act as the single buyer in the market and buy the electricity needed for the three distribution companies from the two Delhi state-owned generation companies (at prices regulated by DERC) and from other sources such as the central government owned generating companies and the power systems of the adjoining states (at prices regulated by CERC) and sell them to the distribution companies, NDMC and MES, at prices regulated by DERC.<sup>9</sup> The end-use tariff in all three distribution companies would be uniform, despite differences in their size, density of load, and other aspects of economies of scale. Thus, the bulk supply tariff charged by DTL to each of the distribution companies would be set at a level that would enable it to meet its operating costs based on agreed targets for efficiency improvement and earn a 16 percent return on its*

<sup>7</sup> It is also relevant to note that states, such as Andhra Pradesh, Haryana, Orissa, Rajasthan, and Uttar Pradesh had enacted their power reform laws prior to the 1998 ERC Act, and had commenced restructuring and regulation. Thus, a body of “in-country” experience and knowledge was available to the politicians of the state of Delhi.

<sup>8</sup> The second Delhi state-owned generation company, Pragati Power Company Limited (PPCL), was formed as a separate state-owned power generation company solely for the purpose of taking over the generation project under construction.

<sup>9</sup> DTL would also buy the power needed for the smaller distribution system operated by the Electricity Department of the New Delhi Municipal Corporation (NDMC)—which has about 100,000 consumers, a peak demand of less than 200 MW, and annual energy needs of 954 GWh—and Military Engineering Service (MES)—which serves military establishments with a demand of less than 35 MW and annual energy needs of about 160 GWh. They buy bulk power from DTL at 66 kV and 33 kV and distribute it to low-voltage consumers in their area following the tariffs prevailing in the DVB area.

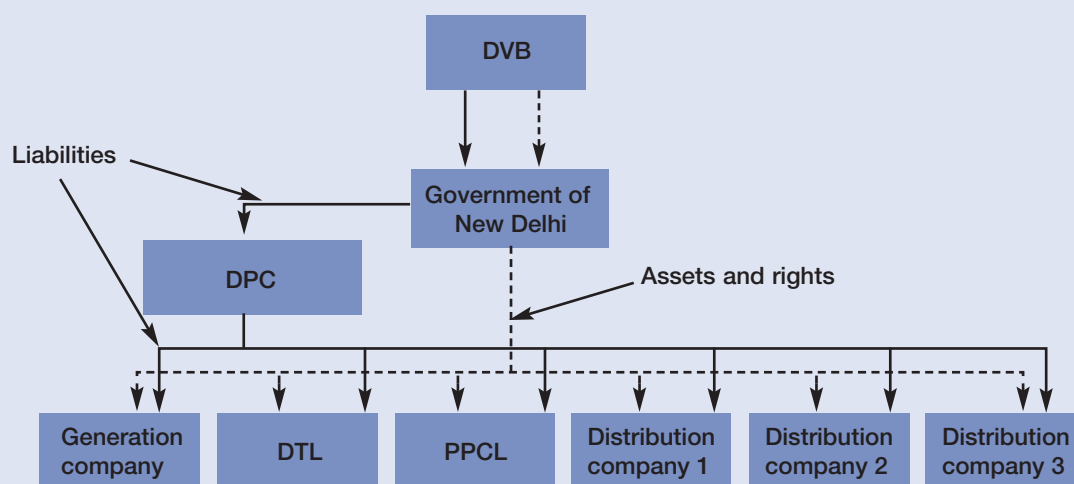
equity. DTL would be enabled to manage the losses arising from such an arrangement through long-term loans to be provided from the state government budget.<sup>10</sup>

### Distribution Privatization Process

The financial problems of DVB were caused primarily by its inefficient distribution operation and to some extent by the need to raise the level of tariffs and correct its structure. Improvement in the operational efficiency of distribution companies would substantially moderate the tariff increases needed to phase out or minimize the subsidies from the state budget to the sector. The adopted strategy was to provide for a transitional period of five years, during which (a) the new distribution companies would improve their operational efficiency in accordance with an agreed annual target; (b) the average tariffs would be raised thrice, each time by about 10 percent during the first three years and at 5 percent and 3 percent during the fourth and the fifth year; (c) the bulk supply tariff from DTL for each distribution company would be fixed by the regulator at a level adequate to enable each of them to earn a 16 percent return on paid-up equity and free reserves after meeting all allowed operation and maintenance (O&M) and investment expenses; and (d) as a result of the combination of increasing efficiency and rising tariffs, the bulk supply tariffs for each of the distribution companies would rise to a level at which DTL would no longer need to subsidize them.

To deal with the problem of the past accumulated liabilities and to create viable sector entities, the mechanism of financial restructuring adopted is summarized in figure D-1. All the assets, rights, and liabilities of DVB were transferred to the Delhi state government. All the assets and rights were allocated among the new generation company, transmission company, and the three distribution companies. All liabilities were transferred to a new holding company called Delhi Power Company (DPC), which issued its entire equity to the government. Of the total liabilities of Rs 231.37 billion (estimated at the end of FY2001), the unserviceable portion of Rs 199.77 billion was retained by DPC, and only the remaining liability of Rs 31.60 billion (or about 14 percent of the total liabilities) was transferred from DPC to the five unbundled companies.<sup>11</sup> The assets of the new unbundled companies were valued not on the basis of their historical cost of acquisition or on the basis of their revaluation, but on the basis of a business model, which assumed that the distribution business would become self sustaining within the transitional period of five years, that there would be no tariff shocks to the consumers, and that the support from the government to subsidize the losses through the transitional period (of about Rs 26 billion, later revised as Rs 34.5 billion, or about US\$784 million) was guaranteed.<sup>12</sup> The asset values were determined at a level sufficient for the operating surplus of the individual companies to service the capital based on the business model mentioned above.

FIGURE D-1. DVB RESTRUCTURING MODEL



Source: Bhatia and others 2004.

<sup>10</sup> Loans to the extent of Rs 26 billion were envisaged (later increased to Rs 34.5 billion) with an interest rate of 12 percent per year, repayment of principal in 18 equal semiannual installments, and a moratorium of three years (later increased to four years).

<sup>11</sup> The amount of Rs 199.77 billion included Rs 129.53 billion from the days of Delhi Electricity Supply Undertaking, a predecessor entity to DVB; Rs 44.57 billion covered by bonds issued against power and fuel liabilities; and Rs 8.87 billion in treasury bill liabilities relating to staff terminal benefit fund.

<sup>12</sup> It is reported that DVB had no reliable asset register and that its accounts had not been audited for more than 10 years.

**TABLE D-1. Financial Structure of the Unbundled Entities (Rs million)**

UNBUNDLED ENTITY	EQUITY	LONG-TERM DEBT TO DPC	TOTAL ASSET VALUE
Generation company	1,400	2,100	3,500
Transmission company	1,800	2,700	4,500
Distribution company 1	1,160	1,740	2,900
Distribution company 2	4,600	6,900	11,500
Distribution company 3	3,680	5,520	9,200
Total for all companies	12,640	18,960	31,600

**TABLE D-2. Stipulated Minimum ATC Loss Levels and Agreed Loss Levels (percent)**

DISTRIBUTION COMPANY	INITIAL ATC LOSS LEVEL IN FY2002	EXTENT OF DECREASE IN ATC LOSS LEVELS					ATC LOSS LEVELS AT THE END OF THE PERIOD
		FY2003	FY2004	FY2005	FY2006	FY2007	
<b>MINIMUM STIPULATED BY THE GOVERNMENT IN REQUEST FOR PROPOSAL</b>							
Distribution company 1 (Yamuna Power)	57.2	1.5	5.0	5.0	5.0	4.25	36.45
Distribution company 2 (Rajdhani Power)	48.1	1.25	5.0	4.5	4.5	4.0	28.85
Distribution company 3 (North Delhi Power)	48.1	1.5	5.0	4.5	4.25	4.0	28.85
<b>LOSS LEVELS AGREED UPON DURING NEGOTIATIONS</b>							
Distribution company 1 (Yamuna Power)	57.2	0.75	1.75	4.0	5.65	5.1	39.95
Distribution company 2 (Rajdhani Power)	48.1	0.55	1.55	3.3	6.0	5.6	31.1
Distribution company 3 (North Delhi Power)	48.1	0.50	2.25	4.50	5.5	4.25	31.1

The liabilities were divided into 40 percent of equity and about 60 percent of long-term debt. DPC held all the equities in the unbundled companies, which also owed their debts to DPC.<sup>13</sup> The resulting financial structure of the companies is given in table D-1.

Having thus fixed the equity and debt values of each distribution company, the government decided to offer 51 percent of the equity in each company to the new private buyers at face value and give them management control. They would be entitled to earn a return of 16 percent on paid-up equity and free reserves. The buyer would be selected in an international competitive bidding among prequalified strategic investors on the basis of the efficiency improvement they would bring in

the first five years. The efficiency criterion chosen for this purpose was called the aggregate technical and commercial (ATC) losses, which covered both system losses and billing and collection efficiency.

In the absence of proper metering of all consumers and meters in the various parts of the system, it was difficult to properly measure technical losses and identify the volume of commercial losses. In this context, the concept of ATC losses was developed by taking into account the billing ratio and the collection ratio.<sup>14</sup> The product of the billing ratio and collection ratio represents the percentage of energy actually converted into realized cash. ATC loss bundles together the technical losses, commercial losses, and collection inefficiency and thus

<sup>13</sup> These debts had a moratorium of four years (capable of being extended to five years if the need arose), maturity of nine years (18 equal installments of the principal) and an interest rate of 12 percent per year.

<sup>14</sup> ATC loss percentage is =  $100 \times 1 - [(\text{energy billed in GWh} / \text{energy available in GWh}) \times (\text{revenue actually collected in rupees} / \text{energy billed in rupees})]$ .

overcomes the problem of being unable to measure the technical and commercial losses. The opening ATC loss levels were determined by DERC while deciding on the tariffs for FY2002. Based on this, the government had specified in the bid documents a minimum loss level trajectory for five years. Six bidders were prequalified, but only two bids each for two distribution companies and only one bid for the third distribution company were received. All had quoted loss reduction targets actually lower than the level specified in the bid documents. The government negotiated a loss reduction trajectory somewhere in between the levels quoted and the minimum levels indicated in the bid documents, completed the privatization transactions, and enabled the new owners to assume control over the distribution companies on July 1, 2002. The minimum loss levels stipulated by the government and the loss levels agreed upon are given in table D-2.

*It was also agreed during negotiations that if the buyer achieved a level of ATC loss reduction higher than the minimum level stipulated by the government in the requests for proposals (RFPs), he would be entitled to the benefit to the extent of 50 percent of such reduction. The remaining 50 percent would go to the benefit of consumers. The first two companies were bought by the Reliance Group, and the third company was bought by the Tata Group. Both were reputable Indian companies with extensive experience in power distribution. Through a formal policy directive issued by the government in November 2001, DERC was obliged to respect the tariff-setting principles embedded in the privatization contract for the transition period of five years. The government realized a privatization receipt of Rs 4,814.4 million (or about US\$107 million).*

### **Handling of the Employee Issue**

*The support of the employees of DVB for the reforms was secured through a negotiated tripartite agreement among the employee representatives, the government, and the new investors that broadly protected the interests of the employees. Important elements covered such aspects as (a) protection of the jobs and no mass retrenchment; (b) terms of employment not to be diluted; (c) continuation of existing welfare schemes; (d) service under DVB and the successor companies to be treated as continuous; and (e) a fund for pension and retirement benefits to be administered by a trust to be set up by the government. The government contributed a sum of Rs 8.6 billion toward the Pension Fund Trust. This was in*

addition to the sum of Rs 4.2 billion that DVB had contributed. The investors were not overly concerned with the large volume of employees, since the age profile was such that most would retire soon. Actually 6,000 employees opted for the voluntary retirement package, which strained the resources of the trust fund. The reputation of DVB with the general public was so bad that the employees are believed to have accepted reform as inevitable.

### **Investment Support**

*The government committed itself to providing support to the new distribution companies in two ways:*

- *DPC, which had the first charge over the distribution assets on the date of privatization, agreed to the creation of the pari passu charge over the assets to enable the companies to borrow funds for distribution investments.*
- *The government would provide support to facilitate procurement of funds under the Government of India scheme called the Accelerated Power Development and Reform Program that was designed to support states in commercializing and improving the financial viability of the power sector. Its investment component financed rehabilitation and reinforcement of the subtransmission and distribution systems.*

### **Post-Privatization Performance of the Distribution Companies**

*Although the agreed ATC loss level to be achieved at the end of five years (30–40 percent) is high compared with the level of about 5–15 percent routinely achieved by the utilities in most developed countries, it still represents a notable improvement over the level prevailing in FY2002 and would have a favorable impact on the necessary tariff increases and the subsidy reduction.<sup>15</sup> The companies have operated the systems for more than three years. In the first year, one of the three distribution companies (Yamuna Power) could not achieve the agreed loss level. In the second and third years, all three met and exceeded the target loss levels (see table D-3).*

*The performance of North Delhi Power is remarkable. Based on the tariff filings for FY2006, the three companies expect to reach loss levels of 32.85 percent, 36.7 percent, and 45.05 percent, respectively.*

<sup>15</sup> This loss level is based on system losses of about 5–10 percent and collection efficiency of about 95–100 percent.

**TABLE D-3. ATC Losses—Targets and Achievements (%)**

DISTRIBUTION COMPANY	FY2003		FY2003		FY2003	
	TARGET	ACHIEVED	TARGET	ACHIEVED	TARGET	ACHIEVED
North Delhi Power	47.6	47.6	45.35	44.86	40.85	33.79
Rajdhani Power	47.55	47.4	45.85	45.06	42.70	40.64
Yamuna Power	56.45	56.5	54.70	54.29	50.70	50.12

Source: Tariff orders of the DERC.

**TABLE D-4. Capital Investment Performance of the New Distribution Companies (Rs million)**

COMPANY	FY2003		FY2004		FY2005	
	ESTIMATED	ACTUAL	ESTIMATED	ACTUAL	ESTIMATED	ACTUAL
North Delhi Power	1,650	485	2,870	2,871	3,034	3,284
Rajdhani Power	1,769	764	4,230	1,120	5,258	5,258
Yamuna Power	1,290	564	3,360	853	5,476	4,053

**TABLE D-5. Bulk Supply Tariffs to the Distribution Companies (Rs/kWh)**

COMPANY	FY2004	FY2005	FY2006
North Delhi Power	1.5754	2.1156	2.1121
Rajdhani Power	1.6005	2.0778	2.2101
Yamuna Power	1.2594	1.5647	1.7704

Source: Tariff orders of the DERC.

*Billing and collection percentages are 65 percent and 100 percent, respectively, in the case of North Delhi Power.* The company has also reduced sharply its share of the load shedding in Delhi state from 40 percent in FY2002 to 1.6 percent in FY2005. In respect of all reliability indicators covering frequency and duration of outages (such as SAIFI, SAIDI, and CAIDI), it has registered remarkable improvements. Although less spectacular, the other two companies also have registered notable improvements in these aspects. Street lights in all three areas have reached a high functionality ratio. Customer complaints, which rose sharply in the first year, are believed to have come down in the following year. Similar was the trend in the criticisms in the news media. The state of Delhi is part of the northern regional grid of the Indian electricity system which, on the whole, is characterized by a surplus of energy and a shortage of peaking capacity. Delhi cannot thus avoid power cuts in certain parts of the year when the capacity shortage is of the order of

200–300 MW.<sup>16</sup> Thus, it is difficult to sort out the public complaints concerning outages. The new companies are clearly making sure that the distribution bottlenecks are being eliminated. Transformer failures and line outages have been reduced dramatically.

*These companies are also undertaking significant capital expenditures on projects for rehabilitating, reinforcing, and modernizing the system.* At the time of tariff determination for each year, DERC agrees to include in the calculations the estimate of proposed relevant capital expenditure. The actual level of relevant capital expenditure of the previous year is discussed in the tariff decision for the following year (see table D-4).

*The last two companies claim to have incurred substantially larger amounts than what the DERC considered actual.* Availability of funds does not appear to be a constraint, although the flow of funds from the Government of India

<sup>16</sup> The Delhi government is pursuing the idea of setting up a 1,000 MW gas-fired combined cycle plant in the Delhi area for private ownership and operation to overcome the capacity and energy problems.



under the Accelerated Power Development and Reform Program had been much smaller than originally envisaged.<sup>17</sup> Difficulties in land acquisition have been cited as a major problem. Nonetheless, progress is being made, and all three companies have brought significant resources for improving the distribution systems. A noteworthy feature is that more than 900,000 tamper-proof electronic meters capable of highly accurate measurement have been installed, replacing the old electromechanical meters that were subject to frequent tampering by consumers.

*Loss reduction levels and tariff increases have a direct impact on the bulk supply tariff for the distribution companies.* The growth in bulk supply tariffs to them, reflecting the reduction in subsidies to the distribution segment, can be seen in table D-5.

*DVB always had difficulties in the past in settling its bills for power purchases from the generating companies owned by the central government.* After the privatization of the distribution companies, DTL was able to make 100 percent payment for all its power purchases, as the new distribution companies managed to improve collections and promptly pay their dues to DTL and as the subsidy support committed by the government in the context of privatization was available.

*In a press conference held on August 26, 2005, the Chief Minister of Delhi summarized the achievements thus: The technical and commercial losses had fallen in three years from the 51–57 percent range to the 37–40 percent range.* Load shedding had been reduced from 3 percent to 0.85 percent, while the daily availability of power had improved to 20–22 hours from the 8–10 hours before privatization. There have been overachievements in relation to targets, which is why the tariff hike had been only 23 percent in the last three years compared to 40 percent envisaged at the time of privatization.<sup>18</sup>

*The media had been frequently reporting protests by sections of the population against privatization, as well as protests about the “fast-running” tamper-proof electronic meters installed by the distribution companies, inflated electricity bills, continued power failures, unresponsive systems for addressing consumer complaints, and poorly functioning street lights.* Apparently the distribution companies had not done an adequate job of winning the confidence and understanding of the consumers. In the context of supply shortages and tariff increases, the wrath of the public led to serious protests and has made it difficult for the politicians to support future tariff increases. The companies need to adopt better communication strategies, address at least the genuine consumer grievances, and secure the support of the consumers for their programs.

*The Ministry of Power and the Power Finance Corporation of India commissioned the country’s leading credit rating agencies, ICRA and CRISIL, to rate the performance of all the SEBs of India.* In the rating report of January 2004, Delhi was rated as the first-ranked SEB, based on 100 criteria. The high rating is based, among other things, on the successful privatization and the functioning of the regulatory system. In the rating report issued in the first half of 2005, Delhi had slipped from the first to the third rank largely on account of the performance of the transmission company and the slide in overall sector viability.<sup>19</sup> In the ratings report issued in the first half of 2006, Delhi has retained its third rank.

### Emerging Areas of Concern

*Although the performance of the new distribution companies warrants optimism, some dark clouds on the horizon are causing concern.* Tariff increases have lagged considerably behind the levels incorporated in the business model adopted for the privatization contracts (see table D-6).

**TABLE D-6. Envisaged and Actual Tariff Increases (%)**

ITEM	FY2003	FY2004	FY2005	FY2006	FY2007
Tariff increase envisaged	10	10	10	5	3
Actual tariff increase	0	5	10	6.6	—

— Not available.

Note: Tariff increases in 2006 for residential consumers and agricultural consumers were subsidized by the government and distribution companies. See discussion in the later part of this case study.

Source: Tariff orders of the DERC.

<sup>17</sup> The Chief Minister of Delhi stated that compared to the promise of the Government of India to provide Rs 4.73 billion under the Accelerated Power Development and Reform Program, the actual releases were only Rs 1.06 billion (see Tribune On Line 2005).

<sup>18</sup> *Power in Asia*, Issue 436, dated September 15, 2006.

<sup>19</sup> *Power in Asia*, Issue 432, dated July 7, 2005.

**TABLE D-7. Actual Average Revenue Realized by the Distribution Companies**

AVERAGE REVENUE/KWH REALIZED (RS/KWH)	FY2003	FY2004	FY2005
North Delhi Power	3.85	3.69	4.06
Yamuna Power	3.54	3.40	3.91
Rajdhani Power	3.35	3.63	4.05

Source: Tariff orders of the DERC.

For a variety of reasons, the actual tariff increases have been 0 percent, 5 percent, and 10 percent, respectively, for the first three years. The actual average revenue realized is summarized in table D-7.

The average sale price per kilowatt-hour in Delhi in FY2005 was in the range of 9.09–9.44 cents/kWh.

Under the system of regulation that was adopted, this should increase the element of subsidy to DTL by lowering the bulk supply rate and correspondingly result in larger loan assistance by the government to DTL. Although the government had allocated a sum of Rs 34.5 billion for this purpose for the five-year period, it is not clear what would happen if the need becomes much greater than this sum on account of failure to raise tariffs in time.<sup>20</sup> Actually when the revenue gap for FY2005 became large (Rs 10.72 billion), warranting a tariff increase of 30 percent, the regulator decided to avoid a tariff shock to the consumers, allowed a tariff increase of only 10 percent and instead of proportionately decreasing the bulk supply tariff of DTL, obliged the distribution companies to treat a sum of Rs 6.96 billion as a “regulatory asset” that would be allowed to be recovered along with financing costs in future years. For FY2006, DERC allowed in July 2005 an average overall tariff increase of only 6.6 percent, and the resulting revenue deficit was sought to be covered partly by the government subsidy of Rs 1.38 billion and mostly by disallowing the full amortization of the regulatory asset created for FY2005. This presents an easy way out of unpleasant increases in tariff or subsidy payments at the expense of the investors. The adopted business model will become impractical if such choices become a regular trend.

Although the average tariff for FY2006 was increased by 6.6 percent, the tariff increases for the agricultural consumers, domestic consumers, and Delhi Metro Rail Corporation were higher at 19.8 percent, 10 percent, and 8.6 percent, respectively. The tariff increases were

lower for industrial consumers (3.7–5.2 percent), and the “nondomestic” consumers (3.6–4.9 percent). No tariff increases were allowed for railway traction and the JJ clusters.<sup>21</sup> This tariff increase resulted in widespread public protests.<sup>22</sup> Protestors blamed the privatization of the sector for the problems faced.

The Chief Minister resisted the political pressures mounted by the opposition parties against tariff increases and for a review of the propriety of the privatization procedures adopted, but when her own party became concerned that the protests would erode popular support to the government, she reluctantly agreed to reverse the tariff increases for residential and agricultural consumers. Under section 65 of the Electricity Act of 2003, the state government of Delhi would provide a subsidy of Rs 890 million (US\$20 million) to cover 50 percent of the tariff increase for residential consumers, and the distribution companies were asked to bear the remaining burden through a grant of rebates to consumers. In respect of agricultural consumers, the government would provide a subsidy of Rs 22 million (US\$0.5 million) covering 100 percent of the tariff increase. The distribution companies proposed a scheme of rebates linked to consumers improving payment discipline and liquidating arrears and to absorb the cost against the potential overachievement in ATC loss reduction in FY2006 and in the near future. DERC approved the proposal, but without the linkage between the rebate and payment discipline, as it believed, that this is really not a case of rebate, but one of passing on to consumers the benefits of potential overachievement of efficiency. DERC also left open further discussions on how exactly the cost of the scheme would be adjusted to tariff hearings for FY2007 based on actual efficiency results.

The second troubling element is the very large subsidization of the households by the industrial and commercial consumers. The average revenue from the sales declines when the share of industrial and commercial consumers

<sup>20</sup> Of this amount, Rs 13.64 billion was disbursed to DTL in FY2003, and Rs 12.6 billion in FY2004. The commitments for FY2005 and FY2006 were Rs 6.9 billion and Rs 1.38 billion, respectively.

<sup>21</sup> These are the unplanned urban slum areas.

<sup>22</sup> Residential energy charges would amount to 5.5 cents/kWh for the first 200 kWh, 8.9 cents/kWh for the next 200 kWh, and 10.5 cents/kWh for monthly consumption above that level. Thus, a household consuming 1,000 kWh a month would pay an average rate of 9.18 cents/kWh. In addition, it would also pay a fixed charge calculated at 27 cents/kW of connected load.

falls and that of the households increases. Thus, despite the tariff increase of 5 percent in FY2004, the average revenue fell for a variety of reasons, including an increase in the share of household consumers in total sales and a decline in the share of industries. A recent Bank report states that industries in India pay some of the highest tariffs in the world for a low quality of electricity supply.<sup>23</sup> This really implies that the scope for increasing the tariff of industrial and commercial consumers is limited or nonexistent and that the tariffs of households must be revised upward to cost recovery levels in order to raise the average revenue realization.

*Although the plans for reducing or eliminating this cross-subsidy are not clear, the regulator has notified phased retail competition (as envisaged in the Electricity Act 2003 of the Government of India) in terms of which, by 2008, consumers with a load of 5 MW and above would be eligible to buy directly from generators at negotiated prices, and the transmission and distribution networks would be obliged to provide nondiscriminatory open access. This threshold would be lowered every year thereafter so that by the year 2013 there would be full retail competition for all consumers with a load of 10 kW and above. However, most households are likely to remain captive consumers of the public utility as has happened in most parts of the world. Although such opening of the electricity market is normally a welcome development, it will be a disaster if the tariffs for households and other subsidized consumers are not adjusted to reflect supply costs. In the short to medium term, all the remunerative customers would leave the distribution company and buy power directly from generators or energy merchants, and the utility would be left with households and small loads with tariffs substantially lower than the cost of supply. Thus if liberalizing the power market were to be pursued, a plan for rapid phasing-out of the cross-subsidy must be implemented. Otherwise, all the new investors in distribution utilities would go bankrupt in a very short time. If all remunerative consumers leave the utility, the entire subsidy burden will have to be borne by the state, and this would be a major risk to the investors. To protect the incumbent utilities from the adverse financial impact of such retail competition, an approach involving the phasing of the rollout of open access and a levy of cross-subsidy surcharge that gets phased out in about 10 years is being tried.*

## Lessons

*This case study was undertaken in the context of the Bank's study relating to methods of filling the investment gaps in the power sector. The basic step in this system is to operate the existing system on a financially viable basis. The major impediment for this in the Delhi system was the high levels of inefficiency in the distribution segment. Innovative methods were devised to privatize distribution on the basis of efficiency improvements and subsidy reduction. Despite political opposition—unavoidable in a democratic regime—the attempt appears to be largely succeeding, and the private companies are making significant investments in the distribution sector.*

*What are the reasons for the success of the reform scheme so far in the case of Delhi? The availability of domestic companies with adequate experience and investment resources is an important factor. Only such domestic investors could properly appraise the political risks involved and judge whether they are manageable. The well-developed domestic capital markets and banking system, as well as the competent and independent judiciary and arbitration systems, provide support and comfort to the investors, and the flourishing and totally free print and electronic media with sharp observers and commentators protect them against arbitrary treatment and abuses. They also keep the investors on their toes in ensuring broad public satisfaction. The protests and complaints of the people ably reflected by the media have resulted in a management change in two of the three distribution companies, and promises were made to effect a visible change in the customer complaints response systems.*

*Although these factors are generally applicable for all the states, the continued existence in power of the political party, the Chief Minister, and other key officials committed to the reform process is clearly the primary reason for success in Delhi. That the Delhi area does not have any significant rural population or agricultural loads has helped, although this was offset to some extent by the large number of slums and colonies, which presented serious collection and subsidy problems.<sup>24</sup>*

<sup>23</sup> World Bank 2004, p. 29.

<sup>24</sup> Delhi is believed to have about 1,400 unauthorized colonies and about 3 million people living as squatters.

