INTER-AMERICAN DEVELOPMENT BANK

Market or State?

Three Decades of Reform in the Latin American Electric Power Industry

JAIME MILLÁN

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Jaime Millán

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Jaime Millán retired at the end of 2005 from the IDB where he worked as Principal Energy Economist in the Infrastructure and Financial Markets Division of the Sustainable Development Department.

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Foreword

The efficient and reliable provision of electricity services, which goes hand in hand with national economic development and addressing the basic needs of the population, has been on the list of priorities of all Latin American and Caribbean governments since the service was first started at the close of the 19th century. As a result, this has also been a top priority of multilateral development organizations, particularly the IDB. Since its creation, the IDB has allocated about US$20 billion, or 14 percent of its total loans, to the electric power industry, making it one of the sectors that has received most attention.

The history of the electricity sector and of the Bank's support for the last 46 years is marked by a constant search for an organizational model able to remedy the shortcomings of the prevailing one. The boom of the entrepreneurial State that began in the 1950s came about in response to the private sector's failure to expand the service. Similarly, the reforms of the 1990s resulted from the State's inability to finance the expansion needed and the lack of incentives for government-owned companies to provide efficient and good quality services. In view of the difficulties of the recent reforms, many people would like to see them rolled back, ignoring the lessons learned and repeating the errors of the past. It would be a very serious error to allow ideological considerations to exert pressure for such a return to the statist model without first reflecting on the reasons for its failure. Likewise, it would be equally costly to continue the reformist model without reflecting on the reasons for its disappointing performance.

In this book, Jaime Millán explains why the State vs. market approach is a false dichotomy in the case of the electric power industry. Despite the apparent simplicity of the message, the author refrains from establishing a simple formula that defines the correct mix of State and market given the diversity of resource endowments, institutional development, and political circumstances in each country.

The information and reflections presented are the result of many years' experience in the sector by someone who had the good fortune of watching the development and performance of alternative models from the privileged vantage point of the IDB. Above all, this book is an invitation to let go of preconceived ideas and optimistic expectations that do not match

the realities of the countries, and replace them with a dispassionate analysis of specific conditions, bearing some fundamental principles in mind. It is clear that there are no universal solutions, but there certainly are specific solutions. There is no shortcut to finding solutions; it requires hard work and a critical analysis of previous experiences. Moreover, those solutions are not to be found in oversimplified academic models or ideological prescriptions. The search for solutions requires the application of fundamental principles to the economic, political and social reality of our times, incorporating the lessons learned as part of an ongoing process in a changing environment. Also important is the application of the new information technologies to improve efficiency and effectiveness. Finally, it is important to avoid extremes.

With this publication, the Inter-American Development Bank wishes to contribute to the search for solutions that will lead to the stable development of the electricity sector, which is a mainstay of national competitiveness.

Antonio Vives
Manager
Sustainable Development Department

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Antonio Vives, manager of the Sustainable Development Department, suggested the idea for this book and permitted me to adapt my workload during my last year of tenure at the Bank in order to concentrate on writing it. Most of the ideas discussed are the product of reflection and dialogue with colleagues in the Bank, experts in the electricity sector in the countries of the region, and academic consultants with whom I have had the opportunity to share ideas. In the Bank, Juan Benavides, Gonzalo Arroyo, Eduardo Lora, Carlos Trujillo and Roberto Manrique were members of the same discussion group and colleagues in the endeavor. I have a debt of gratitude to all my colleagues, including those with whom I disagreed. Consultants Frank Wolak, Ashley Brown, Nils von der Fehr, José Manuel Mejía, Alberto Brugman, Mario Pereira, and Manuel Dussan enriched my understanding of the sector. Manuel Dussan read the manuscript in its totality and Eduardo Lora read some chapters; both of them made valuable comments that contributed to improving its coherence and correcting errors. Gabriel Dobson translated into English the Spanish original and Graciela Testa patiently and thoroughly edited both the Spanish and English versions to make them readable. My thanks to all of them; however, I am solely responsible for any errors and omissions. Finally, my wife Luz María put up patiently with the negative externalities that a work of this nature produces.

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Acronyms

Acronyms appear in their original language; they have been translated into English where appropriate. The names of companies have been generally left in the original.

AAA	Acueducto y Alcantarillado de Barranquilla (Colombia)
ABRACEEL	Associação Brasileira dos Agentes Comercializadores de Energia Elétrica (Brazil)
ACAP	Available capacity
ACL	Free contracting environment (Brazil)
ACOLGEN	Colombian Generators Association (Colombia)
ACR	Regulated contracting environment (Brazil)
AMP	Automatic mitigation of market power (United States)
ANDA	Administración Nacional de Acueductos y Alcantarillados (El Salvador)
ANDE	Administración Nacional de Electricidad (Paraguay)
ANEEL	National Electric Power Agency (Brazil)
ARENA	Republican National Alliance (El Salvador)
ASIC	Trading System Administration (Colombia)
BNDS	National Development Bank (Brazil)
BOO	Build, own, operate
BOT	Build, operate, transfer
CADAFE	Compañía Anónima de Administración y Fomento Eléctrico (Venezuela)
CAESS	Compañía de Alumbrado Eléctrico de San Salvador (El Salvador)
CAMMESA	Compañía Administradora del Mercado Mayorista Eléctrico (Argentina)
CC	Capacity charges
CCEE	Electric Power Reselling Bureau (Brazil)
CEE	Equivalent power cost (Colombia)
CEL	Comisión Ejecutiva Hidroeléctrica del Río Lempa (El Salvador)

CEMIG	Companhia Energética de Minas Gerais (Brazil)
CERJ	Companhia Energética do Rio de Janeiro (Brazil)
CFE	Federal Electricity Commission (Mexico)
CHB	Central Hidroeléctrica de Betania (Colombia)
CHEC	Central Hidroeléctrica de Caldas (Colombia)
CHESF	Companhia Hidro Elétrica do São Francisco (Brazil)
CMO	Marginal operating cost
CMSE	Electric Power Industry Monitoring Committee (Brazil)
CNC	National Marketing Council (Colombia)
CND	National Dispatch Council (Colombia)
CNE	National Energy Commission (Colombia)
CNO	National Operations Council (Colombia)
CNPE	National Energy Policy Council (Brazil)
CODENSA	Colombian distributor
COELBA	Companhia de Eletricidade do Estado da Bahia (Brazil)
CONPES	Economic and Social Policy Council (Colombia)
COPEL	Companhia Paranaense de Energia (Brazil)
CORELCA	Corporación Eléctrica de la Costa Atlántica (Colombia)
CPC	Capacity charges (Colombia)
CRC	Compensation income statement (Brazil)
CREG	Energy and Gas Regulatory Commission (Colombia)
CRT	Theoretical reimbursable capacity (Colombia)
CVC	Corporación Regional del Valle del Cauca (Colombia)
DANE	National Statistics Department (Colombia)
DNAEE	National Water and Electric Power Department (Brazil)
DNP	National Planning Department (Colombia
DR	Residual demand
EBSA	Empresa de Energía de Boyacá, S.A. (Colombia)
ECOPETROL	Empresa Colombiana de Petróleos (Colombia)
EDELCA	Electricidad del Caroní (Venezuela)
EEEB	Empresa de Energía Eléctrica de Bogotá (Colombia)
EICE	Empresa Comercial e Industrial del Estado (Colombia)
Eletrobrás	Empresa Brasileira de Eletricidade (Brazil)
Eletronorte	Centrais Elétricas do Norte do Brasil (Brazil)
Eletrosul	Empresa Transmissora de Energia Elétrica do Sul do Brasil (Brazil)

EMCALI	Empresas Municipales de Cali (Colombia)
ENGESA	Empresa Generadora de Energía (Colombia)
EPE	Energy Research Enterprise (Brazil)
EMP	Empresas Públicas de Medellín (Colombia)
EPSA	Empresa de Energía del Pacífico (Colombia)
EPP	Empresas Públicas de Pereira (Colombia)
ESP	Public service companies (Colombia)
ETESAL	Empresa Transmisora Salvadoreña (El Salvador)
FAZNI	Financial Support Fund for the Electrification of Areas that Are Not Interconnected (Colombia)
FERC	Federal Energy Regulatory Commission (United States)
FINET	Electricity and Telephony Investment Fund (El Salvador)
FURNAS	Furnas Centrais Elétricas (Brazil)
GCE	Crisis Management Bureau (Brazil)
GERASUL	Centrais Generadoras do Sul do Brasil, S.A. (Brazil)
GTZ	German Technical Cooperation Organization (Germany)
IBAMA	Environment and Natural Resources Institute (Brazil)
ICAP	Installed capacity
ICE	Costa Rican Electricity Institute (Costa Rica)
ICEL	Colombian Electric Energy Institute (Colombia)
IDB	Inter-American Development Bank
IFI	International financial institution
IGPM	General market price index (Brazil)
IPCA	General consumer price index (Brazil)
IPE	Planning Institute (Brazil)
IPES	Economic and Social Progress Report (IDB)
IRP	Integrated resource planning
ISA	Compañía Interconexión Eléctrica, S.A. (Colombia)
JNT	Junta Nacional de Tarifas (Colombia)
LaGeo	Geotérmica Salvadoreña (El Salvador)
LGE	General Electricity Law (El Salvador)

LICAP	Locational installed capacity
MAE	Wholesale power exchange
MDB	Multilateral development bank
MEM	Wholesale power market (Colombia)
MINEC	Ministry of the Economy (El Salvador)
ML	Free market
MME	Ministry of Mines and Energy (Brazil and Colombia)
MRE	Power relocation mechanism (Brazil)
MRS	System regulating market (spot market) (El Salvador)
OECD	Organisation for Economic Co-operation and Development
OLADE	Organización Latinoamericana de Energía (Latin American Energy Organization)
ONS	National System Operator (Brazil)
OPEC	Organization of Petroleum Exporting Countries
PCH	Small hydroelectric (Brazil)
PPA	Purchasing power agreement
PPP	Purchasing power parity
PROINFA	Incentives Program for Alternative Sources of Electric Energy (Brazil)
PT	Workers' Party (Brazil)
REDI	Recent Economic Developments in Infrastructure (World Bank report)
RFC	Cold reserve for reliability (El Salvador)
SEGBA	Servicios Eléctricos del Gran Buenos Aires (Argentina)
SIC	Superintendence of Industry and Commerce (Colombia)
SIEPAC	Sistema de Interconexión Eléctrica para América Central (Central American Electric Interconnection System)
SIGET	General Electricity and Telecommunications Superintendence (El Salvador)
SMD	Standard market design (United States)

SSPD	Domiciliary Public Services Superintendence (Colombia)
UPME	Unidad de Planeación Micro-Energética (Colombia)
USAID	United States Agency for International Development (United States)
UT	Transaction unit (El Salvador)
VAD	Distribution value added (El Salvador)
VOLL	Value of loss load

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Introduction

The history of the electric power industry in Latin America has been a continuous search for a formula that would yield a reliable and efficient service, accessible to all. The difficulties that governments of all kinds have experienced in making this fundamental objective a reality remind me of a passage from the Portuguese poet Fernando Pessoa, in his *Book of Disquiet*, where he defines life as the search for the impossible through the useless. Although this observation may give the reader the impression that this volume provides a pessimistic message, this is not the case. Rather, by recognizing the difficulties encountered in implementing all types of models, it counsels caution and moderation in proposing reforms, and allows the identification of designs that, at a reasonable cost, reduce the likelihood of causing situations that invite governments to intervene for short-term motives.

The literature on the experience with reform of the electricity sector in the region and in the developed countries is abundant and varied, although not all is available in Spanish. The reader may well ask if yet another book is needed about this over-diagnosed industry. The persistent debate and the many difficulties encountered encourage me to present a personal view of the problems of the electric power industry in Latin America.

This is not a textbook that describes and analyzes in an orderly and didactic fashion the reform experience in the countries of the region, but rather, an investigation of the causes behind the difficulties faced by both the statist and market models over the last 50 years. Unlike the comparative analyses of the different models and the impacts of reform that are available in published studies, this book starts from the assumption that the reader has a basic knowledge of the issues and focuses on a critical analysis of the design and application of the models adopted in an effort

to identify shortcomings and causes of their failures, emphasizing the special conditions and peculiarities of each country.

During 35 years working in the Latin American electricity sector as a consultant, an official of a state utility, an academic in Colombia, and as an official of the Inter-American Development Bank, where I spent the last 23 years, I have witnessed the rise and fall of the State paradigm, its replacement by the market paradigm, and the frustration produced by the recognition of the difficulties in meeting the expectations raised. During all these years, I have gone through successive cycles of certainty and doubt, hope and frustration, which have led me to mistrust simplistic solutions and to have a certain respect for the complexity of reality, without falling into nihilism. As Camus would say, we have to imagine a happy Sisyphus.

My career began with great certainty. Only a lever and a fulcrum were needed to move the earth and we thought we had them. Everything was possible! Planning and project appraisal techniques in an environment of sustained economic growth left no room for doubt. Analytical instruments, such as stochastic dynamic programming and simulation models, could be used to analyze risks in hydroelectricity generation projects and find the least-cost construction sequence. By establishing rates that reflected marginal costs, we were then able to guarantee economic efficiency. However, this certainty was gradually eroded when I discovered the hand of politics at work and how difficult it was to make the planners' dreams a reality. Nevertheless, I continued to believe that it was sufficient to have the goodwill of technical experts and the support of well-intentioned politicians and good government. I did not then know the world of special interests and the power of incentives.

Later, once I began working at the IDB, I would find a champion of rationality that could help the countries of the region solve their problems by adopting the correct paradigm. My arrival at the Bank coincided with the Mexican crisis and the start of the so-called lost decade for Latin America, which had deep repercussions on the sector, including the suspension of major projects under construction due to lack of demand, electricity rates that did not cover costs, patronage practices and the slow deterioration of the management of state-run companies, and the increase in electricity losses. Thus, it was time to adapt our paradigm to the reigning circumstances. We talked about least-cost expansion under uncertainty and financial limitations, about the need for performance plans to control losses, and about placing stricter conditions on projects. Yet, even all these

ideas were not sufficient to meet existing conditions; deadlines had to be extended and financial rehabilitation programs had to be designed, which were never implemented. But, although our doubts were deep rooted, we still found ways of making excuses: politicians were always getting in the way when all we wanted was a better world. All the proof we needed was in the good performance of three or four companies in the region.

So I was surprised when, in the mid-1980s, the Chileans began to talk about competition and private sector participation. We reluctantly attended presentations at the World Bank where the advantages of these models were proclaimed. We knew that something was wrong with what we had, but we thought that the competition preached by the Chileans was not possible under current conditions in the sector, or without appropriate controls to prevent consumer abuse. These were difficult and painful days because we were being offered a solution that we did not understand, accompanied by an often overconfident market rhetoric. However, we could not offer any alternatives and our doubts kept growing. It was evident that the model that we were defending had run its course and become a very heavy burden for the region's economies. Little by little our resistance was eroded by our lack of arguments and the recognition that goodwill was not sufficient to counteract a system of incentives aligned in the wrong direction. This was the nadir of the cycle, when no one believed in the current model any longer, but there was little confidence in the alternative. A jolt was needed to encourage us to change our tired and emaciated horse for a new one.

And that jolt came with the avalanche of events in the early 1990s when the adoption of the market model by other countries, in addition to Chile, and the academic interest generated by the reforms of the British system as well as the regulatory issues involved convinced us that the problems were manageable. Progress in gas turbine technology and good market design would open the way for competition. A transparent regulatory framework and an independent regulatory agency, together with a system of regulation by incentives, would guarantee efficiency, while a system of targeted subsidies could ensure that the poorest enjoyed access to electricity services. The period that followed was one of achievement, although there were always problems to remind us how difficult it is to meet targets. Thus began a new phase of certainty. However, we had learned the lessons of the past and were more cautious and more ready to establish the necessary conditions. We were confident that, while difficult, the process

was manageable. We struggled against market fanatics who believed that the most advanced forms of competition were possible even in the smallest countries. We made headway, not without difficulty, until the crisis of the end of the twentieth century interrupted progress. Later, problems in California and the collapse in Argentina forced us once again to take stock. We now have the tools of political economy and the new institutional economics to begin to understand the difficulties that reforms go through. A new phase of doubt is beginning, but we are better prepared.

This book is an effort to put my thoughts in order and was motivated by the frustration of searching for solutions for the electric power industry and watching models become outdated (but always finding a good scapegoat for their obsolescence). We know that crises will always occur, and that it is difficult to create appropriate institutions. But this knowledge is not enough. This book is based on experiences and discussions with IDB colleagues, on recollections, documents and presentations from those times and readings on the political economy of the reforms and on institutional economics, to which I turned in an effort to explain the paradoxes I was noticing. It is also enriched by the criticisms that I received during my work and the hard confrontations with reality. It does not offer a solution as many wanted, but it does suggest some criteria that could make the road to the Promised Land, if it exists, less bumpy. The book has a connecting thread: the explanation for the failures of the various organizational models of the sector lies in the weakness of their implicit assumptions regarding the behavior of market agents, and in the difficulty that governments of all types have in designing coherent policies and applying them consistently over time, as well as accepting the commitments and the costs implicit in the model that is finally adopted.

The book is organized into three parts that analyze the experiences of the region with statist and market models and discuss in greater detail selected issues that are important in the current situation. The first part consists of a single chapter that describes the experience with the statist model. The general narrative is illustrated with more detailed descriptions of three countries (Brazil, Colombia and El Salvador) that cover the range of markets existing in the region. This chapter makes note of the achievements of the model, the expectations of the expansion plan, the difficulties in adjusting the electricity rates to accommodate current fads, and the weaknesses behind its assumptions, which ultimately led to its obsolescence. Companies that performed reasonably well are mentioned, but they

are the exceptions that prove the rule, and the analysis of the likely causes for their success is left for Chapter 6.

The second part, which is the most voluminous section of the book, consists of four chapters. Chapter 2 presents a general discussion of the elements and results of the reformist model in three key areas: the role of the State and private investment, competitive electricity markets, and the regulated segments; it also addresses the needs of the poor. Chapters 3, 4 and 5 describe in a similar way the reform experiences in Brazil, Colombia and El Salvador, although in much more detail than for the statist model in Chapter 1. Although all three countries opted for the market model, each chapter covers a different facet of the problem. Chapter 4 also includes details of the problems experienced in Colombia with targeted subsidies for the poorest sectors.

The third part includes three chapters that develop aspects of the market model in the region that are crucial for its future. Chapter 6 expands on the state/market dilemma and discusses the regional experience in light of recent contributions in the field of the political economy of reforms and institutional economics. Possible reasons are discussed for the success of some state companies in the region and why it is difficult to replicate this experience. Chapter 7 summarizes the ongoing academic discussion on the effectiveness of the various mechanisms that have been proposed to guarantee an adequate electricity supply in a competitive market. Chapter 8 analyzes some problems of the political economy of electricity rates to explain the persistence of a culture of nonpayment, which results in heavy electricity losses even in private companies, and how difficult it is for governments to resist the temptation of intervening in setting electricity rates. The chapter concludes with a discussion of the response to the needs of the poorest sectors, an aspect of particular importance if the reforms are going to be considered legitimate.

Some readers may wish that this work provided more solutions and fewer criticisms. However, I hope that I have provided a better understanding of the need for a critical attitude in order to push firmly ahead with reforms. Perhaps, as Pessoa says, we must search for the impossible because it is human nature to do so, and we do it through the useless because it is our only option. But we must remember that we will never find what we are looking for and that we must not yearn for the past.

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PART I

The Paradigm of the State as Entrepreneur

...According to this model (the helping hand), unbridled free markets lead to monopoly pricing, to externalities such as pollution, to unemployment... and to failed regional development processes. Solutions ranging from corrective taxes, regulations, price controls, government ownership and planning are then proposed to cure these problems.

...a helping hand economist is likely to see the problem as one of corporate governance, that is of market failure, rather than one of political governance, that is of government failure.

Andrei Shleifer and Robert W. Vishny
The Grabbing Hand: Government Pathologies and Their Cures
MIT Press, 1998

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Chapter 1

The State Paradigm

In the middle of the last century, electricity services in Latin America and the Caribbean were provided by private companies that served almost exclusively the most populated centers and had no incentives to supply power to remote areas where profitability was more doubtful. This failure led to the nationalization[1] of the service in almost all countries, and beginning in the 1950s, it drove state companies to undertake ambitious expansion plans to address increased demand resulting from economic growth and to expand coverage to all segments of the population. At first, these plans were limited by the funds available, but significant progress was made with help from multilateral banks, which helped legitimize the model.

The adoption of an entrepreneurial role by the state was considered necessary in view of the evident failure of the market to provide the resources for the desired expansion of the service, as well as the externalities implicit in the electricity supply technology, and the existence of economies of scale, which made the market paradigm of the invisible hand inapplicable. The new paradigm, appropriately named by Shleifer and Vishny (1998) "the helping hand" to distinguish it from the "invisible hand," became the dominant paradigm in the region beginning in the 1970s. Its proponents seemed to think that to implement this new paradigm all that was required was a properly trained bureaucracy employing the correct instruments: detailed planning of the expansion of electricity generation to obtain a least-cost sequence of power plant construction that took advantage of economies of scale through the interconnection of electricity systems; valuation of the costs and benefits at shadow prices to reflect

[1] For a detailed analysis of this period see Gómez Ibáñez (2003).

real opportunity costs to society; and rates that reflected the marginal cost of providing the service. This paradigm was based on the assumption that state bureaucracies would have sufficient incentives to find the right solutions for society, that they could access all the information necessary, and that they could adequately manage uncertainty. It was also assumed that mechanisms would exist to prevent governments from using the companies to achieve political objectives, such as increasing employment or controlling inflation, or that politicians would refrain from exploiting the opportunities for enrichment offered by the award of lucrative contracts. In short, they believed the problem was fundamentally technical and that it could be tackled by honest and patriotic officials working in the state companies with support from the multilateral organizations[2] (which would transfer technical expertise and provide incentives through loan conditionalities, thus achieving the efficient development of the sector and guaranteeing financial sustainability).

At the same time, the impact of the first oil crisis in 1973 and subsequent events emphasized the need to replace thermal with hydroelectric and nonconventional generation (such as geothermal), which were much more investment intensive.

During the 1960s and 1970s, driven by economic growth and expansion of service coverage, installed generating capacity grew in most countries at rates of around 12 percent annually, doubling every six years. These very high growth rates were possible with the support of the international financial institutions (the Inter-American Development Bank and the World Bank), which financed hydroelectric generation and transmission lines to connected markets and achieved large gains in efficiency. It was a period when loans to the power sector made up a very large share of the total loan portfolio of the multilateral banks.

Elements of the Model

Initially, most of the companies operating in the electricity sector were vertically integrated monopolies serving isolated urban centers. However,

[2] This paradigm is explicit in the policies of the multilateral organizations, the IDB's Public Utility Tariff Policy and the old IDB energy and electricity policies, as well as in the project preparation guides that were in use at that time.

toward the late 1960s, a new pattern emerged that attempted to integrate national markets through interconnection and concentration in one or two major companies owned by the national government. In countries such as Brazil and Colombia, powerful regional or municipal companies supplied most of the load, but there was also a national entity that acted as a holding company (such as Empresa Brasileira de Eletricidade (Eletrobrás) in Brazil), or the major existing companies joined to create a new company to undertake the interconnection of their power systems and implement future generation projects (such as Compañía Interconexión Eléctrica, S.A. (ISA) in Colombia). The advent of interconnection led to the creation of specialized generating companies that sold to individual companies in countries such as Argentina, Brazil and Colombia, where ownership was not concentrated in a single state company. However, the interconnection process was not immediate; in some countries (such as Brazil and Peru) important regional systems remained isolated until very recently and to this day, Chile has still not completed the process (although for reasons that are particular to this case).

It is interesting to note that in Brazil and Colombia the existence of several companies permitted power exchanges and the rudiments of a market, which forced them to develop sophisticated tools for wholesale reselling of power that took the form of a pool similar to those operating in the northeastern United States.

Planning of the least-cost expansion of generation so as to take advantage of the region's substantial hydroelectric potential required an inventory of the power generation potential existing in each country and the development of mathematical models to select the least-cost construction sequence for generating plants.[3] In the smaller countries these tasks were generally contracted out to consulting firms financed by multilateral banks, but in other countries, including some small ones, governments tried to develop local capacity with help from bilateral organizations. Électricité de France contributed to the development of the planning systems of Chile and Mexico, including development of mathematical models adapted to the needs of particular systems. The German Technical Cooperation Organization (GTZ) helped develop the planning models in Ecuador and Guatemala, as

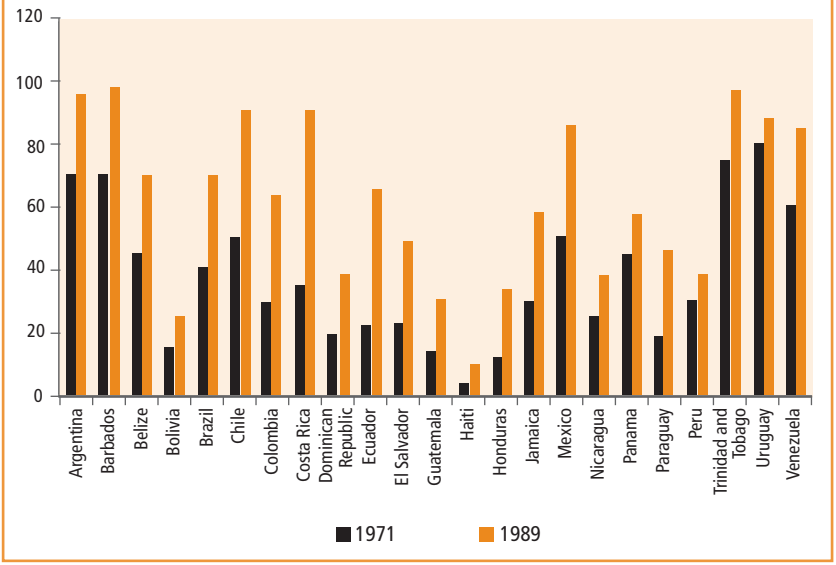
[3] Defined as the project construction sequence on a time horizon that minimizes investment plus operation costs of the set of plants in the system.

well as preparing preliminary inventories in these countries and Colombia. In Brazil, these tasks were completed with Canadian support. The first models used to study interconnection in Colombia were developed by local experts with the support of a mission from Harvard University. These studies led to the identification of considerable hydroelectric potential, which implied that in many countries growing demand could theoretically be met exclusively from this resource for many years. It should be recalled that, at the time, new gas turbine technologies, which were to later revolutionize the market, had not yet been developed. Because the models that the consulting firms and bilateral organizations brought with them were appropriate for the predominantly thermal system prevailing in their countries, local groups in Brazil and Colombia—countries with great hydroelectric potential—had to develop sophisticated stochastic hydrological models, which they would later improve (Millán, 1987).

Similarly, during this period, many local engineering consulting and construction firms in countries such as Argentina, Brazil and Colombia, where demand for new hydroelectric projects was strong, grew significantly. However, with the exception of Brazil, where large local construction firms gained prominence, in most countries this activity was limited to consulting.

Electricity distribution activities, which are less attractive and have lower capital requirements, did not attract the attention generated by the major hydroelectric projects. Yet, significant improvements in service coverage were made and the percentage of the population with access to electricity in the region increased from 42 percent in 1971 to around 70 percent in 1989. Nevertheless, as Figure 1.1 shows, the rate at which progress was made differed markedly by country, and extension of the service to remote areas continued to have lower priority. Large migratory flows to the populated centers in Latin America and the Caribbean required the expansion of coverage to those localities. However, with a few exceptions, the expansion of coverage to rural areas took place in an uncoordinated way and was largely driven by political considerations. Mexico achieved significant increases in rural coverage by relying on oil revenues to finance investments by the Comisión Federal de Electricidad (CFE), a state monopoly. Costa Rica accomplished the same results through an innovative system of rural cooperatives. Toward the mid-1970s, many countries designed and introduced rural electrification plans with support from multilateral banks.

FIGURE 1.1 **Expansion of Electricity Service Coverage**
(percent)



Source: World Bank and OLADE (1991).

In some countries, groups of skilled technicians were successful in implementing many of the proposed projects and, for a while, there was an optimistic belief that adequate management by technical experts could achieve the desired results. Frequent examples of the viability of the state model include the initial achievements of the vertically integrated state monopoly in Costa Rica, Instituto Costarricense de Electricidad (ICE), and the state company in El Salvador, Comisión Ejecutiva Hidroeléctrica del Río Lempa (CEL), in developing their hydroelectric potential, as well as the achievements of regional and municipal companies such as Empresas Públicas de Medellín (EPM) in Colombia, Companhia Paranaense de Energia (COPEL) and Companhia Energética de Minas Gerais (CEMIG) in Brazil, or national companies such as ISA in Colombia. However, as will be shown later, this feverish activity whetted the appetites of local interests, which fought to appropriate the rents from the construction of major works, leading to the first great challenge to the assumptions of the model (Millán et al., 1987). Distribution activity also offered unique opportunities for political cronyism, and for expanding the service in an environment

that lacked efficiency incentives. This would later become one of the key weaknesses of the model.

The 1970s were also witness to the first attempts at regional integration through the development of binational generation projects located on border rivers, such as Salto Grande between Argentina and Uruguay, and Yaciretá between Argentina and Paraguay, both of which received support from multilateral banks, and Itaipú between Brazil and Paraguay, which was developed by the former without help from these institutions. For a variety of reasons, the relative success of the Salto Grande project was not repeated in the other two, particularly in the Yaciretá project, which in addition to being still incomplete and running huge overcosts and delays has been repeatedly charged with being a focus of corruption.

At first, electricity rates were set directly by national or municipal governments and were subject to shifting political needs. There was no regulation as such, and many companies, such as Electricidad del Caroní (EDELCA) in Venezuela, were almost independent emporiums, setting their own rates in the knowledge that they would have recourse to state funds if necessary. The notion that these companies needed to be efficient commercial organization with rates that recovered the investment only arose as a consequence of the conditions established by international lenders, in particularly the IDB and the World Bank, which became de facto regulators (without much success as will be described later). In addition to imposing conditions on rate levels, these institutions were also concerned with the efficient provision of the service, reducing losses (those due to technical shortcomings as well as those resulting from deficient billing and theft), and stemming the use of the companies for patronage. The international lenders were also concerned with the adoption of electricity rates that reflected the marginal costs of providing the service in order to improve efficiency (Millán, 1988). However, although adequate price signals were recognized as an important component of efficient operation, the international financial institutions were limited to encouraging the undertaking of theoretical studies, whose conclusions and recommendations were adopted by the countries on a purely voluntary basis, as in the case of Chile, which did so in 1982.

However, the concern of multilateral banks in these initial years focused on guaranteeing the financial viability of the specific company that executed the project. Any other variables that affected its performance, in particular the political environment, were considered exogenous. The feasi-

bility of obtaining financing that was not directly linked to the project and the amount and timing of transfers from the Treasury were not questioned. It was only later that the banks began to establish conditions regarding the overall performance of the sector.

Although an astute observer could have perceived cracks in the paradigm that would have raised concerns, the general opinion was that all problems could be resolved with good intentions and the support of the multilateral banks. The climate was euphoric and project construction activity feverish. Technical specialists were busy with the implementing the projects as planned and did not realize that the assumptions underlying the model were very weak.

The Beginning of the End: The Assumptions Collapse

Toward the end of the 1970s a series of events in several countries began to reveal the weaknesses of the basic assumptions underlying the model. In particular, it became apparent that least-cost planning instruments did not make it possible to increase effectiveness and that efficiency incentives could not be maintained. Moreover, it was also clear that cost recovery was not taking place and that governments were unable to live up to their commitment not to use the companies for purposes other than providing the service.

The first assumption to break down was that it was possible to expand least-cost generation by taking advantage of the region's great hydroelectric potential. This assumption fell short for technical reasons as well as for lack of managerial capacity and the inability to control the numerous interests that attempted to exploit the opportunities offered by the award of multi-million-dollar construction and supply contracts. Small countries faced particular difficulties in the execution of hydroelectric projects that were perhaps too large for the size of their markets. This was the case of El Cajón in Honduras, Chixoy in Guatemala and La Fortuna in Panama. These difficulties were not limited to the small countries but were common to others as well, including the Guavio project in Colombia, Mantaro in Peru, several projects in Brazil, and the largest of all, the binational Yaciretá project. The very large run-up in costs of these projects weighed heavily on the already weak finances of the companies. The case of the El Cajón project in Honduras is well known because of the huge burden on the national economy that resulted from the debt contracted to develop it.

The relevance of the concept of least-cost expansion was called into question when studies to ascertain which projects were candidates for expansion were carried out for only one or two projects. But a more important problem was the inability to avoid manipulation of the process by state companies who were encouraged by local politicians to do so. In Brazil and Colombia, the companies fought over the privilege of executing projects in their regions because of the expected regional benefits of an operation of this magnitude, but perhaps more importantly, because of the clear opportunities to obtain rents.[4] The efforts of multilateral banks to further the integrated development of an interconnected system clashed with local interests, which saw huge opportunities for profits from contracts and other kickbacks when generation projects were executed in their territories. The difficulty of controlling corruption in the award of contracts was coupled with collusion by groups of local construction companies to raise construction costs (as will be detailed later in the discussion of Brazil). This emphasis on building electricity generation projects left the companies with very little capacity to efficiently manage distribution and service provision. Worse still, the paradigm became increasingly difficult to manage as a result of the financial restrictions and the great uncertainty that characterized the region following the economic crisis of the early 1980s. Until then, the outlook had been one of sustained growth in demand, leading those in charge of planning the development of the sector to assume that uncertainty was merely an academic concern. Likewise, they were not concerned about the huge financial resources required because international banks had ample resources and expectations of continued high rates of high economic growth rates guaranteed that repayment of the debt would not be a problem.

The debt crisis that broke out after the Mexican crisis of 1982 played a critical role in the collapse of the "helping hand" paradigm because it had a major impact on the finances of the sector as lines of credit closed, electricity rates could not be maintained as inflation rose, and local politicians pressured the companies to become sources of jobs during elections. The crisis had a dramatic effect on the companies in the sector. The end of easy financing in Eurodollars coupled with the economic adjustment

[4] These benefits, as well as being ephemeral, given that unskilled labor was an infinitesimal percentage of the total cost, were based on the possibilities they offered regional politicians of gaining access of the rents from the service contracts.

meant increased competition for national resources at a time when foreign exchange rate changes significantly increased debt service costs, and revenues plunged as rates remained unchanged. The economic recession also slowed demand allowing the deferment of some investments; however, in the short term it also represented an additional cut in company revenues, leaving many (temporarily) with considerable spare installed capacity. To all this must be added the previously mentioned impact of the cost overruns in the hydroelectric projects to complete the scenario faced by the electricity companies in the 1980s.

There was growing uncertainty about the demand that had to be met and the costs of the service, as well as about sources of financing and rates. The financial recovery and expansion plans became obsolete almost as soon as they were published, and banks had to continuously adjust financial projections and renegotiate the conditions of the loans, which were never met. This situation is eloquently described in an internal report prepared by IDB officials in 1987, which is partially reproduced in Box 1.1 (IDB, 1987). When this is combined with the lack of efficiency incentives faced by the state companies, it is easy to understand why management continued to deteriorate, as well as the sudden increase in technical and non-technical losses to unprecedented levels (see Table 1.1).

TABLE 1.1 Efficiency Indicators for 1998

	Electricity losses, 1988	Collection period, 1988	Productivity, 1988	
Country	Percentage	Average collection period (no. of days)	Customers per employee	Sales per employee (MWh)
Argentina	17	225	162	699
Bahamas	n.d.	n.d.	n.d.	n.d.
Barbados	8	32	170	865
Belize	n.d.	32	57	170
Bolivia	20	n.d.	210	684
Brazil	13	108	143	975
Colombia	24	89	166	1023
Costa Rica	9	68	85	523
Chile	15	42	n.d.	n.d.

TABLE 1.1 Efficiency Indicators for 1998 *(continued)*

	Electricity losses, 1988	Collection period, 1988	Productivity, 1988	
Country	**Percentage**	**Average collection period (no. of days)**	**Customers per employee**	**Sales per employee (MWh)**
Ecuador	22	115	174	618
El Salvador	15	247	186	592
Guatemala	17	73	70	212
Guyana	21	320	59	123
Haiti	35	113	57	182
Honduras	23	200	79	370
Jamaica	20	52	168	852
Mexico	13	69	188	1107
Nicaragua	17	n.d.	76	261
Panama	21	173	60	378
Paraguay	15	53	134	583
Peru	17	117	121	523
Dominican Republic	27	208	95	441
Suriname	11	n.d.	102	475
Trinidad and Tobago	11	n.d.	93	922
Uruguay	20	119	81	317
Venezuela	16	199	107	1889
Regional average	**15**	**114**	**114**	**558**

n.d. = No information available.

Source: World Bank and OLADE (1991).

The efforts of financial institutions to remedy this situation by imposing rigorous conditions on their loans were futile because, although some improvement was seen during the loan disbursement period, once it ended debtors stopped following the conditionality requirements, as Figure 1.2 clearly illustrates in the case of the Dominican Republic. Table 1.2 shows the shaky compliance with the financial clauses imposed by the multilateral organizations for a group of companies in the region during this period.

Multilateral organizations found it necessary to engage in the costly refinancing of operations in the electricity sector and to make careful financial adjustments. The new situation produced a slight change in the model,

BOX 1.1 The State of the Sector in the Mid-1980s

To summarize the evolution of the sector in the last decade and a half, it should be recalled that at the start of the 1970s energy planners were faced with double-digit increases in electricity demand and rising oil prices, with no apparent indications to suggest that the outlook was significantly different. Consequently, the expansion of electricity systems tended decisively toward major hydroelectric projects and the high and very high voltage transmission works associated with them, which required huge investments concentrated in the late 1970s and the first half of the 1980s. Financing generally relied on significant supplier credits, and loans from commercial and international development banks, as well as government financing from budgetary transfers and large amounts that the electricity companies planned to generate internally.

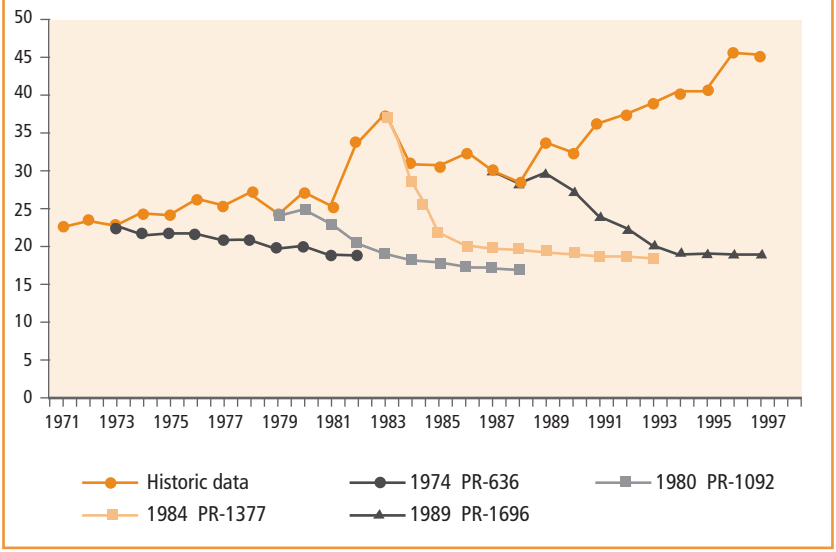
The reality, however, was different. The region's economic crisis resulted in lower than anticipated demand growth, while governments fought inflationary pressures by constraining electricity rates or decreasing them in real terms. Both factors meant a very significant reduction in the internal generation of funds by the sector. This was combined first with the increasing cost of capital and later by the virtual closure of the medium- and long-term capital markets. Because technical considerations and breach of contract liabilities made the investment program very difficult or impossible to stop once started, the electricity companies had to obtain short-term financing (suppliers, lines of credit from private banks at six or eight years, etc.) to continue investing at a minimum rate compatible with the maintenance of their expansion programs.

Aggravated by the absence of supplementary budget contributions and also by the excesses and errors committed by the management of the electricity companies themselves, this situation led to a rapid decline in liquidity ratios and financial solvency, resulting in breach of the financial policy commitments assumed with the IDB and the World Bank and default on the service of the contracted debt. In general terms, this is the current situation of electricity utilities in most countries of Latin America and the Caribbean.

Source: IDB (1987).

which began to recognize factors such as uncertainty and the difficulty of achieving least-cost solutions in the presence of financial restrictions on investment. The multilateral banks looked for solutions in the strict application of their conditionality regarding rates, in the reformulation of investments in progress, and by concentrating their efforts on improving the distribution systems and reducing losses through loans for this purpose

FIGURE 1.2 **Electricity Losses in the Dominican Republic (1971–97)**
(% of energy generation)



and so-called performance contracts.[5] While there was recognition that the incentives of the government and the sector were not aligned, it was naively believed that a stricter application of the Bank's loan conditions could solve the problem. Obviously, a radical change in electricity rates or the capital structure of the companies could not be achieved overnight, and the companies were very soon having trouble implementing the restructuring programs that they were offered. The notion was that the performance of the companies could improve under the threat of not making the loan disbursement, but at the time there was no understanding of the importance of systems of corporate governance to make management responsible for its actions. Perverse political interference was recognized in company decisions but no solutions were offered and there was no capacity to exert influence in favor of improving the efficiency of political management, which, as was eventually recognized, is what ultimately affects the conduct of the companies.

[5] Modality in which disbursements were contingent upon obtaining specific targets for receipts, loss reduction, and improvements in financial ratios.

TABLE 1.2 **Average Profitability Rates of Companies That Revalued Their Fixed Assets (1980–89)**

Country	Company	Average agreed (%)	Profitability achieved (%)	Total no. of employees	Number of periods of compliance
Argentina	AyEE	8.0	6.8	7	1
	Elec. Misiones	8.0	0.0	10	0
	Hidronor	6.2	1.4	7	0
	Salto Grande	8.0	2.0	4	0
Bolivia	ENDE	9.0	3.9	9	0
Brazil	CEMIG	8.5	6.6	10	2
	CESP	8.5	3.4	4	0
	CHESF	8.9	4.9	10	1
	COELBA	9.7	6.3	10	0
	COPEL	7.7	6.9	8	2
	ELECTRONORTE	8.5	1.4	2	0
	ELETROSOL	8.9	7.2	10	4
	PORNAS	8.4	4.5	3	1
Costa Rica	ICE	9.4	8.6	9	4
Ecuador	INECEL	7.9	0.6	8	0
El Salvador	CEL	9.0	4.3	9	0
Honduras	ENEE	10.7	6.3	9	0
Jamaica	J.P.S.	8.0	5.4	10	0
Panama	INRHE	8.4	7.1	10	1
Paraguay	ANDRE	8.0	5.3	8	1
Peru	ELECTROPERU	10.0	3.4	6	0
Dominican Rep.	CDE	9.0	0.0	9	0
Uruguay	UTE	8.0	2.0	9	0
Venezuela	EDELCA	3.5	1.2	4	0
Average rates		**8.4**	**4.1**		
Total periods				**185**	**17**

Source: World Bank and OLADE (1991).

A complementary model emerged in the mid-1980s that took environmental impacts into consideration, something that had been largely ignored during the boom in the construction of large dams with the consequent negative effects on the local environment. Although it is unfair to put all the projects in the same basket, and there are numerous cases in which the environmental impact was less marked due to the characteristics of the projects and/or to the preventative measures taken, there were some very visible and highly publicized cases in which important mistakes were made. This led to the opposition of nongovernmental organizations in developed countries. The environmental lobby initially expressed concern about the direct impact on the local environment and the fate of the population displaced by the works. The immediate result was a notable improvement in environmental practices in the countries of the region, pressured by the international financial institutions that had incorporated the new stance at the insistence of their OECD (Organisation for Economic Co-operation and Development) shareholders. Later, the environmental movement was strengthened by pressure groups that favored the adoption of renewable energy and the efficient use of energy as solutions to environmental problems caused by greenhouse gas emissions, but the movement was not exempt from contradictions among the agendas of the different groups. While those that favored the objective of combating climate change looked favorably on the hydroelectric developments irrespective of their size, the only solution accepted by the movement against large dams was that of energy efficiency and the new small-scale sources of renewable energy (such as wind and solar energy).

Pressure groups from the developed countries promoted integrated resource planning (IRP), which saw the introduction of efficiency measures and renewable energy sources as alternatives in least-cost expansion (IDB, 1993). This was accompanied by subsidies to facilitate the adoption of these measures by consumers and/or companies. Some countries in the region began to undertake activities of this sort but they were short-lived after the collapse of the centralized planning model.

Despite the efforts of the multilateral development banks, the electricity industry continued to deteriorate in most of the region in the 1980s. The inability to set rates that covered costs and to control electricity losses and employment, coupled with the growing debt service burden that resulted from badly executed investments, pushed most companies into a very critical financial situation that required large transfers from the na-

tional budget, and led to deterioration of the service and periodic rationing (as in Argentina, Colombia, and the Dominican Republic). The collapse of the Organization of Petroleum Exporting Countries (OPEC) in 1983, and the ensuing slump in oil prices affected regional oil producers such as Mexico and Venezuela, which had relied on oil revenues to finance investments in electricity. Thus, these countries, which had not borrowed from international financial institutions to finance the industry, now had to do so. In the late 1980s and early 1990s, several countries experienced electricity crises that coincided with the change in economic model. This presented an opportunity for fundamental reform based on good political governance and private participation, following the examples of Chile and the United Kingdom.

To better understand the implications of these events, the remainder of this chapter provides a more detailed account of the experiences of three countries: Brazil, Colombia and El Salvador.

Brazil

The Brazilian electricity system is the largest in the region and accounts for over 40 percent of installed capacity. It is unique in its almost exclusive dependence (90 percent) on water resources. With most of its capacity located in just a few basins far from the urban centers and with great hydrological diversity, the operations of the Brazilian electric power system required careful coordination and sophisticated planning models had to be developed. As in the rest of the region, ownership first shifted from the private to the public sector to later return to the private sector. The last nationalizations of the electricity industry in Brazil took place as recently as the end of the 1970s. Most of the distribution companies, with the exception of those that serve the cities of Rio de Janeiro, Espírito Santo and Brasilia, were controlled by state governments, and in some of the largest, such as São Paulo, Minas Gerais, Paraná, Rio Grande do Sul and Rio de Janeiro, these companies were at least partly vertically integrated. The part of the industry controlled by the federal government was the responsibility of the Eletrobrás consortium, which included the four large generating and transmission companies: Companhia Hidro Elétrica do São Francisco (CHESF), Furnas Centrais Elétricas (FURNAS), Centrais Elétricas do Norte do Brasil (Eletronorte), and

Empresa Transmissora de Energia Elétrica do Sul do Brasil (Eletrosul). The Itaipú hydroelectric plant, the largest in the world at the time (with a 12,500 MW capacity), was operated by the binational entity created for the purpose in the treaty with Paraguay that made the project possible. Eletrobrás was assigned responsibility for planning the expansion, the research and energy efficiency programs and many other functions, which are generally assumed by the energy ministries. It also acted as the industry's financial agency.

Brazil's vast expanse initially hindered the integration of the country's electricity systems. The three isolated systems that made up the electricity network were not totally integrated until after the start of the reform process in the late 1990s. The largest system was south-southeast, which included the largest concentration of economic activity in the country. It was followed by northeast, which relied on the water resources of the São Francisco River to supply electric power to the region of the same name. The northern system was the smallest, comprising various isolated systems that were partially integrated over time.

The electricity sector was nominally subject to regulation by the National Water and Electric Power Department (DNAEE), attached to the Ministry of Mines and Energy (MME). The department was staffed by professionals on loan for periods established by the entities that the DNAEE was supposed to regulate. Its board of directors was far from independent.

Until the mid-1970s the model permitted significant improvements in service coverage and responded to the needs of an expanding economy. However, industry performance was uneven. Despite high investment costs (which are mentioned later) the generating system operated relatively efficiently. A competent technical group of staffers in Eletrobrás was responsible for system planning and operation. They were able to develop techniques compatible with the primarily hydroelectric source of power. Similar technical groups were created in the electricity companies of the country's larger states. However, with only a few exceptions (such as COPEL in Paraná and CEMIG in Minas Gerais), management of the distribution companies, which was controlled mostly by the states, was not as efficient. In general, these companies were used to curry political favors, were overstaffed, and their management of losses and collections was lacking. Although coverage expanded in some states (reaching up to 96 percent in Santa Catarina), it remained at very low levels in many others (3 percent

in Paraná). Thus, coverage at the start of the reforms was not as broad as it could have been.