*The financial engineering in valuing assets on a business model and providing the investor with a clean balance sheet and a business model with a transition period of five years with subsidy was a practical solution for an otherwise intractable problem. The success in the post privatization phase owes much to factors such as (a) government departments and agencies, including state-owned water utilities paying their bills in full and on time; (b) the government adhering strictly to its commitments of subsidy payments; and (c) the government not interfering in any manner in the decisions of the utilities disconnecting nonpaying consumers and the prosecution of those stealing power.*

*The government did not enact, as earlier envisaged, a special new law to speed up the trials of electricity theft, although the Electricity Act 2003 provides for special courts and special police stations for handling these cases on a priority basis.<sup>25</sup> The Delhi government has set up two special courts compared to the total of seven such courts planned.*

*In addition, the involvement of more than one private investor in Delhi provided a competitive urge to each of them to perform better than the other.<sup>26</sup> The public could easily compare and judge which one is performing better. This was not the case in many other states, such as Orissa.*

*Other major technical aspects of the privatization effort and possible areas of improvement for wider applicability in India and elsewhere have been discussed at length and dealt with admirably in the two World Bank papers authored by Bhatia and others (2004).*

*The privatization exercise in Delhi is considered a major improvement over the one undertaken a few years earlier in Orissa. Driven by the Electricity Act of 2003, distribution privatization is expected to be pursued in several other states. The experience of Delhi would be relevant for the other major metropolitan areas in India that have low rural population and little or no agricultural loads. What should they do differently?*

*First, the restructuring until the stage of retail competition should be carefully thought through and a proper schedule drawn up. The sequencing should be in this order: (a) ATC loss reduction and creation of viable distribution entities offering bundled services; (b) unbundling of tariffs for network services and commodity price of electricity; (c) substantial minimization of cross-subsidy to the households over a transition period of about three years; and (d) gradual phasing-in of liberalization of the retail market thereafter.*

*Second, a performance-based multiyear tariff and subsidy package for the transition period of four to five years should be worked out by the regulator (and the government) and incorporated into the privatization contracts. It should become binding on the regulator as well. The Electricity Act of 2003 appears to enable this. Amendment of the State Regulatory Law might have to be considered without diluting the responsibility and powers of the regulator after the transition period.*

*Third, once the business model for the privatization is finalized, a substantial tariff increase should be secured before the privatization and the next increases scheduled for the third year onward of the transition period. This will give the time to stabilize the situation and make tariff filings based on reliable system data and some improvements already achieved in the quality of service.*

*Fourth, the regulator should have a timetable and a mandate for ensuring that end-use tariffs for all categories of consumers reflect the cost of supply to them, instead of focusing exclusively on the average revenue requirements for the utility as a whole.*

*Fifth, the corporatization of the unbundled units and allocation of physical assets liabilities and staff among them should desirably precede privatization, rather than being done on the same day, as was done in Delhi.*

<sup>25</sup> It is worth noting in this context that, unlike other state governments, the state of Delhi has no control over the police force serving its territory. The Delhi police report directly to the Ministry of Home Affairs of the Government of India. Nonetheless, Delhi has succeeded, although with some delay, in enabling reasonable police support to the distribution companies in their campaign against power theft.

<sup>26</sup> The Tata Group owned the North Delhi Power Company, while the Reliance Group owned Rajdhani Power Company and Jamuna Power Company.

## CASE STUDY E: THE DOMINICAN REPUBLIC

### Economic Background

*The Dominican Republic is a middle-income country located in the Latin America and the Caribbean region, with a population of about 9 million and a per capita income of US\$2,400. During the 1990s the country's GDP grew at an annual rate of 5.9 percent, and its per capita income increased annually at 3.8 percent in real terms, making it one of the fastest-growing economies in Latin America—second only to Chile. This was achieved within a stable macroeconomic environment, characterized by low inflation, manageable fiscal deficits, and declining public sector debt. Tourism, telecommunications, construction, and manufacturing played an important role in generating this growth.*

*However, the economy in the Dominican Republic started to derail at the outset of the new millennium. During 2001–02, a combination of external factors and domestic challenges slowed the pace of economic growth to 3.3 percent. The global economic slowdown, the decline in tourism following September 11, and high international oil prices all contributed to a reduction in economic growth. The peso, the local currency, depreciated by 20 percent in 2002 and by a further 16 percent in the first two months of 2003. This led to increased capital outflows and the collapse of one of the country's largest commercial banks, which caused a major banking crisis in the country. The ensuing rescue operation pushed up the quasifiscal deficits and public debt sharply. Inflation rose to 27 percent in 2003 and to 51 percent in 2004. The peso depreciated by 100 percent in 2003. The program agreed to under the two-year Standby Agreement with the IMF did not proceed well until the elections of May 2004. Real GDP declined by 0.4 percent in 2003 and recovered to about 2.0 percent in 2004. The new administration has commenced implementing a new 28-month Standby agreement approved by the IMF Board on January 31, 2005. If the agreed measures are carried out, GDP is expected to grow by 2.5 percent in 2005 and to reach 4.5 percent in 2006.*

*As the Dominican Republic looks forward, many structural issues continue to constrain future economic growth. With increasing globalization, trade liberalization and competitiveness will be new challenges for the country to face. At the same time, many of the old challenges remain. They include entrenched poverty, corruption, persistent inequality, relatively weak social indicators, a weak public sector, and equally weak regulatory and management frameworks for important utilities, especially in the electricity sector.*

*Meeting these challenges requires first and foremost a dramatic improvement in the governance efficiency with which public resources are used. The power sector had traditionally been and is continuing to be a bottleneck to the country's economic growth. Its reform and sound operation has an important role to play in the revitalization of the Dominican Republic's economy.*

### The Power Sector

*The Dominican Republic operates a power system that has an installed generation capacity of 3,600 MW to meet a peak demand of about 1,900 MW. The effective capacity at the end of 2003 was about 3,339 MW, which consisted of 458 MW of hydropower units and 2,881 MW of thermal power units fired mostly by imported oil or gas (from liquefied natural gas) and to a small extent by coal. The total capacity included 1,713 MW of capacity owned by IPPs. Another 923 MW of capacity were under construction for being commissioned during 2004–05. The transmission system consists of 940 km of 138 kV single-circuit lines radiating from Santo Domingo to the north, east, and west. It is weak and overloaded and is in urgent need of reinforcement, both in east–west and north–south directions, to provide reliable power in the capital and northern regions, and to transmit power from the new power plants in the eastern region. Transmission failures caused system-wide blackouts in 2000 (eight times), 2001 (seven times), and in 2003 (three times). Distribution networks cover 88 percent of the population (although the connections for about 8 percent may be illegal). This coverage reaches 100 percent if rural areas are excluded, as shown in table E-1. Government plans envisage coverage of 95 percent of the population by 2015.*

*The power sector has grown rapidly to keep pace with the growth in the economy. Between 1992 and 2001, total demand for electricity in the Dominican Republic increased at an annual rate of 7.5 percent compared to the GDP rate of growth of 5.9 percent for the same period. The word “demand” is a misnomer in the country's context as the country always experienced suppressed demand because of supply constraints. It has been estimated that the unserved energy, which was 40 percent of the potential demand in 1991, had fallen to 11 percent by 2002. During the same period, capacity deficits to meet unsuppressed demand were estimated to have fallen from 30 percent to 16 percent. Although a*

**TABLE E-1. Access to Electricity, Gas, and Wood**

ITEM	ALL	NONPOOR	POOR	URBAN POOR	RURAL POOR
Electricity in home	88	90	79	100	62
Gas lighting	65	19	34	31	57
Gas for cooking	85	89	73	89	60
Wood for cooking	3	2	6	5	8

Source: ENGIH 1998.

lack of installed capacity has not been a problem since early 2003, the country is facing what are called “financial blackouts” discussed later in this case study.

*At an average retail price of 15.7 cents/kWh in 2005, the Dominican Republic has one of the highest electricity tariffs in Latin America and the Caribbean.* The responsibility for the power sector before the reform of the 1990s rested on the state-owned, vertically integrated power company, Compañía Dominicana de Electricidad (CDE), whose performance was characterized by large energy losses, poor collection, and deficient operation and maintenance. Many generation units were either unavailable or operated well below their rated output. To address the generation capacity shortages in the mid-1990s, the government encouraged several IPPs to enter into Power Purchase Agreements (PPAs) with the CDE. Since the deals were nontransparent and negotiated, they resulted in high electricity prices.

*Reliability and quality of supply were, and continue to be, major issues in the power sector.* Power cuts had been a constant problem in the Dominican Republic. In the 1980s generation capacity was not sufficient to meet the peak load. The power system was chronically supply constrained, and widespread blackouts (apagones) lasting up to 20 hours of the day were considered “business as usual.”

*The power sector has been a bottleneck to the country’s continued growth.* The potential contribution of the large foreign investments and sector reform to growth and poverty reduction has been limited by continued problems of unreliable service in the sector. A recent report on the investment environment in the Dominican Republic noted that three quarters of the respondents considered electricity one of the factors discouraging investment decisions in the country both because of its high cost and unreliability of supply.<sup>1</sup>

## Power Sector Reforms

*Power sector reforms carried out in the Dominican Republic, initially with the assistance of the international financial institutions, had a checkered history involving sector restructuring, privatization, and renationalization.*

### Sector Restructuring 1997–99

*In an attempt to solve the long-lasting problems of the lack of available installed capacity and constant blackouts, the government enacted the Public Sector Enterprises Reform Law and decided to carry out a major restructuring of the power sector under its provisions.* Starting in 1998, the CDE’s thermal plants were grouped into two generation companies—Itabo and Haina—and its distribution facilities were divided into three distribution companies—Empresa Distribuidora de Electricidad del Norte (EdeNorte), Empresa Distribuidora de Electricidad del Sur (EdeSur), and Empresa Distribuidora de Electricidad del Este (EdeEste). In 1999 the government auctioned 50 percent of the shares in these five entities, along with management control, to the private sector, for a combined price of US\$641 million, divided almost equally among the generation and distribution companies.

*The government also attempted to improve the functioning of the sector by strengthening the policy and regulatory institutions, initiating a concerted effort to return the sector to financial sustainability, clearing all existing arrears in the sector, raising tariffs to cost recovery levels, and publicly supporting payment of bills by all customers including government ones.*

*The first regulator was appointed in 1997 as part of the Ministry of Commerce and Industry, rather than as an independent entity.* There was no comprehensive regulatory framework, and the entire sector was either in the hands of the government, or consisted of IPPs regulated

<sup>1</sup> World Bank 2002.

by their PPAs and other government contracts. Some efforts have had positive results, but they were not sufficient to achieve a sustainable power sector. Further efforts to reform the sector were pursued during 2001–02.

### Electricity Law of 2001

*Under the new Electricity Law of July 2001 the government’s operational presence in the sector was to be through (a) the CDE, which kept the contracts with the IPPs; (b) a transmission enterprise, Empresa de Transmisión Eléctrica Dominicana (ETED); and (c) a hydropower production company, Empresa de Generación Hidroeléctrica Dominicana (EGEHID). A new holding company, Compañía Dominicana de Empresas Eléctricas (CDEE) was established to own ETED and EGEHID.*

The government planned to phase out the CDE and to transfer its obligations concerning IPP contracts to the CDEE. Further, the 50 percent shares the government owned in the three distribution companies and the two generation companies were to be assigned to another new entity, Fondo Patrimonial de las Empresas (FONPER), to be managed as an investment rather than as a potential sector policy instrument.

*The National Energy Commission (Comisión Nacional de Energía, CNE)—composed of the Secretary of Industry and Commerce, the Secretary of Finance, the Technical Secretary of the Presidency, the Director of the Central Bank, the Secretary of Agriculture, the Secretary of Environmental Affairs, and the Director of the Telecommunications Institute—was placed in charge of energy policy. The office of Electricity Superintendence (Superintendencia de Electricidad, SIE) was placed in*

charge of sector regulation. It was headed by a council of three members, one of whom was the Superintendent, appointed by the President and ratified by Congress. The Consumer Protection Office (Oficina de Protección al Consumidor, PROTECOM) was placed under the SIE.

*The Coordinating Agency (Organismo Coordinador), whose directors are the Electricity Superintendent (whose vote is called upon as a tie breaker) and four others—representing EGEHID, ETED, private generators, and the distribution companies—was placed in charge of dispatch. Table E-2 summarizes some of the most important power sector reform components.*

*At that stage of reform, and contrary to the initially agreed plans, important assets stayed as part of the CDE, such as most of hydro generation and all transmission assets. As it will be discussed later, having transmission assets under the CDE reduced the power sector’s ability to increase investments in this area to reduce chronic transmission bottlenecks.*

### The Crises of 2002–04

*Soon after restructuring, the international fuel prices increased in 2000–01, striking a blow to the sector because of its high level of dependency on imported fuel. Retail tariffs required a substantial increase.*

Instead of raising the retail tariffs, the government chose to freeze them at February 2000 levels. During the tariff freeze, the government sought to alleviate the financial consequences through lower-priced sales of hydro electricity from CDE-owned plants. The government also assumed the responsibility to provide a “general subsidy” to

**TABLE E-2. Summary of Sector Reform**

ITEM	DETAILS
Sector unbundling	Sector unbundling in 1998, with the breakup of the CDE, to create thermal generating companies Itabo and Haina, and distribution companies EdeNorte, EdeSur, and EdeEste.
Privatization	Sale in 1999 of 50 percent shares of Itabo, Haina, EdeNorte, EdeSur, and EdeEste, including management control, to private investors.
Legal and regulatory framework	Passage of a modern Electricity Law in 2001 and issuance of its supporting regulations in 2002. This included creation of an autonomous regulatory agency—the Superintendencia de Electricidad (SIE), the National Energy Commission (CNE) as a policy-making body, and a wholesale market with economic dispatch and settlement—under the Coordinating Agency.

compensate for the failure to increase tariffs for all consumer categories reflecting the increases in fuel price and the consumer price index (CPI), as well as for the depreciation in the value of local currency.

*With the relentless increase in fuel prices, the government was obliged to inject a subsidy of up to US\$20 million per month into the sector, which made this option quickly unsustainable.* Government agencies themselves had difficulty paying their electric bills. In addition, the PPAs imposed a financial drain on the CDE, which was unable to draw sufficiently upon the limited fiscal resources of the central government.<sup>2</sup> The accumulated debt with the IPPs reached US\$179 million in September 2002. Nonpayment for their supplies led the IPPs to suspend production.

*The privatized distribution companies improved the chaotic situation they inherited from the CDE, but they still continued to show large technical and nontechnical losses and poor collection ratios.* Despite government subsidies, the increase in fuel prices eroded their income, which led them to cut power supply to neighborhoods where losses and nonpayment were more acute, and suspend payments to the generating companies.<sup>3</sup>

*The financial crisis of distributors and generators led to one of the worst crises to strike the power sector.* Starting in mid-2002, power cuts curtailed supplies by more than 20 hours per day in very many neighborhoods. Worst affected were the poorest areas, where the collection rate was the lowest. By September 13, 2002, more than 50 percent of all circuits of the principal distribution companies were out of service. The resulting riots claimed 15 lives.

*On September 17, 2002, the government announced urgent measures to deal with the crisis and to seek a structural and permanent solution to the sector's problems.* The measures announced by the government included a comprehensive settlement and payment for arrears; elimination of the generalized subsidy, while maintaining focused subsidies for the poor; and a concentrated effort to fight electricity theft. To achieve this goal, the government established an antifraud unit, the Program to Eliminate Electricity Fraud (Programa de Apoyo a la Eliminación del Fraude Eléctrico, PAEF). Results to date, however, have been modest.

*The power crisis greatly worsened in late 2003 when a significant currency devaluation of the Dominican peso took place, caused mainly by an unprecedented banking crisis.* Fuel costs, tied to the dollar, were not fully passed through to customer tariffs. The tariff for the first 700 kWh residential consumption block was frozen at the February 2003 level, and a Stabilization Fund was created to provide compensation and also handle electricity price fluctuations. Since the government did not have any funds, the Stabilization Fund became a forced interest-free loan to the government by the distribution companies. The macroeconomic crisis, in tandem with tariff increases for some customer segments, put the power sector in a more distressed situation. Collections and revenues decreased even further, and consequently distribution companies were not able to pay for a large part of their power purchases, forcing IPPs to declare themselves physically unavailable, since they had no sufficient working capital to purchase fuel. Thus, the country faced a “financial blackout,” despite having generation capacities far in excess of demand and one of the highest tariffs in the region.

### **Renationalization of the Distribution Companies**

*Financial blackouts and extensive disconnection of nonpaying neighborhoods made the private distribution companies highly unpopular, and in September 2003 (eight months ahead of the elections scheduled for May 2004) the government yielded to the political pressure and decided to renationalize two of the three distribution companies (EdeNorte and EdeSur) by repurchasing the 50 percent shares held in them by Union Fenosa.* The ostensible reason for such renationalization was that the companies were underperforming, both technically and financially jeopardizing the integrity of the power sector. The acquisition process and the price paid to Union Fenosa were not transparent. It is also worth noting that AES Corporation (AES) also sold its shares to an international private equity fund and retained only its role as the operator of the distribution company EdeEste.<sup>4</sup> Operation of the renationalized companies was restored to the CDEE. Under public sector ownership and operation, the unit operating costs of the two companies sharply rose (to 6–7 cents/kWh compared with 2 cents/kWh of EdeEste), and their performance deteriorated.

<sup>2</sup> The PPAs were renegotiated in 2001 (the “Madrid Agreement”). As a result the government’s role as a single buyer was reduced, but the government was obliged to compensate for the stranded costs. The government, however, lacked funds to pay the IPPs even the lower renegotiated costs and accumulated debts to them.

<sup>3</sup> These neighborhoods were predominantly poor.

<sup>4</sup> It is believed that AES did this to clean up its balance sheet and shed risky assets worldwide in the wake of Enron scandal.



## Attracting Investments

The reform and privatization of the power sector in the mid-1990s managed to attract significant new capital for investments in revamping and modernizing existing generation capacity, expanding assets, and accessing natural gas via the first liquefied natural gas terminal in the country. Several new IPPs built greenfield generation capacity, relieving constraints and providing additional resources to support the country's growth.

As a result of investments in the power sector, between the end of 2000 and mid-2003, the Dominican Republic witnessed a 43 percent increase in effective capacity (around 1,000 MW). The distribution companies also made significant investments in the physical network and in the commercial processes. The boost in generation capacity provided temporary relief from the blackouts. Investments in distribution helped reduce losses and improve the quality of service for a while.

The Dominican Republic was able to attract about US\$2.3 billion in new investments in the power sector, a remarkable figure for a country of that size. From this amount, about US\$1.2 billion came from the divestitures of government assets, while the remaining came to finance new generation capacity and distribution network improvements.

During those golden years, the electricity sector alone accounted for 23.3 percent of all foreign direct investments since 1995, and this trend continued with electricity sector investment accounting for 40 percent of all foreign direct investments in 2001. This flow of foreign investment was an important source of financing the current account deficit. In 1999 the flow of foreign resources in the sector was 1.47 times the current account deficit.

To increase generation capacity before power sector reform was designed and implemented, the government invited IPPs, which entered into PPAs to supply the CDE as a single buyer of energy. This resulted in considerable new capacity, as well as reduced power shortage and outages. However, as in other countries, the IPP-PPA approach led to its own set of problems, primarily related to the agreed prices (especially for the capacity price). Where the deals were worked out through negotiations (only one was tendered through competitive bidding), this was linked to issues of transparency. Furthermore, the PPAs with the CDE became inconsistent with the revised sector structure, and had to be renegotiated post reform.

Currently, the Dominican Republic has an installed capacity of about 3,600 MW for a peak demand of about 1,900 MW. The energy mix is diversified, involving a combination of steam plants, gas turbines, combined cycle, fuel oil, and hydro, as shown in table E-3.

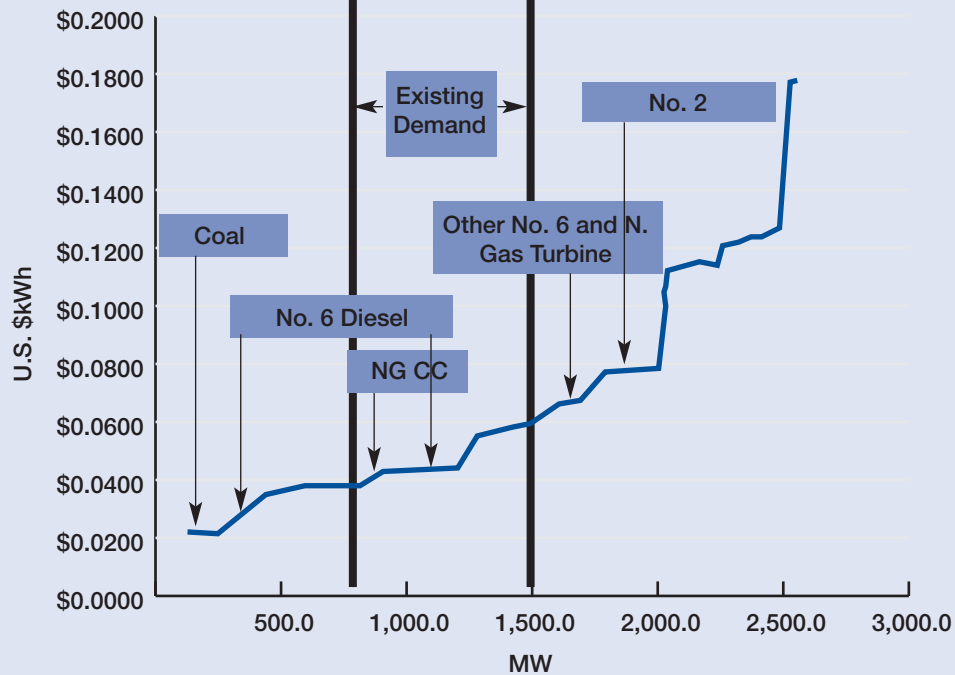
Given the excess capacity in the system, existing demand could potentially be met at a short-term marginal generation cost of US\$60/MWh. Figure E-1 illustrates the merit order for the existing generation capacity. At this point in time, the Dominican Republic could take advantage of its relatively low cost of generation by not dispatching the least-efficient plants. Unfortunately, consumers have not benefited from this "cheaper" energy for three reasons. First, subsidy payments from the government to the generation companies to compensate for the large losses in the distribution system have been unreliable, thereby delaying fuel purchases and the availability of generation capacity. Second, the main two IPP contracts have significant take-or-pay obligations. Third, transmission constraints inhibit a strict merit order dispatch.

**TABLE E-3. Effective Capacity, December 2000 and December 2003 (MW)**

COMPANY	STEAM PLANT		GAS TURBINE		COMBINED CYCLE		MOTORS-FUEL OIL		MOTORS-GAS OIL		HYDRO		TOTAL	
	2000	2003	2000	2003	2000	2003	2000	2003	2000	2003	2000	2003	2000	2003
Haina	230	310	144	153			0	302					374	765
Itabo	379	230	174	173									553	403
CDE											353	458	353	458
14 IPPs			303	301	170	784	422	519	103	109			998	1713
Totals	609	540	621	627	170	784	422	821	103	109	353	458	2278	3339

Source: Organismo Coordinador 2003–2004.

FIGURE E-1. CAPACITY DISPATCHED AND MARGINAL VARIABLE COST



The privatized distribution business also attracted new investments in network improvement, loss reduction, and service quality. Both AES and Union Fenosa are used to operate distribution systems in their home country and abroad. They were fully aware of the importance of improvements related to theft, reduction, and collection. From the time they assumed operational and management control in 1999, they showed notable progress in reducing losses until about 2001/02, as indicated below:

- Union Fenosa–EdeNorte: From 41.9 percent in 2000 down to 32.3 percent in 2001.
- Union Fenosa–EdeSur: From 37.3 percent in 2000 down to 22.2 percent in 2001.
- AES–EdeEste: From 40 percent in the fourth quarter of 1999 down to 27 percent in the third quarter of 2002.

Transmission is one area that has not attracted new investments. Bottlenecks still exist. The CDE remained the owner of transmission assets and hydro-generation facilities. However, it lacked financial resources to improve the grid. Furthermore, legislation did not allow other mechanisms for mobilizing private sector resources for transmission.

### A Power Sector in Disarray

Despite wide-ranging structural reforms, privatization, and significant foreign direct investments in the sector, the power sector in the Dominican Republic continued to remain in total disarray.

### Quality of Service and Power Shortages

Power shortages have been plaguing the Dominican Republic for many decades. As already mentioned, in the mid-1980s the capacity of the system was constrained primarily from the lack of investment in the power sector. Lack of funds jeopardized maintenance of existing generation assets, as well as construction of new power plants. In parallel, consumption was outstripping supply at a fast pace. In the absence of a robust demand-side management program, rolling blackouts were the last and only resort to deal with power shortages.

The power sector reform provided some relief by increasing existing capacity. The power system now is neither capacity- nor energy-constrained, in a purely technical sense. However, the country is still plagued by constant blackouts, as noted earlier. These are usually referred to as “financial blackouts.”

*The country has been experiencing blackouts because of the financial difficulties faced by the generators.* Distribution companies suffering from poor collections could not settle their dues to the generators for the energy purchased from them. Often distribution companies do not even pay a sufficient amount to cover the fuel costs of production. Under such circumstances, some power plants have been forced to stop producing, which led to involuntary power rationing.<sup>5</sup>

*A weak transmission system is also a major source of service quality concerns. Transmission weaknesses have led to frequent countrywide blackouts—eight in 2000 and six in 2001.* Better grid codes and regulations could help make the power system more reliable and affordable. Recent independent technical analysis has suggested that static capacitors should be installed if their capital cost is less than the total of generation capital and operating cost to supply reactive energy, but perverse incentives exist that discourage investment in capacitors.<sup>6</sup> No funds are currently available to the CDE's transmission business to achieve this reinforcement, and the regulated transmission tariffs are set in a manner such that they create no incentives for it to invest. Furthermore, the new Electricity Law consolidates a de facto monopoly to the CDE, which precludes more efficient and faster solutions to expand the transmission grid.<sup>7</sup>

*In many cases, power curtailment and loss of load had been occurring in an unplanned—almost haphazard—way.* It had been difficult for customers to know where and for how long the next blackouts would take place. Therefore, customers must deal with the cost of unserved energy, as well as with a high loss of load probability.

*Figure E-2 illustrates the nature and extent of the power cuts in 2004 in the Dominican Republic.* Despite a total installed capacity of more than 3,000 MW and peak demand of about 1,800 MW, the country has recently curtailed an average of 25 percent of the load, and in some periods even 50 percent. The ups and downs are the direct result of the availability of financial resources to acquire fuel.

*The social consequences of the crisis were significant and extensive.* The population expressed dissatisfaction through public demonstrations that turned violent and led to the loss of lives.

*The unreliability of the service, especially blackouts of up to 20 hours a day, is not distributed evenly among the rich and the poor.* On one hand, the rich were able to partially mitigate the negative consequences of shortages by installing their own backup generation systems. The Central Bank estimated that prior to 1999, 60 percent of businesses used backup generators. This number was still about 44 percent in mid-2002. Some experts estimate that currently 1,500 MW of backup generation is available in the country.<sup>8</sup> Although not the ideal solution for businesses and industries, it was still better than not having energy at all. This alternative is not available to the poor.

*Shortages significantly affect smaller businesses and communities that have less access to coping mechanisms than larger businesses.* Small businesses, such as mechanics workshops, carpenters and food retailers, lost custom and their economic base. Essential social services, such as schools—especially night schools attended by poorer groups—and medical services, were disrupted. The lack of illumination at night also affected the citizens' sense of security and exposed them to a higher risk of crime and violence, especially for women, and particularly in congested urban neighborhoods and slums.

*Furthermore, the way that rolling blackouts have been designed imposed a greater burden on some less-privileged neighborhoods.* This was the essence of the ill-fated Blackout Reduction Program (Programa de Reducción de Apagones or PRA), which will be discussed in the next section.

*The economic losses imposed on the poor are noteworthy. A recent study commissioned by USAID has estimated consumers' willingness to pay for reliable services.* For low consumption brackets, such as 50 kWh per month, customers would be willing to pay about 30 cents per kWh (figure E-3). This represents the costs that the lack of reliable power inflicts on the society. It includes components such as the money spent on alternative fuels, as well as the discomfort and loss of production resulting from constant blackouts.

*During the periods of scarcity and shortage in recent decades, demand response played a relatively small role in alleviating the crisis.* The opposite is what actually occurred: Subsidized rates have fostered overconsumption and wasteful use of resources. Lack of enforcement of basic property rights encouraged theft and nonpayment.

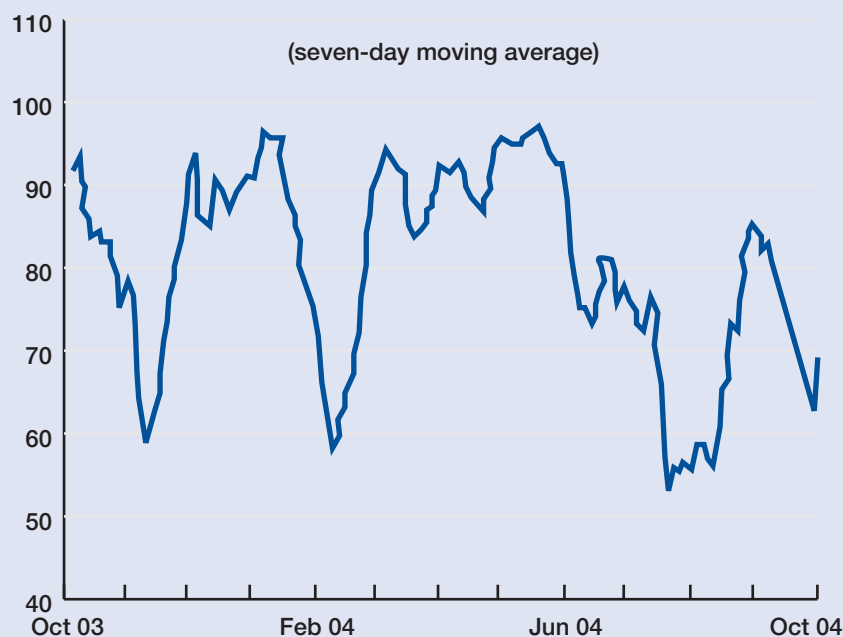
<sup>5</sup> According to the August 12, 2003, edition of Listín Diario, on the previous afternoon, generation was 1,279 MW, while unserved demand was 527 MW.