Construction of new generating plants boomed during the 1970s. The gigantic Itaipú project, which was built without the participation of multilateral banks, had no trouble obtaining financing thanks to the abundant credit available. Expansion based on major hydroelectric projects fostered the creation of consulting firms. The large construction companies became powerful pressure groups that financed political campaigns and formed a cartel that kept competition at bay and was not broken up until the Segredo project.[6] As was the case in Colombia, local politicians and companies mobilized to guarantee that the plants located in their areas of influence were included in the least-cost expansion plan and the resources to build them committed. Although a high quality technical team was formed in Eletrobrás, the decision-making process continued to be captured by local political interests. In the mid-1980s the system went into crisis when it became impossible to obtain the additional financing required for expansion.

In the 1980s, when external sources of financing dried up, Brazil went to the multilateral banks to finance its investments, which represented close to US$8 billion annually because of the high cost of the generating plants. Because it was impossible to maintain the real value of electricity rates, the works had to be postponed repeatedly and rationing took place on various occasions. Large transfers from the central government were also necessary.

The DNAEE supervised the tariff system that, according to the legislation, required a ten percent annual return on assets from the companies. From 1974 to 1993 electric power sale rates, both in block and for the final consumer, were uniform throughout the country irrespective of the cost of the service in each company. This rate uniformity implied financial transfers between companies that were instrumented through a specially created compensatory fund, Cuentas de Resultados para Compensar (CRC; Compensation Income Statement). The government had to set rates to achieve a minimum profitability on assets of ten percent and a maximum of 12 percent in order to remunerate all of the electricity companies. If the rates

[6] In 1990, the president of COPEL confronted the cartel and at great personal risk split the bidding process to allow the participation of the new companies with support from the IDB, which obtained cost savings of over 30 percent of the initial proposal.

yielded higher or lower profits than the 10 to 12 percent range for a particular company, the shortfall or surplus was debited or credited to the federal government through the CRC. The companies held these credits or debits with the federal government off their balance sheets.

Over time, the DNAEE acquired experience in setting rates and became a pioneer in the region. DNAEE was able to set rates based on marginal costs that differentiated by time of day and season, despite the fact that the overall rate was determined by the economic ministries and the central bank, mostly with a view to controlling inflation or simply for political reasons. The industrial policy in effect in Brazil at the time meant that the rate structure subsidized large consumers.

In the 1980s, overall profitability in the electricity sector did not reach ten percent and transfers to the electric companies to offset the shortfall were declining. This resulted in a high level of debt between the federal government and the utilities and between the distributors and generators. By the end of 1992, the federal government owed the electricity sector around US$26 billion, which represented 14 percent of total assets.

In the early 1990s, the Brazilian electric industry was immersed in a very serious crisis. The volume of investments had fallen to around half the figure of the previous decade. Construction of various hydroelectric plants had been suspended due to lack of funds. Rates had not been adjusted to account for hyperinflation and, in most cases, the internal generation of funds by the companies was not sufficient to cover operating costs and debt service. A number of companies had very high labor costs, reflecting the burden of patronage (Leal Ferreira, 1999). Losses from theft and lack of adequate billing were high, and the efficiency and quality of distribution deteriorated because of lack of maintenance and new investments.

The total value of the industry's debt as of September 30, 1992, was US$5.5 billion. For the two most important companies, FURNAS and Itaipú, debt service absorbed 70 percent and 100 percent of income, respectively. The difficult financial situation of the sector is reflected in the figures for the CRC, which had a cumulative value in 1992 of US$23.8 billion, 81 percent of which was related to the companies of the southeastern states (38 percent) and to the federal regions (43 percent). In 1992 the CCR totaled US$7.2 billion, producing an average equilibrium rate of US$80/MWh. Given that the average rate in 1992 was US$47/MWh, the rate differential for that year was US$33/MWh (Ribeiro de Albuquerque, 1993).

In 1993, the government enacted a set of measures to correct problems in the finances of the electricity sector in line with overall economic stabilization, state reform and liberalization policies. Particularly important were changes in the rate policy, such as the elimination of the single national rate, the recovery of rate levels in real terms, the elimination of subsidies and intra-sectoral trade-offs, and the cancellation of liabilities of the companies. The authorization granted to the companies to use the balances in their favor in the CRC to pay off their debts resulted in a decrease of US$19 billion in their liabilities in 1993, reversing their defaults and eliminating restrictions on obtaining new financing. These actions allowed the sector as a whole to achieve a more balanced financial position and moved the rates closer to the economic costs of electricity supply, laying the basis for a deeper restructuring of the sector.

Colombia

Around the middle of last century, electricity in Colombia was supplied by national and municipal state utilities. As in other countries of the region, the government assumed this role because of the inability of the private sector to expand the service beyond the most profitable markets and respond to the challenges posed by a growing country. This model, based on vertically integrated state companies, relied on the support of the multilateral banks to develop hydroelectric potential and generate the electricity required by a country with an economy growing at over six percent annually. This growth led to an expansion in coverage from 44 percent of the population in 1970 to 78 percent in 1980.

However, unlike other countries in the region, in Colombia this was a decentralized process. The two municipal utilities that served the largest markets (Empresa de Energía Eléctrica de Bogotá, EEEB, and Empresas Públicas de Medellín, EMP) generated and distributed about 40 percent of the power, while the remaining 60 percent was supplied by the government-owned regional companies, such as Instituto Colombiano de Energía Eléctrica (ICEL), Corporación Eléctrica de la Costa Atlántica (CORELCA), Corporación Regional del Valle del Cauca (CVC), and ISA. The latter, a national company owned by the other companies, owned the interconnection network and considerable generating capacity. Despite the success of expanded coverage, in 1990 the sector was practically bankrupt,

accounting for 30 percent of the country's total foreign debt and 33 percent of the public sector's nonfinancial deficit.

The history of the Colombian electricity sector was characterized, as were many others, by an ongoing struggle to achieve results that would give it access to the international loans needed to carry out the investments in generation to meet increased demand and expansion of the service. This required constant vigilance to protect the companies from the political cronyism and opportunism of governments. During the 1960s the markets expanded around the large urban centers of Bogotá and Medellín, Valle del Cauca, and Caldas, whose companies began studying projects to develop the area's abundant hydroelectric potential. At the same time, expansion of service in the Caribbean region and other populated centers was based on thermal developments. At that time, rates and levels of losses were not a reason for concern. The challenge consisted in efficiently expanding generation by interconnecting the systems in order to create economies of scale and develop the hydroelectric potential of the central region following a least-cost path. To do this, Colombian technicians prepared planning models for the interconnection studies with the help of a mission from Harvard University and with World Bank sponsorship. This also led to the establishment of ISA (with EPM, EEEB, CVC and ICEL as initial members[7]) to build the interconnection projects and develop future hydroelectric projects (however, the first project was executed by the CVC company). This concentration in ISA of the construction of major future projects was strongly opposed by the municipal companies, which saw the hydroelectric projects as a matter of great prestige for local bureaucracies and as offering numerous business opportunities. Only the power of the World Bank, with the tacit support of the IDB, made the companies reluctantly accept these impositions, but not without covert opposition, which would eventually lead to the failure of the idea of giving ISA the central role in the expansion of generation.

As part of the initial agreements, in addition to accepting that the first plant would be built by the CVC (and given the short life of ISA), it was agreed that the next plants would be selected from the projects proposed by ISA partners based on the criterion of least-cost expansion. This led to a contest between the two municipal companies (EEEB and EPM) to obtain the

[7] CORELCA joined later for construction of the interconnection line with the central system.

distinction, as if it were a sporting event.[8] Each company's consultants spared no effort in reducing cost estimates and highlighting the advantages of their project. It was only possible to make a comparison when foreign arbitrators approved the estimates but, in view of the power of the incentives and the weak management, this initial victory of economic rationale was Pyrrhic.

The regional companies that joined ISA saw a threat to their independence, part of their business culture and the resources of the departments, over which they considered they had preferential rights. The companies did not meet their commitments to make timely capital contributions to ISA and, through its board of directors, opposed raising the rates for wholesale exchanges, which resulted in the political paradox that going against ISA benefited its partners. It became evident that what the technicians thought would be a positive-sum game ended up as a zero-sum game, and it would not be easy for the government to achieve its objective of greater efficiency in the use of resources if it could not reconcile national and local interests.

Thus, ISA became a forum for the reconciliation of diverging interests. ISA took on the role of coordinating all the activities proper to the electricity sector: planning, expansion, operation, and marketing. Only rates for final consumers were regulated from outside. The expansion plans, which were ultimately approved by the national government through the economic cabinet,[9] were prepared by ISA, that is, they were agreed to by the national government and regional utilities, following national least-cost criteria but trying to satisfy the interests of the different regions of the country. As a result, after the regional companies returned to participate in the expansion of generation in the famous Cali agreement, the financial viability of the expansion plans was jeopardized and economic efficiency was reduced because of the commitments acquired. Every company wanted to develop and own generation projects even though they did not have the financial capacity to execute them.

Giving in to regional pressure, the government formulated a hybrid expansion scheme that included projects that, in theory, made up an economically optimal plan. However, the only reason that the plan was optimal was because there were never sufficient alternatives to carry out an effective comparison. Unfortunately, the companies charged with executing those

[8] The first plant built by ISA was Chivor (Boyacá), initially studied by the EEEB with little dispute given the lack of alternatives, but this was not the case with those that followed.
[9] Council of Economic and Social Policy (CONPES).

plans lacked the financial or technical ability to carry them out. In the second half of the 1970s and early 1980s, market liquidity improved markedly thanks to higher oil prices, the revaluation of the Colombian peso, and the acceptance by multilateral organizations of the realities of regional politics. Improved liquidity made it easier to borrow with central government backing, allowing all the companies to get their projects off the ground. The goal of regional self-sufficiency in electricity had a negative effect on the process of least-cost expansion and opened the way for projects that lacked appropriate appraisals and were poorly financed.

With respect to the operation of the interconnected system, the electricity sector was independent and regulation scarce. Rules and parameters for operation and marketing were agreed upon by consensus between the ISA partners, under the complacent gaze of the representatives of the national government.

Under these conditions, the agreements could be no more than an attempt at the reconciliation of interests before an arbitrator—the national government—that had no viable alternatives to offer. The rates of wholesale power exchanges were not regulated by an independent agency until the second half of the 1980s when the National Rates Board was established.[10]

It was not until investment requirements and the industry's deficit and debt service burden undid the existing macroeconomic equilibrium that the government finally intervened more directly, especially in planning and financing the expansion of generating capacity. Various Cabinet ministers joined the ISA Board (the Minister of Mines and Energy was the first to do so, followed by the Minister of Finance and the head of the National Planning Department).

In short, in the words of an authorized spokesman for the sector: "The institutional structure that results from this amalgam of circumstances, agencies and agents could not be more confusing; national, departmental and municipal bodies, each with different interests to defend, meeting to

[10] With the constitutional reform of 1968, and in view of the heterogeneity of the bodies that provided the services, rate control was centralized in the National Rates Board (JNT), an agency attached to the central executive that was created to prevent companies from charging very low rates (due to local pressures), which would prevent them from meeting their obligations and operating and expansion costs. However, in 1986 the Board took an active role in setting rates.

manage a strategic sector for the nation by consensus; a State that is part regulator and part entrepreneur; which preaches financial self-sufficiency and sets ruinous rates policies for the electricity companies; a sector that is self-regulated by consensus, despite the diversity of interests; in short, a sector in which the consequences of decisions are not assumed by the decisionmakers" (Gutiérrez, 1993).

During the 1980s, the sources of external financing dried up following the debt crisis, and rates (which were already lagged) were not adjusted following the 1983 devaluation. As a result, electricity losses increased significantly and, despite an adjustment during the Barco administration (which was supported by multilateral bank loans), management of the distribution companies continued to deteriorate. These difficulties were aggravated by the delays and overcosts of the Guavio project, which would later be reflected in the rationing of 1992.

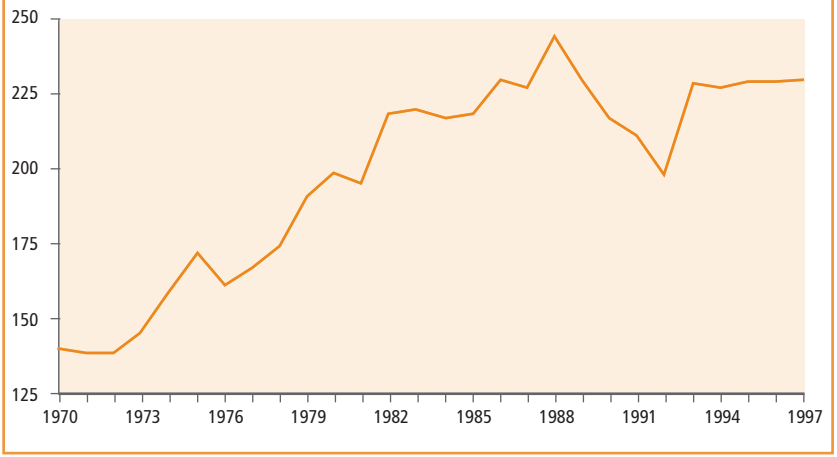
By June 1993, the average national electricity rate was 79 percent of cost, while industrial and commercial tariffs presented overcosts of 20 percent and 26 percent respectively, and residential rates only covered 47 percent of cost. The resulting residential subsidy of 53 percent was equivalent to US$360 million annually according to calculations by ISA in 1991. Nonresidential overcosts, with rates of 110 percent of cost, were around US$120 million, which left a net subsidy of US$240 million annually.

In that period, the electricity sector was responsible for one third of the country's public borrowing, and for paying about 40 percent of the interest on the foreign debt. In some years it accounted for up to 35 percent of public investment. However, it was not producing sufficient domestic revenue, resulting in a deficit of around 1.3 percent of GDP. Between 1980 and 1988, the internal generation of funds in the sector only covered 25 percent of financial requirements, and in 1988 debt service was over 15 percent of current revenue.

By 1991 it was already clear to the government that it could not continue without a radical transformation of the sector. In a speech to the conference of ministers of finance and energy (September 4 to 6, 1991) in Cocoyoc (Mexico), which was organized by the Latin American Energy Organization (OLADE) and the World Bank to analyze the crisis in the regional electricity sector,[11] Luis F. Vergara, then Colombia's Minister of

[11] The conference was titled "A Challenge for the 1990s: How to Overcome the Crisis in the Electricity Sector in the Countries of Latin America and the Caribbean?"

FIGURE 1.3 **Power Losses in Colombia, 1970–97**
(percentage)



Source: ISA.

Mines and Energy, gave a detailed description of the situation of the sector and proposed a change in direction that the government considered necessary in order to deal with the situation (Vergara, 1991). The details of the diagnosis formulated by Vergara were amply documented in various texts of the period, particularly in a World Bank study (1990) prepared at the request of the Colombian Government, which contained an evaluation of activity in the sector. Later studies on the reform process have deepened that analysis and put it into perspective (Fainboim, 2000). However, not much explanation is needed to understand the deterioration of the sector. Figure 1.3 shows the trend in electricity losses in the national system during the 1970–97 period. As can be seen, the companies did not perform uniformly: EPM was the only company that did not require government transfers to meet its demand, and became the model of an efficient public utility.

El Salvador

As in other countries of the region, the electricity service in El Salvador was in the hands of five private companies serving urban centers, whose

concessions reverted to the government in 1997 after 50 years of private control. In 1945, the government set up an independent company, Comisión Ejecutiva Hidroeléctrica del Río Lempa (CEL), to develop the country's hydroelectric potential and provide rural electrification, activities for which the private sector did not have sufficient incentives. After the private companies reverted to the government in 1997, CEL became a de facto monopoly owning all the installed generating capacity, all transmission, all of the distribution in rural areas and, indirectly, the rest of the distribution through its equity ownership in the old private distribution companies, whose concessions were not renewed on expiration. Through the pertinent ministries, the government set standards and supervised the operation of CEL but, in practice, it was not an effective counterbalance for CEL, which, while lacking formal powers, in practice became the electricity governing body. As such, CEL played a principal role in formulating policy, objectives, strategies, as well as in planning and setting electricity rates (which were approved by the Council of Ministers or possibly the president). In 1950, the Council of Government issued a decree to expand the Board of Directors to include the ministers of the interior, economy, public works and agriculture, as well as private agricultural and industrial associations and holders of local bonds, and obtained the right to elect an owner-director and alternate.

In 1971, electricity coverage of the population of El Salvador was only 23 percent, which was very low, even by Latin American standards at that time. The efforts of CEL, along with the urbanization process that was taking place in El Salvador, doubled this figure, which reached 48 percent by 1989, but was still very low. Between 1954 and 1983, CEL developed the hydroelectric potential of the Lempa River. Four plants were built in cascade with a total installed capacity of 430 MW. CEL also built two geothermal plants: Ahuachapán (95 MW) and Berlín (65 MW), becoming a pioneer with recognized technical competence in the development of this energy source in the region. These developments were supplemented by additional thermal generating capacity and the interconnection with the Guatemalan system in 1986.

Development of the electricity industry in El Salvador during the 1970s and 1980s suffered as a result of the armed conflict in the country, which forced CEL to devote a large part of its resources to maintaining the system in operation in the face of sabotage by guerrillas. Consequently, electricity losses increased from six percent in 1971 to 18 percent in 1991.

During the 1990s, the gradual decline in real revenues pushed the financial situation of CEL and the distributors into a severe deficit. Between 1979 and 1990, average electricity prices (wholesale and for final users) fell in real terms to around half, while real costs remained unchanged.

CEL gained a certain amount of prestige while a state company for its ability to develop and execute electricity generating projects. The fact that it was not directly involved in the distribution business meant it was able to contain the plague of political cronyism more than most of its Central American neighbors, and fulfill its mission of developing the country's electricity generating potential at a reasonable (if not low) cost. However, this was not sufficient for rapidly expanding service coverage. The achievements dissipated very quickly due to a short-sighted rate structure that granted general subsidies instead of targeting scarce resources to the poorest. Reversion of the concessions to the government at a time of internal turmoil added lack of incentives for efficiency to lack of remuneration for the service as major problems for the sector. As a result, in the mid-1990s sector indicators did not differ much from those of other state-owned companies in the region. However, the conditions for attempting to reform the sector in line with the new winds that were blowing in the region were in place.

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PART II

The Reform

Successful reforms are those that package sound economic principles around local capabilities, constraints and opportunities. Since these local circumstances vary, so do the reforms that work. An immediate implication is that growth strategies require considerable local knowledge.

Dani Rodrik
Growth Strategies
National Bureau of Economic Research, 2003

...It should be emphasized that the institutions that have emerged in the Western world, such us property rights and judicial systems, do not have to be faithfully copied in developing countries. The key is the incentive structure that is created, not the slavish imitation of Western institutions.

Douglas North
Understanding the Process of Economic Change
Princeton University Press, 2005

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Chapter 2

The Reform: Expectations, Achievements, and Challenges

The electric power industry was included in the sweeping reforms that took place in Latin America in the early 1990s. The objective of the reforms was finding a solution to the region's economic stagnation by shifting to a new economic model. Infrastructure reform attempted to strengthen the few existing efficiency incentives, facilitate the mobilization of financial resources, and do away with the heavy burden on the government budget that these industries implied while, at the same time, continuing to address the needs of the poorest. The measures enacted to achieve these objectives were threefold: (i) fostering the participation of the private business sector in the provision of services, (ii) limiting the role of the state to policymaking and regulation while strengthening its ability to fulfill those roles, and (iii) restructuring infrastructure by unbundling the services vertically and horizontally.

Private participation in service provision guaranteed efficiency incentives and also ensured that any resulting gains would be partially transferred to consumers through competition in the market in those segments where unbundling of the vertically integrated monopoly made it possible and desirable. In monopolistic segments of the market, incentive regulation would achieve the same results. The establishment of an independent regulator would protect investors from opportunistic government interventions while, at the same time, protecting the interests of consumers from possible abuses by the service providers. Under these conditions, the rate schedules that covered the cost of the service in the non-competitive segments, or the prices established by the market in the competitive segments, would be sufficient to attract the necessary financing and remove the burden on government finances. A transparent system

of targeted subsidies would be established to protect the poorest consumers. The unbundling of services would also yield benefits in those segments of the market where private participation remained unfeasible. Breaking up the monopolies even in those situations was not only essential for the creation of the market, it also facilitated corporatization of the state-owned companies and adoption of best governance practices.

Latin America has been a leader in the reform of the electric power industry. In the 1980s, Chile was the first country to introduce integrated reforms to open it up to private participation and competition. The reform process has taken place in stages and has still not reached all the countries in the region. Chile's example was followed by Argentina in the early 1990s and a little later by Bolivia and Peru. In the mid-1990s, the reforms had extended to Brazil and Colombia, and a short time later to most of Central America. Although there has been a decline in the number of new reforms in recent years, few countries remain absent from the process. The most notable of these are Mexico and Venezuela, where few electricity assets have been transferred to the private sector and little has been done on reform.

Almost 15 years since the start of the reforms in the electricity industry, there is unanimity that their implementation has been more difficult than anticipated and, in many places, reform has become a word with negative connotations. For the reform's opponents as well as for its supporters (who had built up optimistic expectations about the speed with which convincing results could be obtained), these facts seem to portend a short life for the reforms. However, although almost no one foresaw the extent of the difficulties, complacent expectations about rapid progress were not common among industry observers. A set of IDB documents, including the *Public Utility Policy* (IDB, 1996a) and the *Energy Sector Strategy* (IDB, 2000), emphasized the difficulties that the task involved and advised a pragmatic approach to the reform process.

The relevance of the caution recommended by these policy documents can be appreciated in two IDB analytical studies on the progress of the reforms in the electric power industry of the region: the chapter on electricity in the 2001 Report on Economic and Social Progress (IPES), *Competitiveness: the Business of Growth* (IDB, 2001), and the book *Keeping the Lights On* (Millán and von der Fehr, 2003). These publications document the difficulties that arose in the implementation of the reforms and show that, despite significant progress, securing those reforms was hindered by the

industry's own characteristics and by the institutional requirements of the models adopted, in the face of the dearth of resources and institutional capacity of most countries. The 2001 IPES concluded that the future of the reform would depend on a satisfactory response to the following challenges: the separation of the roles of the state as entrepreneur, regulator and policymaker; the establishment of a reasonably competitive electricity market that could help control price volatility without reducing incentives for investment in generation; and regulation of the non-competitive segments and the architecture of the regulatory system. Despite the difficulties, both documents were relatively optimistic about the possibilities of successfully meeting these challenges.

Four years after the 2001 IPES was published, many of its conclusions continue to be extremely relevant to the issues that concern us here, although in some cases the situation has continued to deteriorate. Important global and regional developments that were in a gestational stage when the report was written have had unfavorable outcomes, which have put even more obstacles in the way of strengthening the reforms. The frustration of the public with the economic crisis of the last five years, the Enron debacle, and the California crisis, along with other unfavorable international events for the industry and the difficulties in getting the reforms under way, have had a negative effect on public opinion, and are creating reform fatigue. Patience is running out and a growing chorus of voices is heard urging the abandonment of the experiment and a return to the past.

In the global context, unease began with the California crisis. Despite the fact that most observers attributed it to defective design (Joskow, 2001; Wolak, 2002), it led to a questioning of the suitability of market solutions.[1] The Enron debacle threw into doubt the role of marketers and further dampened the appetite of investors. In a context closer to home, the macroeconomic crisis at the start of the century in Argentina suspended the entire reform experiment with the non-recognition of contracts, regulatory intervention and, more recently, the rebirth of the state company as investor. To this was added the defeat of the various reform projects in the Mexican Congress and the new ideological course set by the Chávez administration in Venezuela, plus Costa Rica's aborted reform, the departure

[1] Initially all power transactions had to take place in the short-term market, which favored the exercise of market power, while the distributors could not transfer prices to consumers, which led to their financial collapse.

of the private operator of two thirds of the Dominican Republic's distribution market, and the suspension of the process in Ecuador. Brazil's shift in reform model was, paradoxically, less disturbing (as will be explained later).

Other countries also experienced problems of their own, although they were less pronounced than those mentioned above. Colombia and El Salvador saw difficulties in attracting private investment into new generating plants and the governments of both countries, to a greater or lesser extent, are trying to resume their roles as investors to make up for this apparent deficiency. Honduras has faced difficulties in implementing a market model that was adapted to the country's structure. And the ongoing governance crisis in Nicaragua and the private sector's refusal to make the investments that are required to control power losses and payment arrears have thrown that country's reform experiment into chaos. After a promising start with an innovative design, difficulties in the implementation of Jamaica's new model led it to recentralize its system. As a result, the island nation now faces the challenge of adequately regulating the private monopoly. Countries that achieved important successes in the early years of the reforms are now facing obstacles. For example, Peru has had to cancel the planned privatization of its southern system; political uncertainty in Bolivia threatens the survival of the model; and even Chile, the region's reform pioneer, has had difficulties that reveal the need to modernize its legislation and adopt a more suitable transmission pricing system.

After reading this chorus of lamentations the uninformed reader may well agree with the critics that reform has been a failure and that it would be better to return to the statist model. However, the defenders of this extreme interpretation conveniently forget to review the reasons that led to the failure of the statist model in many countries in the first place. A step back would not fix any of the problems that the reforms are intended to solve, but would incur heavy costs to compensate those who believed in the model and made considerable investments. This has been understood very well by the administration of President Luiz I. "Lula" da Silva in Brazil, which adopted the pragmatic position of accepting the fundamental principles of the reforms. However, the difficulties experienced in solidifying the reform model force us to reflect deeply, with the same care as we did in the previous chapter with respect to the statist model, while taking into considerations the lessons learned from the experience so far. The reform efforts must be examined in the light of the failures of the

old regime, not only to use the comparison to justify moving forward, but also to make sure that the same type of defective reasoning, which at first concealed those failures, does not prevent us from seeing the faults of the new model.

Chapter 1 illustrated how lack of efficiency incentives combined with rate schedules that did not reflect real costs resulted in generally inadequate returns for the state companies, which accumulated very large deficits. The lack of adequate incentives was largely related to the use of the public service companies for political gain. Rent-seeking groups were allowed to capture the industry and distort its objective. The consequences were general and badly targeted subsidies, inefficient and insufficient expansion of the industry, and its use as a virtual employment agency prone to corruption.

The initial expectations of some reformers cannot be taken as a reference point when judging the achievements or failures of the reforms. Rather, it has to be compared with the counterfactual scenario, a difficult task that means making conjectures on what would have occurred in its absence. However, the fact that many of the problems that plagued the old regime persist in the countries that have not undertaken any reforms, or in industry segments where the state has maintained its presence in countries where reform was partial, are good signs that the reformist diagnosis was not completely off the mark.

We can use the lessons of the past to distinguish between those problems that are a natural consequence of the adjustment to the new system (which could be remedied with targeted support and by heeding the lessons learned from the experience), and those that present genuine challenges for the sustainability of the model. It has already been extensively noted that the past and present problems of the electric power industry are fundamentally due to lack of consistency between performance expectations and the real incentives facing companies and consumers. The relevance of the judgments made regarding the existence of suitable complementary institutions and of the expertise required to operate the industry also plays a role in creating those problems. However, the likelihood of resolving inconsistencies within a reasonable time and cost are not equal for both models in most countries in the region. Throughout this chapter, and in the ones that follow, we will argue that, despite the difficulties, the reform program offers greater potential than the statist model, as long as the lessons learned from the experience so far are taken into consideration. Although little

headway has been made, there does not seem to be any other alternative that can provide sufficient incentives to strengthen the commitment of governments.

The problems that the sector now faces are partly inherited from the old regime and partly arise from the difficulties in implementing the new instruments to improve efficiency and promote private sector participation. The first group of problems includes the difficulty of separating the roles of the state in order to avoid the conflicts of interest that arise from its activities as an entrepreneur in competition with the private sector and its role as policymaker and regulator. The second group of problems relates to the difficulty in finding a regulatory model that can be adapted to the institutional shortcomings and the resources available to the countries of the region. There are also several other problems in promoting private participation, including: (i) the establishment of a competitive market able to create long-term investment incentives that guarantee security of supply and reduce price volatility; (ii) using incentives to regulate the distribution segment; and (iii) adequate management of subsidies to provide affordable access to the service for the poorest. These difficulties have highlighted some limitations and failures of the reforms that escaped the initial scrutiny of analysts and to which we now turn our attention.

What remains of this chapter compares the expectations of reformers with actual results in order to identify the reasons behind the discrepancies and, where possible, the possibilities for making adjustments to the processes in order to achieve the desired objectives.

The Roles of the State and the Private Sector

The separation of the roles of the state as policymaker, regulator and entrepreneur and a clear view of the role of the private sector are essential features of the new reform model. Following this new construct, the government should concentrate on exercising its primary roles as policymaker, leaving the execution and application of a regulatory framework to a separate agency, in order to give credibility and stability to the new rules. The entrepreneurial role should be transferred to the private sector, as far as possible. The government should play a subsidiary role, intervening only at times when the private sector cannot perform its function. The inevitable and legitimate transactions between the various interest groups can

be more transparent when these discussions are limited to policymaking, leaving technical matters to the regulatory agency.

The separation of roles is considered an indispensable requirement for making the routine management of the companies independent from other unrelated government decisions, improving the accountability of state-owned companies and increasing their efficiency. It also contributes to leveling the playing field for private and state companies, which facilitates the participation of private capital. Finally, the separation of roles promotes competition, fosters efficient price systems, helps establish and enforce quality standards, and protects consumer rights.

Although the separation of the roles of the state was a crucial part of the reformist creed, the evidence available shows that it was not easy to carry out. In most cases, the boundary between regulation and policymaking is not very clear. This has been evident in Colombia, where a struggle took place between the Ministry of Mines and Energy and the regulator regarding the deregulation of the natural gas market, and in Brazil where the government has legislated on areas that could be considered the purview of the regulators. Conflicts of interest have arisen when the state has continued its role as investor, sometimes in competition with the private sector, and discriminates in favor of its own companies (as was the case in Brazil and Colombia[2]), or when it requires private companies to follow measures that are unrelated to their business objective, such as implementing social policies (El Salvador, Guatemala and the Dominican Republic), or when it forces private investors to participate in joint ventures with the government (as is currently the case in Argentina).

Although no single state company now designs policy, sets rates and provides services, as was typically the case in the past, there is no lasting example of separation of roles as proposed by the reformists. Although, in most countries in the region, this type of separation is formally established in the legislation, state action can always create clear conflicts of interest because of the inability of governments to refrain from intervening in some circumstances. Mention has already been made of those cases in which the government would pay a high political price if it did not intervene (such as when security of supply is in doubt or when prices rise disproportionately). While these instances might provide a temporary justification for breaking

[2] By granting them advantages (such as sovereign guarantees for loans) over their competitors in the private sector.

the commitment not to intervene, these cases must be distinguished from those that take place because the opportunity arises. The importance of this distinction (which is not always easy to make) is that it provides an opportunity to adopt a design that minimizes the occurrence of events that can be used as an excuse to break the commitment.

In some cases, especially in the initial years of the separation process, the state company continues to directly or indirectly carry out regulatory and policymaking functions because of the weakness of the ministries and regulators. In these cases it would be impossible to insist on strict separation in the short term. So, although it is important to analyze the formal aspects of separation, the work of the researcher should concentrate on identifying these conflicts of interest and their potential importance, and recommending viable solutions to minimize them.

These difficulties are a reminder that implementation of the reform program is subject to a series of compromises imposed by the specifics of each country. In addition to a careful evaluation of those specifics, reformers must be prepared to evaluate the existing trade-offs and attempt to minimize the negative impact of the inevitable conflicts of interest caused by the need to coexist with the state as entrepreneur for a long time to come. Consequently, after a short summary of the extent of private sector participation in the electricity sector in the region, and a discussion of the difficulties of applying the regulation recommended by the textbooks, this section ends with a pragmatic analysis of the conflicts of interest originating in the multiple roles of the state.

The Continuing Presence of the State as Entrepreneur

Fifteen years after the beginning of the reform process, private participation in the electricity sector is a long way from becoming a reality in the region, both among countries and between the industry's various segments. The state continues to function as an entrepreneur in all countries except Chile (see Figure 2.1). However, with the exceptions of Paraguay and Uruguay, the electric power industry is not exclusively state-owned in any country. In some countries (such as Costa Rica, Mexico, and Ecuador) private participation is limited to a minority portion of the generating segment through power purchase agreements (PPA).[3]

[3] This formula also exists in Uruguay, at least in the legislation.

This persistence of the state as entrepreneur can be attributed to ideology, to commitments entered into during legislative negotiations, to the central government's lack of jurisdiction over all the assets, or to the private sector's lack of interest in participating (whether because of the absence of an adequate regulatory framework, or errors in the privatization process or simply because of the exhaustion of the political capital that permitted the reform process to begin in the first place). The legislatures of Costa Rica and Mexico have blocked proposals for ideological reasons. In Uruguay, it was an exercise of participatory democracy that led to a popular mandate that the electricity company remain in state hands. Strategic considerations (not always well justified) have led some countries to maintain specific assets in state hands, including nuclear generation in Argentina and Brazil, and hydraulic generation in El Salvador,[4] Guatemala, Peru, and the Dominican Republic. On occasions, the state has reserved ownership of hydroelectric plants for itself in order to use them as social policy tools or to maintain some control over the market (as in the case of Guatemala and Honduras).

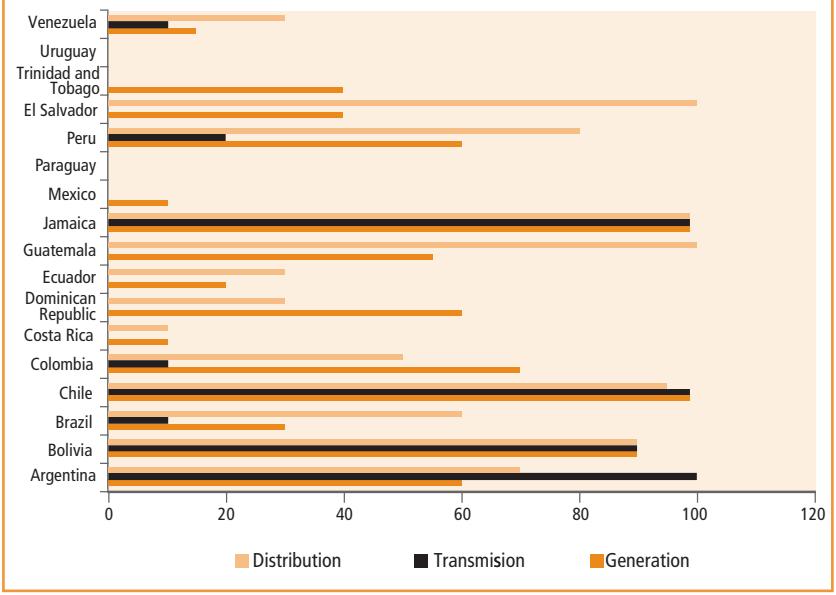
Many countries that adopted the market model and privatized some of their assets have maintained partial or total state ownership of the transmission segment mainly for strategic considerations. There is consensus about the desirability of centralizing the expansion of transmission in one government body. The characteristics of the transmission business (with its lower volume of investment, without direct contact with the public and with relatively fewer employment and business opportunities than distribution and generation) seem to have protected it from patronage interests. However, the performance of state transmission utilities has not always been satisfactory and in some cases is remunerated below cost in order to exercise control over prices. In the case of large-scale binational generating projects, such as Itaipú, Yaciretá and Salto Grande, it is not very practical to consider privatization. In other cases, despite the central government's intention to privatize assets, the assets belong to territorial bodies over which it does not have jurisdiction, for example, the municipal utilities in Colombia, the provincial ones in Argentina, and some in Brazil. In various cases, the slow pace with which the reform moved forward permitted interest groups to become entrenched and block the process. This is what

[4] And, until recently, geothermal generation as well.

happened in Brazil with hydroelectric generation during the administration of Fernando Henrique Cardoso. Difficulties inherent in the projects have also prevented taking advantage of the opportunity to reform, as in the case of ISAGEN and the public distributors in Colombia. The lack of credibility of the reform process and loss of appetite by foreign investors have also contributed to the failure of some privatization attempts (such as in Ecuador).

Capitalization is an interesting private participation scheme that has had a variety of outcomes. It consists of the acquisition of a dominant interest (generally around 50 percent of the value of the company) by the private sector on the condition that it will contribute capital that can be used to pay the company's debt service or to carry out an expansion program. This model was used initially in Bolivia and later in Colombia and the Dominican Republic. While observers agree on the success of the capitalization of Bolivia's electric power industry as well as Empresa de Energía de Bogotá, the capitalization of the utilities in the Dominican

FIGURE 2.1 **Private Sector Participation**
(percent)



Source: Espinasa (2001), updated by the author.

Republic failed for a variety reasons, the most important being institutional weakness.

The companies that remained under state control have performed, with some brilliant exceptions, much as they did before the reforms took place, even in countries that have adopted modern regulatory frameworks. The great majority of distribution companies continue to report high losses for technical reasons or because of fraud or deficient metering and billing, or due to an inadequate governance structure and political interference. Similarly, the use of state-owned companies to achieve non-business objectives continues to be an endemic problem in the region. Rates paid by the final consumer are insufficient to finance expansion and, where the state company is used as a vehicle to make transfers to low income groups, it is done in a way that affects financial performance (see Chapter 8).

Naturally there are exceptions to the rule. Chapter 6 points to the case of Empresas Públicas de Medellín, to which should be added ICE in Costa Rica and ISA in Colombia. Some of the reasons that underlie this performance are also discussed, as well as the likelihood that they could be made sustainable or duplicated in other environments. Later in this chapter we examine some measures that facilitate the independent management of state companies on purely commercial grounds and describe the case of ISA.

Difficulties in Textbook Regulation

By 2005, almost all countries had established formal regulatory bodies, and only one of them (Guyana) had adopted the regulation by contract system, a modality adapted to its size and institutional capacity. A multi-sector body oversees two or more public services in Bolivia, Costa Rica, El Salvador, Jamaica, and Panama, while in Colombia and Mexico the regulatory agency oversees only the electric power and natural gas industries. In most cases the regulator is also responsible for oversight and control. The exceptions are Colombia and Chile where these tasks are in the hands of different entities. In Chile, the regulatory agency also exercises some policymaking functions, while the policymaking body has functions that fall within the jurisdiction of regulation, as well as supervision and control.

For a variety of reasons, the performance, suitability, independence and credibility of these bodies has been largely below expectations. The regulatory task is in itself difficult, but it becomes much more so when

it also includes setting up the agency, designing and testing the market, and developing the body of regulations stipulated by law. The creation of a regulatory culture in countries where this tradition does not exist is a difficult task and takes a long time, especially when complementary institutions do not exist or are incipient and there is a shortage of qualified technical staff. In these circumstances, ensuring the suitability of the regulatory bodies cannot be separated from the importance of the structure adopted for the industry or, more broadly, of the suitability of what has been called the regulatory system (Brown, Stern and Tenenbaum, 2006), which covers all aspects of regulatory activities (such as laws, decrees and regulations), all activities of the regulatory bodies, all appeals processes, and relations between the regulatory bodies and all other state bodies on administrative and policy matters related to the industry.

Regulatory systems have two important areas of concern: *governance* and *substance* (Brown, 2003). Regulatory governance refers to the institutional and legal design of the regulatory system, and is the framework within which decisions are taken. Regulatory governance is defined by the laws, processes and procedures determined by the companies, actions and parameters that must be regulated, the government bodies that make regulatory decisions, and the resources and information that are available to them for this task. *Regulatory governance* is the "how" of regulation. Regulatory substance relates to the content of the regulation, which is formed by the explicit or implicit decisions made by the regulatory body or other government bodies, jointly with the rationality that accompanies these decisions. *Regulatory substance* is the "what" of regulation.

Some academic experts on reform (Cubbin and Stern, 2004) have tried to evaluate the suitability and quality of regulations by studying the extent to which they meet textbook requirements of independence, suitability and transparency in relation to formal aspects of the legislation and composition of the regulatory body.[5] The authors develop an index of the structure of regulatory governance that includes four components: (i) if there is an electricity or energy law; (ii) if the regulator is independent or if the ministry acts as regulator; (iii) if the regulator is financed with contributions from the regulated companies or directly from the government budget; and

[5] The analysis does not take into consideration the particulars of any country, such as the institutional resources and the political economy. In addition, it does not take into account other informal aspects, such as unwritten beliefs or rules.

(iv) if the officers of the regulatory body and the market institutions are remunerated competitively or are subject to restrictions imposed by the civil service salary scale. The authors use this information in an econometric analysis and find that the highest values of the indicators of government structure are associated with greater utilization of generating capacity.

However, although the components of the index are relevant, they are not sufficient, and there is a very high risk in using these classifications to rank a particular country, as shown by a careful analysis of the classification undertaken in a recent article (Wallsten et al., 2004). For example, this classification shows the Dominican Republic in third place above Colombia, while Chile is among the lowest, ranking above only Ecuador. The performance of the sector and the effectiveness of the regulatory effort in these countries quite clearly do not correlate with this index, as anyone with knowledge of the industry can confirm.

Paraphrasing Joskow (2000b), regulatory systems and institutions must be designed with the people who will implement them in mind and in the context in which they should develop. This chapter now examines the factors surrounding regulatory governance that have affected the performance of regulatory bodies in the region, leaving aside issues of substance, which will be dealt with later.

Independence, Technical Suitability and Capture

Regulatory independence has only been relative. Appointment processes are not very transparent and are frequently manipulated by governments; for example, on various occasions regulators have been changed at the request of the government. In any event, the independence of the agency responsible for regulation is not an end in itself, it is a means of guaranteeing for investors that the government will not engage in opportunistic behavior, that it will apply the rules of the game without discrimination, and that the private sector will not abuse the consumer. It is important to generate confidence in the capacity of the regulatory institution to solve problems and make its decisions based exclusively on facts, which means that the agency has to enjoy a degree of immunity from government pressure, be able to freely hire the best regulators and most suitable staff, establish clear procedures for decision-making, be capable of adapting to changing markets, and make credible commitments and other changes related to the style of regulation. To the extent that these conditions are met, it will be possible

to minimize the risk that governments could use the regulatory authority to affect private investors.

However, even this is not enough. In countries where the regulator is financed through user charges there are limitations on the use of the budget, which must be approved by the ministry (see Chapters 3 and 4 for a discussion of the cases of Brazil and Colombia). A common problem for almost all the countries of the region is that there have been setbacks in providing regulators with adequate remuneration because of the envy of government bureaucrats whose salaries are generally much lower. Another problem has been the small universe of candidates suitable for regulatory tasks due to the limitations imposed by the pay, the system of disqualifications, and the human resources available in the country. Although the system of disqualifications could, in principle, help prevent capture by the regulated companies by placing limits on the candidates who qualify to work as regulators, it is in fact facilitating technical capture.[6] Naturally, complying with all the formal requirements is of little use if the functions assigned to regulators do not allow them to deal with the fundamental areas of their competence, as is the case with some agencies in the region.

Difficulties Created by the Lack of Credibility of the State's Commitment

It was too optimistic to assume that governments could delegate critical matters to fully independent bodies capable of making a credible commitment that they would not engage in opportunistic behavior in favor of state-owned companies or expropriate private investors. In almost all cases where difficulties have occurred in the region, governments have directly intervened and considerable evidence indicates that, with very few exceptions, the real power to set rates lies with the government.[7] As will

[6] In the Dominican Republic, where legal requirements practically excluded anyone who was not a former official of the state company from being a regulator, this did not stop the president from appointing a regulator with no experience in the sector. In Colombia it has been difficult to change the requirements that severely limit the number of people who could become regulators. During the early years of the reform in Brazil technicians from the regulated companies were assigned to the regulatory agency, Agencia Nacional de Energía Eléctrica (ANEEL).

[7] In Nicaragua, the Legislative Assembly resorted to micromanaging the electricity crisis of 2004. Although, in theory, the regulatory body met the necessary requirements, in practice there was no effective regulation.

be further discussed later, the institutional mechanism for establishing this commitment has not been very successful for several reasons, including legislative tradition, difficulties during the transition (including the learning period for new procedures and the long period that regulators need to gain a reputation), the huge political importance of the rates, and the responsibility of the state to guarantee continuity of supply. Even in cases where regulators are formally independent and follow recommendations on budgetary independence and appointments, they have not been immune from government intervention when it becomes politically expedient.

Need for Flexibility

A regulatory system is an incomplete contract between regulators and companies; therefore, the credibility of the regulatory commitment is a counterweight to the flexibility required to accommodate unforeseen circumstances and changes in the interests of the actors. When credibility is low, for example, due to fragile rule of law or insufficient protection of property rights, the advantages of flexible regulation have to be abandoned and replaced by a more rigid system. This explains the extreme rigidity of some regulatory systems in the region's power industry, which followed the Chilean example. Chilean reformers considered it necessary to include in the legislation the entire body of regulation to guarantee to potential investors that their investments would not be expropriated by the regulator. However, this had the unintended consequence of preventing the regulatory framework from giving a flexible response to changes in the environment, as was tragically demonstrated during the drought of 1998 and 1999 (described later).

The experience of California shows that structuring electricity markets is a never-ending task. Adjustments are inevitable and the task is to create a system that guarantees that the rules can be changed when necessary. Panama and some U.S. states have adopted similar approaches, setting up groups of independent external experts to oversee the markets and "institutionalize the change" (Arizu et al., 2001). Their experiences suggest two lessons. First, the experts must be seen to be independent and objective. In small- and medium-sized countries this probably means hiring foreign experts. Most of the people with knowledge in this field who live in the country will be perceived as biased, at least initially, due to prior connections with the industry. Second, the experts must have broad terms of

reference. They must have the power to evaluate not only the operation of the market, but also the system operator and regulator. And they must be authorized to recommend changes to the rules and structure. An excellent account of the international experience and the main considerations to be taken into account when setting up this type of institution are presented in a recent IDB publication (Wolak, 2004b).

Transparency and Accountability

This axiom of regulatory theorists has been difficult to implement. Although some countries have made progress in consulting with industry representatives and with the public, transparency is not easy to accept in cultures based on the civil code. In Colombia, it was ten years after the reforms were enacted that secondary legislation was adopted requiring consultation with interested parties and periodic reporting on regulatory achievements, as well as regular evaluations by third parties. An evaluation of the Brazilian system (Brown and de Paula, 2004) found that the regulator was not obligated to submit a report to Congress and that the procedures suffered from lack of transparency. In their report, the authors emphasized the importance of transparency for the effective regulation. To guarantee that disagreements are limited to matters of substance and do not include discussions of the impartiality and suitability of the process, the decisions and the discussion process that led to those decisions have to be fully explained. To avoid unnecessary recriminations they recommend that all the evidence presented for decision-making be made available to the public, including documents, opinions or arguments and all relevant information, except in extraordinary circumstances.

These problems of lack of accountability and transparency are of concern in Chile (Pollitt, 2004b), as well as in Brazil and Colombia. In many cases, the regulatory style is very heavy, dominated by complicated technical procedures with formulas that are sensitive to the parameters chosen and easy to manipulate, hindering objective monitoring of regulation. According to Pollitt, in the Chilean case, this is explained by the bias imposed by the fact that the agency was staffed almost exclusively by engineers, particularly in the years following its creation. In general, dispute settlement mechanisms are deficient or nonexistent, and appeals processes are very often unclear and frequently end up in court. The lack of competent judicial bodies to deal with these matters is an issue in Brazil (Brown and de Paula,

2004), but the problem exists in all countries of the region. Because of the large number of legal actions, the regulators feel prevented from revising their decisions even after their drawbacks are clearly demonstrated.

Limitations of Complementary Institutions

The regulatory model chosen is demanding with respect to complementary institutions such as the need for a competent judicial system, competition oversight bodies, entities with jurisdiction over policymaking, and the rule of law. If these institutions do not exist or do not function adequately, the potential of the regulatory bodies to perform their functions is greatly limited. The regulators do not operate in a vacuum and their effectiveness can be strengthened or weakened depending on the regulatory environment, which includes all government checks and balances, the judicial and legislative systems, financial sector regulation, environmental regulation and policy, dispute settlement and appeals systems, the political system and relations with other countries and multilateral organizations (Jamison et al., 2005). This type of concern is not new, as can be appreciated in the warning given in the background paper for the preparation of the IDB's Energy Sector Strategy (Box 2.1); however, one could have been optimistic at the time about ongoing progress in this area.