<sup>6</sup> As an example, with all units the Haina plant in the central zone was producing approximately 150 MW and 80 MVAR. It was estimated by CCE that if the reactive requirements could be met by static capacitors, an additional 24 MW of generating capacity would be set free to serve load within the Santo Domingo load zone.

<sup>7</sup> For example, BOT schemes used in Peru or BOO in Brazil.

<sup>8</sup> Blanlot 2004.

FIGURE E-2. ELECTRICITY SUPPLY AS A PERCENTAGE OF DEMAND



Source: International document, USAID (2004).

Removal of meters and payment of fixed fees in extensive PRA areas have contributed to wasteful consumption among the poor. Needless to say, if an economic good is perceived to be almost without cost, its consumption grows exponentially. Theft and nonpayment contributed to the perception of electricity as “a free good,” which fostered consumption even further.

### **The Distribution Business and the Culture of Nonpayment**

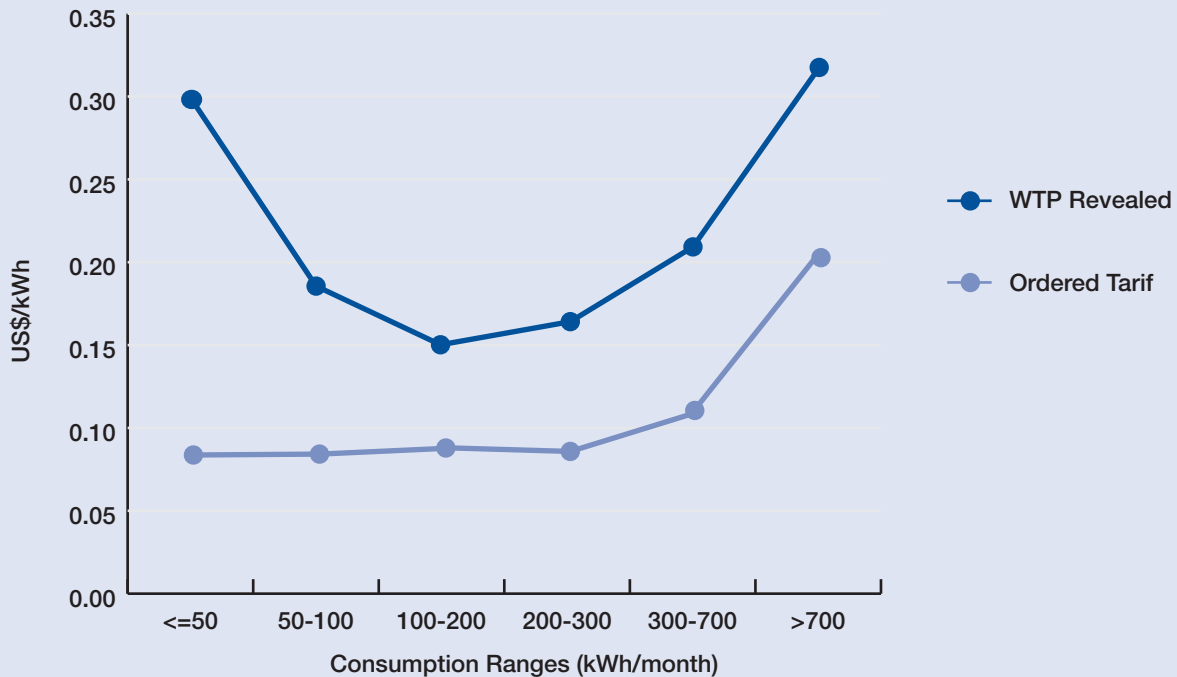
*The distribution business is the most dysfunctional element of the power system in the Dominican Republic.* Poor quality of service, permanent customer dissatisfaction, and relatively high prices have induced theft through illegal connections, as well as nonpayment of electricity bills, by the rich and poor alike. Unpaid bills arise because of what is somewhat facetiously known as *la cultura de no pago* (an ingrained habit of not paying). More realistically, the nonpayment is caused by the inability of the distribution companies to cut off supplies for overdue bills. Defective commercial processes and poor law enforcement mechanisms, in tandem with the impunity with which customers reconnect to the grid illegally, are additional layers of complexity to the problem.

*For more than 40 years, electricity was perceived as a “free good.”* Until privatization, theft was rampant, and procedures for cutting off customers in arrears were largely innocuous—customers could reconnect themselves without any ensuing penalty. Theft of electricity was not culturally perceived as a crime and was not enforced as such.

*The performance of distribution companies is measured through the cash recovery index (CRI), which is a product of the billing ratio (energy billed in gigawatt-hours divided by the total energy put into the network in gigawatt-hours) and the collection ratio (actual cash amount collected divided by the total amount billed in monetary terms).* A well-managed distribution utility would have a billing ratio of 90 percent or above and a collection ratio of 98 percent or above, and the resulting CRI would be 88 percent or above. At the time of privatization in 1999, the distribution companies in the Dominican Republic showed dismal CRIs in the range of 40–50 percent, with the weighted average being 43 percent. The private sector was able to achieve substantial improvement by achieving CRIs ranging from 62 percent (EdeNorte) to 69 percent (EdeSur), before macroeconomic factors put the power sector in complete disarray. By 2004 the CRIs deteriorated to 35 percent in EdeNorte and 46 percent in EdeSur—both renationalized entities. It was a little better at 51 percent in EdeEste.<sup>9</sup>

<sup>9</sup> These figures exclude the PRA areas, since they are not comparable. Most of the PRA areas are in EdeEste jurisdiction.

FIGURE E-3. REVEALED WILLINGNESS TO PAY IN RELATION TO TARIFF



Source: International document, USAID (2004).

Lack of proper collections led the sector into a vicious cycle. The vicious cycle starts with the end users, who do not pay their distribution companies for the energy consumed.<sup>10</sup> Poor collections call for tariff increases to survive, which in turn feeds back into the process by increasing theft and nonpayment.<sup>11</sup> In turn, the distribution companies do not pay the generators for energy purchases, and the generators end up facing liquidity crises and curtailing generation.

As already presented, privatized distribution companies were able to achieve important results in terms of losses and collections. However, in absolute terms, the end result was still insufficient to assure sustainability. Those companies alone were not able to go much further in the absence of the rule of law and a government capable of enforcing contracts and paying its own bills, as well as in an environment in which theft of energy was not treated as a crime. Some attempts made by the government to fix this problem produced cosmetic results. This vacuum in governance impeded efforts in the sector to achieve further badly needed improvements.

### The Complex Issue of Widespread Subsidies

In a few instances in the last couple of years, the government has tried to limit and target subsidies better. The government acknowledged that the electricity sector was a major source of fiscal costs, since the structure of the electricity tariff was not designed to reflect the changes in the international fuel prices, exchange rate, and differences in foreign and local inflation rates, even though the costs of production paid to generators under the PPAs to the IPPs reflected these changes. This situation created a generalized subsidy amounting to Peso 370 million per month or 1.2 percent of the GDP in 2002.<sup>12</sup> Financing such inefficiencies in the power sector crowded out other social investments. In 2002, for example, subsidies in the power sector reached US\$300 million—half the budgeted amount for basic education in the country.

The government has tried a few times to eliminate generalized subsidies, focusing instead on those who need the subsidy most. For example, a generalized

<sup>10</sup> Either because of delinquent payments or outright, rampant theft.

<sup>11</sup> The impact of technical and nontechnical losses is remarkable in countries with high costs of bulk power, such as the Dominican Republic, which basically imports hydrocarbons to meet most of its generation needs.

<sup>12</sup> Total arrears emerged and by the end of 2002 were as high as US\$226 million or 8.3 percent of fiscal revenues of that year.

subsidy was eliminated in 2002, and a new indexation system was established to take into account increases in oil prices and movements in the exchange rate. Electricity tariffs increased between 40 percent and 107 percent, with the highest increases affecting the larger consumers of electricity. This has been replaced by a much more targeted subsidy for poor urban neighborhoods through the PRA. This is implemented at a cost of Peso 100 million per month—less than 25 percent of the cost under the generalized subsidy.

*However, the 2002–03 macroeconomic crises reversed most of the ongoing effort to provide selective, smart subsidies.* Political pressure to keep prices low was intense. In response to the currency devaluation crisis, the government decided not to allow full pass-through of dollar-denominated fuel costs to customer tariffs. This action was an attempt to mitigate the impact on tariffs for all customer groups. It was a direct and explicit subsidy to electricity rates, for all customer categories, at levels that did not fully reflect costs. This action served not only to increase consumption, but also to further reduce the power sector's cash generation, which led to escalating rolling blackouts.

*A USAID report (2004) estimated the total subsidy provided to the power sector in 2004 to be of the order of US\$682 million.* This consists of both explicit subsidies for fuel (US\$27 million), lifeline rates (US\$112 million), and the PRA (US\$226 million), and the implicit subsidies resulting from the cumulative losses of the distribution companies (US\$317 million).

*It must be noted that the tariff in the Dominican Republic is one of the highest in Latin America, reaching 14 cents/kWh (prior to the currency devaluation).* By September 2004 the applied retail tariff reached 15.7 cents/kWh. Therefore, the government's latitude to increase tariffs further is relatively limited, particularly considering that customers always have the second best option to "steal" energy or not to pay for it.<sup>13</sup>

*The important issue is not so much to raise tariffs for the customers who pay as to decrease theft and nonpayment.* A simplified analysis developed by the World Bank in 2003 showed that sustainability of the power sector would be greatly enhanced if improvements in the CRI could be attained. A sensitivity analysis of tariff levels is presented in table E-4.

*With technical losses running at 15 percent and collection rates at 95 percent, the 2002 tariff levels would be sufficient to assure economic and financial equilibrium for EdeNorte and for EdeSur.* In the case of EdeEste, even a tariff reduction from US\$155/MWh down to US\$134/MWh would be possible.<sup>14</sup> Conversely, at the 2002 performance levels for each company, the necessary tariff for breakeven would require unrealistic tariff increases for all the distribution companies.

*In a country heavily dependent on imported oil, the cost of energy is high most of the time—and particularly so during oil shocks combined with currency devaluations.* As a consequence, losses have an immense effect on the financials of a distribution company. To illustrate this point, the World Bank carried out another simplified sensitivity analysis showing the joint impact of changes in the collection rates and technical losses. Table E-5 shows the average breakeven tariff, given different levels of operational performance of the distribution companies. There is almost an exponential effect of the collection on the breakeven tariffs. For example, if losses were 30 percent and collections 60 percent, the breakeven point would be about US\$242/MWh.

*Despite being a theoretical analysis, it properly highlights the substantial impact of collections and losses on the financial status of the sector.* Needless to say, it is unrealistic to imagine that the tariff charged to customers who do pay their bills can be increased indefinitely, up to, for example, US\$240/MWh (see table E-5). Therefore, it is not feasible to maintain such low collection rates over a long period. It would lead, and it has indeed led, to a collapse of the entire system.

*To aggravate matters, because of the poor quality of service, customers used to paying their bills tended to lose the incentive to continue to do so.* On the government side, a poorly designed and enforced property rights system made things worse, since people who were stealing energy or not paying their bills were not compelled to change their behavior.

### **Blackout Reduction Program**

*In 2001 the government established the Blackout Reduction Program (PRA), a two-year program with the objective of targeting subsidies to the poor on a geographical basis (barrios carenciados, or neighborhoods lacking in services)*

<sup>13</sup> In 2003 the regulator authorized distribution companies to increase their tariffs, but they preferred not to do so, under the assumption that further rate increases would aggravate the issues of theft and nonpayment.

<sup>14</sup> A tariff of US\$155/MWh is the same as 15.5 cents/kWh.

**TABLE E-4. Breakeven Tariff Analysis**

COMPANY	EXISTING CASH RECOVERY INDEX (CRI) FOR 2002	2002 TARIFF (US\$/MWH)	BREAKEVEN TARIFF FOR 2002 (US\$/MWH)	EFFICIENT TARIFF: CRI = 80.8% (15% LOSSES, 95% COLLECTIONS) (US\$/MWH)
EdeNorte	60.3%	124	167	125
EdeSur	68.8%	124	146	124
EdeEste	62.7%	155	163	134

**TABLE E-5. Effect of Collection Rates and Losses on the Breakeven Tariff**

COLLECTION RATE (%)	BREAKEVEN TARIFF (US\$/MWh)	
	AT A LOSS LEVEL OF 30%	AT A LOSS LEVEL OF 15%
40	362	299
50	290	239
60	242	199
70	207	171
80	181	149
90	161	133
100	145	120

and implementing rolling blackouts in a more organized fashion.<sup>15</sup> The program envisaged a provision of about 20 hours of electricity per day in certain designated areas, generally the poorest neighborhoods (barrios) in the cities. The energy delivered to those neighborhoods was heavily subsidized by the government and by the utility. Roughly speaking, distribution companies would be responsible for covering 25 percent of the required subsidies to serve PRA customers, while the government was responsible for the remaining 75 percent.

Initially the program worked reasonably well. A tariff increase was applied to other customers, who in turn obtained more reliable service. The poor also benefited, since the number of hours curtailed in low-income areas was reduced to reasonable levels. The program brought some initial relief, but it did not prove to be sustainable. With the aggravation of the macroeconomic crisis, the flow of cash into the power sector started to shrink. That shrinkage implied less money for fuel, fewer hours of generators running, and more frequent blackouts.

Despite being initially touted as a success, the PRA had several built-in perverse incentives. Rates charged to customers in the PRA neighborhoods were nominal and based on a flat fee, which was determined as a function

of the estimated installed load. A few commercial customers who were located within the boundaries of the PRA were charged regular fees, on the basis of kilowatt-hours consumed. Metering was virtually nonexistent, and payment was not based on metered consumption. The PRA tried to facilitate the emergence of community self-monitoring groups to increase collection and defray the service costs. However, for practical purposes, the collections in the PRA neighborhoods were negligible.

*The PRA was a kind of geographic targeting methodology, also known as a "poverty map."* It is widely used in many sectors, because of its simplicity, when poverty is spatially concentrated. This seemed to be the case in the Dominican Republic. However, one of its negative aspects has to do with incentive costs. It may affect people's behavior to become eligible, such as through relocation and migration to those designated areas. Perhaps even more serious is the fact that there is no metering for any customers. Such a "negative incentive effect" induces higher consumption of a subsidized commodity, leading to waste and the crowding out of private and public transfers.<sup>16</sup>

*The PRA's perverse economic incentives jeopardized its medium-term sustainability.* Initially, subsidies were about US\$30 million per year. In 2003 the opportunity cost of

<sup>15</sup> In the absence of an alternative way to deal with the PRA issues, the program has been extended.

<sup>16</sup> Coady and others 2004.

the energy consumed by the PRA grew to US\$120 million, and it is expected to grow even further, perhaps to US\$200 million, in 2005.

*The PRA represents the antithesis of a sound demand management program.* The subsidies and the mechanisms for rationing energy need to be completely revamped. Some of the most important issues to be addressed include the resource waste that this system seems to engender and the growth in the number of customers in PRA areas. However, addressing the PRA requires political courage, investment, and time. Weak governance and lack of government commitment have led to the postponement of the design and implementation of a sound plan to look for better ways to target subsidies and manage shortages in the Dominican Republic.

*Most of the customers in the neighborhoods do not have meters, and neither the government nor the distribution companies are planning to introduce meters in the short term.*<sup>17</sup> Not surprisingly, lack of meters and payments based on a flat fee (as opposed to individual kilowatt-hour consumption) lead to resource waste. Cases of lightbulbs without switches have been documented. PRA consumers are believed to have changed over from propane to the use of electricity for cooking. Illegal hookups abound, and the distribution network in the neighborhoods is overloaded and deteriorated, which is increasing technical losses and facilitating theft.

*Distribution companies have virtually no incentives to fix this technical problem either.* For them, providing 25 percent of generation costs to those neighborhoods as subsidies to the poor is more advantageous than delivering regular services to those poor customers, where losses and nonpayment are a chronic problem. They have been working actively with the government to qualify more and more areas and customers under the PRA umbrella. The population under the PRA grew substantially. In early 2003, the PRA neighborhoods consumed an estimated 10–12 percent of energy produced in the Dominican Republic.<sup>18</sup> In late 2004, it was estimated that 500,000 customers, or one-third of the country's total client base, were located in PRA-designated areas. The current size of the PRA may jeopardize the financial sustainability of the entire power sector.

*In addition to those perverse incentives, the PRA did not seem to be a well-targeted subsidy scheme, which is a usual drawback of geographically targeted subsidies.*<sup>19</sup> This is because the population within the qualified neighborhoods is heterogeneous in terms of income and consumption. However, customers are treated equally in terms of subsidies and the quality of service provided. This “one size fits all” approach is an inefficient way to allocate subsidies and ration energy, since customers' willingness to pay for electricity and the reliability of its supply are not taken into account.

*It is unacceptable to maintain the current scheme in perpetuity, given the perverse incentives created.* Other countries that have faced similar difficulties were able to significantly reduce losses and increase collections. There is no political consensus among the distribution companies and the several branches of the government on what needs to be done. The blackouts are just the tip of the iceberg. Resolving the problems of the power sector requires a much more comprehensive approach. The role of demand in response to prices (or the lack thereof) has to be better understood and taken into account in the design of a new subsidy and rationing scheme. The political courage and commitment to address the intertwined issues in the PRA are yet to be proven, but they are a prerequisite and a priority to the medium-term sustainability of the power sector.

### **Key Lessons from the Experience in the Dominican Republic**

*Below are seven important lessons that can be learned from the experience in the Dominican Republic.*

#### **Power reform is not the culprit of the problems faced by the electric sector in the Dominican Republic**

*Contrary to what is sometimes alleged, the reform does not appear to be the culprit for the problems faced by the power sector in the Dominican Republic.* Nothing indicates that sector unbundling, privatization, and segregation of the market into three distribution companies led to inefficiencies of scale or scope. The causes of the problems of the power sector in the country are more

<sup>17</sup> The introduction of meters is seen by the government and by the distribution companies as a dangerous move, since it would be met with staunch resistance from the population and would risk jeopardizing the still fragile progress made in having them accept paying their bills. Furthermore, distribution companies have no economic incentives to do so. Installing, reading, and maintaining meters increase investment and operational costs, which are unlikely to be recovered by the tariffs charged in PRA-designated areas, often at great political cost. Distribution companies' real incentive is to extend PRA's life as much as possible. Funding 25 percent of the energy delivered to PRA neighborhoods is still more advantageous than serving those kinds of customers at nominal rates and with a very low CRI.

<sup>18</sup> In the same period hydro power represents 15 percent of national production.

<sup>19</sup> Coady and others 2004.



deeply rooted. They have to do with a long history of people's (as well as the government's) not paying their bills, voluminous subsidies, energy theft, lack of contract enforcement, and corruption. No power sector model is bulletproof in the face of this kind of void in governance. Debating some of the imperfections of power sector reform does not address the central issue of lack of good governance. As a corollary, new proposals tinkering with industry structure and privatization are distracting, given the magnitude of the critical problems at stake.

***Sector reform did help attract capital, particularly in generation***

*Despite the alleged problems, reform and privatization were able to attract about US\$2.3 billion to the power sector in a matter of a few years. This is a remarkable feat, given the size of the power sector in the Dominican Republic. Investors were attracted in part by what seemed to be a coherent power sector reform in a market that offered prospects for growth. Furthermore, the single-buyer role played by the CDE at the outset of the reform attracted new IPPs and increased generation capacity.<sup>20</sup> At that point in time, since blackouts were primarily caused by the lack of generation, resolving this bottleneck seemed to be the avenue to eliminating the chronic power shortages. Distribution companies in private hands made some investments to enhance the reliability of the grid and of the commercial processes, but more could have been done. Investment in transmission did not materialize, since this activity basically remained in the hands of a state-owned and regulated monopoly. On the whole, attracting investments was the bright side of the power sector reform in the Dominican Republic.*

***Attracting capital is just one part of the equation, but it is not a guarantee to a sustainable power sector***

*Many countries struggle to attract capital to their power sector. Some of them are more successful than others. Despite being an important ingredient, capital is a necessary, but not sufficient, condition. Investments, public or private, must have decent financial returns to cover operational costs and to support growth. Otherwise, the system does not become sustainable. This did not happen in the Dominican Republic. For the power system to become sustainable, it is mandatory that a vigorous and effective effort be made to improve governance and enforce the rule of law.*

***Governance improvements must precede sector restructuring and privatization***

*This question marked the debate about privatizations in the power sector in the early 1990s. The discussion centered on "fixing" the operational and financial aspects of the business prior to privatization. In retrospect, the question was mischaracterized. What needed to be fixed was the governance system—not the utility per se. Governance here includes, among other things, respect for contracts and property rights. In the absence of this precondition, any ownership structure, either public or private, is doomed to failure.*

***Fixing the power sector in countries like the Dominican Republic requires serious political commitment and the right incentives***

*The impact of losses and collections on the sustainability of the power sector is evident. However, confronting this issue is politically sensitive. It requires addressing cultural aspects related to a common view that electricity is a "free good" and that people do not have to pay for it. It is a flawed perception of property rights that needs to change. The Dominican Republic is not the only country facing this problem. Other countries in Africa and Eastern Europe, with less human and financial resources, were able to tackle the problem of theft, losses, and collections effectively. What seems to be lacking in the Dominican Republic is the incentives for the government to adopt a committed, forward-looking approach. The governments behaved as if they knew beforehand that if things went really wrong, there would always be a safety net of international assistance to bail out the power sector. Politicians thus prefer not to confront the real, thorny political issues, such as fixing the issue of subsidies to the poor. The constant sense of "urgency" and the mindset of managing the next crisis overshadow the importance of adopting a more coherent approach. The donor community in general may have a role in discouraging such easy options.*

***Governance is important, but fixing the power sector in the Dominican Republic requires more and substantial investments in distribution***

*Important investments in distribution are still necessary. Some essential investments were planned, but never made. In 2003 AES estimated it would need about US\$80 million to rehabilitate the system, while Union Fenosa*

<sup>20</sup> As in most cases of the single buyer model, here too increased generation capacity had been acquired at a high cost, and a good part of such high cost capacities soon became stranded.

estimated that some US\$40 million would be required. Some of those investments would have had a payback period of less than a year, but they never came to fruition. For example, the Union Fenosa loss reduction and collection increase plan should recover about 350 GWh in one year and therefore reduce its energy purchases by 13 percent. The situation is even worse today, because of the lack of investments by the CDE after Union Fenosa utilities were nationalized. In addition, one can reasonably assume a minimum of US\$150 to provide meters and accessories for each PRA customer, which would result in a total investment need of US\$75 million for the entire country for this purpose alone.

*The overall effort to increase efficiency in the distribution sector is a joint responsibility between the government and utilities.* The government should consistently support enforcing property rights and should provide regulatory incentives for the system to perform correctly. Utilities must have the motivation, capital, and management skills to carry forward an effective program of revenue recovery. Many of those elements were absent as part of the sector reform in the Dominican Republic.

***Demand-side management needs to be an integral component of sector reform because the Dominican Republic is the antithesis of conservation and energy efficiency***

*The PRA is a flawed arrangement.* Since energy is not metered, it provides perverse incentives for energy usage. Empirical evidence of wasteful use of resources abounds, both in regular and PRA areas. The consequences of waste are immediate: The more the community consumes, the fewer will be the hours of supply available. The PRA should be revised, both in its subsidies, as well as the way load shedding is implemented. In principle, the geographic targeting scheme may be preserved, at least as an interim measure. However, it must be combined with some metered consumption and subsidies to the poor in the form of energy vouchers or fixed monthly payments to be subtracted from their individual bills. A detailed plan to solve the problem should be put in place, which would probably take two to three years. Unless this issue is taken seriously by the government and by donors, the country will always be dealing with problems in the power sector as “the next crisis around the corner.”

## CASE STUDY F: ETHIOPIA

### General Background

*Ethiopia has an area of 1.1 million square kilometers, equivalent to the combined size of Texas and France. Landlocked, it lies between Sudan to the north and west, Kenya to the south, Somalia to the southeast, and Djibouti and Eritrea to the east. Addis Ababa, the country's capital, is situated 9 degrees north of the equator. Ethiopia's topography is characterized by cool highlands running down the central and western parts of the country, and hot lowlands, mainly to the east. The dominant physical feature is the vast central plateau with an average elevation of between 1,800 m and 400 m. Ethiopia has Africa's fourth highest mountain (Ras Dashen, 4,600 m) and one of the lowest points on the earth's surface (the Danakil depression, up to 120 m below sea level).*

*The highlands are temperate, with most rain falling between mid-June and mid-September. However, many areas of the lowlands are susceptible to drought, which can lead to food shortages and even famine. Widespread deforestation resulting from the extensive use of wood for fuel is having a deleterious effect on the natural and human environment in some areas.*

*With a population 74.8 million in mid-2006, Ethiopia was the second most populous nation (after Nigeria) in the Sub-Saharan Africa region. Life expectancy at birth was 42.5 years, and the literacy rate was 42 percent in 2004. Population growth is expected to remain at or above the 2 percent level. Ethiopia's rural population is 83 percent of total population, a figure that has fallen only slightly (from 87 percent) since 1991. In 2001 Ethiopia was the seventh least-urbanized country in the world.*

*Ethiopia's political landscape has been dominated by the Ethiopian People's Revolutionary Democratic Front (EPRDF) party since the overthrow of the Marxist Mengistu regime in 1991. The government formed by that party had an ambitious reform agenda, and showed focus and determination in pushing it through. However, the state controls much economic activity, directly or indirectly, and observers in the donor community note a certain doctrinaire inflexibility in policy implementation, which manifests itself, for example, in a reluctance to give enhanced economic freedom to the private sector and a disinclination to accept externally originating policy proposals. Although the level of corruption is thought to be low (a perception that is contradicted by a recent*

*survey), government decisions sometimes tend to favor enterprises controlled by, or closely connected with, the ruling party.<sup>1</sup> The party, led throughout this period by Meles Zenawi, faced the first fully democratic elections in May 2005 and secured a majority in the parliament. The opposition party members, however, boycotted the parliament, and there has been political tension resulting in the clashes between the protesters and the police and in the arrest and imprisonment of key opposition leaders, civilians and journalists.*

*Although the developmental challenges facing Ethiopia are intimidating enough, the country also faces a renewal of tension with neighboring Eritrea over disputed border territories, as well as occasional outbursts of domestic insurgency by armed factions in the Ogaden and other regions.*

*Ethiopia shares with Burundi the melancholy distinction of being among the poorest countries in the world, measured in gross national income (GNI) per capita. Per capita GNI in 2004 was estimated at \$110 based on the World Bank Atlas methodology (World Bank 2004).<sup>2</sup> Agriculture provides the livelihood of 85 percent of the Ethiopian people, but drought, pests, and severe soil erosion have kept agricultural yields erratic and low. GDP growth is significantly affected by climatic factors, with low rainfalls being associated with low or negative growth. After a drought-induced GDP contraction in 2002/03, the economy rebounded with 11 percent growth in 2003/04 and 8.9 percent growth in 2004/05. Increasing oil prices could jeopardize similar growth in the near future.*

*The consumer price index (CPI) grew at an average annual rate of 4 percent between 1980 and 1990 and at the same average rate between 1990 and 2003. In 2004 it grew at 8.8 percent.*

*The current account deficit was 7.7 percent of GDP, and the trade deficit was 25 percent of GDP in 2004. Foreign debt amounted to 98.5 percent of GDP in 2003. Ethiopia is the world's eighth largest recipient of foreign aid, which amounted to \$1.3 billion in 2002. It is estimated that development assistance needs to be at four or five times that level for the country to be able to meet the U.N. Millennium Project goals for Ethiopia.*

This case study was originally prepared by Peter Kelly, Consultant. It has since been updated by Venkataraman Krishnaswamy in the light of new information that became available and also revised slightly in the light of comments from World Bank staff.

<sup>1</sup> Ranked 137th among 159 countries in the world by Transparency International (2005) with a score of 2.2 in a scale of 0 to 10, zero being the most corrupt and 10 being the least corrupt.

<sup>2</sup> Per capita GNI is estimated to have improved to \$130 in 2005.