This is not the appropriate place to judge the progress made on these fronts in the region, but other specialized works have emphasized shortcomings in this respect and a reading of the daily press confirms it. Latin America has an institutional deficit that threatens the process of solidifying the reforms implemented in the recent past and the implementation of so-called second-generation reforms. Aspects that are taken for granted in other countries, such as the rule of law, clear property rights, an independent and competent judicial system, mechanisms for peaceful dispute settlement, performance of contracts, and the quality of public bureaucracies (including the bodies that oversee competition), are absent or are only beginning to be established.[8]

[8] In an empirical study of institutional development, Burki and Perry (1998) show that although the countries of Latin America and the Caribbean have made headway in the areas of contract performance and expropriation risk, they still lag behind other regions. In fact, the region has improved very little in measures of the level of corruption and the quality of the bureaucracy. This was confirmed by a World Bank study, which shows that the region also

BOX 2.1 Reform of the Industry and the State

Reform of the electric power industry is a fundamental part of any effort at reforming the state because they complement each other and are complemented by reforms in other sectors or industries. The right time to undertake reform, as well as the speed with which it is implemented, can depend on progress on other fronts. If the idea is to replace a model based on a vertically integrated state monopoly with a market-based competitive system, there must at least exist institutions and basic legal frameworks for the operation of a market economy. The success of this type of reform depends, then, on the maintenance of the rule of law where contracts are respected, appeals channels are well defined, and mechanisms for controlling monopolies are strong. The establishment of a new regulatory framework is closely linked to the existence and/or establishment of the legislative and judicial framework in the overall state reforms and to the strengthening and/or establishment of complementary institutions. Experience also indicates that it is not possible to initiate reforms without having a stable macroeconomic environment in place. The absence of these two requirements explains Brazil's delay in undertaking reforms in the electric power industry despite the prolonged crisis and the risk of shortages experienced in the 1990s.

Source: IDB (1998).

In the best case, the absence of competition policies and suitable competition authorities overburdens the already heavy task of the regulator, and in the worst case, it leaves it in the hands of unqualified bodies that are easy to capture. Consequently, the number of options available to create the market is limited. Legal uncertainty stemming from institutional restrictions is a frequent problem in the region; not only can it discourage investors but, what is worse, it can give the wrong incentives to unscrupulous investors helping them achieve their objectives with little transparency to the detriment of the overall development of the market.

An additional aspect related to the importance of the process of political decision-making to the sustainability and permanence of these

seems to lag with respect to legal certainty of property rights and reliability of the judicial system. The study also shows that countries with legal systems based on civil law (particularly those inspired by the French tradition, which is the case in most Latin American countries) have generally had difficulty in providing adequate legal protection to creditors and minority shareholders, which in turn results in very weak and concentrated capital markets that restrict opportunities for investment and growth.

measures is the central topic of the IDB's 2005 Economic and Social Progress in Latin America (2005 IPES) (IDB, 2006). One chapter, in particular, analyses the effect of the integrity of this process on the performance of public services in four countries of the region (Bergara and Pereyra, 2005). Although a strict interpretation of these considerations could lead to pessimistic conclusions about the future of regulation in many countries of the region, it could also help understand the limitations of the model and assess the importance of continuous and well-balanced progress on all fronts.

Credibility and Legitimacy

In the last instance, and regardless of how it is arrived at, the effectiveness of the regulators depends on the credibility and legitimacy of the institution. Ayala and Millán (2003) identified this as the fundamental problem for the sustainability of the reform in Colombia and suggest the adoption of specific measures in the area of constitutional and legal restrictions to improve it. Political, legal, and popular support for this type of institution and culture is critical for the survival of the system. However, its legitimacy does not only depend on the capacity of the regulatory bodies to perform their functions, but also on legal rules that define its formal authority, the willingness of the courts and other government organizations to recognize and abide by these rules, and the belief and acceptance by companies, customers, foreign governments, and multilateral organizations that these bodies are legitimate and competent (Jamison et al., 2005).

Consequently, it is fundamental to develop a regulatory culture through the dissemination of knowledge and training of the judicial bodies and lawmakers, which should include the commitment of academia and industry organizations to help develop that regulatory culture. In addition, it would be necessary to show ongoing progress in the quality of institutions, as well as the identification of the causes of past errors and adoption of measures to minimize opportunities for conflicts of interest. Lastly, to justify the process, success in the adoption of a transparent subsidy system for the poorest and acceptance by the public that this is a task for the state and not the regulator are crucial. The regulator is only responsible for the problem of achieving efficiency through the transparent application of the principles. The weak payment capacity of poor consumers is a government responsibility that must be addressed by designing and financing a system of transparent and equitable subsidies.

Conflicts of Interest in the Multiple Roles of the State

Faced by the practical difficulty of achieving the separation of state functions, the question becomes how to minimize the occurrence and seriousness of the negative impacts that conflicts of interest can have on the development of the electric power industry. This section summarizes some of these conflicts and suggests measures to mitigate them.

Regulator and Policymaker

The lack of a clear delineation between the functions of the regulator and the policymaker has led to conflicts in several countries. Complains generally center on whether the regulator or the government has overstepped its bounds. Regardless of whether the government is represented in the regulatory commission and has a vote (as in Chile and Colombia), or commission members are independent experts, the areas of responsibility of the regulator and the ministry are not clearly defined. This lack of definition results from incomplete legislation and/or because of faults in the regulations themselves. Some of the questions raised by this problem are: Can the regulator, in its role as consumer guardian, regulate aspects of hydrocarbon exploration and development strategies, or limit their exports? Can the ministry define by decree matters that indirectly affect the production costs of a regulated service such as electricity? The answers depend on the legislation and regulations, as well as the circumstances of each country, but there are some general rules that define areas of macro-regulation, which would fall under the government's responsibility, and micro-regulation, which would be the responsibility of the regulatory body (Brown, 2003). Although an analysis of legislation in the countries, combined with observation of their recent history and current conditions, would identify the potential of these failures for causing important conflicts of interest, their solution through changes in legislation could be hindered by the reluctance of governments to open a parliamentary debate that could have unforeseen consequences. Although conflicts are not limited to cases where lawmakers have established the explicit participation of the government in the regulatory body, the management of these bodies requires additional measures given the temptation to confuse the two roles when they are exercised by the same person. A critical case already mentioned is that of Chile, where the regulator simply plays the role of

advisor and the ministry directly exercises functions that are clearly the responsibility of the regulator.

Regulator and Entrepreneur

In most countries of the region, the state continues to play an important role as entrepreneur, either through the central government or through territorial bodies. Conflicts of interest can arise when the minister chairs the board of directors of a company and at the same time, by virtue of his other functions, participates directly or indirectly in regulatory or policymaking decisions that affect company performance. This happens in very few countries in a direct way because most have regulatory commissions made up of independent experts. However, it can occur indirectly when the minister, or the president himself, intervenes in regulatory decisions or in the regulation of the law to favor a state company or to control price rises for reasons that do not concern the functioning of the industry. In the first case, the conflict is more serious when the government participates in some segments in direct competition with the private sector, such as electricity generation. A regulatory culture is only just emerging in the region and, in more than one case, when there were problems with the rate structure the president has intervened directly, ignoring the independent body responsible for the industry.

Regrettably, there is only anecdotal evidence on the degree to which these conflicts occur in the region, but it would not be difficult to obtain information on them in each country through a study of recent history and by asking entrepreneurs, analysts and other interested parties for their opinions. In principle, when the government is represented on the regulatory commission, conflicts of interest among the roles of the state as regulator and entrepreneur can be resolved by a regulation that clearly defines the cases in which the minister or his representative should recuse themselves from voting and by adopting clear governance rules for state companies (as will be discussed in the chapter on Colombia).

Entrepreneur and Policymaker

One of the ways in which the conflict between the government as entrepreneur and as policymaker can arise is when it uses state-owned companies for purposes other than the provision of services such as, for example, as

a means for furthering social policy goals such as increasing employment. Yet, this type of conflict of interest can be subtler. Through a series of interventions, the government can grant state-owned companies favorable treatment, placing them at a competitive advantage vis-à-vis private companies. This danger will exist as long as the government owns companies that compete with the private sector, particularly in situations where the government is the final guarantor of the service. Frequently, governments resort to direct interventions in order to guarantee that future investment will take place instead of enacting the reforms that would create incentives for private participation. However, some conflicts can be mitigated with the establishment of explicit verifiable commitments and the adoption of governance measures in state companies.

The principle implicit in these agreements is to prevent the company from being used to achieve objectives other than the efficient and financially sustainable provision of the service. This concept is known in the specialized publications as corporatization and entails the notion that publicly owned companies should be operated as commercial businesses. Other requirements are that they must be subject to taxation and pay interest, obtain competitive rates of return on capital, be subject to hard budget constraints, and be responsible for their own budget, borrowing, purchases, hiring and pay policies. Their boards of directors must be solely responsible for a commercial operation that produces public utility, which is the only legitimate objective of the company. Governments can contribute to achieving national objectives with transparent mechanisms that do not jeopardize the company's financial health or integrity. Only when this objective is achieved can the regulatory procedures be applied equally to both state-owned and private companies. However, these conditions are very far from being a reality in the countries of the region and there are considerable political obstacles in the way of their implementation, as the difficulties experienced in Colombia demonstrate (see Chapter 8).

One successful example of corporatization is the case of the ISA transmission utility in Colombia where the government implemented a governance system reinforced by a private minority interest through the process known as equity democratization. The government has kept its commitment to respect the governance agreements of the companies and the rights of minority shareholders. Although the government has a majority interest, the chairmanship of the board is held by a representative of the minority shareholders. The company has been repeatedly selected by

Transparency International as a leader in this area. Its excellent management has made it one of the most prosperous companies in the region, to the point of participating as a private company in major projects in Bolivia, Ecuador and Peru and more recently as shareholder in the Electricity Interconnection System for Central America (SIEPAC) project.

The Reform Sequence

Before the reforms were enacted, most public service companies in Latin America were vertically integrated state companies. This meant that reformers were saved the debates on stranded costs[9] that plagued the liberalization process in the United States and Europe. However, the sequence in which reform measures are implemented can create its own stranded costs that affect the performance of the sector. The reform sequence advocated by the literature on the subject begins with the establishment of a solid regulatory framework, continues with the restructuring of public assets and organization of the relevant markets, and ends with privatization (starting with the distribution segment). This sequence has many advantages: it permits the industry to develop the desired structure, facilitates privatization by providing clear signals to investors, guarantees the existence of financially solid buyers in the wholesale markets, and avoids the presence of state companies in competition with private companies.

Unfortunately, the period for introducing the reform is generally very short, and a mix of factors (such as historical legacy, ideology and fiscal issues) defines the real sequence (as opposed to the ideal one). Additionally, almost without exception, the reforms that are finally adopted fall far short of what reformers had in mind because of the compromises and concessions that have to be made to win legislative support. These compromises introduce additional restrictions that directly or indirectly affect the implementation of the reforms and have costs that are often not apparent until sometime later.

Some experts suggest that there is a rational sequence for the privatization process. For example, they maintain that the distribution companies should be privatized first because they are the most likely to obtain gains in efficiency and also because they are the first link in the chain that generates

[9] These are the costs incurred to compensate companies that made investments protected by the provisions of the previous regulatory regime.

cash (private generation is of little use if there is no one to buy the power). Others contend that the process should be determined by cash shortfalls; that is, that the most efficient companies should be privatized first because they are likely to yield higher sales prices for the government. As explained later, the sequence that was actually adopted in the countries that privatized had more to do with reasons specific to each country than to any specific sequence. In Chile, where the government was free to act any way it chose, the process began with the distribution companies in the central system and then continued with generation. In Argentina, generating companies were privatized at the same time as the distribution companies owned by the federal government (which were the only ones that fell within its jurisdiction), but leaving out binational bodies that required agreements with other countries, and nuclear generation for strategic and security reasons. In Colombia, the government first privatized the state-controlled generating companies, but delayed the privatization of the distribution companies, which it also controlled, and the CORELCA companies for regional policy reasons. For financial reasons, privatization of municipal companies was only possible in the case of EEEB.[10] The distribution segment was privatized first in Nicaragua, but the privatization of existing generation was stalled because of prevailing market conditions. The sequence was similar in Brazil where the government could not continue as planned with the privatization of existing generation because of opposition from the bureaucracies of the state companies in alliance with local politicians. In Panama all segments were privatized simultaneously. As mentioned earlier, many countries, such as El Salvador, Guatemala and Peru, reserved the ownership of hydroelectricity generation for the state for a variety of reasons.

Reform by the Book

A major concern of Chilean reformers was encouraging the participation of private investors. The difficulty of this task could not be overestimated given the innovative model proposed. This would have been a challenging endeavor even in a developed economy with the required market institutions and legal traditions already in place. Chilean reformers were aware that such an effort required time and patience, as well as imagination. Al-

[10] This privatization also resulted from the efforts of a particularly audacious mayor.

though the autocratic regime of the time imposed other severe costs on the country, it gave reformers the time and the means they needed to develop the plan in stages. A well-structured process of corporatization of state monopolies was started long before there was any talk of private sector participation. The corporatization process was accompanied by the adoption of a rates policy based on marginal costs, which were obtained with the help of mathematical models specially adapted to the composition of the country's generating capacity (which included a hydroelectric plant with multiyear regulation of reservoirs). These components were incorporated into a very detailed law (passed in 1982) that left very little to the regulator's discretion and that, given the political system in existence, was very difficult to change. An important aspect of the law, which analysts do not often take into account, is that the independence of the regulator is very far from the standards ordinarily required. The functions of the regulator were exercised by the National Energy Commission, made up of cabinet members who are also responsible for most policymaking functions. Again, given the conditions in Chile at that time, this peculiarity does not seem to have significantly affected the perception of investors.

After completing the corporatization process, and prior to the restructuring process, the Chilean government guaranteed the expansion of the generating capacity required during the critical transition period by entering into agreements with multilateral lenders, mainly the IDB, for the loans required to finance major hydroelectric projects. It was only then that distribution was separated from generation and the privatization process began. The government granted generous incentives for the participation of local financial groups and employees of the privatized companies, which would later take control of the largest investors, the pension funds. This was quickly followed by the privatization of the generation segment, which took place with the notable absence of foreign investors. They arrived in Chile only years later, purchasing existing assets at high prices and investing in some new projects. The success of privatization and of later investment in new plants was greatly helped by the guarantees given to investors, which included limited competition, as will be seen later.

Concessions Are Needed to Enact Reforms, but They Have a Price

The reform process in Colombia, which was facilitated by adoption of a new constitution, began with the establishment of the regulatory frame-

work and the regulatory body as well as with strengthening complementary institutions. The compromises that had to be made to enact the legislation initially prevented privatization of the distribution utilities, which remained subject to the incentives and political influence of the old regime. Consequently, these companies did not improve their management indicators and continued to post high electricity losses and labor costs. These deficiencies provided the justification for linking private capital to the generating and distribution companies of Bogotá and to the distribution companies of the Caribbean coast. However, other state-owned companies could not follow this example for political reasons (see Chapter 4).

Shortcuts Are Sometimes Necessary to Take Advantage of the Opportunities

Chile's success in making the transition to the new system, which involved the private sector without jeopardizing supply, encouraged other countries to follow suit. However, the conditions that permitted Chile to follow the correct sequence of reforms were not present in other countries. Fiscal considerations led Argentina to privatize the state company, Servicios Eléctricos del Gran Buenos Aires (SEGBA), before it was able to implement the new regulatory framework and create the needed market institutions. To compensate for these limitations, the government offered investors in generation initial contracts lasting eight years. Investors in the distribution segment were granted comfortable rate schedules that would not be reviewed for ten years. Fortunately, these limitations were only temporary because vertical separation of market segments was followed by the establishment of the regulatory body and the market. This opened the way for developing a competitive market in generation and attracting new investments[11] (although this was less successful for transmission).

However, shortcuts can be costly. In Brazil, the reform process began with privatization of the distribution companies. While this was the correct step to take, it was done without first completing the regulatory framework or establishing the wholesale market. This delay in the start-up

[11] Favored by the development of natural gas reserves, made possible by the reforms in this sector, and by the good business climate resulting from the new macroeconomic stability associated with the convertibility program.

of key institutions, added to other obstacles such as strong opposition to privatization of the generation companies (led by the bureaucrats of the state companies in concert with local politicians), finally resulted in the suspension of investments in new generating plants at the time when they were most needed by the system.

In the early 1990s, several Central American and Caribbean countries, lacking the resources to invest in the new plants needed to avoid service rationing, could not wait for the reform to attract the private sector. They chose instead to enter into BOO (build, own, operate) or BOT (build, operate, transfer) contracts with the private sector before beginning the reforms as such. The lack of a clear regulatory framework and the urgency of these operations permitted the independent power producers to obtain high rates of return on the investment and impose inflexible conditions, such as firm purchase contracts (without right of rescission), which intensified the financial problems of companies already in deficit. The bad reputation of these contracts, which increased due to lack of transparency in their acquisitions, led to numerous accusations of corruption. The financial impact of these contracts on the sector was felt for many years after the start of the reforms due to failures in allocation of stranded costs, as occurred in Guatemala (Benavides and Dussan, 2004).

Not all the guaranteed power purchase agreements (PPA) suffered from the problems described in the preceding paragraph. Some PPAs in Colombia were negotiated through a transparent process that was compatible with the operation of the market (although because of the emergency situation, costs were higher than would otherwise have been the case). In Mexico, these contracts were the only possible alternative for bringing in the private sector, given the constitutional and political restrictions on reform.

Competitive Markets Without Reducing the Security of Supply

The establishment of competitive electricity markets was one of the main components of the reform package to promote economic efficiency without overburdening the regulatory authority. However, as in other parts of the world, the task was more difficult than expected. In addition to the many problems of application that have plagued the markets of the developed countries, Latin America faces its own difficulties.

The small size of the markets, the country risk and the strategic behavior of large investors create obstacles for reaching the minimum number of participants to ensure a competitive market. Increasing competition to keep prices low also increases the risk to investors and reduces stability, something that financiers of infrastructure projects generally require. In several countries, a rapidly growing market and dependence on hydroelectric resources lead to periodic energy constraints, rather than the installed capacity constraints faced by systems dominated by thermal power, which increases price volatility and the potential for some agents to exercise market power. In other countries, lack of human resources, the absence or weakness of the institutions that control and regulate competition, and the ambiguous function of the judicial system have hindered supervision of market competitiveness and implementation of the regulations.

This section does not attempt to present an exhaustive evaluation of the performance of competitive electricity markets in the region, a task that far exceeds our objectives. Instead, it presents some useful features for identifying the problems that afflict those markets and discusses the challenges that have to be overcome to achieve the planned objective. Consequently, the section begins with a description of the expectations at the start of the reform, mainly with reference to IDB policy documents. The next section outlines the structures of the industry and the designs of the wholesale market in the region, as well as some characteristics of their performance. It then goes on to discuss the set of problems that explain the mismatch between expectations and performance. It concludes with some thoughts on the difficulties that markets experience in adapting their models only half way.

Expectations of the Reformers

Although competition offered opportunities for improving efficiency, many reformers in the 1990s had no illusions about the likelihood of achieving a competitive market similar to that for commodities. They would have been satisfied with workable competition even if it were not perfect (IDB, 1996b).

Competition is not simply a "yes" or "no" question, but rather one of degrees. The real issue is whether it is possible to create a workable competition. Until now no general standard has been developed for a market with "competition in practice," so it is important to make an informed judg-

ment based on an evaluation of the barriers to competition and of market performance. Technological development in the electric power industry means that competition *in the market* is only possible in the generation and marketing segments, and that its scope, in both the wholesale and retail markets, depends on the characteristics of each market. The transmission and distribution segments are natural monopolies where competition *by the market* is only possible when awarding the concessions and when the regulator establishes rate schedules and defines the technical features.

Electricity markets need to be centralized even in segments where competition *in the market* is possible. There are several reasons why these markets cannot be organized in the same way as the commodity markets with which they were originally compared, including the fact that electricity cannot be stored.[12] This was recognized in the initial designs of electricity markets in pioneering countries such as Chile, England and Wales as well as in those countries that immediately followed their example. However, these limitations can mean that there are great opportunities to exercise market power that were not sufficiently appreciated at first.

While competition can be impossible in certain segments of the market, it can be achieved in others. For example, in a small market where it is difficult to create price competition in supply, competition can be possible in investment in new capacity and in the operation of existing facilities. Clear guidelines in this respect can be found in the IDB internal document, "Racionalidad de la nueva Política de servicios públicos domiciliarios" (1996b), which states: "In most of the large- and medium-sized countries in the region, it is feasible to have *competition in the market*, although competition in supply is limited to large and medium-sized consumers. In contrast, in small and some medium-sized countries, competition in the market is not yet feasible, despite the improved possibilities created by recent technological changes, the increase in the size of the market due to interconnections, and widespread use of natural gas. In the generation segment, *competition by the market* is achieved by acquiring additional capacity for the distribution companies, or a government body, through BOO (build, own, operate) or BOT (build, operate, transfer) mechanisms.

[12] Other reasons are the need to maintain adequate voltage and frequency in the network at all times to prevent the system from going down, the relatively small (or nonexistent) participation of demand in the market, and the length of time needed to bring new generating capacity to market, among other factors.

Transmission and distribution services are natural monopolies that do not allow competition in the market. Competition by the market can occur when the individual companies compete for the right to a concession that is auctioned periodically to promote competitive bidding."

According to another IDB paper (1998), which provides de background research for the Bank's energy strategy: "Increasing competition to promote greater efficiency can reduce incentives for participation by the private sector in the initial phase. A higher level of competition in the long term brings better prices for the consumer, but can increase the risk perceived by investors and delay investment in the short term. The credibility of this system of power exchange in an electricity system is a key factor for its competitive operation but it can take a considerable time to mature."

Most reformers agreed that to take advantage of the benefits of competition it was necessary to separate the potentially competitive segments of the market from those that are a natural monopoly. Not doing so would intensify any conflicts of interest and make the task of the regulator more difficult when a participant with interests in all segments uses the regulated segment to increase its ability to exercise *market power* in the competitive segment. Ownership of the transmission system is particularly important because free access by competitors can be limited if it is controlled by generators. The need for many competitors is clear, but this was not achievable without first breaking the horizontal monopoly structure of generation and dividing ownership of individual plants. "The vertical separation of the activities of generation, transmission and distribution is essential and is justified by competition in the market in the generation sector. In the large and medium-sized countries of the region, in which competition in the market is feasible, the resulting benefits are generally greater than the losses in economies of scale and in the diversification associated with vertical separation. In contrast, small countries can enjoy significant economies of scale but few benefits from competition in comparison with the losses from economies of scale and diversification. In these cases, it can be beneficial to maintain vertical integration, at least for the time being. To guarantee competition in large power markets, it is essential to have a minimum number of generating companies of similar size" (IDB, 1998).

However, in its day, the idea of complete unbundling of the segments, which necessarily meant the sale of assets to completely unrelated buyers, was not universally shared. Some thought that accounting separation was

sufficient. In any event, even when it was necessary to sell, not many problems were anticipated given that the companies were state owned.

The IDB also recognized the fundamental role played by the transmission system of the market operator and an adequate design: "*Competition in the market* is based on the existence of an adequate mechanism for network integration that facilitates financial and physical transactions. For the system to be sustainable, the mechanism must reflect the technical characteristics of the market (especially in hydroelectric systems) and must be capable of operating accurately. The cornerstone of a competitive market is the selection and implementation of an adequate system for operation of the electricity network. Countries use different models. The special conditions of systems that depend mainly on hydroelectricity are a special problem [...] Free access to transport networks is a basic condition for competition, which is not always achieved [...] The existence of vertically integrated transmission and generation systems is one of the main obstacles to competition."

As will be shown in the sections that follow, not all the countries in the region heeded the warnings of the preceding paragraphs. Although the results confirm that these warnings were not in vain, the difficulties that they mention were unimagined by the most cautious reformers.

The Different Structures of the Electric Power Industry

In early 2005, most countries in the region[13] had adopted a form of vertical unbundling and made attempts to separate the regulated segments from those where competition was possible. Unfortunately, some of them have not made much headway with implementation. The decisions of Guyana and Jamaica to maintain a vertically integrated system could be justified by reasons of size of the market, and it is also possible that other small countries that abandoned their vertically integrated structure would have fared better if they had not done so. Despite warnings (IDB, 1996b) regarding the importance of market size in defining the scope of competition, there was widespread optimism about the likelihood of achieving competition in the market.

[13] The exceptions were Guyana and Jamaica, which opted to maintain a vertically integrated industry; Paraguay, where there is de facto separation from generation but competition in this segment is irrelevant given the existence of mega-projects; and Mexico, where the reform process faced constitutional problems.