*Ethiopia suffers from severe infrastructural deficiencies in all important areas. Only 12 percent of the national road network is paved. There are fewer than 8 fixed and mobile telephone lines per 1,000 people, and 2.2 personal computers per 1,000 people.*

### **The Power Sector in 1997**

*In 1996/97, the year in which electricity sector reform is generally considered to have commenced, Ethiopia had a population of 60 million, implying about 15 million households. It was estimated that about 5 percent of the population had access to electricity. The Ethiopian Electric Power Corporation (EEPCo) had 536,000 customers at the end of the year, equivalent to about 3.6 percent of total households. Most customers were in Addis Ababa and a few other larger towns that are connected to the main grid. Annual new connections were of the order of 10,000–20,000, and the time taken to connect a new customer was typically up to a year from the date of application.*

*In 1996/97, power was provided through two distinct sets of systems. The interconnected system (ICS) served mainly urban customers in Addis Ababa and a few other towns. It had 488,000 customers. Additionally, several self-contained systems (SCSs) served a further 47,000 customers in towns all over the country.*

*The ICS generation capacity consisted of six hydro plants and a number of small diesel generators with a total system installed capacity of 379 MW and a peak load of 294 MW. Plant availability of the hydro plant was 95 percent. Power generated was 1,552 GWh. Total network losses amounted to nearly 18 percent, leaving sales of 1,277 GWh.*

*The SCS sales base amounted to 37,000 customers dispersed throughout a country twice the size of France. Power was supplied by a mixture of minihydro plants and diesel-generating sets with total installed capacity of 37 MW and a peak load of 22 MW. Power generated in 1996/97 amounted to 62 GWh, and total losses were greater than 26 percent of the power generated. Sales were 46 GWh.*

*The transmission network was 5,006 km in length, and distribution networks totaled 14,624 km.*

In 1996/97, the weighted average electricity tariff was ETB 0.252/kWh, equivalent to 4.1 cents/kWh.<sup>3</sup> EEPCo was being provided with increasingly large subsidies, which took the form of direct grants for investment, as well as the forgiveness of debt servicing. This practice tended to impose significant burdens on the state budget.

*EEPCo had total sales of 1,324 GWh at the average tariff of ETB 0.252/kWh, earning gross revenues of ETB 399 million. Customer collections were poor and receivables averaged 105 days' sales. A net profit before tax of ETB 74 million was earned. Overall, funds from internal sources amounted to ETB 219 million, but borrowings of ETB 101 million and grants of ETB 1.7 billion brought total sources to over ETB 2 billion. Investments were ETB 329 million, but almost ETB 1.2 billion, which had been received from the government to finance a multiyear investment program, were invested in treasury bills and government bonds, the latter being redeemed over the following eight years. The company had 8,353 employees.*

*In summary, EEPCo in 1996/97 was operating on a scale and at a level of efficiency that was in many ways admirable and more effective than similar utilities in many countries with fewer disadvantages than Ethiopia. However, the institutional arrangements that were in place were hardly touching the massive challenges that confronted the development of the country's energy infrastructure. Table F-1 summarizes key operational data for EEPCo for 1996/97 and illustrates the progress achieved up to the current and most recent completed years.*

### **The Power Sector in 2003/04**

*In the following seven years, remarkable improvement in the performance of EEPCo had contributed to the economic growth of Ethiopia. New generating capacity was added, leading to total installed capacity of 792 MW in 2003/04 and a peak load of 468 MW, 90 percent and 48 percent higher, respectively, than in 1996/97. All the net increase in capacity was in the ICS. Capacity, output, and sales in the SCS actually declined over the period, as a result of the separation of assets based in Eritrea from EEPCo. The transmission network had grown to 6,534 km, an increase of 31 percent over the 1996/97 level, and the length of the distribution networks now extends to over 23,000 km, representing an increase of 55 percent during this period.*

<sup>3</sup> The average exchange rate during the year ended July 7, 1997, was ETB 6.13 to \$1.00. The exchange rate as of March 31, 2006, was ETB 8.7283 to \$1.00. The financial year is from July 8 to July 7.

**TABLE F-1. Key Indicators for the Power Sector**

ITEM	1996/97 (ACTUAL)	2003/04 (ACTUAL)	2004/05 (ESTIMATED)
Peak load (MW)	317	468	
Installed capacity (MW)	416	792	780
Gross generation (GWh)	1,614	2,316	
Total losses (GWh)	292	470	
Transmission network (km)	5,006	6,534	
Distribution network (km)	14,624	22,662	
Average tariff (birr/kWh)	0.252	0.463	0.463
Sales (GWh)	1,323	1,847	2,250
Number of customers ('000)	536	777	947 (World Bank estimate)
Sales revenue (million birr)	399	930	1,235
Receivables as days' sales	105	35	40
Pretax profit (million birr)	74	105	257
Funds from operations (million birr)	219	245	1,055
Funds from other sources (million birr)	1,823	934	1,807
Investments (million birr)	329	1,089	4,098
Long-term debt (million birr)	1,647	4,597	7,024
Capital and reserves (million birr)	3,422	8,315	9,429

**TABLE F-2. Customers and Sales, 2003/04**

TARIFF CATEGORY	CUSTOMERS (NUMBER)	SALES (GWh)
Domestic	667,100	652
Commercial	98,837	455
Street lighting	1,352	22
Low-voltage large industry	8,444	351
High-voltage large industry	96	365
Own consumption	470	2
Total	698,360	1,847

In mid-2004 EEPCo had 777,000 customers, an increase of 45 percent over the 1997 level equivalent to an average growth rate of 5.5 percent. All but 37,000 of the customers were connected to the ICS. Sales were 1,847 GWh compared with 1,322 GWh seven years earlier, an annual average rate of increase of almost 5 percent. The average end-user tariff had increased to ETB 0.463/kWh (5.1 cents/kWh), almost double the 1996/97 level in local currency terms. Customer collections were equivalent to 87 percent of billings. Table F-2 shows the makeup of demand.

The Project Appraisal Document of the World Bank for the Electricity Access (Rural) Expansion Project (World Bank 2006b) indicates further improvements since 2003/04. According to this document, the total number of customers

of EEPCo increased to 933,502 by September 2005. The billing-to-collection ratio improved to 97.4 percent for 2004/05, receivables expressed as days' sales dropped from 105 in 1997 to 40 days in 2005, and total system losses (both technical and commercial) including auxiliary consumption dropped to 20 percent of gross generation. The tariffs were further raised in June 2006 by 22 percent which, after adjusting for the lifeline rate, is expected to increase the average revenue per kilowatt-hour sold by 18.8 percent.

Approximately 10.5 million people, or 15 percent of Ethiopia's population, now have access to electricity, "access" being defined as residence in a town that is connected to a power grid, and about 6 percent of

*households are actually connected.* It now takes seven days from the date of application for a new customer to be connected at the time of initial electrification of the village when the utility crews are still working in the area. Applications for connections made after the departure of the crews from the area may take longer. Overall the waiting time for new connections had been reduced from more than 90 days to about 14 days by 2005.<sup>4</sup>

*Despite these advances, it remains a sobering fact that per capita consumption of electricity in Ethiopia, at around 30 kWh, is no more than 1.5 percent of the world average.*

*From 1996/97 to 2001/02 EEPCo's revenues and profits grew steadily, on the basis of an average tariff, which increased by more than 50 percent in 1997/98 and a further near-20 percent the following year, thereafter remaining unchanged.* However, profits were significantly depressed in 2002/03 and 2003/04 as a result of rising operational expenditures (primarily fuel and personnel costs). The availability of investment funds was also affected adversely in these years by loan repayments and by a buildup of stocks associated with the investment program. A major recovery is expected in the current year, with funds from internal sources in 2004/05 projected to be at their highest level ever, over ETB 1 billion. This amount is expected to be supplemented by borrowings of ETB 1.8 billion (see table F-3 for a summary of outstanding borrowing) and ETB 1.3 billion in bond and equity issues to the government connected to the Universal Electrification Access Programme (UEAP), allowing EEPCo to devote ETB 4.2 billion (\$463 million)<sup>5</sup> to its investment program in 2004/05. This represents a 12-fold increase on the investment level in 1996/97. EEPCo had just under 10,000 employees in mid-2004, an increase of 18 percent over the 1997 level.<sup>6</sup> The growth in employee numbers has been mostly in the higher technical and professional grades.

*According to the World Bank's usual methodology for measuring the self-financing performance of utilities, EEPCo's self-financing ratio was between 43 percent and 90 percent every year until 2001/02.* Lower internally generated funds combined with a much-expanded investment program have since reduced it to 24 percent in 2002/03, 20 percent in 2003/04, and a projected 14 percent in 2004/05. The company's debt service coverage ratio has, with the growth of new borrowing, fallen from extremely high levels in the years to 2001/02 to 2.9 times in 2002/03, 1.2 in 2003/04, and 2.1 times

in 2004/05. To prevent a deterioration in the debt service capability of EEPCo and to improve its liquidity, the company has negotiated with the government a debt restructuring arrangement by which (a) an outstanding old debt of ETB 1.27 billion would be converted into equity; (b) overdue debt service payments of ETB 291 million would be rescheduled over the next 10 years; and (c) the grace periods for 12 loans would be extended by five years.

### **What Happened between 1997 and 2004?**

*The starting point of the change process in the Ethiopian power sector was an acceptance of the fact that without extensive electrification of the country, it had no chance of getting onto the path of sustainable development.* The Energy Sector Assessment carried out by the World Bank/ESMAP in 1994 suggested options and strategies for energy development in Ethiopia and provided an analytical base for donor financing. The World Bank Country Assistance Strategy (CAS) noted in 1997 that per capita electricity consumption was only one-half of that in Mozambique and one-sixth of that in Kenya. Shortage of electricity was a major impediment to industrial growth.

*The dialogue between the government and the Bank and other agencies culminated in a series of major policy moves by the government starting in 1997, which included the following:*

- The enactment of a new Electricity Law.
- An acceptance in principle of the need for private sector involvement in the development of the sector, although precisely how this might be achieved was not defined at the time.
- A Proclamation that established a new regulatory authority, the Ethiopian Electricity Agency (EEA), in order to separate matters that are clearly regulatory from EEPCo, which was corporatized under its present name (it previously had the status of a state authority).
- Establishment by the same Proclamation of the principle of third party access to the grid.
- The establishment of a task force within EEPCo to design an internal restructuring of the utility, including delegating more autonomy to regional managers,

<sup>4</sup> See World Bank 2006a.

<sup>5</sup> The average exchange rate in 2003/04 was ETB 8.85 to \$1.

<sup>6</sup> This has further increased to 10,582 during 2005/06, which was caused largely by the opening of several new customer service centers and district offices.

**TABLE F-3. EEPCo Long-Term Debt**

NO.	LOANS	BORROWING CURRENCY	LOAN AMOUNT (MILLIONS)	INTEREST RATES	REPAYMENT PERIOD INCLUDING GRACE	LAST REPAYMENT
<b>A</b>	<b>Old AfDB/AfDF loans</b>					
1	MoFED—AfDF 87/006 (Koka Dire Dawa)	UA	10	8.75%	5+15	2007
2	MoFED—AfDF 87/022 (Koka Dire Dawa)	UA	27	8.75%	5+15	2007
3	MoFED—AfDB 92/11 (Northern transmission)	UA	24	0.00%	5+15	2014
4	MoFED—AfDB 92/35 (Northern transmission)	UA	30	1.75% to 4/09 3.75% thereafter	5+40	2045
<b>B</b>	<b>IDA loans</b>					
1	MoFED—IDA 1704 ET (45 kV and 66 kV )	SDR	40	8.00%	5+15	2013
6	MoFED—IDA 3019 ET (EII —ilgel Gibe I, )	SDR	146	7.19%	5+20	2025
7	MoFED—IDA 3712 ET (Energy Access)	SDR	105	6.00%	5+15	2023
<b>C</b>	<b>EIB loans</b>					
8	MoFED—EIB 7—1114 (EII—Gilgel Gibe I)	⌘	41	6.00%	5+15	2017
9	MoFED—EIB (Energy Access, Load dispatch)	⌘	25	6.00%	5+15	2025
10	MoFED—EIB (Gilgel Gibe II)		82	6.00%	5+15	2024

Source: AfDB stands for African Development Bank. AfDF stands for African Development Fund. UA stands for Unit of Account. UA is used by the African Development Bank and is equivalent in value to SDRs or any other similar unit designated by the IMF.

accounting separately for noncore activities, decentralizing the accounting and billing system, introducing a program of human resource development, and improving operations planning.

Some of these developments have been of radical significance in their impact—actual or potential—on the massive challenge presented by the need to extend access to electricity to more people.

- The initiation of an electricity pricing policy that included the phased elimination of all subsidies to EEPCo.
- A new capital structure for EEPCo.
- A new strategy on rural electrification.
- Major new investments in hydroelectric generating facilities to meet urgent capacity constraints.

### **Private Sector Participation**

*The opening of the power sector to possible private sector participation, and in particular the liberalization of the isolated SCS system, arose from the government's realization that because of capital, management, and human resource constraints EEPCo alone could not feasibly expand access rapidly enough within a reasonable period.*

The government therefore adopted a two-track strategy, comprising grid extension by EEPCo, and isolated electrification by the private sector, including community-organized cooperatives and similar entities. For the grid-extension arm of this strategy, the key to progress was seen as success in implementing the commercialization and decentralization of EEPCo's operations. Much appears to have been achieved in this direction.

*For the isolated rural electrification arm of the strategy, the key was providing conditions that would encourage and promote private or community involvement.* It is not so clear at this stage how effectively this part of the strategy has been implemented. It was decided to allow local private investment in generation facilities up to 25 MW (hydro or thermal) and local or foreign investment in projects over 25 MW. About 400 local groups have expressed interest to the Rural Electrification Agency in developing minihydro-based isolated systems (less than 100 KW capacity). Of these, about 12 have submitted detailed business plans.<sup>7</sup> The average scheme would supply 950 households and would cost about \$100,000. It is planned that, within the next two years, the agency's throughput of schemes would reach 50 per year.

*However, despite these initiatives, it seems that little or no private sector investment in generation has taken place so far.* It is thought that no private finance project has as yet progressed beyond negotiation. The major barriers appear to be the following:

- Investors want higher tariffs than the prevailing EEPCo tariff.
- Investors want guarantees against perceived risks under implementation agreements (especially the offtake risk).

### **Power Sector Regulation**

*The establishment of the EEA in 1997 under Proclamation No. 86/97 was an important step toward recognizing the different roles that are appropriate to a modern power sector, and paralleled the corporatization of EEPCo, which relinquished its former regulatory role to the new agency.* The agency, which became operational in 2000, defines its mission as being to "apply a regulatory system that upholds transparency, fairness, and sustainability, and that encourages competition for high-quality, efficient, economical, and up-to-the-standard electricity services, thereby assisting the development of the electricity industry, so as to ensure the rights and obligation of the customer,

the public, and the supplier, and to contribute to the speedy development of the country." It carries out the normal duties of an energy regulator, including licensing, monitoring standards, issuing certificates of professional competence, and supervising the safe operation of facilities in accordance with the law. It was also expected to recommend tariffs for the approval by the government and the parliament. It was headed by a general manager appointed by the Prime Minister. He heads a professional staff of 60 spread over several departments. The World Bank is providing training support to improve its regulatory capacity.

### **Investment Program**

*EEPCo has under construction two large hydropower projects (Tekeze—300 MW, 980 GWh/year and Gilgel Gibe II—420 MW, 1500 GWh/year) to be commissioned in 2007 and 2008, respectively.<sup>8</sup>* It is also contemplating several new hydropower projects. For the period 2006–10, the investment program calls for a total funding of \$5.1 billion, of which 59 percent would be for new generation, 29 percent would be for distribution, and the remaining 12 percent would be for transmission. Overall about 25 percent of the total investments would be for the system expansion to rural areas. Such an ambitious program, especially the rural expansion, could strain the financial soundness of the utility considerably unless accompanied by significant tariff increases, which could be difficult in such a poor country. The adverse impacts are sought to be moderated by (a) significant equity contributions by the government, (b) restructuring of the debts of EEPCo, (c) adoption of cost-effective appropriate technical standards and choices for rural expansion, and (d) tariff increases needed to keep the financial health of the utility sound. Still there may be a need to prioritize and rationalize the investment proposals and also rethink the rural expansion strategy and its pace.

### **Tariffs**

*The EEA is currently working on the development of methodologies for price-setting (the World Bank is financing consultancy assistance).* Currently, EEPCo works on the basis of a four-year marginal cost-based price framework, which is the basis of annual applications for a price review. The EEA reviews the application and makes recommendations to the government. The final arbiter of price increases is the parliament. The tariff in 2004/05 of ETB 0.463/kWh (about 5.1 cents/kWh) has

<sup>7</sup> By mid-2006, about 40 local business groups are believed to have submitted their business plans.

<sup>8</sup> The country's hydroelectric potential is estimated at 30,000 MW. Of this, only about 2 percent had been developed by 2005.



remained unchanged since 1999. It allowed EEPCo to cover its cash costs, but has caused the company's own contribution to its investment needs to decline from the level of 43–90 percent prevailing during 1996/97 to 2001/02 to a low of 14–21 percent in the later years. In addition, the ability of EEPCo to service its rising debts was being fast eroded, and the company faced potential liquidity problems. To provide some relief, in June 2006 the government approved a tariff increase of about 22 percent, which was expected to be implemented during course of 2006. Allowing for the adjustments relating to lifeline tariffs, this is expected to translate into an 18.8 percent increase in the average revenue per kilowatt-hour of sales. Thus, when the tariff increase is fully implemented, the average revenue per kilowatt-hour would rise to the level of about 6.05 cents.

### **EEPCo Organizational Reforms**

*The internal organization and management of EEPCo has been transformed during the last eight years. The targets set by the government for the organization in 1997 were simple:*

- Increase generating capacity.
- Reach all regions of the country.
- Increase sales.
- Improve collections.

*In order to promote the achievement of these targets, the company was reorganized. The most significant measure was a decentralization of operations and management, with the division of the company into eight regions with 10–15 districts in each region. Each district is responsible for supply, maintenance, and commercial matters in the district, including new connections, revenue collection, and disconnections. (It is now proposed to set up subdistricts responsible for meter reading, collections, and local customer relations.) Organization of a separate management unit (called the UEAP Office) within EEPCo in 2004/05 with considerable autonomy to carry out the rural expansion program is a recent innovation.*

*Also in 1997, EEPCo prepared its first medium- and long-term business plan, which included demand forecasts and a generation plan. These exercises provided the basis for approaching donors for investment finance. The World Bank, African Development Bank (AfDB), European Investment Bank (EIB), and Organization of the Petroleum*

*Exporting Countries (OPEC) were approached, together with bilateral financiers, such as Canadian International Development Agency (CIDA), Swedish International Development Agency (SIDA), Norwegian Agency for Development (NORAD), France, Italy, Arab banks, the Kuwait Fund, and Japan. Project documentation was prepared for submission to prospective financiers. EEPCo staff used industry-standard software for transmission planning and prepared the transmission and distribution projects themselves, while consultants were hired to assist in generation planning.*

*The company has made extensive use of modern organizational change techniques, including business process reengineering, benchmarking against international best practice, gap analysis, and the extensive use of performance management systems.*

*A bidding process has now been initiated with the aim of concluding a management contract with a foreign utility to provide complementary services to the existing management within EEPCo. The conscious aim of this initiative is “to transform EEPCo into a first-class power utility” in the context of the power sector reform program.*

### **Governance**

*In 1997 EEPCo reported to the Ministry of Mines and Energy, but now reports to the Ministry of Infrastructural Development, one of two so-called super-ministries. It is governed by a board of eight members—three ministers, two Ministers of State (lower-level ministers), a private sector representative (currently the head of a local consultancy company), an appointee from a university, and a representative from the official level of the Ministry of Infrastructural Development. The Minister of State for Capacity-Building (this is the second super-ministry) acts as chairman.*

*The Board of EEPCo can be regarded almost as a minigovernment, as far as power sector issues are concerned, because of the extent of ministerial representation on the board. Major proposals developed by EEPCo are brought in the first instance to the EEPCo Board. Following approval, perhaps in amended form, they are submitted to the Minister of Infrastructural Development, which then obtains government approval. (At this stage, the Ministry of Finance may play a major role, especially if the proposal involves foreign borrowing.) Proposals surviving these stages are finally submitted to parliament for approval.*

*In the case of foreign borrowing or foreign grant aid, the Ministry of Finance is normally the borrower or grant recipient, which then makes a subloan agreement with EEPCo. When EEPCo prepares a project, it carries out an economic and financial appraisal that shows the maximum cost of funds that the project can bear. The government usually seeks to attach a 6 percent coupon to the subloan (in order to underline EEPCo's responsibility to operate commercially), and the rate is finally agreed following negotiations between EEPCo and the Ministry of Finance. In the case of rural electrification projects, for example, EEPCo seeks an interest rate of zero or as close to zero as possible; it often succeeds in securing such rates.*

*The governance of EEPCo is characterized by tight governmental control rather than by commercial independence. This reflects the special nature of the job the company is being asked to do—to provide essential national infrastructure rather than to operate in a competitive marketplace. In the circumstances, the model is not a bad one, and it seems to work well. However, there is a striking disparity between the small scale of EEPCo and the enormity of Ethiopia's infrastructural deficit in the power sector.*

### **Public Sector Reform**

*In 2002 the government embarked upon a major civil service reform program aimed at reforming public institutions to make them more responsive to the demands of customers and citizens generally. Apart from central government agencies, such as the passport office and customs, the program is also being piloted in EEPCo and Ethiopian Telecom. It seems that this initiative is helping the cause of modern management in the power sector, by encouraging an alignment of management culture and ethos between EEPCo and the other official agencies it deals with.*

### **The Business Climate**

*The evidence from studies of the factors constraining business in Ethiopia is mixed. According to the latest World Bank Investment Climate Survey, 74 percent of businesses regarded high tax rates as a major constraint to investment in Ethiopia, while 39 percent regarded corruption as a major constraint. However, other areas, such as crime, bureaucracy, labor skills, and labor regulation, were not so widely regarded as major constraints.<sup>9</sup>*

### **How Did EEPCo Manage to Do as Well as It Did?**

*Over the years from 1996/97 to 2004/05, EEPCo will have invested more than ETB 10 billion (about \$1.2 billion) in roughly doubling its generation and distribution capacity, lengthening its transmission grid by 40 percent, and increasing its customer base by 50 percent (see table F-5). Table F-3 shows the profile of EEPCo's borrowings. During the years from 1996/97 to 2004, and including 2004's projected borrowing, drawdowns have amounted to ETB 5 billion (roughly \$600 million), approximately the same as the company's contribution to its investment program from its own resources. The company has been able to access credit from multilateral and bilateral lenders and has an unimpeachable credit record. Its total level of system losses is about 20 percent, and its collection ratio in 2004/05 was 97.4 percent. The company is well regarded internationally as a well-run and focused organization. The 2006 Project Appraisal Document of the World Bank (2006b) describes it as "one of the strongest utilities in the continent." These are significant achievements (see tables F-4, F-5, and F-6 attesting the good financial performance of the company).*

*How was Ethiopia able to do this? What special factors helped EEPCo? The primary factor was a certain consistency of focus by the government. The fact that the same government has been in power in Ethiopia since 1991 has helped to maintain focus and policy consistency. The health of a democracy usually demands changes in government from time to time. However, 14 years with one party in government is not exceptional. There is no doubt that on achieving power in 1991, the ruling party correctly identified the developmental challenges facing Ethiopia, and it has stuck religiously to this agenda ever since. Such consistency and integrity is associated all over the world with solid economic results.*

*The fact that management in EEPCo embraced change, rather than resisting it, was also a major factor. The impressive number of management development initiatives taken over the years is testimony to a management culture that puts a high value on results. This has not been the case in every utility starting out in similar circumstances.*

*The extraordinarily close relationship between EEPCo and the government, exemplified in the composition of the EEPCo Board, has been a strength, even though in highly developed countries, it would be considered a weakness. It has permitted, for example, a fairly*

<sup>9</sup> Access to electricity was seen as a major constraint by 42 percent of those interviewed.

seamless integration of EEPCo's activities with the government's wider UEAP agenda. (It is notable that, as far as we know, this close relationship is not being abused, for example, by seeking more favorable treatment for privileged customers in the matter of collections and disconnections, which is common in some other countries.)

*The consequent achievement of a reputation for thoughtful strategic analysis and prudent financial management gave encouragement to donors and lenders. Nothing more eases the path to a financier's door than his knowledge that money is well spent and investments well maintained.*

### **Could Ethiopia Have Done Better?**

*Ethiopia could have done better. In the first place, it seems to be clear that a certain control mentality on the part of the government has hindered the development of a vibrant private sector presence in the power sector which, given the enormity of the job to be done, should have been seen as absolutely essential. There is work for everyone to do in this sector, public or private.*

*Second, Ethiopia could have spread the benefits of electricity to a significantly greater proportion of its population, but only if the country had been in receipt of much greater foreign aid. Given the limited fiscal resources available, Ethiopia has made the best use possible of the (quite large) share of these resources allocated to the development of the power sector. However, as has been pointed out, the substantial and admirable efforts that have been made are only scratching the surface of Ethiopia's infrastructural deficit, barely keeping pace with the growth in population.*

*To regard the power sector issue in Ethiopia in recent years as a question of reform and restructuring would be misleading at best. Equally, to focus on the performance of EEPCo as a utility would be to miss the point. Ethiopia is desperately poor and grievously lacking in all the elements of infrastructure that are essential for self-sustaining economic growth. The provision of electricity, or at least the possibility of access to electricity, is not a policy option—it is a necessity. The normal standards of investment analysis, as applied by fiscal authorities, cannot be used here. And Ethiopia is already spending much of its national product on investments in the electricity sector. Gross capital formation (GCF) has grown from 12 percent of GDP in 1990 to 21 percent in 2003, with a growth rate of 6.5 percent per year, which is almost twice the average for Sub-Saharan Africa (the*

average GCF for which was 19 percent in 2003). This implies GCF of \$1.4 billion in 2003, of which about 12 percent would have been spent by EEPCo. In 2004/05, this percentage is likely to be a multiple of the 2003 figure.

*Given this fact, to focus on EEPCo and its performance since 1997 is, in a sense, like looking at the tree rather than the forest. EEPCo is a major corporate entity in Ethiopia, probably the largest cash generator in the country. However, of the more than 70 million people in Ethiopia, upwards of 60 million have no relationship with EEPCo, no realistic chance of becoming EEPCo customers, and little likelihood of experiencing the benefits of electricity in their lifetime. No matter how well managed EEPCo is, no matter how efficiently it spends its investment funds, it will never—short of a radical rethink about the way the power sector is to be organized—catch up with Ethiopia's growing need for electricity infrastructure. This was specifically acknowledged by the government and the World Bank in preparing the Energy Access Project in 2002. If Ethiopia had 10 EEPCOs, each one as well resourced as the existing company, and each responsible for the supply of electricity in a region, there might be a chance of developing the necessary power infrastructure during the next decade.*

*It follows that the concept of a single, largely centralized utility, with tight governmental control of power generation and rural electrification, is counter-productive. A centralized power company is a way to ration development, not to drive it. Even under the most optimistic assumptions, it is impossible to imagine that EEPCo could deploy sufficient managerial and technical capacity to achieve what is needed over such a large country.*

*For the future, a way forward could be to ask several donors to sponsor (through power utilities in their own countries) the development of networks in specific areas of the country. This could be done on a "funded concession" basis (probably with World Bank participation), with EEPCo (or successor regional distribution companies) taking over responsibility after a period of years. Generating capacity could be added in a similar manner, with EEPCo retaining responsibility for the transmission and system operation functions (and perhaps its existing generating and distribution assets). The purpose of this approach would not be to move toward privatization, but to bring many more players onto the field.*

## Lessons from the Ethiopian Experience

The first lesson from the Ethiopian experience relates to the importance of integrity at top governmental levels—not only in the sense of personal integrity, but integrity in the sense of unremitting adherence to an agreed strategy.

The second relates to getting a rational policy, legal, and regulatory framework in position—as Ethiopia did in 1997—to obtain clarity to all stakeholders, including managers and financiers.

The third lesson relates to the benefits that flow from a commitment to serious planning exercises that realistically estimate the challenge ahead and what the utility can achieve in the face of these.

The fourth relates to the investment in good financial management systems and the staffing of the financial function with strong staff as a key to gaining the confidence of financiers.

The fifth relates, on the negative side, to the need to eliminate regulatory or doctrinaire barriers to private sector involvement in the power sector of a country where fewer than 15 percent of the population have access to electricity.

**TABLE F-4. EEPCo Summary Financial Results—Income Statements, 1996/97–2004/05**

	(YEARS TO JULY 7—MILLIONS OF BIRR)								
	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
	ACTUAL	ACTUAL	ACTUAL	ACTUAL	ACTUAL	ACTUAL	ACTUAL	ACTUAL	ACTUAL
Sales (GWh)	1,324	1,358	1,333	1,374	1,413	1,625	1,704	1,847	2,250
Average tariff (birr/kWh)	0.252	0.384	0.456	0.457	0.462	0.458	0.458	0.463	0.463
Electricity sales revenue	399	597	658	681	747	797	789	930	1,235
Interest income	34	63	65	57	9	9	18	5	7
Total revenue	433	659	723	738	756	805	807	935	1,242
Fuel and material costs	63	64	50	55	58	56	84	102	146
Personnel costs	86	93	97	104	109	116	124	135	132
Depreciation	82	79	81	112	118	129	314	369	385
Other operating costs	14	17	20	14	24	24	18	31	44
Total operating costs	245	253	247	285	309	326	539	637	708
Gross profit (loss)	188	407	476	453	447	480	267	298	534
Interest expense	51	48	37	30	25	21	18	36	182
Amortization of devaluation loss	52	57	31	28	27	24	24	24	24
Other nonoperating expenses	10	7	86	2	2	11	52	133	70
Profit (loss) before tax	74	294	321	394	393	424	173	105	257

**TABLE F-5. EEPCo Summary Financial Results—Cash Flow Statements, 1996/97–2004/05**  
(years to July 7—millions of birr)

CASH FLOW STATEMENTS									
	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
	ACTUAL	ACTUAL	ACTUAL	ACTUAL	ACTUAL	ACTUAL	ACTUAL	PRELIMINARY	PROJECTED
Profit (loss) before tax	74	294	321	394	393	424	173	105	257
Tax	—	-62	-51	-82	-63	-56	-72	—	—
Add-back depreciation	133	136	112	140	145	153	339	394	409
Sale of Government bonds	—	122	122	122	122	122	91	152	57
Decrease (Increase) in working capital	-17	-304	-147	201	165	278	-138	-530	172
Consumer deposits or prepayments	29	-14	48	34	31	66	70	96	157
Other internal sources	—	2	0	0	—	—	—	29	2
Funds from internal sources	219	173	404	808	792	987	462	245	1,055
Borrowings	101	152	360	232	294	459	613	934	1,807
Grants	1,722	247	65	53	117	11	3	0	1
Other sources	—	—	—	—	—	—	—	—	1,321
Total sources	2,042	571	829	1,093	1,203	1,456	1,079	1,179	4,184
Investments	329	415	446	480	1,210	943	1,777	1,089	4,098
Loan repayments	3	3	2	313	83	157	159	205	500
Deferred charges	—	—	99	—	8	4	6	—	—
Treasury bills purchased	275	156	142	1	—	—	—	—	—
Government bonds purchased	908	—	—	—	—	—	—	—	—
			689						
Total applications	1,515	574		794	1,302	1,105	1,943	1,294	4,598
Increase or decrease in cash	527	-3	140	299	-99	351	-864	-115	-414
Cash at start of year	372	900	897	1,037	1,336	1,238	1,589	725	611
Cash at end of year	900	897	1,037	1,336	1,238	1,589	725	611	196

— Not available.

**TABLE F-6. EEP Co Summary Financial Results—Balance Sheets and Ratios, 1996/97–2004/05**  
(years to July 7—millions of birr)

BALANCE SHEETS									
	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05
	ACTUAL	ACTUAL	ACTUAL	ACTUAL	ACTUAL	ACTUAL	ACTUAL	PRELIMINARY	PROJECTED
Long-term assets	4,334	4,536	4,735	5,100	5,985	6,541	10,274	11,268	14,623
Cash	900	896	1,037	1,336	1,238	1,589	726	611	196
Other current assets	1,040	1,555	1,841	1,537	1,436	1,410	1,534	1,941	1,665
Total current assets	1,939	2,451	2,878	2,873	2,674	2,999	2,260	2,552	1,861
Total assets	6,273	6,988	7,613	7,973	8,659	9,539	12,534	13,820	16,896
Current liabilities	1,205	1,415	447	344	408	570	557	908	442
Net current assets	735	1,036	2,431	2,529	2,266	2,429	1,703	1,644	1,419
Net assets	5,068	5,573	7,166	7,630	8,251	8,969	11,978	12,912	16,043
Capital and reserves	3,422	3,900	4,530	4,904	5,359	5,712	8,195	8,315	9,429
Long-term liabilities	1,647	1,673	2,637	2,725	2,892	3,257	3,782	4,597	7,024
Total capital and liabilities	6,273	6,988	7,613	7,973	8,659	9,539	12,534	13,820	16,896
RATIOS									
Self-financing ratio (simple)	0.66	0.41	0.90	1.03	0.59	0.88	0.17	0.04	0.14
Self-financing ratio (World Bank method)	0.58	0.43	0.90	0.70	0.81	0.63	0.24	0.02	0.21
Debt service coverage ratio	78.8	68.0	206.9	2.6	9.5	6.3	2.9	1.2	2.1
Current ratio	1.6	1.7	6.4	8.4	6.6	5.3	4.1	2.8	4.2
Pretax profit ratio	17%	45%	44%	53%	52%	53%	21%	11%	21%

## CASE STUDY G: LITHUANIA

### General Background

Lithuania is situated on the eastern coast of the Baltic Sea and has land borders with Latvia to the north, the Kaliningrad region of the Russian Federation to the southwest, Poland to the south, and Belarus to the east. The country has an area of 65,300 square kilometers and is generally low-lying. It is situated in a temperate continental climate zone, with average annual air temperatures of 5.5 degrees Celsius, with 17.8 degrees Celsius in June and -6.5 degrees Celsius in January. The western part of the country, influenced by the Baltic Sea, has smaller temperature variations than the eastern part.

The population of Lithuania was estimated at 3.4 million people in the fourth quarter of 2004 and is believed to be declining at the rate of 0.33 percent per year. The total population peaked at around 3.7 million in 1990 following a period of immigration from other Soviet republics. The urban proportion of the population has been growing and is currently estimated to be around 67 percent, similar to the level in Switzerland and Austria.

Lithuania is a functioning parliamentary democracy. Since the restoration of national independence in 1990, there have been several presidential, parliamentary, and local elections, and power has shifted between several coalitions and alliances, including former Communists, as well as Liberals and Conservatives. However, the general thrust towards Western European-style market policies has been fairly steady. Lithuania has become a member of NATO since March 2004 and a member of the European Union since May 1, 2004.

The per capita gross national income (GNI) in Lithuania was estimated at \$5,470 in 2004 based on World Bank Atlas methodology (World Bank 2004b). It is one of the fastest-growing economies within the European Union. The growth rate in real GDP was 6.8 percent and 10.5 percent, respectively, in 2002 and 2003. In the subsequent two years, the growth rates were 7.0 percent and 7.5 percent. The growth rate is expected to be somewhat lower at 6.0 percent and 5.3 percent, respectively, in 2006 and 2007.

The inflation rate (CPI), which was at 2.7 percent in 2005, is expected to remain in the range of 2.1–2.8 percent in the next two years.

Lithuania's trade balance and current account balance were both negative at 11.2 percent and 7.0 percent of GDP in 2005. Total gross external debt of the country had risen from 39.5 percent of GDP to 50.8 percent of GDP during 2002–05. Net foreign direct investment, which was at 8 percent of GDP in 2002, hovered around 2.5 percent of GDP during 2004–05.

The government's fiscal deficit had narrowed down to a negative 0.5 percent of GDP in 2005. Public debt as a percentage of GDP declined from 22.3 percent in 2002 to 18.7 percent in 2005.

For about 10 years, the Lithuanian currency, litas, was pegged to the dollar (\$1 = LTL 4). In 2002 it was pegged to the euro (€1 = LTL 3.4528). In 2004 Lithuania joined the European Exchange Rate Mechanism, and during 2006–07 the country will adopt the euro as its currency.

Unemployment has come down from 13.8 percent to 8.3 percent during 2002–05. About 16 percent of the population is estimated to live under the national poverty line.

The good economic performance of recent years has led to improved sovereign credit ratings. Standard and Poor's rated Lithuania as A- with a positive outlook in the fourth quarter of 2005. A possible upgrade is currently under consideration. The issue of 10-year bonds worth €600 million was successfully placed a year ago at an annual interest rate of 4.5 percent, the lowest coupon since Lithuania began borrowing overseas.

### The Legal and Business Environment

Lithuania has made substantial progress in adapting its legal system to the demands of a liberal, internationally oriented market economy. In several important areas—property rights, the registration and legal recognition of property purchases and sales, the enforcement of contracts, bankruptcy law, the enforcement of debt collection, the removal of barriers to foreign investment, the transparency and fairness of tax laws, and privatization law—the problems facing businesses wishing to operate in Lithuania, or to acquire Lithuanian assets, are close to Western European norms. That is not to say that some problems do not persist. The World Bank's (2004a) "Lithuania: Investment Climate Assessment" noted in

particular the need to streamline business registration procedures, to overhaul company law to allow for reconstruction in the face of company difficulties, to simplify land usage law, and to improve tax legislation in order to place an unequivocal obligation on the State Tax Inspectorate to issue binding rulings.

*However, Lithuania's progress has been more impressive than its failures in this area.* The World Bank's (2005) publication, *Doing Business in 2005*, ranks Lithuania at 17th position in the world's economies for its global business environment—the ease of doing business in the country—ahead of all other Central and Eastern European (CEE) countries. And in three crucial legal areas—starting a business, closing a business, and enforcement of contracts—Lithuania is identified as one of the world's top 10 reformers.

### **Energy in Lithuania**

*Total primary energy consumption in 2002 was 349,000 TJ, or almost exactly 100 GJ per capita.* This puts Lithuania in the middle of the spectrum of CEE countries, which range from less than 50 GJ per capita in some of the Balkan countries to almost 200 GJ per capita in Russia. At purchasing power parities primary energy intensity was about 1.25 toe per \$1,000 in 1999, representing a 12 percent decline in intensity since 1995.

*The primary energy demand in 2002 was met by nuclear energy (41.8 percent), oil (27.6 percent), gas (22.2 percent), biomass (7.4 percent), coal (0.8 percent), and hydropower (0.2 percent).* Apart from abundant supplies of timber, Lithuania has virtually no indigenous sources of energy. Total oil production is around 500,000 metric tons, about 6 percent of requirements, and all other oil supplies are imported from Russia and refined at the Mazeikiiai refinery. However, the construction of a new oil terminal at Butinge allows Lithuania the possibility of diversifying its sources of oil imports. All natural gas is imported from Russia. Because of the country's topographical profile, the potential for further exploitation of hydropower is low. The native energy source with the greatest potential is biomass from waste wood and straw. An increasing number of municipal district heating boilers are being converted to use biomass.

*Final consumption of energy in 2002 was met by oil products (35 percent), gas (23 percent), heat (16 percent), biomass (13 percent), electricity (12 percent) and solid fuels (1 percent).*

### **Policy and Institutional Aspects**

*An updated National Energy Strategy was adopted by the parliament (Seimas) in October 2002.* The aims of the strategy include the following:

- Liberalization of the electricity and natural gas sectors by opening the market pursuant to the requirements of EU directives.
- Privatization of specific electricity and natural gas enterprises.
- Preparation for the decommissioning of the Ignalina Nuclear Power Plant and the disposal of radioactive waste and long-term storage of spent fuel.
- Integration of energy systems into EU energy systems within the next 10 years.
- Development of regional cooperation and collaboration with a view to creating a common Baltic electricity market (CBEM) within the next five years.
- To raise the proportion of electricity generated in combined heat and power (CHP) mode to at least 35 percent of total electricity generation by the end of the period.

*A new energy law that regulates general energy activities (such as electricity), energy development and management, and energy and energy resource efficiency came into force in July 2002.*

*In January 2002 a new electricity law came into effect, which provides the basic principles regulating generation, z with EU law.* It formulates the relations between electricity and service suppliers and their customers, and sets out the conditions for the development of competition in the electricity sector. The law set out the stages for market liberalization and for the recognition of consumers who are eligible to conclude direct electricity purchase contracts with power producers or independent suppliers. Following successive extensions of eligibility, since January 1, 2004 customers consuming more than 3 million kWh have been so eligible, and it is planned to extend eligibility to all customers by 2007.



*The principal entities active in the electricity sector are as follows:*

- The Ministry of Economy is responsible for energy policy and for the supervision of the main regulatory agencies in the energy field.
- The ministry is assisted in the implementation of these tasks by the Energy Agency, which has particular responsibilities in the areas of energy efficiency, renewable energy, and the updating of policy.
- Regulation of the sector is accomplished by the National Control Commission for Prices and Energy, commonly known as the Energy Prices Commission.
- The Ignalina Nuclear Power Plant is owned and controlled directly by the government.
- The State Nuclear Inspectorate, VATESI, is responsible for supervising Ignalina.
- Lietuvos Energija (Lithuanian Power Company), which is also state-owned, is the transmission system operator and market operator. It also owns a hydro station (Kaunas), which was regarded as being too small to privatize, and a pumped storage station (Kruonis), which plays a vital role in system regulation and exports.
- The Lithuanian Power Plant, commonly known as Elektrenai, is the largest non-nuclear generator and is in separate state ownership.
- Vilnius CHP, which is owned by Vilnius District Heating Company, a municipal enterprise, is being operated under a 15-year lease-concession arrangement by a local subsidiary of the French company, Dalkia.
- Kaunas CHP is owned by Gazprom.
- Mazeikiai CHP is in state ownership awaiting privatization.
- Eleven other small CHP plants, mainly associated with industrial enterprises, are licensed electricity producers and sellers.
- Two electricity distribution companies, Rytu Skirstomieji Tinklai AB (eastern) and Vakarų Skirstomieji Tinklai AB (western): the latter company has been privatized, while RST currently remains in state ownership.

- The Lithuanian Energy Institute, which carries out fundamental and applied research in energy technology and economics.

## **The Power Sector**

*Electricity supplies 12 percent of Lithuania's final energy needs. Final net consumption in 2002 was 6,530 GWh. Sixty-three percent of final consumption is used in the household and service sectors and 37 percent in industry and transport. Peak domestic demand was 1,952 MW in 2004.*

*The current structure of power generation capacity in Lithuania is as shown in table G-1.*

*Lithuania has 1,598 km of 330 kV and 4,419 km of 110 kV transmission lines and is interconnected through 330 kV lines with Belarus (4 lines), Latvia (4 lines), and Poland. There is also a 750 kV line from Ignalina to Belarus. The Lithuanian power system operates in parallel with the Belarussian, Estonian, Latvian, and Russian systems. A 400 kV high-voltage line is planned with Poland as part of the Baltic Ring. There is also a plan for a 1,000 MW interconnector with a Swedish off-shore wind farm. Realization of these projects will depend on their economic viability and the availability of funding, from the EU and other sources.*

*Lithuania is a member of the Union for the Co-ordination of Transmission of Electricity (UCTE) and the Baltic Ring Electricity Co-operation Committee (BALTREL).*

*The electricity subsector is notable for its structure and capacity-demand imbalance. The restoration of national independence found Lithuania in possession of two very large generating assets—the 1,800 MW thermal power station at Elektrenai, commissioned in the 1960s, and the 3,000 MW nuclear power station at Ignalina, whose two units were commissioned during the 1980s. Both of these stations were constructed to serve the electricity needs, not of Lithuania, but of the northwest region of the former Soviet Union, and either was capable of serving Lithuania's entire electricity needs virtually unaided. Indeed, even after 1990, Lithuania continued to be a major source of power for neighboring countries, particularly Belarus, Russia's Kaliningrad oblast, and Latvia. Because of the relative operating cost structures, Ignalina Nuclear Power Plant has been the base load*

**TABLE G-1. Installed Capacity and Power Generated, 2004**

POWER PLANT	INSTALLED CAPACITY (MW)	POWER GENERATED (GWH)
Ignalina Nuclear Power Plant	3,000	15,102
Elektrenai Thermal Power Plant	1,800	745
Vilnius CHP	384	1,211
Kaunas CHP	178	689
Mazeikiai CHP	194	179
Other municipal CHPs	14	—
Industrial CHPs	88	—
Kruonis Hydropower Plant	800	522
Kaunas Hydropower Plant	101	359
Other hydropower plants	15	—
<b>Total nuclear</b>	<b>3,000</b>	<b>15,102</b>
<b>Total thermal</b>	<b>1,800</b>	<b>745</b>
<b>Total CHP</b>	<b>858</b>	<b>2,079</b>
<b>Total hydropower plants</b>	<b>916</b>	<b>881</b>
<b>Total all generation</b>	<b>6,570</b>	<b>18,808*</b>

— Not available.

\*Excluding small independent power plants connected to the distribution networks.

plant at all times that it has been available, contributing about 80 percent of total electricity output, with the balance of requirements being provided by the CHP plants at Vilnius, Kaunas, and Mazeikiai. Elektrenai has served primarily as reserve capacity. Overall, the excess of capacity over demand is 2,952 MW.

*This situation, which has remained stable for almost 20 years, is now changing.* Under pressure from the EU, and particularly neighboring Nordic countries, the first RBMK-type unit of Ignalina was permanently shut down on 31 December 2004, and the second unit is scheduled to close in 2010.<sup>1</sup> The EU has undertaken to finance the costs of closure, estimated at €2–3 billion. More than €200 million has been allocated to the decommissioning of the first unit, and a contract has been signed with a German consortium for the construction of a spent fuel storage facility. The government has expressed a desire to replace Ignalina with new nuclear capacity, which would supply all three Baltic states and also allow continued exports to other neighboring states. There have been discussions with representatives of the French government and Électricité de France about the use of French technology to build a 1,400 MW replacement for the first reactor at an estimated cost of €1.5–2 billion. However, there is also a view in some circles that if new nuclear capacity is provided, it should consist of two much smaller reactors. In fact, serious doubts remain about the economic justification for any new nuclear investments at all.

*Ignalina's Unit 2, which will remain in production until January 1, 2010, is capable of meeting Lithuania's domestic electricity demand on its own, except at times of peak winter demand or during maintenance or unplanned shut-downs.* The CHPs will continue to sell power to the system at times of the year when cogeneration yields sufficiently low unit costs. Elektrenai will continue to provide mainly reserve capacity, although in the nature of things, the very low utilization levels recorded in recent years are likely to rise.

*However, the closure of Ignalina Unit 1 may reduce or eliminate Lithuania's ability to export power.* Exports in the last three years have averaged over 7,000 GWh annually and have earned substantial revenue for Ignalina and for the Kruonis pumped storage hydro station. Although a proportion of exports is bartered against purchases of nuclear fuel from Russia, there have been some question marks over the profitability of other exports, but Lithuanian officials maintain that they are profitable. When both Ignalina units are shut down, export potential will depend on the extent to which the older units at Elektrenai have been rehabilitated and on the extent of construction of new, modern generating capacity.

<sup>1</sup> RBMK (*reactor bolshoy moshchnosti kanalniy*) refers to a now obsolete class of graphite-moderated nuclear power reactor that was built only in the Soviet Union.

**TABLE G-2. Generation Forecast for 2011 with and without a Common Baltic Electricity Market**

STATION	2004 PRODUCTION GWH	PROJECTED 2011 PRODUCTION GWH	
		WITH CBEM	WITHOUT CBEM
Ignalina	15,102	0	0
Elektrenai	745	4,974	5,540
Vilnius CHP	1,211	1,930	2,247
Kaunas CHP	689	540	415
Mazeikiai CHP	179	274	230
Hydropower plant or pumped storage	881	206	321
New combined-cycle gas turbine	—	2,275	1,054
New combined-cycle gas turbine CHP	—	—	2,071
<b>Total</b>	<b>18,808</b>	<b>10,199</b>	<b>11,878</b>
Peak load (MW)	1,952	2,378*	2,378

\* This is the base case. High case peak load is 2,607 MW, and low case peak load is 2,148 MW.

## Demand and Supply

*Net demand (final consumption) in Lithuania in 2003 was 7,179 GWh.* Electricity intensity, measured in terms of kilowatt-hours per capita in relation to GDP per capita, is the lowest of any CEE country, at 0.38 kWh per dollar in 2003. Recent studies suggest annual growth rates in the next few years of 2.5–3.5 percent per year, yielding a 2010 final consumption level of between 8,500 and 9,100 GWh. The implications of such a level of consumption for Lithuania's power infrastructure will depend to a considerable extent on the progress made in establishing a CBEM, as well as on the decisions reached in relation to the various interconnector projects being considered. In 2002 a memorandum was signed by the authorities of the three Baltic countries laying down the principles of market regulation, and a draft Baltic Grid Code was developed. Consultants engaged for this purpose have estimated Lithuania's gross domestic electricity demand in 2011 (the year following the closure of Ignalina Unit 2) at 11,876 GWh. On the assumption that CBEM would be functioning and that Ignalina would be shut down totally by 2010, the consultants' economic analysis suggest that in 2011, Lithuania's gross generation requirements would be 10,199 GWh (compared with the generation of 18,808 GWh in 2004), which would most economically be

produced as shown in table G-2. The CBEM scenario includes the assumption that in 2011 the balance of Lithuania's needs (to meet domestic demand of 11,876 GWh) would be imported from Estonia.

*This study indicated a need for substantial new capacity in the coming five years.* If, however, the CBEM does not proceed, Lithuania's generation needs (to meet domestic demand only) would be 11,876 GWh, identical to domestic demand, and would most economically be produced as shown in table G-2. Thus, the absence of a wider market for electricity in the Baltic region would compel Lithuania to fund very substantial additional investments in CCGT technology.

## Investments

*The entities in the power sector are all profitable, and they have been able to fund the investments needed to meet market needs.* In 2004, the Lithuanian Power Company (LPC) earned a pretax profit of LTL 109 million (compared with LTL 89 million in 2003) on revenues of LTL 958 million (2003: LTL 941 million) including LTL 299 million in export revenues. In the three years ending December 31, 2003, the LPC invested LTL 572.5 million. This was broken down as follows:

- Transmission grid: LTL 198 million.
- Distribution network: LTL 121 million.<sup>2</sup>
- Hydropower plants: LTL 46 million.
- Thermal power plant: LTL 18 million.
- Buildings and so forth: LTL 40 million.
- Communications and dispatch control: LTL 29 million.
- Metering: LTL 16 million.
- Information technology: LTL 65 million.
- Other items: LTL 40 million.

*During this period, the LPC reduced its total borrowings (long-term and short-term) from LTL 479 million in December 2000 to LTL 171 million in December 2003. The LPC's investment program for 2005 was LTL 164 million, and indicative figures for the next three years (to 2008) are for a total investment of LTL 442 million—all excluding the proposed Lithuania–Poland 400 kV interconnector.*

*The eastern distribution company (information is not available for the western one) envisaged investments totaling more than LTL 870 million in the years 2003–06. They would be in network development, communications and control, accounting systems, and information technology implementation.*

### **The Reform Process**

*The profile of the Lithuanian electricity sector in 2005 is unrecognizable from what it was in the early 1990s. In 1993/94, when the World Bank first engaged with the sector, there was a single, state-owned, vertically integrated monopoly responsible for every aspect of electricity production and delivery (aside from nuclear generation), as well as most heat generation and delivery, a weak regulatory agency, and a Ministry of Energy, which struggled to assert its authority in the face of an entrenched institutional structure. Prices were uneconomic, and subsidies were rife throughout the system. Since then, despite occasional temporary setbacks, progress has been surprisingly steady. There have been a number of key landmarks:*

- *In 1993 the World Bank first engaged with the Lithuanian energy sector when it carried out an Energy Sector Review and preparation of the Power Rehabilitation Project (the subject of a \$26 million World Bank loan) commenced. The latter project included a commitment to support the restructuring and commercialization of the Lithuanian State Power System, as the Lithuanian Power Company was then known.*
- *In 1995 the government adopted a National Energy Strategy, which set out the main parameters for all subsequent reforms.*
- *From 1996 the LPC started to improve its management structures and systems, including the establishment of a treasury function.*
- *Starting in 1997 the government implemented changes in the governance of the LPC at board and management levels, and since 2000 an effective nonexecutive board has been in place.*
- *Also in 1997 the Energy Prices Commission was reestablished on the basis of independence: the members are appointed by Lithuania's president and can be dismissed only for a stated misdemeanor or other similar reason, and financing of the commission is provided in the state budget. The commission has achieved a reputation for authoritative analysis and transparent decision making, which has been critical to reform in the sector and to the achievement of economic pricing.*
- *At the same time, the government provided decisive assistance to the LPC in the collection of overdue receivables and imposed payment discipline on state and budgetary consumers of electricity (and heat).*
- *Also in 1997 the six major district heating networks owned by the LPC were transferred to municipal ownership.*
- *In 2000 the law on the reorganization of the LPC was adopted, and accounting unbundling of generation, transmission, and distribution commenced, while noncore activities were corporatized and the Lithuanian electricity market started operating.*
- *A new electricity law was adopted in 2001 (and amended in 2004).*

<sup>2</sup> 2001 only (after 2001 the distribution networks were the responsibility of the two new regional distribution companies).

- A new energy law was adopted in 2002.
- On January 1, 2002, the LPC was divided into five independent companies: the LPC (transmission, market operation, Kaunas and Kruonis); Lithuanian Power Plant (Elektrenai); Mazeikiai CHP; Eastern Distribution Company; and Western Distribution Company.
- On April 1, 2002, customers purchasing more than 20 GWh per year were given the freedom to contract directly with suppliers of power.
- In 2003 there were 25 eligible consumers accounting for about 26 percent of the market.
- In 2004 the status of eligible consumer was extended to all consumers (except residential customers).
- The Western Distribution Company was privatized in 2004; the new owners are Lithuanian businessmen. The Eastern Distribution Company is 80 percent state owned, with 20 percent held by E.ON Energy. The two distribution companies are very similar in size, the main difference being that the western company has more industrial customers.
- Prices have been cost-covering for several years. Average prices in the second quarter of 2004 were (cents/kWh, including taxes):
  - Producer: 3.41
  - Wholesale: 4.81
  - End user: 8.37
  - Residential: 9.51
  - Nonresidential: 7.84

These prices are at the higher end of the range for CEE countries.

- A three-year price cap starting January 1, 2005, is now in force. This sets the maximum price for residential consumers at LTL 0.31/kWh (about 11.7 cents/kWh).

## Why Lithuania Succeeded

In the early 1990s, most observers rated Lithuania's chances of achieving major reforms in the energy sector within 10 years as being very low. In the wider economic and political context, EU membership was seen to be so far off as to be not worth including in practical planning. Yet now Lithuania is an example to other countries in transition, including some of its closest neighbors. What went right? Several important factors can be identified in the electricity sector:

- Lithuania is culturally and historically closer to Western Europe (and particularly to the Scandinavian countries) than most CEE countries and takes many of its models (for example, for legal instruments) from these countries.
- The Ignalina issue, and the fears of neighboring countries concerning it, lent an urgency to reform.
- In 1995/96, for a short but critical period, Lithuania was fortunate to have a Minister of Energy (at that time the Ministry of Energy was a separate department of state) who was business-oriented, modern in his thinking, and not afraid to stand up against opposition to reforms.
- Then, and at all critical times, there was a small (perhaps very small) cadre of advisors and senior officials in the Ministry of Energy and in the Ministry of Economy who were advocates of reform and who were self-confident enough to maintain their intellectual and practical positions on critical policy areas.
- A surprising number of young people who were in important positions in the Ministry, in the Energy Agency, and in the LPC were ambitious (perhaps for themselves as well as for the country), and they saw that reform would either be embraced by the main entities or would have it forced upon them.
- Again at a crucial time, in 1995–98, the LPC had a general director who, although reared in the old tradition, saw the need for change.
- The World Bank and other international agencies, notably the EU-PHARE program, engaged early with the reform process and stuck doggedly with it. The EBRD was also involved in financing the LPC in 1994/95.