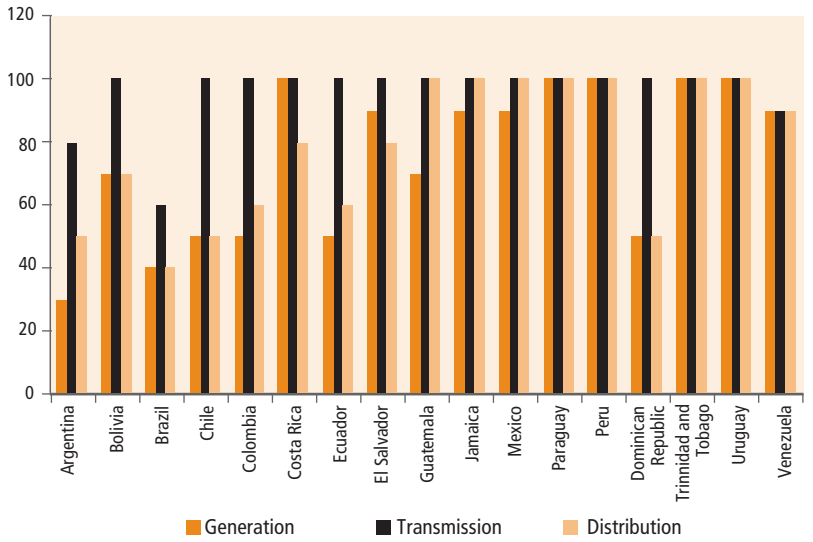
Also, many of the countries that established competitive markets did not make much progress with effective separation. Some required only accounting separation while others left the door open for reintegration by permitting acquisitions and mergers. Although the ownership of the companies was mainly in state hands, it was not possible to split them up adequately because many were owned by municipal or state governments over which national governments had no jurisdiction. Some countries retained state ownership of hydroelectric plants and operated them in a manner that was not compatible with competition in the market.

The example of Argentina, which restructured its sector and restricted indirect control of ownership in order to increase the scope for competition in the segments where it was possible and desirable, was not successfully repeated in the region.[14] In Chile, the structure of the sector remained highly concentrated both vertically and horizontally. In pursuit of a minimum business size that would allow development of major hydroelectric projects, the government left most of the generating assets, water rights and all trunk transmission of the central systems in the hands of the Endesa business group. Through risky financial maneuvers, Endesa would later control over 70 percent of generation, 60 percent of distribution and all transmission in Chile's central system. Although El Salvador and Guatemala restructured their markets, they did not restrict the purchase of assets in the various segments, which ultimately offset any initial achievements. AES, an investor that controls about 75 percent of the Salvadorian distribution market, has announced the building of a new generating plant, as it previously did in the Dominican Republic. In Colombia, compromises surrounding the reform process helped maintain vertical integration in municipal utilities. Private companies also remain vertically integrated either as a result of privatizations or of mergers. The companies are only required to maintain separate accounting. In addition, they have mounted legal challenges to the limits on their participation in the generation market.[15] In Brazil, restrictions on vertical integration between generation and distribution were relaxed to facilitate investment in generating capacity during the transition.

[14] Changes in generating technology, such as gas turbines, and the availability of gas in Argentina reduced the importance of economies of scale and increased the potential number of participants.

[15] The limits also exist for distribution companies where there is no competition in the market. The critics say that this restriction is a barrier to purchase of state companies by established private distributors who have financial resources and interest in doing so. Dis-

FIGURE 2.2 **Market Share of the Three Largest Firms**
(Percent)



Although electricity legislation as well as anti-monopoly and anti-oligopoly laws prohibited concentration in different market segments and strictly limited integration in Peru, both horizontal and vertical concentration exist in practice as a result of business mergers (Bergara and Pereyra, 2005). This inconsistency between the rules and actual events was resolved by changing the rules under the complacent gaze of the rest of society.

As a result, electricity generation in almost all Latin American countries is very concentrated. The three largest producers in Argentina and Brazil, where competition is most developed, control 30 percent and 40 percent of the national market, respectively. In other countries, concentration reaches 50 percent or more (Figure 2.2). Concentration is also high in the natural monopoly segments.

Most of the region's markets use a single institution to operate the electricity system in real time and to manage spot and day-ahead markets,

tribution companies in mature markets generate surplus cash above their investment needs. They are faced with a choice between investing in the country to purchase other companies or repatriating the profits.

including billing and collections. The only exception is Brazil, which has independent institutions for the two functions. Operation of the system and market in Colombia is the responsibility of the state-controlled ISA transmission company.

Market Design

The difficulties imposed by a defective structure were part of the reasons that led reformers in the 1990s to adopt a variety of market designs that did not necessarily follow the models of the developed countries (see Box 2.2 for a description of selected markets in the region). With the exception of Colombia, which adopted a model inspired by the one initially introduced in England and Wales, and El Salvador, which adopted a model similar to that of the Nordic countries, most other countries adopted variations of the Chilean model. The Chilean model is known as the cost model to distinguish it from the one used in Colombia and El Salvador where generators make price offers for dispatch. Under the cost model, the system operator uses a mathematical model that takes account of external parameters to determine the prices at which power should be traded in the spot market in order to meet demand. Some of these parameters, such as power conversion factors and fuel prices, are supplied by the generators and others, such as the cost of the power not supplied or rationed, are defined by the regulator.

Financial forward contracts (or physical contracts as in El Salvador) can be used to complement the spot market. Some countries required marketers to contract a certain percentage of their total demand in specific forward contracts, while other countries have left these decisions to the companies themselves.[16]

Generators may not be able to recover their investments because the value adopted for the cost of rationing is, in fact, a cap on spot market prices. Consequently, in recognition of generator's contribution to ensuring that there is enough power supply, spot market prices were enhanced with so-called capacity charges. These charges were paid by the customer and received by whichever generator actually satisfied that demand (or were dispatched), and had different modalities (which are discussed in Chapter

[16] Guatemala and Panama required that 100 percent of demand be in forward contracts, while Brazil required that 85 percent of power be in forward contracts.

BOX 2.2 An Overview of Selected Wholesale Markets in Latin America and the Caribbean

Chile: the pioneer and its followers. The Chilean wholesale market is made up of contracts between generators and distributors with prices regulated through a simulation of the future operation of the system, and deregulated contracts negotiated directly between generators and large customers (those consuming over 2 MW). A centralized dispatch model is used to set the price between generators (the only participants in the spot market). Prices are set by means of an administrative system because there is no equilibrium price that results from the interaction of supply and demand. The designers of the Chilean market sacrificed the competitive ideal for promoting private investment in generation and distribution. Chile's success in privatizing the electricity system without jeopardizing the continuity of service led Bolivia, Peru and other countries to follow its example in the 1990s. The supply crisis of 1999 led to modifications in the Chilean model to facilitate long-term contracts, among other things.

Argentina: improving the model. By the early 1990s, Argentina had learned from Chile's experience that to guarantee broader competition it was necessary to segment the structure of the sector, vertically and horizontally, and establish limits on cross ownership. Argentina's wholesale electricity market differs in some aspects from the Chilean model in relation to structure and details. Electricity dispatch continues to be based on costs, but the basis is the half-yearly statement of costs of the generators, which includes hydroelectric power. Prices for immediate delivery are used in trading between generators, but distributors and the large users can also buy on the wholesale market (distributors purchase at a set price). The system operator is Compañía Administradora del Mercado Mayorista Eléctrico (CAMMESA). It is not a club whose only members are the generators, but includes all the market participants, making it less vulnerable to capture. Other innovations include the introduction of payments for ancillary services, and procedures to manage network congestion. However, not all the changes were for the better, as capacity charges show.

Colombia: a second-generation wholesale market. Colombia, which also has a predominantly hydroelectric system, moved even further away from the Chilean model. In the mid-1990s, it established a system of auctions similar to the market in England and Wales. Although bilateral contracts are permitted, they are financial in nature and are similar to the contracts for differences. Spot market prices are used for final settlement, which are also similar to those in England and Wales and have identical bidding models for hydroelectric and thermal generators. The model also takes into consideration a single zone with an ideal dispatch and reassigns costs between supply and demand in the presence of transmission constraints that do

BOX 2.2 An Overview of Selected Wholesale Markets in Latin America and the Caribbean *(continued)*

not reflect localization of the constraint. The Colombian model was unique in the region because it introduced price bids and permitted participation by independent marketers. Customers whose usage exceeds 100 kW can participate indirectly in the day-ahead market if a marketer represents them. Payment for power is replaced by a capacity charge.

El Salvador: too good to be true. In 1997, El Salvador adopted the most daring electricity market design known so far. Any consumer, irrespective of size, can choose a supplier and there are no restrictions on market structure. The system operator, known as the System Regulatory Market (MRS), dispatches the physical contracts first and then proceeds to set the equilibrium price based on input and output programs specifying prices and quantities presented by the generators and distributors in a similar way to the Nordic market. Forward contract prices are indexed at the MRS price, which also serves as reference for establishing the transfer price to final consumers.

Brazil: a premature market. The Brazilian electricity system is 95 percent hydroelectric and has a large storage capacity. It is composed of groups of dams and physically interdependent plants located in the same river basin. The coordinated operation of the system is necessary for obtaining potential synergetic gains. For the Brazilian designers this feature makes it difficult to hold daily auctions, such as those held in England and Wales. The system adopted initially in Brazil consisted of a long-term contract market and a market for immediate delivery for the balances managed by the system operator with the help of a complex mathematical model. The operation of the system determined the guaranteed power, that is, the power that has a 95 percent probability of being in surplus. This was shared among the plants, which were free to sell it through long-term contracts. The system operator was in charge of the operation of the plants, whose owners were required to maintain availability. Settlement of the transactions and adjustment of the positions of the participants took place through the wholesale power exchange (MAE), with management control by the participants.

And a change along the way. The main concern following the supply crisis of 2001 was how to guarantee that it would not be repeated. The model adopted by the Luiz I. "Lula" da Silva administration divides the market into competitive and regulated segments. The large consumers participate in the competitive segment in the same way as they did in the previous model through contracts and purchases in the spot market, while in the regulated segment the distributors purchase power through forward contracts in two types of auctions. In the first auction, known as old power,

BOX 2.2 An Overview of Selected Wholesale Markets in Latin America and the Caribbean *(continued)*

the established generators are the only participants and each distributor signs individual contracts. The second type of auction is for power contracts guaranteed for terms of over 20 years that will be delivered *n* years after the auction, which in total respond to the growth of demand established by the distributors, adjusted by the Planning Institute (IPE). Only companies that compete for the right to build and operate the plants identified by the IPE compete in this segment. The power bought is assigned among all the distributors proportionally to their share of demand, and each generator has to sign contracts with all the distributors. There are mechanisms for adjusting the positions of the distributors.

7). Colombia, which implemented a model based on bids but with caps set by the cost of rationing, also adopted a capacity charge; in contrast, Guatemala and Panama adopted variations on the capacity markets utilized in the eastern United States.

Performance

The choice of which market design to adopt is made by comparing total design and execution costs with the resulting static and dynamic increases in efficiency versus the alternative that it replaces. Given the incipient state of most markets in the region, there are no rigorous evaluations, although there are indicators of the degree of competition, included lower consumer prices and improvements in the ability to attract the investments required to keep the lights on. It may not always be possible to fulfill these two conditions simultaneously because, although increased competition in the spot market results in lower prices and benefit consumers in the short term, prices that are too low do not provide incentives for investments in new plants.

Robust competition was behind Argentina's success in reducing wholesale prices from US$50 per MWh in 1992 to around half that much early this century. In the 1997–2003 period, prices in Chile were also around half of the level of the mid-1980s, but most of the gains took place after the import of gas from Argentina in the mid-1990s, which stimulated the timid competition that existed in Chile at that time. Competition was

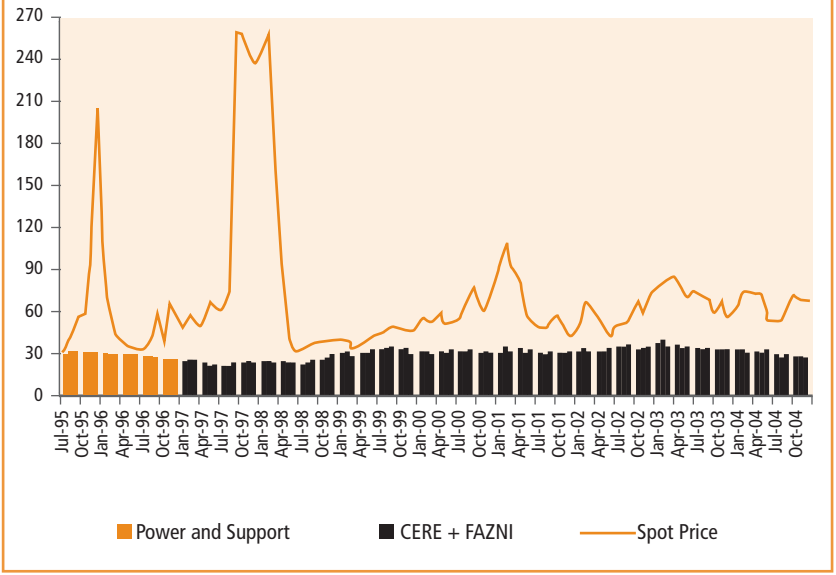
not very extensive in the market for immediate delivery in Chile, whose principal function was to define transfer prices between generators. The reason for the lackluster competition was a defective market structure that was exacerbated by the fact that the established generators managed the market with little transparency. Despite these successes, the rigidity of the Chilean model has imposed some costs. There were power cuts in late 1998 and early 1999 that experts attribute to the incompatibility between incentives facing market participants and the objective of providing the service (Fischer and Galetovic, 2000). The power cuts triggered a political crisis that led to the first substantial reform of Chilean electricity legislation in 18 years. Some critics (Pollitt, 2004b) hold that the complex procedure used to forecast future node prices (which establish the transfer of the cost of power to regulated consumers) has prevented the development of a long-term contract market, and that the capacity charges modality has stifled the development of markets for ancillary services.

Although there have not been any spectacular declines in prices in the Bolivian and Peruvian markets, neither have they experienced any failures that jeopardize their stability. Any criticisms directed at the Chilean model also apply to those in Bolivia and Peru, which are almost identical to the former (although they do not have problems of an unsuitable structure seen in Chile). Guatemala and Panama have established variations on the Chilean model. They use long-term contracts and capacity markets and have maintained an operation that, although not immune from problems, has not seen any very important failures and has maintained a reasonable level of prices. Comparisons with prices before reform are not indicators of the performance of the new model because most of them did not reflect the cost of power production, and important changes in fuel prices have to be taken into account. To do this, an alternative scenario would have to be constructed reflecting costs if the statist model had remained in place.

The initial performance of the electricity market in El Salvador confirmed fears that it was not an appropriate model. As soon as it came into operation in 2001, prices rose strongly as participants exercised market power. This aroused the anger of consumers, who were directly affected by the increase in prices for immediate delivery. As a result, the government was forced to intervene. Since then the model has operated under a series of limitations. Reforms are still in process, as described in Chapter 5.

A better comparison can be made in the Colombian case. The recurrent droughts caused by the El Niño phenomenon had a significant

FIGURE 2.3 **Average Spot Price in Colombia (US$/kWh December 2004)**



Source: Compañía Interconexión Eléctrica, S.A.

impact on prices in Colombia's predominantly hydroelectric system. Figure 2.3 shows that price peaks were concentrated at times when power was scarce, that is, during periods of drought. It also shows very long periods of low prices when hydrological conditions were more favorable (this benefits consumers but is of great concern for investors). The opportunities for the exercise of market power increase during periods when the system margin is limited and when failures occur in the transmission system. In general, prices have been below the costs of new generation for meeting demand, although they include an additional payment to cover capacity charges. This mechanism has been very controversial in Colombia; critics say that it does not provide the long-term price signals that stimulate new investment, does not remunerate power effectively delivered, and involves very important transfers between generators which lead to continuing disputes (Ayala and Millán, 2003). At present the regulator is examining a new design after various failed attempts to find a replacement (see Chapter 4).[17]

[17] During 2000 and 2001, repeated terrorist attacks against the Colombian transmission network caused a de facto fragmentation of markets and provided strong incentives for gen-

As in most of the world, retail competition is limited to very large loads. In Chile, mining and manufacturing, the largest users of electricity, account for 40 percent of demand, but this is not usually the case. In Colombia and Guatemala, where consumers with over 100kW of load can participate in the unregulated market, their share is around 25 percent. In Colombia marketers compete to serve regulated consumers with debatable success. The heterogeneity of consumer payment capacity and a defective design of marketing charges have allowed independent marketers to take advantage of these loopholes to skim the markets for the best customers.

Although it is too early to judge the impact on investment of the different models adopted, it has varied between countries and over time. We have mentioned how the Chilean strategy attracted investors into the expansion of generation in the early years of the reform, guaranteeing supply in the critical transition period. However, the concentrated Chilean market limited foreign participation and for some time the regulator was concerned that the lack of projects could jeopardize the continuity of supply. As noted in Chapter 3, the poorly planned transition in Brazil had unfortunate results for the market. Following reform in Argentina, many investors in new capacity were attracted by a competitive electricity market resulting from abundant natural gas, macroeconomic stability resulting from the adoption of the convertibility plan in 1991, and an equally favorable business climate.[18] Initially, there were many natural gas generation projects in Colombia planned, but this ended with the low prices caused mainly by the fall in demand (Ayala and Millán, 2003), and there is now a consensus that incentives for investment in new generation are not sufficient. In Peru, investment took place, as it had initially in Guatemala and Panama, but due to a variety of circumstances its capacity to attract investments could not be truly tested. In Honduras, investors responded to calls for purchase of power from the state company; and while private investors initially responded to opportunities in the renewal of thermal generating equipment, the current market is not attractive for investment.

erators to exercise their market power. Prices in the market for immediate delivery in the first quarter of 2001 soared until the regulator intervened. However, the intervention was not very successful (Ayala and Millán, 2003) and contributed to keeping market participants away and increasing confusion.

[18] Some analysts think that perhaps there were too many investors because of the strong incentive of the mistaken system of capacity charges (Estache and Rodríguez-Pardinas, 1998).

The way in which the region's performance is judged depends to a large extent on the ideological viewpoint of the person doing the assessment. Ideology also plays a significant role in the debate in other parts of the world. For example, prices in the Nordic markets have been relatively high in recent years because of droughts. However, different analysts offer this as proof of the markets' weaknesses (Finon, 2004) *and* of their strengths (Bergman, 2005). There is less controversy in explanations of the performance of the Australian market. And although observers seem unanimous about the problems faced by the pioneering market of England and Wales, they do not agree about the success of the new design (Newberry, 2005). In the United States there is consensus regarding the causes of the failure in California and, despite the difficulties of the markets in the east, their performance is considered reasonable. Nevertheless, many voices have been raised recently averring the absolute failure of the entire market experiment partly for reasons peculiar to the U.S. system.

A more recent evaluation of the liberalization of markets by three prestigious American academics (Chao, Oren and Wilson, 2005) has concluded that, although not all efficiency gains have been attained, the performance of the markets cannot be considered a failure. The most important achievement has been the establishment of the system operator, which has made possible the organization of regional markets. In this context, the justifications given for a vertically integrated market become less relevant. But it has not been possible to establish retail competition for all customers or guarantee sufficient supply. Lack of retail competition means that distribution companies will continue to be suppliers of last resort for most customers, which requires a reconsideration of their role. Both this problem and that of creating adequate incentives for independent generators to build new plants are fundamentally financial and related to risk management. Their solution requires applying the basic principle of assigning the risk to whoever is in the best condition to bear it.

Experience shows that although the region's reformers were more realistic about the likelihood of establishing competitive markets than reformers in other parts of the world, they still overestimated the potential in electricity markets, even in medium- and large-sized markets. Experience also teaches that many of the problems faced are common ones, that the potential for competition in the retail market is limited to large customers, and that the benefits of expanding it to all customers does not compensate for the costs involved (at least given the current state of technology), and

that there are problems for guaranteeing sufficient supply and for overseeing adequate competition. Moreover, the limitations on human and institutional resources further reduce the options available to the countries of Latin America and the Caribbean. The issue is too complex to allow a detailed consideration here of the extent of the challenges facing the markets of the region, but Chapter 7 presents a critical review of the existing literature, which will introduce the interested reader to the international debate and its relevance for the markets of the region.

The Difficulty of Transmitting Price Signals to Consumers

The establishment of a highly competitive electric power market resulted in an increase in price volatility that governments did not dare pass on to consumers for fear of political repercussions. Consequently, consumers could not respond to higher prices by cutting consumption, which severely limited the operation of the market. Additionally, although these interventions limited volatility, they were asymmetric, especially when governments imposed price caps. These caps, together with high systemic risks, reduced revenues for generators, hindering the financing of projects and reducing the appetite of businesses for undertaking new generation works.

Most of the systems for transferring the costs of generating electricity to consumers (even those in the more competitive market for large customers) distort price signals in one way or another in order to prevent volatility. Although it is obviously necessary to protect against extreme volatility, the abandonment of price signals reduces the response capacity of the system and its ability to manage crises, as was convincingly demonstrated by the events in California and Brazil. Although the almost simultaneous supply crises in both markets have many common features, the political responses differed. The impact of the crisis on the respective economies had a lot to do with whether or not consumers were faced with incentives to reduce consumption. The inability to effectively transmit the need to reduce consumption to California consumers forced the government to institute rolling blackouts, effectively rationing supply in vast areas in order to prevent the collapse of the system and a total power failure.[19] In contrast,

[19] California consumers did not receive the correct signals to reduce consumption because of the existence of regulated electricity rates that prevented passing higher spot prices on to consumers. Another reason was the absence of restrictions on free market participants to return to the regulated market when spot prices were high.

the Brazilian government imposed consumption quotas that provided for penalties for those who exceeded their quota and rebates for those who consumed less (Maurer, Pereira and Rosenblatt, 2005). In addition, large consumers who consumed less than their quota were permitted to sell their unused quotas to those who had exceeded it. This provided an interesting test of the market mechanism to deal with the crisis.[20]

The asymmetric nature of interventions to control volatility not only reduces the incentives to invest in certain types of plants, but can also affect the security of the system and reduce the incentive to use effective instruments to deal with volatility. In the first case, cushioning the impact of normally occurring price changes can increase the probability of power failures. For example, a spot market price cap in the dry season can reduce incentives to maintain the reservoirs full. In the second case, spot market price caps can reduce incentives for participants to use risk management instruments, such as options or long-term contracts.

Regulatory interventions are needed to prevent price volatility when appropriate (risk) hedging instruments cannot be developed. Capacity charges and/or the obligation to maintain a large percentage of load under contract (discussed in Chapter 7), are examples of interventions to protect investors. The need for intervention is clear in the case of small consumers, who lack financial hedging instruments even in developed countries.

This need to protect small consumers seems to restrict the effective participation of demand in the market, but several authors argue that subjecting at least a portion of consumption to changes in spot market prices can significantly improve the operation of the markets (Borenstein, 2001). A similar proposal, adapted to the conditions of markets with a predominantly hydroelectric supply, was presented by von der Fehr and Wolak in their advisory report for the Brazilian government. Regrettably, the Brazilian government did not accepted the recommendation even though the importance of consumer response in managing the crisis had been clearly demonstrated by the measures adopted by the administration of Fernando Henrique Cardoso (von der Fehr and Wolak, 2002).

The refusal of the Brazilian government to apply the lessons learned to the design of the new model reflects the fear that governments of all hues

[20] The government of Argentina attempted a variant of the Brazilian method to deal with the supply crisis of 2004. However, the incentives were much weaker, leading to a less successful measure.

have of paying the political cost of sudden increases in electricity prices. In various countries of the region, governments have spent valuable financial resources on controlling the impact of abrupt increases in fuel prices, which are not recovered with a contribution in the low part of the cycle. Even countries that have accepted in principle the importance of transferring some part of the volatility to consumers have done so in such a way that, in the best of cases, the impact is not appreciable and, in the worst of cases, it is counterproductive.

The original design of the Salvadorian market considered transferring the spot prices directly to regulated consumers. However, it was changed many times to accommodate public opposition. Initially, the government tried to smooth volatility by establishing quarterly transfer values based on an estimated spot price for the period. Although this cushioned the price signal, it did maintain the relationship between the price and the supply of power given the seasonal nature of water availability in the hydroelectric plants. However, this procedure was soon replaced by the average price in the previous quarter, and later, by the average price in the previous six months. The lag in the price signal that resulted from this type of smoothing meant that consumers experienced a fall in prices at the precise time that water shortages required the operation of more costly thermal plants. Other countries (such as Colombia) that permitted a partial transfer of the spot price relied on a 12-month moving average to cushion the seasonal variation in the cost of power.