- *Partly as a result of the work of these agencies, the government (and perhaps the president deserves some of the credit) decided to establish an independent regulatory commission for energy, with which they could not subsequently interfere.*
- *The government (again with the agreement of the World Bank) wisely avoided tackling the privatization issue head on, but rather sought major economic gains from industry restructuring and efficiency improvement. By the time privatization started, it was no longer a hot political issue (and, not coincidentally, the government's financial returns from privatization were augmented by the delay).*
- *A small but significant number of Lithuanian émigré lawyers and other professionals returned to Lithuania and helped the local political and economic reformers enthusiastically.*
- *The Russian economic crisis of 1998 had a devastating effect on the Lithuanian economy (which was much more dependent on trade with Russia than most countries) and compelled fresh thinking by key people.*
- *Lithuania's EU candidacy led to the systematic adoption of EU directives and market principles (although, interestingly, this doesn't seem to have had the same effect in Latvia and Estonia, where the pace of reform in the electricity sector has been much slower).*
- *The Lithuanian energy and electricity infrastructures were in comparatively good condition to start with. The prime minister and the Minister of Economy in 1999–2000 took the initiative of appointing as members of the Supervisory Board of the LPC reputable private sector representatives, which served the company well.*

## **Lessons from Lithuania for Bank Operations in other Transition Economies**

*It is difficult to draw universal lessons from the particular experiences of one country, although some things are common in every cultural and political environment:*

- *It is not necessary for the entire political and sectoral establishment to be reform-oriented for progress to be made. Every entity or individual manager who secures an improvement in efficiency, in structures, or in governance plays a part in preparing the ground for further reform.*
- *In early 1997 a middle manager in the LPC attended a course in treasury management, which led him to negotiate a \$125 million syndicated loan from a consortium led by Merrill Lynch (term 3 years, coupon LIBOR +3.75 percent). This transformed the company's liquidity and made the LPC the focus of attention by international capital markets. This provided an additional and crucial force for reform.*
- *Privatization is not the goal of reform. If it is likely to be politically controversial in a country, it should be kept well off the table. World Bank experience shows that most of the benefits associated with privatization can be secured through independent regulation, unbundling, and good governance.*
- *Consistent engagement by the World Bank and other agencies, especially during the years when structural adjustment and other budgetary support programs are important to a government, can provide a continuous weight to make the reform impetus almost irresistible.*

## CASE STUDY H: TURKEY

### Political and Economic Background

Turkey has a population of 71.7 million and a per capita GDP of \$4,114 (2004). It is a candidate for accession to the EU in the near future. Its economy has faced many ups and downs in the past. At the beginning of the current decade, in order to stabilize the economy and reduce inflation, Turkey adopted an IMF program with a currency peg regime to serve as an anchor to the program. In early 2001 a financial crisis erupted, in the context of which the currency peg regime became unsustainable, and the Central Bank of Turkey announced (in February 2001) that the country would switch to a floating exchange rate regime.

The main response to the crisis, however, came in the form of a new economic program introduced in May 2001. The economic program was designed to restore financial stability and ensure public debt sustainability through (a) fiscal tightening, (b) rapid restructuring of the banking sector, (c) significant public sector reforms, (d) a renewed privatization drive combined with further liberalization (particularly in energy, telecommunications, and agriculture), (e) strengthening of the role of independent regulatory bodies to improve the climate for private investment, and (f) strengthening of social assistance programs to help low-income groups adversely affected by the crisis.

Monetary policy after the crisis focused on financial stability as its primary objective. The Central Bank chose to implement a gradual strategy instead of immediate outright inflation targeting, in light of the constraints placed on monetary policy by the post-crisis environment characterized by the loss of credibility and the dominance of public debt in the economy.

The economy recovered strongly during 2002, despite continuing volatility in the financial markets, and GNP growth reached 7.8 percent, more than double the rate originally targeted. In February 2002 Turkey signed a new, three-year standby agreement with the IMF. In November 2003 Turkey held parliamentary elections, which resulted in the Justice and Development Party (AKP) forming the government replacing the previous three-party coalition.

Structural reforms undertaken by the previous governments and continued by the current AKP government in all sectors of the economy, combined with monetary and fiscal discipline, institutional reform, and recent political stability have had positive outcomes, resulting in strong economic growth and declining inflation.

In a setting of political stability, the government maintained its tight grip on public finances. The budget deficit fell below 10 percent of GNP, and the gross central government debt appeared to stabilize at around 75 percent of GNP. The year of 2004 marked the first time in 30 years that Turkey experienced a single-digit inflation rate (see table H-1). In 2004, the consumer price index grew by 9.32 percent over the previous year and the Wholesale Price Index by 13.8 percent.

Concerning poverty, a recent analysis by Morgan Stanley suggests that "to [the] surprise of many, the country's remarkable growth has been an egalitarian phenomenon. That is, the rich are not getting disproportionately richer, and the poor are actually getting better off in today's Turkey."<sup>2</sup> This analysis was based on the results of household surveys from 1994 and 2003, where a comparison between the aggregate shares of household

**TABLE H-1. Economic Indicators, 1999–2004**

ITEM	1999	2000	2001	2002	2003	2004 <sup>1</sup>
GDP (billion \$)	199.2	204.9	153.5	184.8	239.8	295.1
GDP per capita (\$)	3,092	3,199	2,360	2,774	3,452	4,114
GDP (annual % change)	-4.7	7.4	-7.5	7.9	5.8	8.0
Current account balance (billion \$)	-1.3	-9.8	3.4	-1.5	-6.9	-15.5
Current account balance (% of GDP)	-0.7	-4.8	2.2	-0.8	-2.9	-5.2
Inflation (annual % change)	64.9	54.9	54.4	45	25.3	9.3

Sources: Internal documents of the IMF, World Bank, and Turkish Treasury.

This case study was prepared by James Sayle Moose. It has been revised slightly in the light of comments received from the World Bank staff.  
<sup>1</sup> GDP figures for 2004 are World Bank estimates. Later data seem to indicate an actual GDP growth rate of 10 percent in 2004 and about 7.6 percent in 2005. Inflation fell further to 7.7 percent in 2005.  
<sup>2</sup> Cevik 2004.

income received by each quintile of the income distribution in these periods shows a visible improvement in the distribution of income in Turkey.

*One outcome of the inflationary process experienced in the Turkish economy between 1980 and 2002 was the increased volume of currency issued, with the amount of currency in circulation in 2002 reaching 27,407 times the 1980 levels, that is, from TL 278.6 billion in December 1980 to almost TL 7.6 quadrillion in December 31, 2002. A new Turkish Lira (YTL) was adopted on January 1, 2005, as the currency unit of the country.<sup>3</sup>*

*In October 2004, the European Commission, in a communication to the European Council and the Parliament, stated that it “considers that Turkey sufficiently fulfils the political criteria and recommends that accession negotiations be opened.” Following an EU summit in Brussels, the European Council and Turkey agreed to begin accession negotiations on October 3, 2005. The main driver of political and economic reform in the coming years will likely be this EU accession process.*

*At the end of 2004, the government announced further economic measures, including raising retirement benefits and public sector pay, and cutting personal, corporate, and value added taxes. In a December 2004 policy statement, the Central Bank of Turkey announced that it would take measures to enhance transparency and predictability of its decision-making process and that formal inflation targeting would begin in 2006. The economic program includes a commitment to continued fiscal discipline, through maintaining a primary surplus target amounting to 6.5 percent of GNP, in order to bring public debt down by about 10 percent of GNP over the course of three years. To this end, the government reportedly plans to set targets for social security deficits, undertake reforms of public expenditure, tax administration, and tax policy. Other components of the economic program include strengthening the Central Bank’s monetary policy framework and further improvement of the banking sector through the passage of a comprehensive financial services law. The financial services law addresses controversial issues relating to bank owners and managers, licensing, and related party lending. It also allows for more effective government monitoring of the sector.*

*In May 2005 Turkey and the IMF agreed on the terms of a new \$10 billion three-year standby arrangement to support the country’s economic program during 2005–07.*

The program is broadly a continuation of the policies followed since 2001. Analysts expect further improvement of the Turkish economy and financial markets, in light of political stability, EU accession prospects, and the new economic program with an IMF backing.

*Despite the positive performance of the economy, concerns remain with respect to the magnitude of the current account deficit, interest rates, and inflation, which remain high by international and EU standards. Other risks associated with the sustainability of Turkey’s economic performance include the problems in the social security system and the sizeable government debt. Analysts warn that further price increases related to the higher oil prices, indirect tax increases, or a weaker exchange rate could pose a threat to the realization of the inflation targets.*

### **The Turkish Electricity Sector**

*Turkey operates a power sector with an installed generating capacity of about 36,856 MW, a peak demand of 23,199 MW, and an energy demand of 149 TWh (2004). Turkey has a well-developed electricity system with almost 100 percent electrification. The country’s main demand centers lie in the western and northwestern parts of the country, while a significant amount of generating capacity is in the east and southeast. This calls for long transmission lines. Its transmission assets include nearly 14,000 km of 380 kV lines and 31,500 km of 154 kV lines. The transformer capacities at these voltages amounted about 20,110 MVA and 46,240 MVA.<sup>4</sup> The medium-voltage (33 kV) and low-voltage (0.4 kV) distribution lines and transformers in the system amounted to 818,500 km and 81,000 MVA, respectively.<sup>5</sup>*

*Transmission and distribution losses combined accounted for about 22 percent of electricity generated by Turkey’s power plants in 2004.*

*The transmission system is in much better shape than the distribution system, since investments in transmission have remained relatively much higher than those in distribution (in part because of World Bank financing of transmission). Losses in the transmission system, at 2.4 percent, are at or near the operating norms of OECD countries (see figure H-1).<sup>6</sup> Losses in distribution, which are currently in the range of 15–18 percent, are high because of theft, but also because the system has suffered from a lack of adequate investments during the last*

<sup>3</sup> The new Turkish lira (YTL) is equivalent to 1 million old lira (TL).

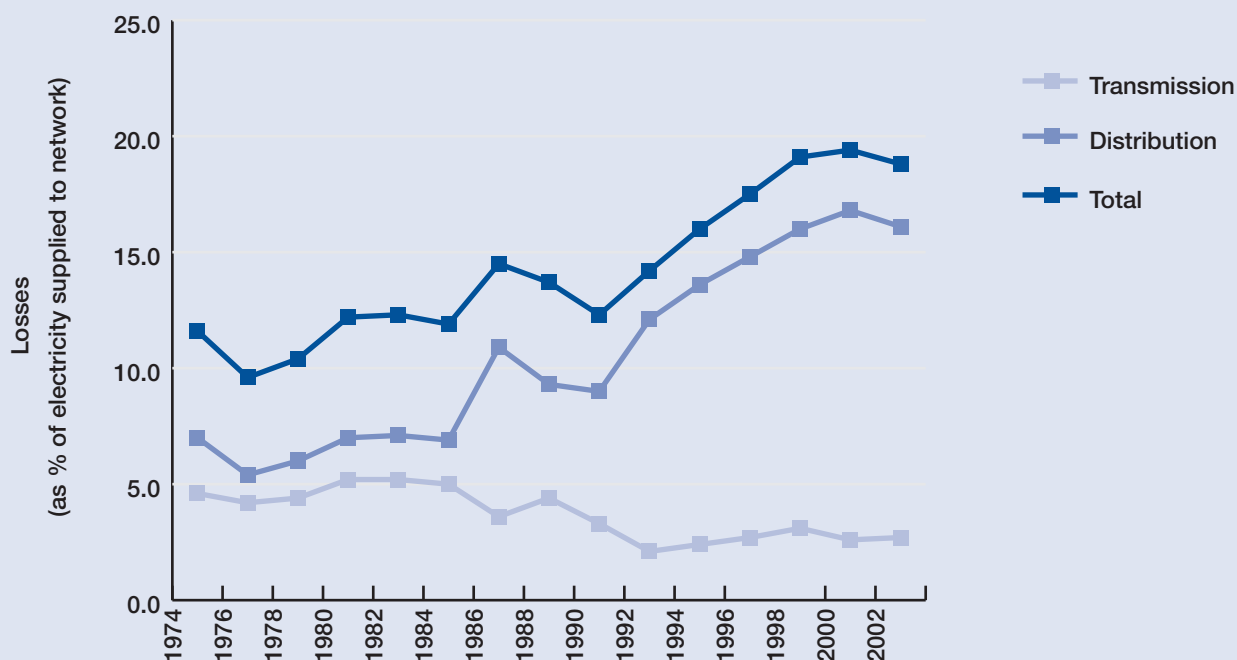
<sup>4</sup> TEIAS 2003.

<sup>5</sup> TEDAS 2003.

<sup>6</sup> This figure excludes losses in power plants, but includes all system losses, with transmission being defined as voltages above 34.5 kV, although almost all transmission lines are 154 kV or 380 kV.



FIGURE H-1. TRANSMISSION AND DISTRIBUTION LOSSES



Source: TEIAS 2003.

eight or nine years because of financial crises, as well as uncertainty over whether distribution would or would not be privatized. The percentage of losses is higher in the eastern and southeastern parts of the country. However, in terms of kilowatt-hours lost, losses are highest in Istanbul—the main load center.

### Electricity Prices

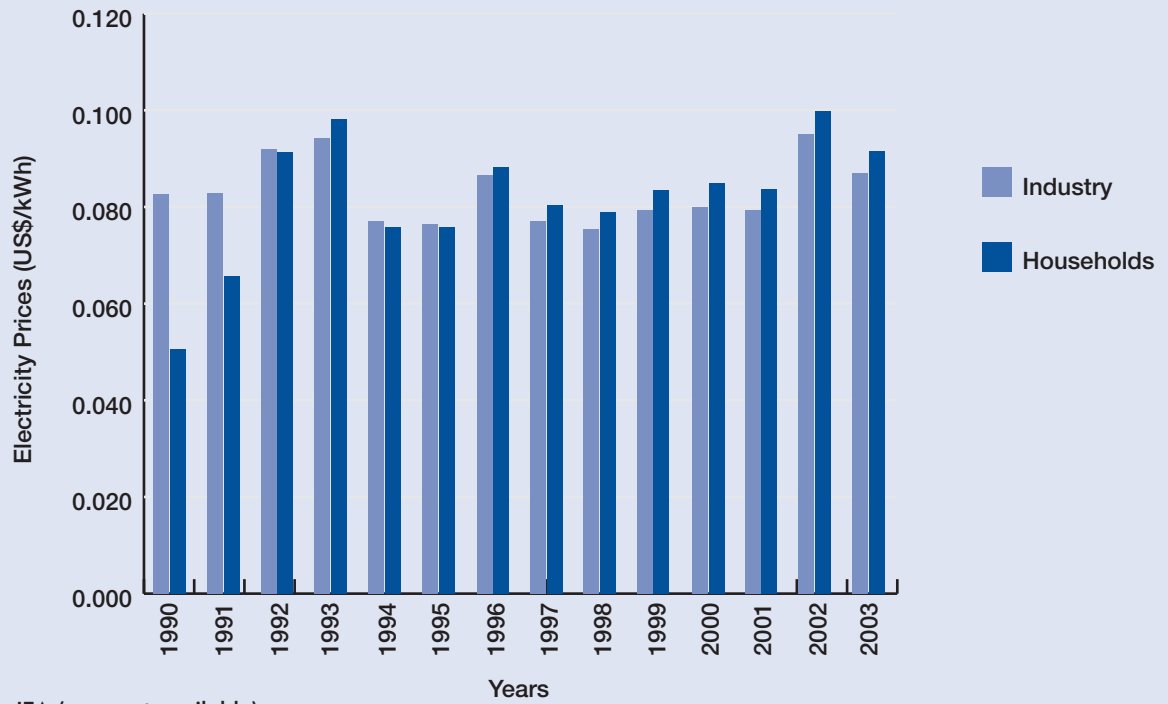
*In keeping with high inflation and the change in the value of the Turkish lira and as part of the efforts to restore the financial situation of the electricity sector, electricity prices have been raised considerably since 1998.* Retail tariffs (charged by TEDAS, the distribution and retail company) approximately doubled during the course of 2001 in Turkish lira terms. This compares with inflation of 88.6 percent and thus represents a significant increase in real prices from 2001 to 2002 that was needed to restore financial balance to TEDAS operations. Prices rose somewhat further later in 2002, but they have been stable since early 2003. The retail electricity price averaged at around 8.5 cents/kWh in 2003, excluding VAT.

*National uniform tariffs apply across the country.*

Cross-subsidies exist both between regions and between consumer groups. As can be seen from figure H-2, the cross-subsidy of residential consumers by industrial consumers has greatly diminished during the last 10–12 years. Still, however, industrial users subsidize residential users, and further adjustments are needed in the future. As a result, prices paid by industrial users for electricity in Turkey have been much higher than the prices paid by their OECD counterparts over the recent years (see figure H-3).

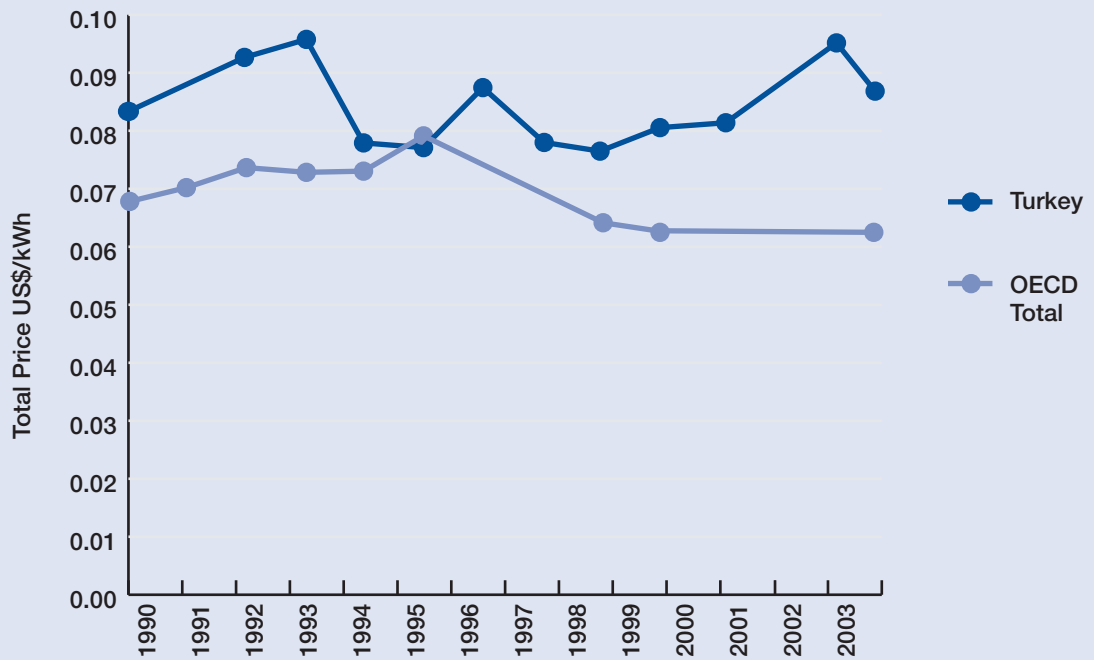
*Billing and collection efficiencies that were reasonable until then faced a severe stress during the financial crisis of the 2001–02.* Significant arrears accumulated in the sector. This was also exacerbated to some extent by the uncertainties surrounding the privatization of the distribution companies. However, some improvements have since been achieved, and the collection-to-billing ratio is presently at 90 percent. The task of dealing with past arrears and of ensuring payment discipline of municipalities and other government agencies is engaging the attention of the authorities.

FIGURE H-2. RESIDENTIAL AND INDUSTRIAL PRICES



Source: IEA (year not available).

FIGURE H-3 COMPARISON OF INDUSTRIAL PRICES WITH OECD AVERAGE



Source: IEA (year not available).

### Electricity Supply and Demand

Electricity demand in Turkey has grown rapidly in the recent decades. During the period from 1971 to 2001, the average electricity demand growth rate was 8.92 percent. Actual annual growth rates in peak demand and energy demand during 1990–2004 are summarized in table H-2. The relationship between GDP growth rates and the energy growth rates is presented in figure H-4. The rapid growth in demand led to supply quality problems and limited power cuts in the late 1990s.<sup>7</sup> Further demand growth, combined with delays in attracting new private investment in generation, led to grim forecasts about the supply-demand balance and expectations of shortages as early as 2001.<sup>8</sup>

The government responded to existing and imminent supply shortfalls by taking various demand-side measures that included reducing street lighting and combating electricity pilferage. Other short-term measures the government resorted to included increasing electricity imports from Bulgaria and using modular plants or the “mobile” power plants.<sup>9</sup>

Demand growth slowed down as a result of the earthquakes of 1999 and the 2001 economic crisis, both of which had a significant impact on GDP growth. As a result, the projections of severe supply shortages did not materialize. In fact, when the contracted new generation capacities came on line, Turkey had an excess capacity situation.

In 2004, total electricity consumption reached 149.2 TWh, a 6 percent increase over 2003. Electricity consumption by industrial users accounted for 48 percent of total consumption, followed by residential consumers at 23 percent, commercial consumers at 12 percent, government offices at 4 percent, and another 13 percent by others, including irrigation and street lighting.

All electricity is now supplied domestically, since imports from Bulgaria were stopped. The share of electricity generated by state-owned power plants is currently 45.4 percent of the gross generation (see table H-3).

The breakdown of the 2004 gross electricity generation according to primary resources is presented in figure H-5 and in table H-4.

**TABLE H-2. Peak Demand and Electricity Consumption, 1990–2004**

YEAR	PEAK DEMAND (MW)	CHANGE OVER PREVIOUS YEAR	ENERGY DEMAND (TWh)	CHANGE OVER PREVIOUS YEAR (%)
1990	9,180	7.3	56,812	8.0
1991	9,965	8.5	60,499	6.5
1992	11,113	11.5	67,217	11.1
1993	11,921	7.3	73,432	9.2
1994	12,760	7	77,783	5.9
1995	14,165	11	85,552	10
1996	15,231	7.5	94,789	10.8
1997	16,926	11.1	105,517	11.3
1998	17,799	5.2	114,023	8.1
1999	18,938	6.4	118,485	3.9
2000	19,390	2.4	128,276	8.3
2001	19,612	1.1	126,871	-1.1
2002	21,006	7.1	132,500	4
2003	21,729	3.4	141,151	6.5
2004	23,199	6.8	149,239	5.7

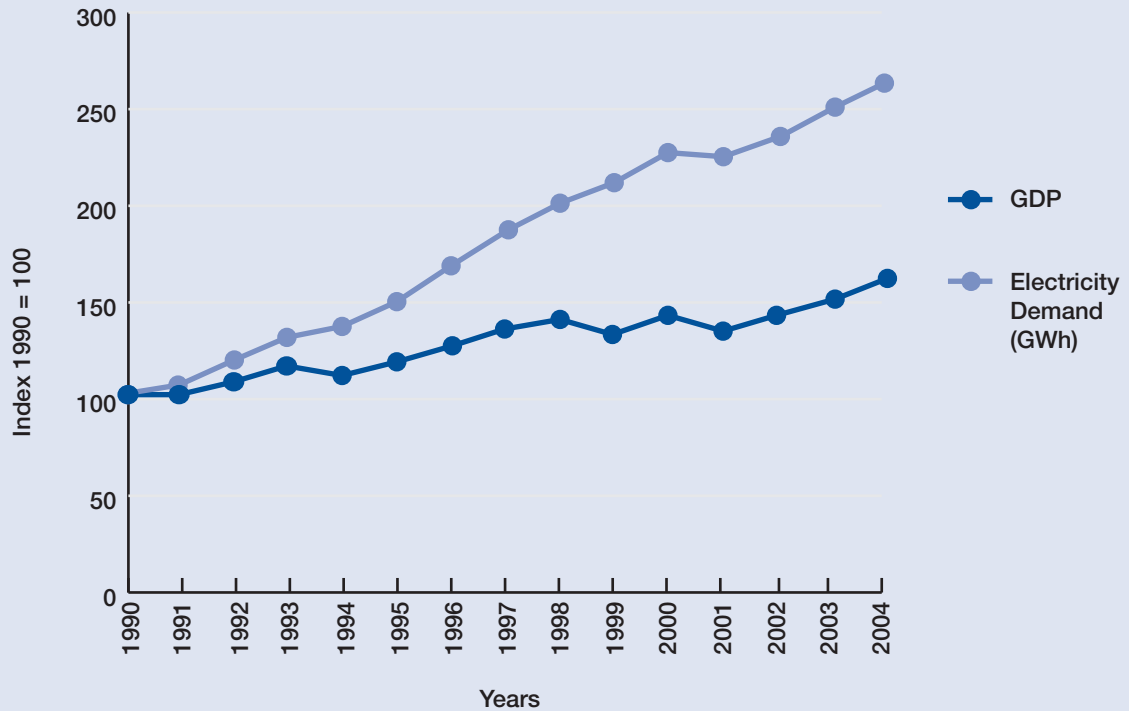
Source: Internal document of TEIAS (2005).

<sup>7</sup> This problem is cited as an important factor that induced large industrialists to self-generate, along with the fact that self generation (auto-production) is cheaper.  
<sup>8</sup> Forecasts prepared by the Ministry of Energy and Natural Resources at that time estimated 8 percent annual electricity demand growth rate. A review of these forecasts by the State Planning Organization argued that these projections were too high and the new capacity contracts that TEAS entered into based on them were too much.  
<sup>9</sup> IEA 2001.

According to the current figures, about 49 percent of the electricity generated in Turkey in 2004 was generated from indigenous resources and 43 percent from imported gas.

In 2004 a "Report on Long Term Electricity Demand" was prepared as a joint effort by the Ministry of Energy and Natural Resources (MENR), the Energy Market Regulatory Authority (EMRA), the State Planning Organization, and the Treasury. The report provides

**FIGURE H-4. GDP-ELECTRICITY DEMAND RELATIONSHIP**



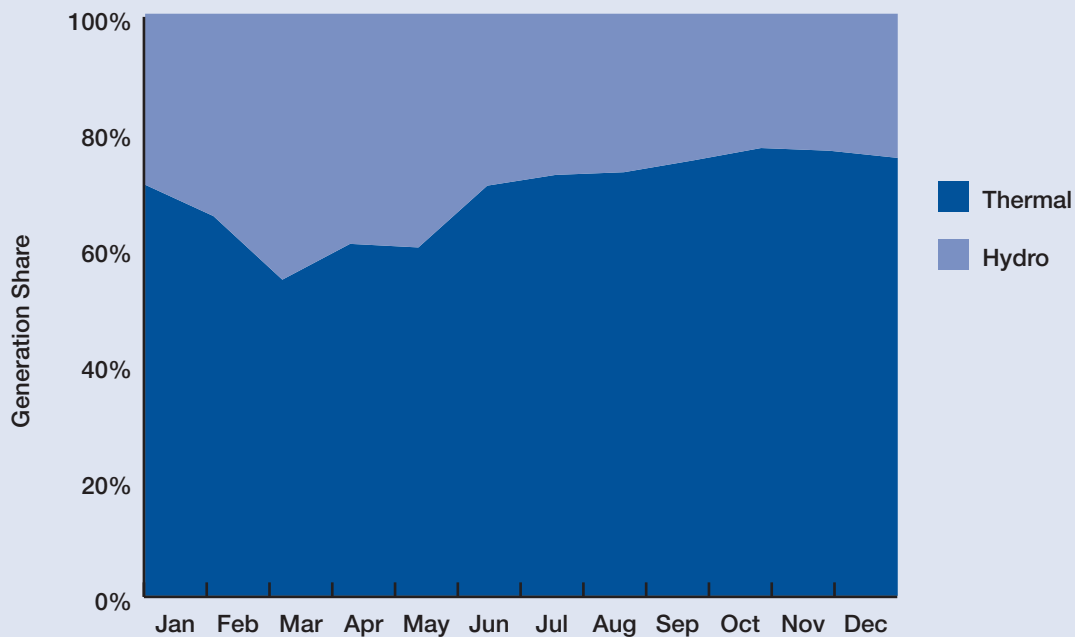
Source: Demand Data from MENR (year not available) and GDP data from the IMF WEO Database.

**TABLE H-3. Breakdown of Electricity Generation by Ownership, 2004**

PLANT TYPE	SHARE IN GENERATION (%)
EUAS	39
EUAS affiliates	2.8
Plants in privatization scope	3.6
<b>Total public sector share</b>	<b>45.4</b>
Build-operate-own (BOO)	24
Auto-producers	15.1
Build-operate-transfer (BOT)	9.6
Generation licensees	2.4
Transfer of operating rights (TOOR)	2.6
Mobile plants	0.9
<b>Total private sector share</b>	<b>54.6</b>

Note: State electricity generating company.  
Source: Internal reports from the TEIAS Dispatch Center.

FIGURE H-5. GENERATION MIX, 2004



Source: Internal reports from the TEIAS Dispatch Center.

TABLE H-4. Breakdown of Generation by Primary Resource, 2004 (percent)

PRIMARY RESOURCE TYPE	SHARE IN GENERATION (%)
Thermal	69.2%
of which natural gas	43%
Hydro	30.7%
Wind	0.1%

Source: Internal reports from the TEIAS Dispatch Center.

updated forecasts of electricity demand that were prepared based on the Model for Analysis of Energy Demand (MAED) and associated sensitivity analyses. The study focuses on three different scenarios for electricity demand growth and three sensitivity analyses based on one of the scenarios (see table H-5).