In Chile, the prices paid by regulated consumers are an estimate of the expected value of the marginal cost of power during a four-year period. During 1998 and 1999, this meant that consumer prices were being slashed at the precise time that a supply crisis caused reservoirs to empty (Fischer and Galetovic, 2000).

Models That Are Not Compatible with the Structure of the Industry

Perhaps one of the main problem in establishing competition in practice is that of the compatibility between the model adopted and the structure of the industry. We have already seen how difficult it was to put into practice reform measures that permitted the horizontal and vertical unbundling required by the competition models, despite the fact that they anticipated having problems doing this. There is no ideal market model because it is not possible to

prevent market power completely. But difficulties in addressing the issue of market power can be aggravated if there are shortcomings in the structure of the industry. Perhaps the most obvious example is that of a market that lacks a sufficient number of participants. Excessive optimism about the types of transactions that can be efficiently decentralized results in the poor operation of the market. When markets are small, it is not a matter of identifying measures that will promote competition, it is also important to determine what can be done to mitigate the consequences of lack of competition or incomplete competition (Millán and Vives, 2001). However, very few governments accepted the possibility that their nation's small markets would be faced with these limitations, and many consultants and international financial organizations advised small countries like Haiti (with maximum demand under 200 MW) or Honduras (with maximum demand under 700 MW) to unbundle their industries and adopt a market design similar to that of larger countries. Fortunately this advice was not always followed.

Behind the collapse of the wholesale market in El Salvador (which only had two generators at the beginning) is the inadequate structure of the industry. The absence of obstacles to vertical integration threatens current adjustment efforts. In Chile, competition was not fostered until natural gas imports from Argentina opened the way for the entry of new market participants and dismantled the vertical integration between transmission and the largest generating company. To a greater or lesser extent, almost all countries shared this problem because, as indicated earlier, Argentina was the only country where the structure of the sector was perfectly compatible with the competitive model.

Some experts are reluctant to use the so-called single buyer model[21] because of the dangers that this entails and the poor results that some countries had with BOT projects (Lovei, 2000). As already stated, failure to assume the stranded costs caused by BOTs and BOOs in generation projects whose contracts were entered into prior to the reform or during its initial stages, limited the later development of the competitive market in some countries because the contracts' rigid conditions restricted operations. One reason for the poor performance was that most of the contracts were entered into in a seller's market with limited competition in awards when rationing and emergency conditions were imminent. This later resulted in

[21] Under the single buyer model, one entity (usually the government) analyzes the expansion needs and enters into competitive PPA contracts.

stranded costs. However, in view of the absence of alternatives, instead of rejecting this modality outright, it would be more constructive to identify institutional arrangements that minimize the problems that are associated with it. In the case of Honduras, for example, difficulties were caused by the government's existing contracting system. In a study financed by the IDB, Walker and Benavides (2003) examine alternatives for addressing those problems and improving the effectiveness of procedures, including contracting by distributors. However, as with any other system, the alternatives require efficient and transparent management by the government. The question then becomes how to identify the schemes that presents the fewest risks and most possibilities for implementation.

In cases where for reasons of market size (and others) it is desirable to maintain a vertically integrated system, a certain degree of competition can be allowed in the purchase of power by holding auctions for long-term contracts. However it is essential to guarantee the transparency of such purchases and, as far as possible, eliminate the participation of the integrated company in the auctions. Regrettably, this did not happen, at least initially, in some of the countries (such as Jamaica) that have adopted this structure.

The Mexican case is of particular interest. Because it was impossible to enact a reform package that would permit private sector participation in the market for electricity, the government fostered private participation through PPA contracts with the vertically integrated state company, the Federal Electricity Commission (CFE). This scheme has succeeded in linking a significant number of private generators during the last ten years under acceptable conditions. Unfortunately, exposure to many contracts as well as difficulties in adjusting rate schedules and making management changes to improve industry finances increased the CFE's credit risk, which was already substantial.

As occurred in North America (Joskow, 2003; Chao, Oren and Wilson, 2005), lack of adequate transmission networks created an important obstacle to competition in the wholesale market. During periods of high demand, bottlenecks in the network can create local monopolies (as in Colombia because of terrorist attacks) or reduce investment in transmission (as in Guatemala). In general, the stronger the transmission networks, the stronger the competition. The economic benefits of a transmission network with spare capacity are particularly important in systems in which the generation segment is considered competitive.

The preceding discussion reveals the importance of each country's particular conditions in determining adequate market design and the structure needed to promote competition. This is only possible if we start with a careful analysis of the likelihood of effective competition in the industry, identifying the obstacles that prevent its development, and also assessing the suitability of the market design, taking into account existing physical, human, and institutional limitations and how they affect the structure that can be adopted.

The technological and structural limitations on the creation of the market can generally only be partially overcome and this takes time. An analysis of the potential for competition in the market should emphasize those restrictions that cannot be eliminated within the time horizon of the reforms, but it should also bear in mind that any measures adopted should keep the door open to opportunities for competition that may arise once existing impediments have been surmounted. Where competition is limited by market size, growth in demand can offer opportunities to expand a transmission system or allow the entry of new participants into the market. In some cases interconnection with the systems of neighboring countries can lead to an expansion that helps control market power and facilitates competition. This argument has been frequently used to justify efforts to integrate electricity systems, such as the regional markets in Central America and the Andean region. However, the difficulties inherent in the creation of integrated markets, as evidenced by the experience of the European Union, can mean that this option will not bear fruit for a long time.

It may be the case that the number of participants is not sufficient to guarantee a relatively competitive market even after exhausting possible asset sales and ensuring that the design of the transmission network minimizes possibilities of exercising local market power. In such cases, experts agree that an adequate design of the wholesale market could help reduce incentives for market participants to exercise market power, and suggest a series of measures that, although necessarily incomplete and not devoid of problems, allow for greater competition.

As already mentioned, a market design based on cost statements places a cap on price bids and prevents periods of excessively high prices from taking place.[22] However, these advantages are obtained at the cost

[22] It may not be clear whether the hike in prices results from scarcity rents associated with the shortages or is due to the exercise of market power

of higher than normal prices for extended periods and, as the experiences of Chile (Pollitt, 2004b) and Panama (Arizu, 2003) show, there are many opportunities to manipulate the market even in these conditions. There is also a strong consensus among the experts that the incentives for exercising market power decrease when the generator has contracted long-term obligations for a significant portion of its power because this concentrates bidding in the more competitive long-term markets. Similarly, the participation of demand in the market becomes more competitive. Wolak (2004a) develops an analytical framework to validate these arguments, which is summarized in the section on markets in Chapter 7.

But, even if these measures are taken, the effort could come to nothing if there is no credible regulatory process to oversee competition. The reformers did not foresee the complexities of overseeing the operation of the market and identify cases of market power. They believed that courts or competition agencies would be able to identify these occurrences and sanction them appropriately. The naiveté of this argument was quickly demonstrated in developed country markets when, despite strong institutions and judicial systems, they were forced to adopt the system of independent agencies to monitor and oversee the market in order to produce useful information for the regulator, the competition agency, and existing and potential participants. In the Latin American and Caribbean region, Panama was a pioneer in setting up a committee of external experts to oversee the market, while Colombia is studying the possibility of adopting a system of the type used in some U.S. states and European countries. A consultant whose work was financed by the IDB (Wolak, 2004b) analyzed the possibility of applying this system to the Central American regional market, but the market regulatory body has not made headway in this process.

The operation of the market is based on the existence of suitable market institutions and adequate corporate governance. At the start of the reform it was thought that the system operator and the market administrator should be organizations formed by the generators. However, this led to capture of the institutions by incumbent generators, as in the case of Chile, or crippled decision-making, as happened in Brazil. The current trend is that these entities should have a board of directors composed of independent experts who are advised by operating committees made up of all market participants. Although the availability of financial and human resources has not been a limiting factor in medium or large countries, it has been for many small countries. An interesting solution was found in the

Dominican Republic where international consultants were hired to operate the market.

Sufficiency of Supply

A frequent problem of the markets established in the region is lack of long-term signals to stimulate investment in new projects. The initial assumption that signals from the spot market would be sufficient to foster investment has not been very realistic neither in the markets of the region nor in the more mature markets of the developed countries. The problem persists even in countries that have adopted measures to supplement spot market price signal, such as capacity charges or capacity markets that remunerate the availability of the generator independently of the market. This is in addition to the preference of consumers and producers for stable price signals over time, which is not possible in very volatile markets. In these conditions it seems that there are trade-offs between the need for competition in short-term markets and involving demand in the market, and the need to provide the signals for investment and price stability that both producers and consumers require.

There is a wide-ranging debate on the effectiveness of capacity charges, or capacity markets, or of the adoption of long-term sale commitments as solutions to the problems described (see Chapter 7). Problems in the use of capacity charges have led several countries to seek solutions that provide incentives for building new plants, help minimize opportunities for the exercise of market power and reduce volatility (such as the requirement to contract long-term power). Chile recently changed its legislation to make contracting more effective. The same types of reforms are currently being adopted in Colombia, El Salvador and Peru.

Although it is known that long-term contracts can provide the necessary incentives for new investment, it is not clear how to create incentives for distributors to enter into these contracts,[23] how to guarantee minimum conditions (such as terms that give investors confidence), and how to guarantee transparent and efficient procedures for negotiating these contracts (which prevent the short-term market power problems from becoming

[23] One of the costs of introducing competition into the retail segment for all customers is that it does not create incentives for marketers to sign contracts with the terms required by investors in generation.

long-term problems). A solution suggested by von der Fehr and Wolak (2002) is to hold compulsory auctions so that distributors cover a large part of their needs with long-term contracts and/or purchase options. The extreme solution was put into effect by the da Silva administration in Brazil. This solution was based on the need to meet future demand and involves holding auctions for building and operating plants that sell their power to distributors in contracts of 20 years or more. Although this solution eliminates market risk for the generator, it introduces new sources of uncertainty and transfers the costs of the possible over-installation required to guarantee sufficient supply to the consumer (see Chapter 3).

Regulation of Monopolistic Segments and Targeting the Poor

Local electricity transmission and distribution are generally considered natural monopolies. In most countries there is a company that operates the transmission network and several regional monopolies that operate the distribution networks. With the exception of some ancillary services, there is little margin for competition in electricity transmission services (although it is perhaps possible to make a comparative evaluation).

The great majority of countries have adopted a regulatory framework for the electricity sector that in some way reflects the concerns of reformers.[24] However, enforcement of the regulations has not always been adapted to the particular conditions of each country and regulatory procedures require frequent adjustments or modifications (this is not surprising given that the process is only just beginning). During the early years of the reforms, regulators devoted most of their scarce resources to establishing markets and regulating them, which led to the postponement of very important aspects of the regulation of monopolistic segments. Defects in market structure created opportunities for some participants to exercise their market power, making the task of the regulator even more difficult and further delaying the work of regulating distribution.

Long-term sustainability (through the adoption of regulatory incentive mechanisms to generate sufficient income to cover all costs, including return on capital) that is compatible with risks and other local conditions

[24] In many cases, financial assistance to set up the regulatory framework was provided by international financial institutions.

continues to be a difficult goal to achieve for both private and state-owned companies in mixed or homogenous systems. At the start of 2005, none of the countries with a sector dominated by a state monopoly had rate schedules that reflected costs and contributed to expanding the system. More regrettable is the fact that in many of the countries that implemented the reform, governments have intervened in the market to maintain low electricity rates for all consumers—a flagrant expropriation of investors.

Countries have adopted different price setting mechanisms for transferring the cost of generation, transmission and distribution to the consumer. All of these mechanisms include some type of incentive for efficiency. Table 2.1 presents a summary of the different schemes used in the region. In the column labeled "generation", "market" refers to those cases where the rates paid by consumers include a component that reflects the cost of generation for the distributor or marketer (adjusted for the losses permitted by the regulator and/or moderated over time). Similarly, "traditional" refers to a variety of forms used in the past, which do not include efficiency incentives. And "marginal cost" refers to the procedure used in Chile and in some of its followers, that relies on estimates of the long-term marginal cost transferred to consumers. In the columns labeled "transmission" and "distribution", "price cap" identifies those countries that adopted a price cap system in which a price is set for several years and is modified to reflect improvements in efficiency. The "efficiency standard model," which was first adopted by Chile and then by Bolivia and Peru, is based on costs for a model distribution company, which are then used as comparison for similar companies. Electricity rates are established for four-year periods at the end of which they are reviewed. The critics point to the enormous burden of information that this method imposes on the regulator (Joskow, 2000a). Finally, the system adopted in Colombia cannot be strictly considered a model company. The rate base includes the valuation of assets at replacement value but stipulates criteria to limit recognition of certain components of the system and includes theoretical estimates of the efficient investment. It also establishes criteria based on statistical analyses designed to recognize operating and maintenance costs, as well as transfer efficiency gains to the consumer, which has been the subject of numerous criticisms.

False expectations were created that price cap regulation would moderate the asymmetry of the regulator and require fewer resources than the cost regulation system. The inability of the Chilean system to transfer improvements in efficiency obtained in distribution to the final consumer

led to a review of the procedures for settling cost disputes between operators and the regulator. If this occurs in countries that have a long tradition for regulation (such as Chile), then it is easy to understand the difficulties encountered by smaller countries as a result of asymmetries between the regulator and the regulated companies. The reformers believed that the incentive system that accompanies the price cap model would permit the regulators to limit their activities when making their regular review of the companies every four or five years. However, it soon became clear that the new system does not eliminate the need for considerable information on the regulated company, as well as a careful statistical analysis, a task that was neglected in many countries and led to difficulties for the reviews. The difficulties caused by these false expectations of price cap systems have been recognized in the specialized publications. Joskow (2005) finds that although the price cap system has the advantage of an economic rather than an accounting approach, it does not reduce the effort required by the regulator.

Due to the innovative nature of this type of regulation only one price review has been made. Although it is natural to expect these processes to be

TABLE 2.1 Price Setting Mechanisms

	Generation	Transmission	Distribution
Argentina	Market	Cap Price	Cap Price
Bolivia	Marginal Cost	Cap Price	Efficiency Standard
Brazil	Market	Traditional	Mixed
Chile	Marginal Cost	Traditional	Efficiency Standard
Colombia	Market	Cap Price	Mixed
Costa Rica	Traditional	Traditional	Traditional
Ecuador	Market	Traditional	Efficiency Standard
El Salvador	Market	Cap Price	Efficiency Standard
Guatemala	Market	Traditional	Efficiency Standard
Jamaica	Traditional	Traditional	Traditional
Mexico	Traditional	Traditional	Traditional
Paraguay	Traditional	Traditional	Traditional
Peru	Marginal Cost	Efficiency Standard	Efficiency Standard
Dominican Republic	Market	Traditional	Traditional
Trinidad and Tobago	Traditional	Traditional	Traditional
Uruguay	Traditional	Traditional	Traditional
Venezuela	Traditional	Traditional	Traditional

Source: Espinasa (2001).

subject to disputes given the volume of money at stake, almost all the price reviews carried out have been very controversial, particularly the Colombian one, and have revealed the deficiencies of the process, which at first sight seemed impeccable. The disputes centered on the definition of the rate base, that is, the assets subject to remuneration and the related remuneration rate, as was the case in the old cost of service regulatory system. Another very controversial aspect was the introduction of quality requirements because the companies alleged that they were not included in the rate remuneration.

In Peru, a similar conflict broke out between the regulator and the distributors during the initial definition of the rates used to determine the asset replacement value. The value published by the regulator in 1997 was challenged by the companies at all levels of the administrative and judicial chain; the challenge was accompanied by a strong public relations campaign. The regulator maintained its position with the support of the political authorities, including the president, until the companies finally abandoned the litigation (Campodónico, 2000).

Another important problem is that of transferring generating and transmission costs to the final user. Several countries had problems finding an adequate and equitable procedure, in an atmosphere of great controversy. Most of the methods adopted cushioned the price signals and on many occasions completely distorted them, resulting in low prices during shortages and vice-versa. Although there are problems of efficiency related to location of generating plants, the main objective of the rate should be to provide the resources needed to finance expansion of the trunk network. Since transmission costs generally represent a small portion of the price of consumption, the efforts of the regulatory agency to "adjust" the permitted profitability rate for transmission are not likely to significantly reduce prices to consumers. More important is the fact that if this rate were very low, investment would be insufficient, causing congestion costs and strengthening local market power. In the long term, consumers pay a high price in exchange for a small short-term gain.

The regulations governing electricity transmission in Argentina were not sufficiently explicit about the definition of expansion of the system. As a result, an agreement between the affected parties was required before new construction could proceed. As might be expected, this led to disputes and delays in completing the works (Pollitt, 2004a). In most countries, expansion of the trunk transmission network is centrally planned and the costs

allocated to consumers are based on different variants of the cost of the service.

The coexistence of privately owned and state-owned firms that respond to different incentives presents special problems for regulation. Although it could be argued that with an adequate government structure state companies would have the same incentives as private ones, achieving an adequate structure takes time. Some regulators have had to spend considerable resources on overseeing the financial performance of state companies, which for political reasons adopt lower rates than those permitted by the regulator.

In most countries, regulations provide strong incentives for distributors to reduce technical and non-technical electricity losses and improve their collection systems. Many privatized companies were able to significantly decrease their losses in just a few years. However, this was not the case with most of the companies that continued under state ownership as well as some private companies that worked in difficult institutional environments (such as those in Nicaragua, the Dominican Republic, and Colombia's Caribbean coast). There are several explanations for this, ranging from strategic behavior by investors in expectation of influencing the price review, to difficult local conditions (including extreme poverty, a culture of nonpayment, difficulties in enforcing the law and others). Some private investors have been slow to accept the fact that slum dwellers behave differently and have different financial restrictions than their customers in more developed countries. An interesting illustration of these problems, as well as some solutions, was presented in a series of workshops held at the IDB in 2004 (Manzetti and Rufin, 2005). The main lesson learned was that a gradual effort is required to develop a payment culture, including facilitating payments and making them more affordable, as well as showing that the company respects its poor customers, takes their needs into account, and is concerned about the quality of the service. This can only be done in a system that targets subsidies to the poorest.

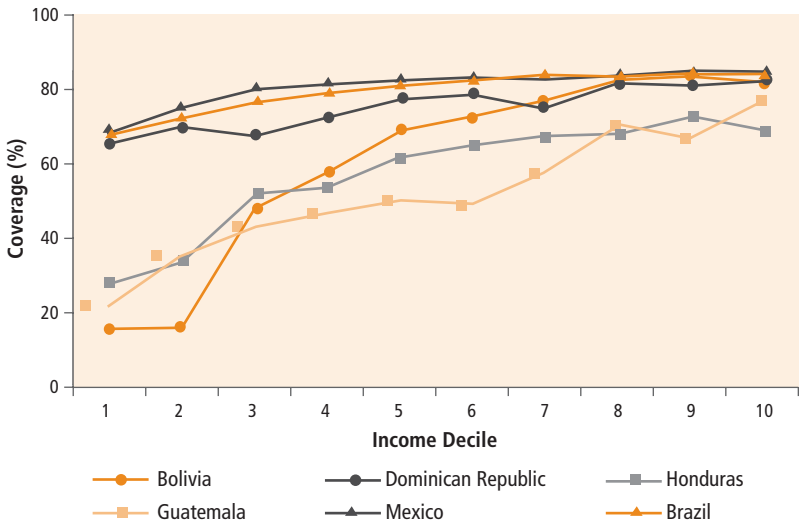
With few exceptions, the countries of the region have had difficulties in designing a transparent and efficient subsidy system targeted to the poorest sectors. The most obvious problem occurs when the governments limits electricity rate for all consumers without providing any compensation to the private operators. However, even when the government does compensate private owners for the cost of lower rates for poor consumers, in most cases, those resources are not allocated with transparency and

targeting leaves much to be desired. Under pressure from middle class consumers, governments in several countries have set a very high threshold (300 kWh in Guatemala and Honduras) below which power is subsidized. This leads to important inclusion errors, such as subsidizing higher income consumers or channeling resources away from the poor. The result is increases in the cost of the subsidy that threaten its sustainability (Foster and Araújo, 2004). Often, governments are reluctant to allocate budgetary resources to cover the entire subsidy, so they use cross-subsidies, making other consumers pay for the subsidies or passing the cost on to the state-owned company, jeopardizing its financial sustainability. In other cases the cost of fuel subsidies has been borne by the state company or directly by the Treasury. A recurring problem has been the timing of subsidy payments by the government and the persistent arrears of state institutions.

Some countries have designed objective subsidy-targeting mechanisms whose performance should be monitored in order to ascertain if it could be used in other countries. Colombia and Brazil use additional criteria to identify consumers who fall below a threshold and should receive subsidies. For example, the characteristics of the person's residence are used in Colombia (Chapter 4 presents a discussion of the achievements and problems of this method), and Brazil requires subsidy recipients to show evidence of participation in a social assistance program. There are also examples of efficient designs for improving access to the service by poor people without detriment to company finances. Companhia de Eletricidade do Estado da Bahia (COELBA), the distributor that supplies the state of Bahia in Brazil, posted significant improvements in its collection from poor users after devoting its compulsory energy efficiency contribution to subsidizing the acquisition of efficient domestic appliances by its poor customers (Pinhel, 2005). Although any system is necessarily incomplete and susceptible to manipulation, it is possible to achieve important improvements by modifying subsidy thresholds without significant increases in levels of exclusion

A more serious problem is improving access to the service by segments of the population that are not covered. As Figure 2.4 shows, the poorest suffer serious discrimination in access to electricity services. Any subsidy system that does not target this segment of the population necessarily contains important exclusion errors. However, it is unfair to say, as NGOs frequently do, that the reforms halted the expansion of the service to poor rural populations. Chile, for example, expanded electricity services

FIGURE 2.4 Households with Electricity by Income Decile



to the most distant (and costly) regions and achieved a level of coverage that is similar to that of the developed countries. Countries that enacted explicit provisions to require use of privatization resources to increase coverage have also meet with significant success.[25] Colombia has allocated part of the gains obtained from international power exchanges to expansion of coverage. Brazil also expanded coverage during the few years of reform and the new administration has made this a key commitment. Perhaps the only exception are Nicaragua and, to a lesser extent, the Dominican Republic, where explicit provisions for expansion of the service were not established during privatization.

Achievements and Challenges

The introduction to this chapter remarked on a series of events that have obstructed the progress of the reforms and which, in the opinion of many,

[25] Includes El Salvador and Guatemala.

have jeopardized their sustainability. This pessimistic climate contrasted with the cautious but optimistic message that appeared four years ago in the IDB's 2001 Economic and Social Progress Report: "[...] although the reform of the power sector has advanced significantly in Latin America, there are still many tasks to be resolved. Some arise from the technological characteristics of electricity markets and others from the fact that many Latin American countries lack the institutional development and the human resources implicit in the models adopted. Consequently, the positive consequences of the reform have varied from country to country. However, their success has to be measured from a pragmatic point of view, weighing what is desirable against what is feasible." It was also mentioned that the chapter would offer proof to support the thesis that if the lessons learned were assimilated, despite the difficulties, the reform was the best hope for the sector.

This chapter contains a general discussion of the contrast between the reformist dream and the experience during the early years of the reforms, but a more detailed treatment of the experiences of three countries and three issues of critical importance for the success of the reforms is left for later. Although the correct place for summarizing the lessons learned would be the end of the book, given the diversity of subject matter and in spite of risking later repetition, this chapter cannot end without a brief recapitulation for the benefit of the reader.

As stated in the introduction, the reforms have to be judged by their impact on correcting the problems that led to their implementation, including the inability to raise the capital required for expansion; the constant drain on government finances; poor quality of service; inadequate rate schedules and low levels of consumer satisfaction; high levels of losses and low internal efficiency; and use of companies for political ends and administrative corruption. But given the short life of the reforms, it is also important to analyze their sustainability and study other possible unintended impacts of their implementation. Although there are several studies on the region's infrastructure reforms (Estache, 2005), none of the impact studies on the electric power industry compare these effects consistently, or more importantly, undertake cause and effect analyses with the appropriate rigor. However, based on the many observations, it can be said that despite the problems and the tasks pending, it is possible to show cases of progress toward achieving the desired objectives.