*Scenario I is based on the State Planning Organization's projections of GDP growth rates and the relative contributions of the agriculture, mining, manufacturing, energy, construction, transport, and other service sectors to the GDP. The projections of GDP growth and its sectoral breakdown were in turn determined based on*

the government's targets and programs. Scenario II attempts to demonstrate the sensitivity of electricity demand to changes in the subsectors of the manufacturing sector. The "old scenario" uses older GDP projections and sectoral breakdowns, which were determined by the State Planning Organization for 2001–20. Moreover, four sensitivity analyses were carried out based on Scenario I, by changing the GDP-related assumptions for that particular scenario (see table H-6).<sup>10</sup>

*The Turkish Electricity Transmission Company (TEIAS) prepared an Electricity Generation Planning Study in order to provide information and guidance to decision*

<sup>10</sup> Sensitivity Analysis I-A assumes a 5 percent increase in the GDP growth rate after 2008. Analysis I-B assumes a 10 percent decline in the GDP growth rate after 2008. Analysis II assumes a 5 percent decline in total GDP for the period 2010–20, with a smaller decline during 2005–10. Analysis III is based on a 4.5 percent increase in total GDP for the period 2008–20.

makers, investors, and market participants on the likely availability of power from existing plants and those under construction and licensed, as well as the timing, amount, and composition of the new generation capacity that will be needed to meet electricity demand for the period 2005–20. The main results of the study are presented in table H-7.

The study builds on the demand projections (Scenario I and Scenario II) of the Joint Study on Long Term Electricity Demand discussed above, and uses the WASP IV generation—investment optimization model. The energy generation projections in table H-7 include generation from existing power plants, those under construction, and those that have obtained licenses as of July 2004. Figure H-6 shows the same information related to meeting peak demand.

The study finds that, if demand keeps growing at an average 7.9 percent per year, as foreseen under Scenario I of the Joint Study on Long Term Electricity Demand and if, in addition to the power plants currently under operation, power plants under construction and those power plants that were licensed by EMRA as of July 2004 are completed and become operational on time, the following will be true:

- Installed capacity will be able to cover peak demand only until 2012.
- Generation under average hydrological conditions will cover energy demand only until 2010.

- Firm generation (under dry hydrological conditions) will cover energy demand only until 2009.

Thus, it is clear that new generation capacity will be required and that this capacity needs to be started in the next year or two in order to meet forecast demand for 2009.

A study commissioned by the World Bank for the government of Turkey concluded that there would be a surplus electricity generating capacity until 2007–08 and that there would be no need for new generating capacity in Turkey before 2007 or 2008. The study also noted that with substantial licensed capacity additions or lower economic growth, the capacity surplus could extend well beyond 2010.<sup>11</sup>

Additional assessments carried out by the same consultants in September 2006 indicate a greater level of supply uncertainties, making it possible for capacity and energy shortages to emerge as early as 2009. Short-term measures under consideration include demand-side management, which could delay the emergence of shortage at least by two years, and market-oriented load reduction strategies. Medium-term measures under consideration include capacity incentive mechanisms that would help the emergence of a capacity market to complement the energy market. This could help in the materialization of private investments in the more rapid creation of additional capacities.

**TABLE H-5. GDP Growth Rate Assumptions for the Three Scenarios**

SCENARIO	2005–10	2010-15	2015-20
Old scenario	8	7.5	6.1
Scenarios I and II	5.5	6.4	6.4

**TABLE H-6. Electricity Demand Forecast Scenarios**

ELECTRICITY DEMAND	SCENARIO I		SCENARIO II		OLD SCENARIO	
	GROWTH RATE (%)	GWh	GROWTH RATE (%)	GWh	GROWTH RATE (%)	GWh
2005		159,650		159,650		168,262
2010	8.3	242,020	6.3	216,750	9.6	269,842
2015	7.8	356,202	6.4	294,563	7.8	409,531
2020	6.4	499,489	6.8	406,530	6.6	570,521

Source: Internal Report on Long Term Electricity Demand from MENR.

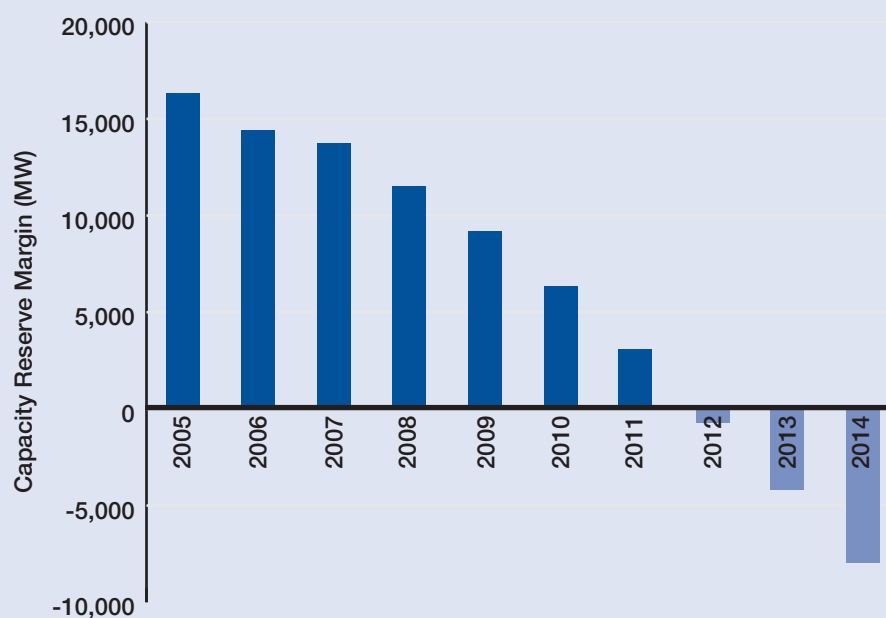
<sup>11</sup> Economic Consulting Associates 2003.

**TABLE H-7. TEIAS 10-Year Projection Based on Average Hydro Conditions, 2005-14 (GWh)**

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
<b>Generation from existing capacity</b>										
Thermal	157,436	159,223	164,523	163,885	168,438	168,979	168,167	168,466	168,466	168,466
Hydro + wind	44,305	42,760	42,591	42,466	43,766	43,766	43,766	43,766	43,766	43,766
<b>Total</b>	<b>201,742</b>	<b>201,983</b>	<b>207,114</b>	<b>206,351</b>	<b>212,204</b>	<b>212,745</b>	<b>211,934</b>	<b>212,232</b>	<b>212,232</b>	<b>212,232</b>
<b>New generation—under construction and licensed</b>										
Thermal	14,952	17,039	20,169	20,169	22,569	22,569	22,569	22,569	22,569	22,569
Hydro + wind	5,677	9,490	13,143	14,344	14,505	14,555	14,555	14,555	14,555	14,555
<b>Total</b>	<b>20,629</b>	<b>26,529</b>	<b>33,312</b>	<b>34,513</b>	<b>37,074</b>	<b>37,124</b>	<b>37,124</b>	<b>37,124</b>	<b>37,124</b>	<b>37,124</b>
<b>Total generation</b>										
Thermal	172,388	176,262	184,692	184,054	191,007	191,548	190,736	191,035	191,035	191,035
Hydro + wind	49,982	52,250	55,734	56,810	58,271	58,321	58,321	58,321	58,321	58,321
<b>Total</b>	<b>222,370</b>	<b>228,512</b>	<b>240,426</b>	<b>240,864</b>	<b>249,278</b>	<b>249,869</b>	<b>249,057</b>	<b>249,356</b>	<b>249,356</b>	<b>249,356</b>
<b>Electricity Demand</b>										
Demand	159,650	176,400	190,700	206,400	223,500	242,020	262,000	283,500	306,100	330,300
<b>Margin of Available Generation</b>										
	62,720	52,112	49,726	34,464	25,778	7,849	-12,943	-34,144	-56,744	-80,944

Source: TEIAS 2004.

**FIGURE H-6. PEAK DEMAND VERSUS INSTALLED CAPACITY, 2005–14**



Source: Internal document on Turkey Electricity Generation Planning Study from TEIAS.

## Government Strategy

The government's strategy is laid out in the "Electricity Sector Reform and Privatization Strategy Paper" issued in March 2004.<sup>12</sup> The strategy paper lays out the principles and objectives of privatization, discusses the necessary steps to ensure successful privatization, and confirms the government's commitment to the competitive market structure introduced in 2001, based on bilateral contracting, together with a balancing and settlement system. This strategy relies largely on the private sector to provide the needed investments.

The main problem the government had faced in the electricity sector had been the one indicated in the section, *The Turkish Electricity Sector, above*—how to meet the continuing substantial increases in electricity demand. The total cost of meeting this demand is estimated to be about \$3.0 billion per year with most of the required investment in generation (around \$2.2 billion per year). Substantial investments are needed in distribution (around \$500 million per year) and transmission (around \$200 million per year).

Government strategy for the electricity sector has been relatively stable for a number of years, with both the AKP and its predecessors following the same general approach. This approach has focused on trying to attract the private sector into improving the operations of the existing generation and distribution assets (thus increasing efficiency and lowering costs) and also trying to attract it into investing in new generation capacity.

Earlier attempts for outright privatization did not succeed because of constitutional limitations that led to the view that the provision of electricity was a public service to be supplied by the government. Ways to work around this constraint were created through the introduction of other models of private participation. These were Law No. 3096 enacted in 1984 and Law No. 3996 enacted in 1994. Law No. 3096 created the build-operate-transfer (BOT), transfer of operating rights (TOOR), and auto-producer models for private participation, whereas Law No. 3996 aimed at increasing their attractiveness through providing government guarantees and tax exemptions. Law No. 4283 enacted in 1997 introduced the build-operate-own (BOO) model and provided for the relevant guarantees.

The main thrusts of the government policy are to the following:

- To privatize a large portion of the existing public generation assets, mainly the thermal plants, but also some of the hydropower plants. It is thought that this would improve their efficiency, at least for the thermal plants. This was tried first through the TOOR model (see below), but this model, as implemented in Turkey, required that the Turkish Treasury guarantee sales price and sales by these plants, which created large contingent liabilities that the Treasury did not like. The Council of State (Danistay), the highest level administrative court, also did not like this approach. Therefore, this approach has been abandoned. The current approach is to try to sell portfolios of generation assets.
- To keep the transmission system and the largest hydropower plants (which have multiple uses) in government hands. The transmission system operator is also the market operator.
- To privatize distribution assets in order to reduce distribution losses. This was initially attempted using the TOOR model. However, there were flaws in the approach, as well as opposition from the Council of State, so it was abandoned. The option of the outright sale of the regional distribution companies also met with opposition. The government therefore is trying a modified TOOR model and has invited bids for the operating rights for the distribution companies for a period of 49 years.
- To attract private funds into building new generation capacity. A number of arrangements have been used to do this, which are described in the section, Private Investment in Electricity Generation, below. On the whole, these arrangements have been successful and there have been no major shortages of electricity. However, the results are very mixed with some approaches quite successful and others marginally successful if at all.
- To create a regulatory authority to regulate the sector and set electricity prices. This was successfully accomplished with the Electricity Market Law of 2001 (Law 4628), and EMRA is now functioning reasonably well.

<sup>12</sup> Republic of Turkey 2004.



- *To establish competition in the sector to bring down prices.* This process is just getting under way, with the market rules and procedures having largely been established and the balancing wholesale market having begun trial operations recently. Retail competition is also gradually deepening, with an estimated 30 percent of the market now considered “eligible.”
- *To develop renewable energy resources.* Turkey has considerable renewable energy resources, mostly hydropower. Many of the larger hydropower sites have been developed by the government water resources institute, and others are being developed. There is also a major effort currently, assisted by the Bank, to enable the development of small and medium-sized hydropower projects developed by the private sector. The Renewable Energy Law of June 2005 provides the enabling framework for private investments in such projects. Consequently, an increase in private sector interest in this activity is being witnessed.
- *To energy efficiency and demand-side management.* Efforts have been made to develop demand-side management and energy efficiency in Turkey, although little information is available on whether these efforts have produced significant savings in electricity usage. These efforts have been largely carried out by the Electric Power Resources Survey and Development Administration (EIE), which is part of the MENR. A draft law on energy efficiency is currently under consideration in Parliament.

**Private Investment in Electricity Generation**

As indicated above, Turkey has managed largely to avoid any electricity sector investment gap, because of the large investment by the private sector in the Turkish power

industry. Private sector investment in power generation has been considerable during the past eight years, with privately operated power plants now providing about 55 percent of the electricity supply for Turkey. Various arrangements have been used to attract these private plants with differing results. The main such arrangements are the BOTs, the BOOs, the TOORs, auto-producers, and the so-called mobile plants. Overview information on these different types of arrangements is given in table H-8. These arrangements are then described in more detail further below.

*The BOTs are the oldest financing model used in Turkey.* These plants had a power sales agreement (PSA) initially with the government-owned Electricity Generation and Transmission Company (TEAS), but after the restructuring of TEAS, the contracts were transferred to the government-owned Turkish Electricity Trading and Contracting Company (TETAS). These PSA contracts are take-or-pay contracts usually valid for 20 years, after which the plant returns to government ownership. The sale price consists largely of a fixed charge or charges plus the cost of fuel (usually natural gas). The fixed charges are very high in the initial years and then drop over time with charges often remaining quite high for the first 10 years. As a result, the power produced by these plants has been extremely expensive, substantially higher than the wholesale electricity prices in Turkey. The PSA contracts normally call for TEAS/TETAS to take the power that can be produced by the plants or pay for it (take or pay).

*Most of the capacity in the BOT plants is in gas-fired combined cycle plants. However, there is one large hydropower plant built under this arrangement (Birecik), as well as a number of small hydropower plants and two small wind farms.* These plants currently produce about 14 TWh of electricity per year or about 10 percent of Turkish electricity usage.

**TABLE H-8. Private Electricity Generation, 2004**

TYPE OF ARRANGEMENT	CAPACITY (MW)	GENERATION (TWh)
BOT	2,349	14.3
BOO	6,102	35.9
TOOR	650	3.9
Mobile	780	1.2
Auto-producer	4,416	22.5
Private companies	735	3.7
Total private	15,032	81.5
Private share of Turkey's total	41%	54.6%

*The BOT contracts were individually negotiated with developers.* These developers made proposals to the government to build a generating plant at a site they had obtained. For the major gas-fired power plants (see table H-9), the developers were mainly foreign, including Enron (Trakya), whereas for the hydropower plants the developers are mainly Turkish, except for Birecik. The MENR negotiated most of the concession arrangements with the developers. TEAS negotiated the PSAs under orders from the ministry. The Turkish Treasury provided a government guarantee for the legal agreements between MENR, TEAS, and the developer. These arrangements were generally not transparent, and there are allegations of corruption. An investigation of some of them is ongoing in Turkey.

*Although the BOT plants provide reliable power, they have been expensive for Turkey in the shorter term (high electricity prices) and have created major contingent liabilities.* The contingent liabilities to the government (the Treasury) from the BOTs have been estimated by an outside consultant to be about \$1.3 billion per year presently and to remain at more than \$1 billion for the rest of this decade.

*BOO bids to the developers were also launched by the government, even while the government was trying to develop generation capacity through the BOT model.* The general locations for these plants were determined by the government (TEAS), and the developers were selected on a competitive basis, largely by TEAS. Five plants were financed using this model, four of them being gas-fired plants and the fifth being an imported coal-fired plant (see table H-10). For these plants, the developers (mostly foreign) receive an agreed price for generation plus the cost of fuel. TEAS also signed a take-or-pay contract for 80 percent of their power output, and the Treasury provided a guarantee for the PSAs. At the end of the contract, the plant remains with the developers. Since there was considerable competition to build the plants and they remained with the developer, the spread over fuel costs for these plants is relatively modest. The prices of the power produced by these plants are therefore fairly close to the average wholesale price of power in Turkey, although this depends heavily on the price that these plants pay for gas. There have been no serious allegations of corruption. Three of the gas-fired plants belong to one group, and the fourth gas plant belongs to a second group, whereas the imported coal fired plant is now partially owned by the Turkish military pension fund (OYAK).

*Although the price of power provided by these plants is relatively reasonable, the PPAs with them still represent a major contingent liability for the government.* This contingent liability has been estimated by outside consultants at about \$2 billion per year currently and continuing at this level through about 2017. The likelihood that this contingent liability would become an actual liability is, however, extremely low, since these plants face a very low dispatch risk because of their relatively attractive power prices. This was demonstrated by OYAK's decision to buy into one and pay a premium.

*TOOR was an arrangement whereby the government tried to improve the operation of existing government-owned plants. Under this arrangement, the government transferred the operating rights to a power plant to a private developer for a period of typically about 20 years.* The developer signed a PSA with TEAS at an agreed price again with a high off-take requirement. The developer is responsible for rehabilitating the plant and completing the agreed investments, and is generally expected to increase the capacity of the plant (which often had deteriorated) to the level indicated in his bid. Two plants were "privatized" under this TOOR arrangement to Turkish developers. Agreements were reached between MENR and other developers to privatize a large number of other plants. However, this did not occur, because the Treasury refused to guarantee the PSA contracts, because of concern over its contingent liabilities. (The two TOORs that were finalized (see table H-11) do not have Treasury guarantees.)

*On the whole, this has been a fairly satisfactory arrangement.* The plants appear to be better operated, and needed investments have been made in them, which TEAS could not undertake because of budgetary constraints and uncertainties about the future of these plants. The government did not assume any contingent liabilities, because it did not guarantee the PSA between the Turkish developers and TEAS for the Çayırhan or Hazar Plants. However, there is an implicit guarantee, since the government would be unlikely to allow a state-owned company to default on major contracts of this sort.

*The mobile plants are smaller, privately owned power plants that are hired to the state-owned generation company, EUAS (formerly TEAS), and operated by the owners of the plant under service agreements with EUAS.* The electricity generated by these power plants belongs to EUAS, and EUAS supplies electricity to TETAS on relatively shorter-term contracts of about five years.

**TABLE H-9. BOT Power Plants**

POWER PLANT	FUEL	CAPACITY (MW)
Ova	Natural gas	258
Trakya	Natural gas	499
Uni-Mar	Natural gas	504
Esenyurt	Natural gas	188
Birecik	Hydro	672
Small hydro (12)	Hydro	211
Small wind (2)	Wind	17
<b>Total</b>		<b>2,349</b>

**TABLE H-10. BOO Power Plants**

POWER PLANT	FUEL	CAPACITY (MW)
Adapazarı	Natural gas	798
Gebze	Natural gas	1,545
Izmir	Natural gas	1,540
Ankara	Natural gas	899
Iskenderun	Imported coal	1,320
<b>Total</b>		<b>6,102</b>

**TABLE H-11. TOOR Power Plants**

POWER PLANT	FUEL	CAPACITY (MW)
Çayırhan	Lignite	620
Hazar 1,2	Hydro	30
<b>Total</b>		<b>650</b>

These contracts are guaranteed by the Turkish Treasury. There is a fixed capacity payment plus a variable price for fuel. The prices for these power plants are higher than the prices charged by the BOOs and are above retail or industrial levels.

*The developers who have built these plants are all Turkish.* A total capacity of 780 MW is spread over a number of plants, each with a high off-take requirement. Currently contingent liabilities by the Treasury for these plants are about \$120 million per year. However, they disappear by 2007 when the contracts expire. When their contract with EUAS ends, these units will enter the market as independent power producers (IPPs) will probably following the auto-producer model discussed below.

*The auto-producer model is similar to the concept of captive plants, although it has been modified to suit the Turkish requirements, and it had been successful in increasing the generation capacity. Under this model, a developer builds a power plant and finds his own customers who become shareholders in the auto-producer group. In some cases, the plant is developed entirely or largely for captive consumption. The auto-producer group plants tend to sell power slightly below market rates in order to obtain customers. The government has a very limited role and does not provide any guarantees for the developer. This model has grown very fast and there are now a large number of these plants—mostly gas-fired, but also hydropower plants. The total capacity of the auto-producers and auto-producer groups, at about 4,400 MW, is second only to the BOO plants.*

The auto-producers can provide electricity at lower retail prices than the grid, since (a) the auto-producer groups or auto-producers do not have the high stranded costs that TETAS needs to recover as a result of its purchase contracts with the BOTs and to a lesser extent the mobile units; (b) they do not have the losses in distribution and nonpayment problems faced by TEDAS, the state distribution company; and (c) the auto-producers can cherry pick their customers—and they do. However, after the enactment of the Electricity Market Law of 2001, no new auto-producer groups have been established because of the possibility of establishing generation companies instead. Also current auto-producer group companies are changing their status to generation companies with the support of EMRA.

Private generation companies are privately owned “merchant” power plants. They tend to be smaller plants that have not set up an auto-producer group arrangement or that have terminated this arrangement. The total capacity in this category so far is relatively small (735 MW), but it may represent the wave of the future.

The various private financing arrangements discussed above have provided the great majority of the increase in Turkish electricity generating capacity since the early 1990s. They are the main reason why electricity generation has kept up with the increase in electricity demand, and shortages of electricity have been limited and transitory.

With the elimination of government guarantees, future additional generating capacity will come largely from private generation companies selling to distribution companies and other potential customers, as well as from the auto-producer model. Further recent amendments allow distribution companies to set up their own generation facilities, and it is likely that after their privatization, some of these companies will do so.

In addition, Turkey, like a number of other countries, is establishing an electricity market in order to foster competition and facilitate private participation in the electricity sector. This electricity market will be operated by an autonomous department within TEIAS, the government-owned transmission company, but the market will consist of numerous private generation companies, the government-owned generation company (EUAS), and numerous private customers, including the privatized distribution companies.

This strategy is laid out in the *Electricity Sector Reform and Privatization Strategy Paper* issued by the government in March 2004.<sup>13</sup> The strategy paper lays out the principles and objectives of privatization, discusses the necessary steps to ensure successful privatization, and confirms the government’s commitment to the competitive market structure introduced in 2001, based on bilateral contracting, together with a balancing and settlement system. This strategy relies largely on the private sector to provide the needed investments.

## Lessons Learned

The main lesson learned from the Turkish experience is that private investors can be attracted to investing in power generation and can provide the incremental generation needed to meet rising electricity demand. However, some ways of doing this are much better than others. In the case of Turkey, the auto-producer group model, which was largely developed by private Turkish entrepreneurs, has worked best. The government does not take on any contingent or other liabilities for these plants, but simply gets out of the way and lets the entrepreneurs build and operate them. The BOO has also worked well in Turkey primarily because the concession arrangements were competitively bid, resulting in low fixed prices, and the electricity from these plants is economically attractive. However, the government does have large contingent liabilities associated with these plants, having guaranteed off-take and prices, although these liabilities are highly unlikely to be realized. The TOOR model was barely tried, but the two examples where it was tried were successful, with the government assuming no contingent liabilities, although TEAS/TETAS did.

The BOT model in Turkey did not work well. However, this was not the result of the model so much as because (a) contracts were negotiated in a nontransparent manner and were not competitively bid; (b) these contracts took a very long time to finalize, but were subject to escalation all the time that they were being negotiated. As a result, the prices of electricity sold by the BOT plants are high and will remain high for some time. The sales contracts for these plants are basically stranded assets in that the cost of the power is more than it can be sold for. (TETAS, the Turkish trading company that has these contracts, largely offsets them by buying cheap hydropower from EUAS, the state generating company.)

<sup>13</sup> Republic of Turkey 2004.

*A second lesson is that privatization of distribution is difficult, at least in Turkey.* The government has not so far been successful in its efforts to privatize distribution assets. Although it can in theory be done, the legal and political hurdles have been very significant. However, distribution privatization is the next major step in Turkey's development of an electricity market, and the government realizes this. Without some sort of privatization of distribution (whether asset sale or an improved TOOR arrangement), the high losses in distribution will not be significantly reduced. In addition, without distribution privatization, it will be difficult to attract new private generators to supply the market, since they would not have creditworthy private distribution companies to sell to. Instead, any such generators would want government guarantees. Fortunately, the Government of Turkey is now making a major effort to privatize distribution. It has transferred the distribution company, TEDAS, to the privatization agency. The privatization agency has restructured TEDAS into a number of regional distribution companies and has issued bids for their long-term operating rights.

*Finally, the whole process of creating a largely private electricity sector that is competitive—the goal of the Electricity Market Law—it has taken longer and been more difficult than anticipated.* This is a result of both the pre-existing conditions, including large stranded assets (BOT and mobile plant contracts), and resistance from parts of the bureaucracy. However, progress continues to be made, and the goal should eventually be achieved.



## CASE STUDY I: VIETNAM

### Economic Background

Vietnam's population was 82 million in 2004, and its population growth rate was about 1.4 percent per year. Its annual per capita income in 2003 was about US\$480. Per capita real GDP growth had averaged at 6 percent per year during the previous 12 years. The general poverty rate had fallen from 58.1 percent in 1993 to 19.5 percent in 2004 at an average annual rate of about 3.5 percent.

In the mid-1980s Vietnam began its shift from a centrally planned economy to a more market-driven one. As part of the 1986 policy of Doi Moi (Renovation), the government undertook a series of comprehensive macroeconomic reforms. The measures taken as part of the reform effort included the removal of subsidies, liberalization of prices, adoption of a floating exchange rate, liberalization of domestic trade, and reduction of tariffs on commercial and noncommercial imports.

The transition to a market-driven economy was supported by the development of a legal framework that involved the adoption of several important pieces of legislation, such as the Law of Enterprise, as well as amendments to the Law of Foreign Investment, Trade Law, Law on Export-Import Duties, and Labor Code, among others. These moves were designed to create a stable and favorable business environment, and they attracted both foreign and domestic investment.

Vietnam's 1993–2003 economic growth rates averaging 7.2 percent have been among the highest in the world. Such growth rates are expected to be maintained at about the same levels in the near term.

In 2001 the government announced a plan for reforming state enterprises, which involved the divestiture of one third of the 5,600 state-owned enterprises and efforts to increase the competitiveness of the ones retained by the government. As part of this effort, enterprises that were previously under provincial and city people's committees, line ministries, and general state corporations were partially or wholly divested, liquidated, assigned to other entities, or their operations were transferred under management contracts.

The financial sector reform program of the government involved (a) restructuring the joint stock banks, (b) restructuring and commercialization of the state-owned banks, and (c) improving the regulatory framework and enhancing transparency. Moreover, the first stock market was set up in Ho Chi Minh City in 2000.

Over the course of the last decade, the government made significant progress in fiscal reform, largely through the establishment of institutions that have strengthened its control over public finances (see table I-1). Government fiscal control was quite loose in the early 1990s, with no unified national budget and a multiplicity of institutions involved that were in charge of revenue collection and expenditures. The government worked to address this issue through the introduction of unified tax laws, state budget laws, and the creation of a State Treasury, which would be directly under the control of the Ministry of Finance.

Recent economic growth was driven by export growth, domestic investment, including infrastructure spending, and industrial growth. Despite strong exports, the trade deficit rose to nearly 7 percent of GDP in 2003. The

**TABLE I-1. Economic Indicators, 2000–05**

INDICATOR	2000	2001	2002	2003	2004	2005
GDP	5.5	6.9	7.1	7.3	7.7	8.4
Industrial production index	15.7	14.6	14.5	15.5	16.0	17.2
Consumer price index	-0.6	0.8	4.0	3.0	9.5	8.4
Fiscal balance as a % of GDP	-2.8	-2.9	-1.9	-2.0	-1.4	-1.4
Trade balance (US\$ million)	-1,187	-1,135	-3,027	-5,107	-5,451 OR 5% OF GDP	-4,648 OR <2% OF GDP
Current account balance as a % of GDP	..	2.1	-1.2	-4.9	-3.8	-0.9

Source: World Bank 2006.

contribution of agriculture to the GDP is still around 37 percent. Domestic saving and investment amount to about 27 percent and 35 percent of GDP, respectively.<sup>1</sup> In 2004, the economy grew 7.7 percent, and growth was broad-based, with expansion in the industry, construction, and services sectors. Analysts surmise that this expansion may have been fueled by the government's acceleration of its privatization efforts and its moves to restructure the financial sector. Prospects of accession to World Trade Organization (WTO) may have motivated the government and the body politic to pursue the reforms, since such accession offers good prospects for the economy.<sup>2,3</sup>

*An analysis by the IMF in January 2005 projected that Vietnam's economic growth would remain strong in 2005 and beyond, with real GDP growing at about 7 percent per year.<sup>4</sup> The IMF cautioned that the realization of that outlook would depend on continued progress in private sector development and structural reforms, especially in the areas of state-owned banks and enterprises, and the WTO accession process, which is essential for sustained strong export growth.*

### Energy Resources

*Vietnam is moderately well endowed with natural resources. Its hydropower potential exceeds 17,000 MW, and its proven high-quality coal reserves are estimated at 165 million metric tons. Its proven natural gas reserves amount to 6.8 Tcf, but soon it may be proved to exceed 10 Tcf. Its proven oil reserves are believed to exceed 600 million barrels.<sup>5</sup> The northern part of Vietnam is rich in hydro and coal resources, while the southern part is rich in oil and gas resources. The central region has a small amount of hydropower capacity. Because hydropower delivers nearly 40–50 percent of the total electricity produced, the supply side has a seasonal and regional character. Hydropower is a particularly dominant source of energy in the north. In wet seasons, hydropower is transferred from the north to the south. In the dry seasons this flow is reversed, with thermal power generated from the natural gas-fired units in the south meeting part of the energy needs of the north. A strong north–south transmission link enables these electricity flows.*

### Generation Assets

*The installed generating capacity, which was around 100 MW in 1954, was expanded to about 11,340 MW by the beginning of 2005. Of this, a capacity of 2,518 MW (or 22 percent) was with independent power producers (IPPs), and the balance of 8,822 MW (or 78 percent) was in the public sector. Of the capacity in the public sector, 47 percent was hydroelectric, 33 percent was gas-fired, 14 percent was coal-fired, and the rest was fired by fuel oil and diesel. The IPP units were mostly gas-fired. At the end of 2000, the system had a total installed power generation capacity of 6,195 MW (including two IPP plants with a total capacity of 425 MW), of which about 53 percent was hydroelectric and the rest were fossil fuel-fired thermal plants. The available capacity was estimated at 5,814 MW, which met a peak demand of 4,890 MW.<sup>6</sup> Thus, during 2000–04 the capacity nearly doubled, and the share of hydropower capacity fell, indicating a more rapid expansion of gas-fired capacity, as well as an increase in the IPP capacity. The peak demand in 2004 was about 8,300 MW compared to an installed capacity of about 11,340 MW. Despite this, the actual available reserve margin for the power system proves very thin in years of drought (such as 2004), especially during the summer, because of poor water flow in the rivers and into the reservoirs. Rolling power outages take place in such years.*

### Network Assets

*The transmission and distribution systems of the country have grown rapidly during the last decade as they try to keep up with rapidly growing electricity demand. The interconnection in May 1994 of the north and south networks, with a 1,500 km long 500 kV line, contributed to the improvement of the power supply in the south. The second circuit of this important transmission line is about to be completed. In addition, a second 500 kV north–south transmission line is also under construction.*

*Electric power transmission is provided at the high-voltage network at 500 kV, 220 kV, and 110 kV levels, and distribution is provided at the medium-voltage*

<sup>1</sup> The investments rose to 38.9 percent of GDP in 2005.

<sup>2</sup> The accession to WTO appeared likely to take place in 2006.

<sup>3</sup> The economic background section draws heavily from World Bank (2006).

<sup>4</sup> IMF 2005.

<sup>5</sup> See EIA 2005. The reserves data are very conservative. Substantial new deposits of oil, gas, and coal are being discovered in ongoing explorations. The ADB mentions a substantially larger resource base (see ADB 2005).

<sup>6</sup> ADB 2003.



**TABLE I-2. Electricity Transmission Assets**

VOLTAGE LEVEL	TRANSMISSION LINES (km)	TRANSFORMER CAPACITY (MVA)
500 kV	2,469	4,050
220 kV	4,794	11,190
110 kV	9,820	14,998
<b>Total</b>	<b>17,083</b>	<b>30,238</b>

Source: EVN website.

**TABLE I-3. Breakdown of Electricity Consumption by Sector, 2004**

SECTOR	CONSUMPTION (TWh)	SHARE OF TOTAL (%)
Industry and Construction	17.89	45.2
Households	17.61	44.5
Agriculture & Forestry	0.55	1.4
Commerce & Services	1.79	4.5
Others	1.75	4.4
<b>Total</b>	<b>39.59</b>	<b>100.0</b>

Source: EVN website.

network at 35 kV, 22 kV, 10 kV, and 6 kV. The low-voltage supply is at 220 volts. The size of the transmission assets can be gauged from table I-2. In 2004 there were 115,308 km of medium-voltage lines and 109,199 km of low-voltage lines. The total medium- and low-voltage transformer capacity amounted to about 28,604 MVA.

*Network losses are reportedly high, but not excessive.* Progress was made in lowering losses from 22.5 percent in 1995 to 15.6 percent in 1998 and to 13.4 in 2003. The losses in 2004 were reported at 12.09 percent, but were probably somewhat understated. The losses are mostly related to technical reasons and can be reduced only by further distribution network rehabilitation and reinforcement. Nontechnical losses in the form of theft and illegal connections form only a minor part of these losses.

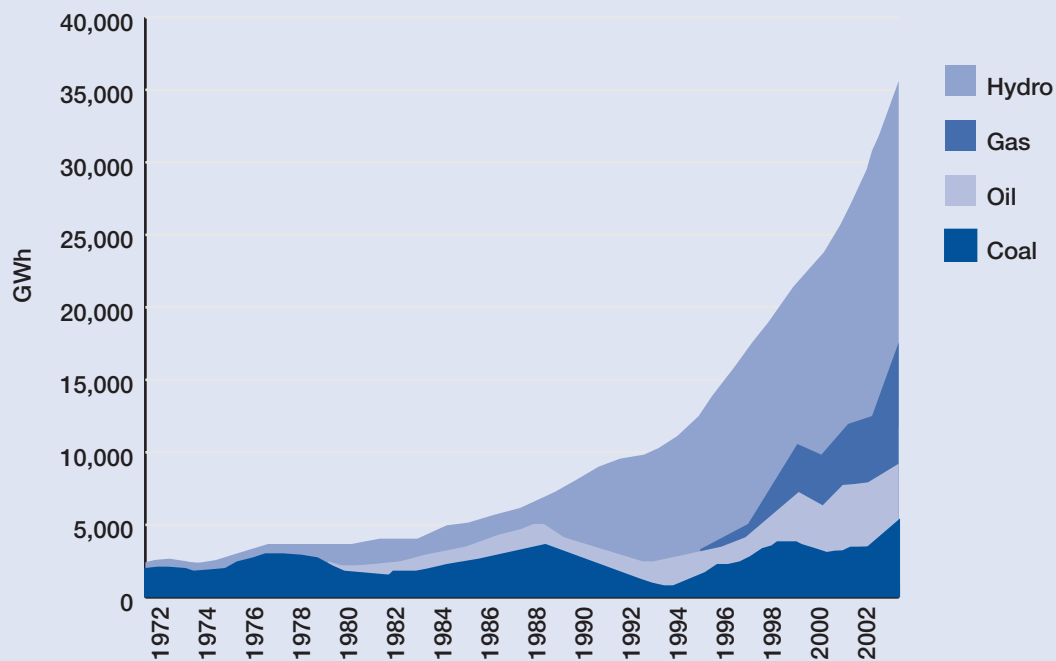
*Electricité du Vietnam (EVN) is making large new network investments with its own funds and with support from various donor agencies.* EVN has already converted most of its old 66 kV lines into 110 kV lines and is working to gradually harmonize the medium-voltage network to 22 kV. It has also started moving the overhead systems underground in major cities, such as Hanoi and Ho Chi Minh City.

### Electricity Demand

*Vietnam's per capita annual electricity consumption at around 497 kWh is about half the average for all East Asia and Pacific countries.* Electricity demand grew by an average of 15 percent per year during 1995–2004 at a rate nearly twice the GDP growth rate. This is not uncommon among countries that start from a very low base. Furthermore, the economy is undergoing a structural change from an agricultural base to one that is more industrial, with the concomitant increases in energy intensity. Industry (including construction) and households accounted for the biggest shares of electricity consumption in 2004. The combination of these two consumer categories make up nearly 90 percent of total electricity consumption in Vietnam (see table I-3).

*Access to electricity by household has increased from 51 percent in 1996 to more than 80 percent by 2003.* Still there were about 3.5 million households (about 16 million people) without access to electricity. By the end of 2005 EVN reported in its website that 97.95 percent of the provinces, 95.9 percent of the communes, and 90.4 percent of the households had been electrified.

FIGURE I-1. EVOLUTION OF GENERATION FUEL MIX, 1972–2002



Source: International Energy Agency 2004.

### Electricity Generation

Gross power generation had increased from 8.7 TWh in 1990 to about 46.4 TWh in 2004, an annualized growth rate of about 12.7 percent. By December 2005, electricity output exceeded 53 TWh, amounting to a year-on-year increase of 14.2 percent. Hydropower's share in total electricity generation reached 75 percent in the mid-1990s, but has been declining since then with the growing use of natural gas for power generation (see figure I-1). The share of hydropower in 2004 fell to 38.2 percent, and the rest came from fossil fuel-powered plants. In December 2004 Vietnam started buying electricity from China (about 100 GWh in 2005) to meet increased demand in the north. In the future, Vietnam may also import power from Cambodia and Laos, so the related transmission links are being strengthened. A Vietnamese state-owned construction corporation (Song Da), EVN, and four other Vietnamese state-owned corporations have formed Vietnam-Laos Electricity Development and Investment Joint Stock Company to construct on a build-operate-transfer (BOT) basis Sekaman-3 hydropower project in Laos with an installed capacity of 250 MW at

an estimated cost of US\$274 million. The construction commenced in April 2006, and the commercial operation of the units is scheduled for 2009. Vietnam expects to import at least 0.98 TWh of energy annually from this source in Laos. This company is also conducting a feasibility study for Sekaman-1 project with a capacity of 460 MW.<sup>7</sup>

### Electricity Prices

Retail electricity tariffs are uniform across the entire country. Electricity tariffs were developed until recently by the vertically integrated state-owned power company EVN, reviewed by the Ministry of Industry and the State Planning Committee, and finally approved by the prime minister. Electricity tariffs had been increased several times since 1992 to meet the cost of supply and to produce adequate net internal resources to finance about 30 percent of the capital costs of system expansion, while maintaining the debt service ratio and debt-to-equity ratio at healthy levels. The weighted average retail price of electricity in 2004 amounted to

<sup>7</sup> *Power in Asia*, Issue 451, dated April 13, 2006.

5.1 cents/kWh excluding a VAT of 10 percent. Average price for private producers is around 4 cents/kWh. Average retail prices may have to be raised by 2007 and again by 2010 moderately by about 6 percent (based on the current exchange rates) to maintain the self-financing ratio, debt service ratio, and debt-to-equity ratio of EVN at the present healthy levels. As in many developing economies, the residential consumers are cross-subsidized by industrial and commercial consumers. Although the levels of average tariff are adequate, the structure needs reform to reflect cost of supply to the various classes of consumers. Further, the bulk supply tariff adopted by EVN to sell power to the nine distribution companies is governed by the obligation of these companies to maintain healthy financial ratios based on the countrywide uniform retail tariffs rather than on actual costs of supply to each distribution entity.

### **Institutional and Regulatory Framework**

*The Ministry of Industry oversees the power sector and has the primary responsibility for policy and planning.* Its responsibilities since May 2003 include the following:

- *Organizing, directing, and monitoring implementation of the country's national energy policy, including the development of nuclear power, new energy, and renewable energy.*
- *Preparing a power system master plan (in collaboration with the Ministry of Planning and Investment and EVN in order to guide and manage investments in the sectors.*
- *Approving and monitoring the master plans of the provinces and cities.*
- *Reviewing electricity tariff proposals and submitting them with recommendations to the prime minister's office for approval.*
- *Preparing regulations on network and equipment safety and submitting them to the government and the prime minister's office.*

*EVN is the vertically integrated state-owned corporation that generates, transmits, distributes, and sells electricity.* Established in 1995 as a state-owned corporation under the State Enterprise Law, EVN is the dominant electric

power provider in the country, operating a majority of the power plants, as well as the transmission system. EVN is responsible for executing the power system plan developed by the Ministry of Industry and for implementing the investment programs in the electricity sector either by itself or through joint ventures. EVN operates the transmission and subtransmission system for the entire country. The distribution systems in all major urban areas and some rural areas are operated by the subsidiary distribution companies of EVN (called PCs).<sup>8</sup> EVN is organized as a general company with a series of wholly owned subsidiary companies for generation, transmission, and distribution. Three of the nine distribution subsidiaries cover the north, central, and south regions, and the remaining six cover major urban areas Hanoi, Haiphong, Ho Chi Minh City, Dong Nai, Ninh Binh, and Hi Duong. EVN's subsidiaries also include those for load dispatch, consulting, and telecommunications.<sup>9</sup> The consultancy services provided by the company include survey, investigation, and design and construction supervision for various in generation and high-voltage distribution projects. Low-voltage distribution in rural areas is primarily the responsibility of provincial authorities, and is undertaken by about 8,800 rural communes, of which only 19 percent are supplied directly by the power companies of EVN. The Ministry of Science Technology and Environment is the agency in charge of implementing the Master Plan for Energy Conservation and Energy Use Efficiency.

*In October 2005 the Electricity Regulatory Authority of Vietnam was established as a unit of the Ministry of Industry in the context of sector reform, unbundling of the sector, and the proposed gradual move toward competitive markets.* Its primary concerns for the present are to develop tariff setting methodologies and recommend tariff schedules.

### **Finances**

*Based on the consolidated financial statements of EVN and its subsidiaries, EVN had been operating as a profitable entity during the entire decade (see table I-4).* Its operational efficiency is notable. It had been able to contain its system loss levels to about 12 percent by 2004, and its accounts receivables are maintained at approximately 20 days' sales equivalent. Its average tariffs had been adjusted to make up for changes in its cost structure and exchange rate. Its revenues had been adequate to finance 30–40 percent of the capital costs of the massive system expansion it has carried out after

<sup>8</sup> In most rural areas, EVN provides a medium-voltage connection to the commune center, and the local commune mobilizes funds and installs low-voltage distribution to households and others in the commune. These are rudimentary systems with high loss levels and low reliability. The end-user tariff in such areas is exempt from uniform national tariffs and is often substantially higher than the national urban residential tariff. Technical losses in such rural systems are not captured in EVN's system loss statistics.

<sup>9</sup> In addition, EVN has subsidiary enterprises for noncore activities, such as telecoms (including a mobile telephone company).

**TABLE I-4. Financial Performance of Electricité du Vietnam**

INDICATOR	1996	1997	1998	1999	2000	2001	2002	2003	2004
Average revenue cents/kWh	4.7	4.9	4.5	4.6	4.8	4.6	4.5	5.1	5.1
Average revenue dong/kWh	516	566	595	645	675	678	687	790	800
Debt-to-equity ratio	11:89	18:82	34:66	41:59	47:53	50:50	50:50	53:47	55:45
Debt service ratio (times)	13	31	37.7	8.6	2.6	1.6	3.6	3.4	3.7
Self-financing ratio (%)	51	30	26	34	42	26	42	49	55
Operating margin as % net sales	26	11	13	16	12	10	12	12	13
Return on average net fixed assets (%)	..	1.9	3.6	3.3	2.1	3.7	4.4	4.4	3.7

Source: World Bank 2004b and 2005.

meeting its operational expenses and debt service obligations. Its operations are carried out with no notable explicit subsidy from the government.

*In the early days following its establishment in 1995, EVN's fixed assets were largely financed from government equity, without incurring any significant long-term debt. This financing arrangement changed over time. Between 1996 and 2000, foreign loans reportedly provided the largest proportion of EVN's total investment, averaging 54 percent. The company's own funds and other sources accounted for 28 percent, while domestic credit lines accounted for 18 percent of the total investments.<sup>10</sup>*

*EVN has been successful in establishing a corporate culture and commercial orientation, especially in the recent years. Its financial accounts are strictly separate from the government budget, and EVN receives no government subsidy for its investments or operations, except for resettlement expenses related to a few multipurpose hydropower projects. It faces commercial terms for most of its borrowings.<sup>11</sup>*

*On account of its operational efficiency and prudent financial performance, EVN had been able to attract significant amounts of official development assistance by way of loans and grants from various international financial institutions, including the World Bank and Asian Development Bank (ADB), and from bilateral foreign aid sources, especially from France, Japan, Sweden, and a*

*range of other OECD countries.<sup>12</sup> On the strength of its balance sheet, it had also been able to raise lines of credit from the local state-owned commercial banks.*

*The government's policy is to refrain from making any new equity contributions to EVN, except for socially oriented projects, such as rural electrification, and to make EVN financially autonomous. This has led to a better leveraging of the assets and a steady rise in the debt-to-equity ratio from 1996 to 2004. Given the industry practice, EVN still has head room to borrow, since the debt-to-equity ratio in the power sector can go up safely to 70:30, provided the borrowing is on prudent terms. It is interesting to note that EVN launched a domestic bond issue of D 350 billion (US\$22 million) in March 2006 with a term of five years and an initial coupon rate of 9.6 percent. From the second year onward, the interest will be adjusted to be 1.2 percent higher than the average of the rates offered by the four large Vietnamese banks.<sup>13</sup> The proceeds will finance part of the investment program for 2005–10.*

### **Evolution of the New Strategy for the Sector Investments**

*Given the economic dynamism of the country, demand for electricity is growing even faster than in the past. Demand growth through 2010 is projected at around 15 percent per year and at a slightly lower rate thereafter*

<sup>10</sup> U.S. Commercial Service 2003.

<sup>11</sup> For further details, see World Bank 2006b.

<sup>12</sup> The Japan Bank for International Cooperation (JBIC) had been the biggest lender, followed by the International Development Association (IDA) and ADB.

<sup>13</sup> *Power in Asia*, Issue 450, dated March 30, 2006.

**TABLE I-5. Expansion Targets for Generation Capacity**

GENERATION CAPACITY BY FUEL	INSTALLED GENERATION CAPACITY (MW)		
	1996	1997	1998
Hydro	4,199	8,601	12,519
Gas- and/or oil-fired	4,350	6,724	12,467
Coal-fired	1,205	4,965	5,560
Diesel-fueled	202	345	346
<b>Total</b>	<b>9,956</b>	<b>20,636</b>	<b>30,892</b>

Source: World Bank documents.

through 2015. To meet this demand in a reliable manner, the generation capacity needs to become nearly three times larger than at present. Government plans envisage generation capacity increases, as shown in table I-5. Corresponding transmission and distribution investments would be needed to deliver the additional power to the customers. It has been estimated that annual investments of the order of US\$1.5–2.0 billion will be needed through 2010.

*The government realized that it would be difficult to put through a system expansion of this order in the given time frame on the basis of reliance on official development assistance alone and with EVN as the only player.*

The domestic banks have already exhausted their lending limits in relation to EVN (about 15 percent of their legal capital).<sup>14</sup> It therefore decided to open power sector investments to other players. A target of 20 percent of the total capacity was set for construction by adopting the BOT for the period 1997–2005. It has largely succeeded in this. Overall, the government decided the following:

- *To encourage the establishment of IPP-type generation projects on the basis of BOT, build-own-operate (BOO), and build-transfer-operate (BTO).*
- *To encourage EVN to form joint ventures with other enterprises producing coal, oil, or gas to establish such IPPs.*
- *To encourage foreign-funded IPPs prudently.*
- *To authorize EVN to sell minority shares in its generation and distribution subsidiaries (a process called equitization) to generate cash to finance new investments.*

*In addition, the government enacted a new Electricity Law (2004), unbundled EVN by function, and introduced initially a market structure under which EVN (primarily responsible for transmission and load dispatch) would act as a single buyer and purchase all the generated electricity from all the generating units in the country (whether state-owned or IPP-owned) and sell it to the distribution entities on the basis of regulated prices or contracted prices, as the case may be.* This structure has enabled the entry of the above range of investors in generation. In stages, the structure will evolve into a market where there will be multiple generators and multiple distribution companies, and large buyers would be buying and selling electricity in the wholesale market on the basis of competition. Regulatory authority would also evolve in a manner to support and oversee these developments.

*In a move with a focus broader than the electricity sector, the government enacted several laws in 2000 to attract foreign investors by facilitating business activities in the country.*<sup>15</sup> The laws provided incentives to foreign investors through a number of measures, including import tariff exemption and reduction, as well as reduced withholding tax rates, and allowed 100 percent foreign-owned enterprises to invest in the country. These incentives were accompanied by a reaffirmation that foreign investors would continue to enjoy those benefits even if changes were made in the Vietnamese laws. A list of IPP projects thus developed is given in table I-6. With Phu My 3 becoming operational in March 2004, the installed generation capacity under private operation reached 2,239 MW.<sup>16</sup> The development of all these projects relied on the provision of government guarantees.<sup>17</sup>

<sup>14</sup> For example, in respect of the 280 MW Buon Kuop Hydropower Project costing US\$290 million, four domestic banks have lent to EVN US\$133 million (12 year term including 4 years of grace). See *Power in Asia*, Issue 438, dated October 13, 2005

<sup>15</sup> Some of these laws have been replaced by the Unified Law on Investment (2005).

<sup>16</sup> The EVN website, however, gives the total IPP capacity at the end of 2004 as 2,518 MW.

<sup>17</sup> The Phu My 2.2 project was financed under a World Bank Partial Risk Guarantee, which backstopped government guarantees to the project sponsors' lenders. The Phu My 3 project was financed by the sponsors and commercial borrowing.

**TABLE I-6. Private Participation in Power Generation, 2004**

PROJECT NAME	TYPE OF PPI	CAPACITY (MW)	FINANCIAL CLOSURE YEAR AND CONTRACT PERIOD		FUEL	MODEL	TOTAL INVESTMENT (US\$ MILLIONS)	% PRIVATE
			PERIOD	PERIOD				
Amata Power Bien Hoa Ltd.	Greenfield	20	1997	30 years	Diesel	BOT	110	100
Can Don	Greenfield	72	1999	25 years	Hydro	BOT	81	100
Hiep Phuoc Power Company	Concession	675	1996	50 years	Diesel	ROT	205	70
Phu My 1 Power Plant	Greenfield	40 (?)	1999	20 years	Natural Gas	BOT	39.5	100
Phu My 2.2 (with partial risk guarantee from ADB)	Greenfield	715	2002	20 years	Natural Gas	BOT	480	100
Phu My 3 (with MIGA cover)	Greenfield	717	2003	23 years	Natural Gas	BOT	412	100

Source: World Bank 2004a.

**TABLE I-7. The Phu My Complex**

PLANT	CAPACITY	DETAILS
Phu My 1	1,090 MW	Three 240 MW gas turbines and one 370 MW steam turbine
Phu My 2.1	450 MW	Two 145 MW gas turbines and one 160 MW steam turbine will be extended by two more 138 MW gas turbines
Phu My 2.2	720 MW	Two 280 MW gas turbines and a 160 MW steam turbine
Phu My 3	720 MW	Two 235 MW gas turbines and one 250 MW steam turbine
Phu My 4	440 MW	Two 145 MW gas turbines and a 150 MW steam turbine

Source: Power Engineering International 2003.

An important area of development is the Phu My complex in the southeastern part of the country. This complex, supplied by the natural gas from the Nam Con Son offshore field, will be the host to a big part of the country's installed capacity, when all projects are completed (see table I-7). The other two major evolving power complexes are at Nhon Trach and O Mon. The development of natural gas-fired plants in these complexes would help to offset Vietnam's heavy reliance on hydropower.

The Deputy Minister of Industry announced in September/October 2005 that the government would encourage local private enterprises to invest in 14 IPP power generation projects (a total of 10,000 MW) and encourage foreign investors in seven BOT projects (a total of 11,000 MW).

The private sector would be encouraged to invest in power distribution segment also.<sup>18</sup>

An example of the joint venture mode of constructing an IPP power station is the new 600 MW coal-fired power station in Hai Phong by a joint venture in which ENV holds 77.5 percent, Vietnam Coal Corporation 10 percent, Vietnam Machinery Installation Corporation 5 percent, Vietnam Exim-Bank 5 percent, and Vietnam Insurance Corporation 2.5 percent of the shares. It will cost US\$640 million and produce 3.6 TWh of electricity annually, and is expected to be commissioned by 2007. On reaching commercial production, an initial public offering (IPO) would be issued to recoup part of the investment.<sup>19</sup> Another example would be the 2,640 MW

<sup>18</sup> *Power in Asia*, Issue 438, dated October 13, 2005.

<sup>19</sup> *Power in Asia*, Issue 434, dated August 4, 2005.

gas-fired combined cycle plant at Nhon Trach, which is being developed by a joint venture among EVN, PetroVietnam, and the United Kingdom's BP Exploration Operating Company in Vietnam.

*Equitization program commenced with the sale of 35 percent of the shares in two hydroelectric power stations (Vinh Son—60 MW and Song Hinh—70 MW) in March 2005.* This raised US\$29.5 million from 215 individual and institutional investors. Another 5 percent of the shares were sold to the employees, and EVN retained the 60 percent share and management operational control. Similar sales of shares in the electricity distribution business in Khanh Hoa province brought in another US\$1.3 million.<sup>20</sup> Encouraged by these sales, EVN is pursuing the sale of minority shares (49 percent) in five more hydropower stations (total 905 MW), three coal-fired stations (total 1,240 MW), and one gas-fired thermal plant (380 MW). EVN will retain 51 percent of the shares.<sup>21</sup> While privatization of EVN as a whole is not envisaged, an equitization program involving the sale of up to 49 percent of the shares in various generating and distribution companies would be pursued by prudently timing the sale. A substantial portion of the distribution companies are expected to be equitized in 2006–07.<sup>22</sup>

### Rural Electrification Challenges

*By the end of 2005 EVN reported in its website that 97.95 percent of the provinces, 95.9 percent of the communes, and 90.4 percent of the households had been electrified.* Of the 8,524 communes that have access to power, 2,913 communes are directly served by EVN, and the rest are clients of local power service cooperatives or state-owned enterprises.<sup>23</sup> Rural areas are served by electricity management systems in the form of power service cooperatives, multiservice cooperatives, district or commune level private enterprises, and private entrepreneurs organized at the commune or province level. The majority of the communes are served under the power service cooperative model. The Ministry of Industry and EVN have been providing support to the cooperatives, assisting with accounting and other basic required skills, and organizing training camps for members of cooperatives. In most cases, EVN provides a medium-voltage connection to the commune center and local organization constructs and handles the low-voltage distribution to the consumers. These systems provide rudimentary initial connections to the local population, usually with a low quality of service, including low voltage

and poor reliability, and often at residential electricity price levels significantly higher than the national uniform residential tariffs in urban areas. The challenges to achieving a more satisfactory and widespread rural service include a lack of resources, institutional capability, and the ability of the people to pay, apart from the inherent problem of low density of demand applicable to rural load all over the world.

*In 2004 Vietnam's prime minister outlined plans to extend the power grid and to provide access to all communes and rural areas in the country by 2010.* The World Bank and other donors are providing substantial assistance to the government in this regard.

### Conclusion

*Vietnam was chosen for the case study because of the high economic growth rates and the high electricity demand growth rates experienced over the last 10–15 years and the even higher growth rates forecast for the coming decade.* Vietnam has demonstrated that despite being a low-income country, it can successfully meet such rising demand because of the following:

- *The high levels of operational and financial efficiency maintained by its power utility EVN.* It contained the system losses at around 12.5 percent, and its low accounts receivable level (of about 20–30 days' sales equivalent) attests to its high billing and collection efficiency. Throughout the period, EVN had been able to meet its full operational expenses and debt service obligations and still produce internally generated cash adequate to finance 30–40 percent of the system expansion costs.
- *The high levels of operational and financial efficiency of EVN that enabled it to access a significant amount of official development assistance and domestic bank credit for its capital expenses.*
- *The ability of the government to adapt to changing circumstances by a change of its policy stance.* When it became clear that the rapid growth in demand called for massive capacity additions in a short time frame, the government adopted an approach to enable the entry of domestic enterprises and foreign private investors into the power sector and undertook sector reform and reforms to the investment regimes to enable such entry.

<sup>20</sup> This was actually a provincial branch of the distribution company PC3.

<sup>21</sup> *Power in Asia*, Issue 434, dated August 4, 2005.

<sup>22</sup> *Power in Asia*, Issue 438, dated October 13, 2005.

<sup>23</sup> *Vietnam Economy Times* 2005.

- *The ability of the government and the utility to work in a cohesive and coordinated manner, which helped to overcome possible institutional weaknesses.*

*Human resources appear to be a major strength of EVN. Successive boards of directors, management, and staff of EVN appear to be important components of the success of the sector. They clearly appear to have brought enthusiasm and commitment to their jobs, along with a good understanding of the operation of their sector and a ready access to data and analytical work. The critical challenge is to put in place the regulatory system that will encourage further private investment in generation and distribution, which will enable further efficiency gains.*

*Although the private sector investments have helped EVN considerably, it has done so at a cost. The market risk remains with the government, which faces considerable contingent liabilities. Given the relentless rise in demand and the prudence exercised in contracting new capacity under government-guaranteed BOT arrangements, this risk may not prove onerous. To date, electricity prices have been adequate to cover costs, but the margins would become thin as the share of power purchased from IPPs rises.<sup>24</sup> The questions that will be interesting to follow as Vietnam goes forward are (a) the assignment of risks, presumably gradually moving away from the government to private investors; and (b) the need to address both financial viability of the sector initially through regulated tariffs and later through competitive wholesale market, while protecting the poor through targeted safety nets.*

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<sup>24</sup> This share which was about 13 percent in 2004 and is expected to rise to 33 percent by 2010.



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