Achievements

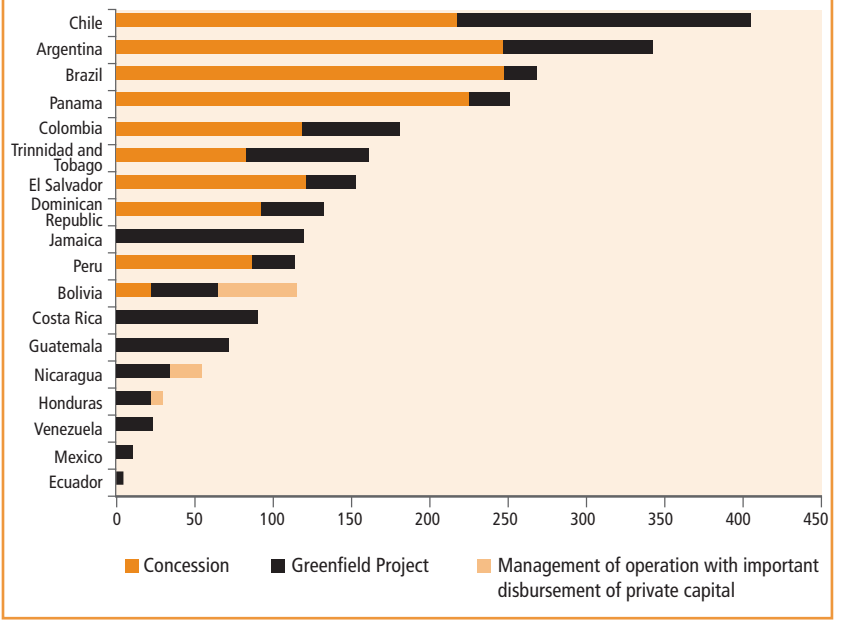
Private Sector Participation

There has been a significant increase in generating capacity in countries that reformed their electricity sectors. The only exception is Brazil where the start of new activities has been delayed. From 1990 to 1999 the private sector invested US$16 billion in new capacity and at the end of the period the threat of cuts in electricity supply had decreased in almost all countries. In the 1990s, Latin America had the largest number of private electricity projects among all developing countries. According to the World Bank, of a total investment of US$193 billion in the developing world, US$74 billion was invested in Latin America. Brazil, Argentina and Colombia are ranked among the world's top ten developing countries in the amount of private investment in electricity (US$29 billion, US$12 billion and almost US$6 billion, respectively). Argentina, Brazil, Chile, Colombia and Panama are among the leaders in per capita investment (see Figure 2.5). In Argentina, the reform attracted US$7.5 billion in investment in thermal generation with natural gas adding over 5,000 MW (about 25 percent of total capacity) between 1992 and 2002 (Pollitt, 2004a). Although new investors have entered the market, they have not been very numerous, particularly after the stagnation in demand resulting from limited economic growth in the last five years and the difficulties of traditional investors following the California and Enron disasters. State companies continue to be important in some countries and continue to bear the burden of social programs and priorities and to be used as vehicles for transferring rents to certain interest groups.

Improvements in Efficiency

By eliminating technical and non-technical losses, reducing overstaffing and offering a better quality of service, most privatized distribution companies were able to substantially increase their efficiency. The first to do so were those in Chile. They then used this experience to participate in the privatization of distribution companies in Argentina, Brazil, Colombia and Peru. CODENSA, the privatized distributor in Bogotá, cut its losses by almost half (from 24 to 12.5 percent), increased the number of customers per employee from 800 to 1,900 and reduced the frequency of power cuts

FIGURE 2.5 **Private Investments in Electricity (1990–99)**
(US$ per inhabitant)



and the average time of supply cuts by over 30 percent in only two and a half years (Ayala and Millán, 2003). The distribution losses of service companies in Argentina and Chile are even lower, between five and ten percent (Pollitt, 2004a and b).

Between 1992 and 2002, the availability of generating plants in Argentina improved by 30 percent and labor productivity improved by 300 percent during a five-year period (Pollitt, 2004a). However, these improvements have not been universal across all privatized companies and there are still countries and regions (mainly in areas with economic problems and marginal barrios and slums) where companies have had difficulty controlling losses and recovering their costs.

Wholesale Prices

Wholesale prices have also fallen in the countries where competition has been introduced. They declined by up to 30 percent in Argentina (Pollitt,

2004a) and 20 percent in Colombia (Ayala and Millán, 2003).[26] Real electricity rates fell by 29 percent in the Greater Buenos Aires area between 1992 and 2002, mainly due to a 70 percent drop in wholesale prices. In Chile, wholesale market prices in 2002 were around half of what they had been in the mid-1980s, but most of the gains took place when gas imports from Argentina stimulated competition. However, despite the successes, competition is generally limited and blocked by concentration.

Gains

Although the gains are genuine, it is often disputed whether or not they are adequately distributed. Given the serious price distortions that existed before the reforms (including large subsidies to residential consumers at the expense of nonresidential consumers), nonresidential consumers have been the main beneficiaries of the price reductions, large customers with direct access to the wholesale market have especially benefited. In some places, the gains achieved in wholesale prices prevented the adjustment for residential customers from being even more difficult. In other places, progress was made on making the subsidies more transparent and targeting them to the poorest. Governments in general benefited from the income they received from privatizations and from the savings resulting from not having to finance loss-producing companies, while society as a whole benefited from being able to devote those public resources to other uses. The regular review of distribution rates required under the new price cap system has proven to be more demanding than expected. While the reform has significantly expanded coverage in several countries, there are still important pockets of population without access.

Challenges

In addition to emphasizing the achievements of the reforms, the cursory analysis of the reform experience presented in this chapter concentrates on the technical and institutional problems described in the conclusion of

[26] Although low prices in Colombia can be partly attributed to the fall in demand brought on by the recession, they would not have been possible without competition. Similarly it is not possible to imagine the penetration of natural gas in Argentina before the reform (which was biased in favor of a hydroelectric solution).

the 2001 IPES report and provides some evidence regarding the failures of the reform to articulate a set of coherent incentives to modify the behavior of participants and improve efficiency, increase investment and meet social needs without being a burden on the state. However, for reasons of space, the formal analysis of the political economy of the reform and the explanations recently given for increasing public opposition are omitted. This subject, fascinating and of capital importance for confronting the mentioned threats, merits special treatment that I am not able to provide at this time, but to which some colleagues have made important contributions (Benavides, 2003). For now we will have to be content with some isolated interpretations made during the study that are summarized in the concluding chapter and in the discussions in Chapters 6 and 8.

This chapter has identified the difficulties of separating the different roles of the state and preventing the conflicts of interest associated with them. It recognizes that it is not realistic to ask a national government to keep the commitment to separate the functions of policymaker, regulator and entrepreneur and respect the independence of the regulator in situations in which the government has political responsibility and in which its survival is at stake. The risk of shortages and uncontrolled increases in rates has been a headache in the region as well as in developed countries because it provides an excuse for the government to intervene in the market and weakens institutions. To avoid a justifiable intervention by the government, the market model should minimize the probability of occurrence of these events. Any strategy to make the market model sustainable, as well as contributing to preventing said occurrence, must be supplemented by actions that minimize the cost of intervention, for example by establishing prior conditions in which it would be legitimate to intervene, as well as designing intervention procedures.

For a variety of reasons,[27] the government continues to act as entrepreneur in most countries in the region. This situation creates special challenges for regulators due to the different nature of the incentives required for private or state-owned companies as well as the conflicts of interest associated with the simultaneous participation of private and state-owned businesses in the market. Also, the governance and the management plans of state-

[27] Those reasons include ideology, a preference for using state property as a residual right of control, a reaction against privatization, and the lack of interest of private investors following the crisis in the power markets.

owned companies have not led to efficient management, and it remains to be seen if the experiences of the relatively successful state companies in the region (such as ICE, EPM. and COPEL) can be repeated in other countries. Some joint venture models that include the participation of private shareholders could also be replicated. An example of this is the model adopted by ISA in Colombia (see Chapter 4) where an equity democratization plan, combined with a tradition of good management, has kept at bay political interests and the use of the company by the government for ends other than its corporate objectives. However, the most appropriate procedures for improving incentives for state-owned companies are a function of the particular conditions in each country.

Although it is clear that the sequence that the textbooks recommend for execution of the reforms has undeniable advantages, in practice only Chile has been able to adopt it. This has imposed additional costs on the reform process. *Textbook regulation* has been difficult to achieve. Thus, we must rethink the conditions for achieving the desired objectives instead of insisting on formal conditions that cannot be applied to the countries of the region.

It has not been easy to establish competitive electricity markets in Latin America and, at the same time, attract the investments needed to guarantee sufficient electricity supply to meet demand. Inadequate market structures, reluctance to allow prices to play a role in the market, lack of incentives for investors to commit funds to new generating plants, and the incipient state of institutions, all impose severe restrictions on the set of possible market designs. The reformers anticipated some of the difficulties and proposed innovative solutions. Although these solutions have problems that are common to all compromises and necessarily yield lower than expected levels of efficiency, they have resulted in reasonable market performance in several countries. Given the difficulties experienced with decentralized markets in larger countries that have more developed institutions, adoption of cost-based markets does not seem to have been a bad idea. Until the collapse of its economy in 2002, Argentina was a prime example for the region and, although they are constantly evolving, the markets of Bolivia, Chile, Colombia, Guatemala, Panama and Peru continue to function. Despite the fact that the difficulty of achieving competition in small markets was fully anticipated, some countries, such as El Salvador, insisted on a market design that was not compatible with its size and had to pay for that mistake.

The difficulties experienced by the markets of the region are not exclusive to them and have been studied by distinguished academics and specialists from around the world, as the reader can appreciate in the review of publications on the subject presented in Chapter 7. This chapter expresses a preference for a type of solution that is not immune from problems and has not yet been put into operation in any country; namely, issuing long-term contracts for an important part of the load. Several countries are currently studying ways to restructure the market to incorporate these ideas, but implementation has not been easy. The reader will appreciate the size of the problem in the descriptions of the efforts of Brazil, Colombia and El Salvador in Chapters 3, 4 and 5, and in a discussion on the documentation with a view to their applications in the countries of the region in Chapter 7.

In the last instance, the advantages of any change depend on whether its benefits exceed its costs. Since most markets are still going through a learning stage and a process of adjustment and improvement, and since any comparison implies assumptions that are difficult to formulate about what would have been the performance of the markets in the absence of change, it is premature to come to a final judgment. However, the persistence of old problems in most of the companies that did not introduce reforms should encourage reformers to continue to make efforts to adapt market designs to the opportunities available in each country. The extent to which each country manages to solve its problems and move forward is a great unknown that depends on many factors, but one thing is clear: no effort can be successful unless it starts from a realistic, pragmatic and transparent evaluation of the specific limitations and takes into account the trade-offs implicit in each alternative. It is crucial to define the type of competition that can be achieved without jeopardizing the basic objective of attracting the investments needed to keep the lights on.

Regulation of monopolistic market segments has turned out to be more difficult than expected. In particular, it has not been possible to implement a satisfactory system of regulation by incentives. Although, in general, private companies have greater efficiency incentives, in some cases cultural conditions and weak complementary institutions have prevented the realization of the anticipated gains. A particular challenge is to keep the reformist promise of targeting the subsidy to the neediest sectors for reasons of political economy, although important progress has been made in some cases. Another serious problem is the persistent difficulty of transferring

the cost of the service to consumers, even in countries that have embraced reform. Chapter 8 examines in more detail the difficulties of charging for the service and targeting the subsidies to the poorest.

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Chapter 3

The Reform in Brazil

Although the measures enacted in 1993 provided some degree of financial relief, the financial weakness of the companies as well as other problems delayed investment considerably. Between 1991 and 1994, only an average of about 1,000 MW of capacity were added to the system each year and many works remained suspended. A solution to the industry's problems that included private participation was essential because the Brazilian government had proven itself incapable of making the financial commitments required to increase investments in the industry within the framework of the *Real* Plan. The reform path followed by Brazil was tortuous and had moments of euphoria and moments of desperation. Although the reformist experiment almost failed as a result of the supply crisis of 2001, at the time of this writing (2005) there is hope that it can be got back on track and that a solution that responds to the needs of the moment will be found. This chapter describes the reform implemented by the Fernando Henrique Cardoso administration in the 1990s, and provides an account of the crisis of 2001 and the lessons that can be extracted from it. It then describes the reform implemented by the Lula administration and details its strengths and weaknesses. The chapter ends with an analysis of the difficulties experienced in setting up a regulatory system and discusses some of the analyses of its performance.

The Cardoso Reforms

The Cardoso administration began to design a new electric power industry model during the latter half of the twentieth century. At the same time, it used the powers granted by the Concessions Law (enacted in 1988 and codified in 1995 by means of Law 9074) to promote private genera-

tion projects (that mostly took the form of self-generation by important industrial groups), and start an ambitious privatization program that promised significant revenues.

Development of a new model for the industry required a long process of building consensus. It was based on the proposals of a foreign consulting firm (Coopers & Lybrand) that involved the interests of state bureaucracies as well as other legitimate interests that emerged from the technical complexity of a system (which was dominated by hydroelectric generation from a few highly interdependent basins). However, the government's fiscal situation was such that it could not delay privatization in order to follow the conventional sequence of events; namely, establishing a new regulatory framework, creating a regulatory body and having an operating market in place before beginning privatization.

The government delegated the privatization process to the National Development Bank (BNDS). Privatization began with the distribution companies, which were the focus of inefficiency and patronage and also offered the best opportunities for improved management, making them especially attractive to private sector investors. To make privatization of the distributors viable without having the other components of the reform ready, the government decreed that state generators would sign long-term contracts with the distribution companies with phased expirations beginning in 2003. The process began in 1995 with the privatization of the Escelsa company, owned by Eletrobrás, and continued with Light Serviços de Eletricidade S.A. and Companhia Energética do Rio de Janeiro (CERJ) in 1996. In total, around 60 percent of distribution was privatized between 1995 and 1998, providing the Treasury with approximately US$27.7 billion in revenues. By 2001, 64 percent of the nation's distribution companies had been privatized with average premiums of 40 percent over the minimum price. However, of all the large vertically integrated companies owned by the states, only São Paulo's companies were privatized. A heavy blow against privatization was the revocation of the negotiations to grant control of the Minas Gerais company (CEMIG) to U.S. companies. The decision, made by the state's new governor, Itamar Franco, was later upheld by the courts. The distribution company for the state of Paraná (COPEL) was offered for sale only after the crisis, and did not find suitable buyers. In fact, all the companies put up for sale were those in which Eletrobrás had acquired equity control by capitalizing the debts that bad management had prevented them from settling.

How do we explain this initial success in the sale of the distribution companies? Access to a market as large as Brazil's encouraged local and foreign private businesses to bid aggressively and, in some cases, offer payments of around double the base price. The race to buy in Brazil is even more surprising considering that it took place without a specified industry model or even an independent regulator in place. Moreover, it was based on distributor concession contracts with existing generators at prices for a fixed period time until the gradual deregulation of the market began in 2003. In the opinion of various authors (Rufin, 2003; Brown, 2003), in its zeal to succeed in the first negotiations, BNDS offered very favorable conditions to investors.[1] In addition to offering loans to the purchasers, BNDS did not stipulate any quality conditions or made other types of requirement that would have been expected in a regulated system. This omission would cause concern later in 1997 when lack of investment by Light, combined with an extremely hot summer, triggered service cuts in Rio de Janeiro, which put the recently created regulatory body (Agência Nacional de Energia Elétrica, ANEEL) in a difficult position because it had no legal powers to place sanctions on the company.

ANEEL was established and began operations in 1997 as a result of the Light crisis. Design of the wholesale market took more time because of a lengthy consultation process that covered all the interests of the companies and the special features of the generating sector, which required the development of customized designs.[2] The agreement was not finalized until 1998, yet at the time of the 2001 crisis the wholesale market had still not settled a single transaction.

The success of the privatization of the distribution segment was not repeated in generation in part because of delays in establishing market rules, but mainly because of opposition from the technical staff and management of the companies (which waged a strong campaign against privatization), and from politicians who had a vested interest in maintaining state government control of the generating assets of the Eletrobrás group. By late 1998, with the exception of Eletrosul, no other large generating utility had been privatized (including FURNAS). Although 26 percent of generation was

[1] Although the results were not always promising, as shown by the impact of rationing on financial performance.

[2] The generating sector is dominated by interdependent hydroelectric plants and concentrated in very few basins.

in the hands of the private sector by 2001, only one fifth was in the hands of a privatized generating company (Centrais Generadoras do Sul do Brasil S.A., GERASUL). The rest was in the hands of vertically integrated companies and self-generation by large industrial groups.

The model proposed for the sector included dismantling Eletrobrás and transferring its planning functions to the Ministry of Mines and Energy (MME). It also involved shifting physical operations to a new organization, the National System Operator (ONS), whose board of directors was made up of industry participants and did not include federal government representation, and the wholesale power market (MAE) whose board was initially formed only by industry participants.

The Origins of the Crisis

The transition to the new model was based on completion of some major construction projects and on future linking of the private sector through thermal plants, which would begin to generate electricity in 1999.[3] A trouble-free transition was vital for the success of the system, and investments had to be available to guarantee energy supply in a fundamentally hydroelectric systems that was subject to hydrological risk. Some analysts have attributed the supply crisis that broke out in early 2001 to a severe drought, while others have blamed an *investment drought* caused by the failure of the market model to attract the needed investments. However, before entering into this debate, it is necessary first to digress into a discussion of the special characteristics of the Brazilian generating system.

The streamflows of the rivers that feed the hydroelectric plants are very volatile both seasonally and annually, and it is not possible to predict them accurately. It is only possible to refer to them in probabilistic terms, either as the probability that a certain value is exceeded or using stochastic model parameters to describe the time series of the flows. These times series show dependence over time and between the flows of neighboring rivers, which requires complex modeling. The Brazilian system is composed of a series of interdependent plants with multi-annual storage capacity, which

[3] The thermal plants use mainly natural gas produced locally and imported from Bolivia through the recently-built gas pipeline.

makes the problem more complex and requires coordinated management of the hydroelectric and thermal systems to guarantee that the probability of not meeting demand in a given month during the planning horizon is less than an established threshold. It is not possible to guarantee supply with certainty without excess capacity. Since this would yield very high costs, planners chose an arbitrary threshold. Nevertheless, on occasions, a value is established where the additional cost of the investment and operation of the system is equal to the expected value of the cost of incurring in a supply failure.

Brazilian planners use a five percent tolerance for failure in a given month for a demand projection. This indicates that even if the system were expanded following this criterion, there is still a five percent probability of rationing. A supply failure could be due to an extreme drought with probability of occurrence equal to less than the design criterion. It could also be due to a less severe drought that takes place at a time when the installed capacity required to guarantee the desired reliability is not available because of investment lags. Supply failure could also result from higher than expected demand. But it could be due to errors in the estimate of the power that the system is able to supply with a given reliability, to a mistaken interpretation of the concept of reliability, or to inadequate operation of the hydrothermal system. It should be noted that this planning system does not take into account consumer response to price changes, which could reduce consumption and ease the supply shortfall.

Many explanations for the crisis of 2001 were put forward, most of them reflecting the ideology of the analyst. However, there is a consensus that the problems of guaranteeing new generation during the transition played a decisive role in the crisis. Although the drought played a role, errors in allocation of *guaranteed power* (which can be guaranteed with over 95 percent confidence) gave a false sense of security that prevented contracting power to maintain the reliability of the system at the required level (Pereira, 2003; Maurer, Pereira and Rosenblatt, 2005). In the Brazilian system each distribution company is required to contract up to 85 percent of its demand through guaranteed power contracts, and buy the rest on the spot market. At the time of the crisis, the distributors had, in theory, 100 percent of their demand contracted (Maurer, Pereira and Rosenblatt, 2005). In addition, as it became clear that reservoir levels would be insufficient, distributors feared that the regulator would not authorize them to transfer their higher costs to consumers via higher rates.

However, even if we accept the hypothesis that system security was lower than necessary, difficulties in attracting private investment to meet long-term expansion needs raised doubts about the probability that a timely detection of the error could have avoided the crisis.[4] The Ministry of Mines and Energy had been aware since 1999 of the difficulties in committing private investment to the new thermal electric plants and had organized an emergency plan (known as PPT), which ordered the state company, Petrobrás, to create joint ventures with the private sector to counter the lack of investment incentives. Similarly, the MME ordered Eletrobrás to offer purchase guarantees to ease risks for new generators. In 2000 the MME applied for multilateral bank financing of these projects.

Private investors had difficulties with the definition of the terms that would make their investment viable. As stated earlier, there were delays in starting up the wholesale power market and it had lackluster results. Indeed, the wholesale power exchange was unable to make settlements because FURNAS (the state generating company) refused to meet its commitments to pay the spot market price for the power that it needed to meet its obligations.[5] An additional factor was uncertainty about important aspects of the new regulatory framework, such as the transfer of generating costs, losses, congestion management contracts, establishment of gas prices and foreign exchange risk management (given that the natural gas price was fixed in U.S. dollars), and difficulties in establishing long-term contracts with distributors and non-regulated large consumers.

As mentioned earlier, since most distributors were contracted 100 percent until 2001, any new contracting was done at the risk that ANEEL might not accept transferring the cost to consumers. Thus, only vertically integrated companies, which benefited from defects in the regulation of so-called normative values, were willing to build new generation. However, the rigidity of the transfer of foreign exchange risk to consumers, which was not resolved until Petrobrás agreed to temporarily assume the risk in view of imminent rationing, prevented signing timely agreements with these companies.

[4] In 2000 the system operator warned of the dangers of rationing and requested the emergency contracting of a new generating plant, but because it was impossible to reach an agreement with ANEEL on transferring the cost of the power to consumers, these efforts also failed.

[5] FURNAS's problems stemmed from delays in putting the Angra II nuclear power plant into operation.

Management of the Supply Crisis of 2001

In April of 2001, the Cardoso administration was taken by surprise by imminent need to engage in major rationing due to the low level of streamflows and water stored in the reservoirs. The MME had not given any warnings because it had pinned all its hopes on the new Petrobrás and Eletrobrás projects, and on improvements in the hydrological situation. Given the political consequences that the situation could lead to, the government took direct control of the crisis and named the president's chief of staff (Pedro Parente) as coordinator of the Crisis Management Bureau (GCE) to adopt the necessary measures, including establishing the necessary procedures for power rationing.

The GCE, which was made up of a select group of industry and government experts, implemented a set of measures that ranged from obtaining emergency generation and refloating the projects in progress to preparation of an innovative program to cut consumption by 20 percent by establishing a quota system for consumers and incentives and sanctions to ensure compliance.[6] In accordance with the energy efficiency required by law, the subsidies were targeted to allow low-income users to install efficient lighting. In addition, industrial and commercial companies that were able to exceed their reduction quota were offered the opportunity to sell their surplus to companies unable to meet theirs. The use of market instruments to manage the crisis avoided the use of programmed cuts in service, which would have been extremely costly for the economy. The success of this program was such that three years after the end of rationing, consumption had not returned to pre-crisis levels, which in turn caused large losses to the distributors. In fact, the law required the generators to comply with the obligations contracted with the distributors provided that they were considered a case of *force majeure*. This would have imposed heavy payments on the state-owned generators (the great majority of generators are state-owned). Given the situation, the government opted for condoning this obligation and compensated the distributors by passing the cost on to consumers. However, costs were passed with a sizeable lag (three years), which had a significant impact on the cash flow of the distributors, as will be explained later.

[6] Cuts in consumption were needed to keep the system from collapsing and causing generalized power outages.

The GEC was not dissolved after the crisis was over, but instead became a permanent group responsible for making adjustments to the new model to prevent a repeat of the situation. To this end, a bill was passed in the last days of the legislature that proposed eliminating the problems originating from the *normative value* system, a cap on wholesale power prices that distributors could pass on to their regulated consumers. The solution consisted of establishing compulsory auctions for long-term power supplies for a volume equal to 95 percent of demand. In addition, both guaranteed power and the operation of the model that defines exchanges in the spot market were reviewed and revised. To improve the high-level coordination of issues related to the industry, the National Energy Policy Council (CNPE) was reactivated. The CNPE was originally set up in 1998 but had been inoperative until the crisis, although it had operating subcommittees. Two bodies were set up to deal with the problem of lack of planning and to ensure that there would be no more surprises: one for planning and another for market follow-up. The government also reformed the national system operator and the wholesale market exchange to eliminate the bottlenecks that had prevented adequate decision-making, and Petrobrás took measures to correct existing problems related to the foreign exchange risk. In 2003, the government organized the first auctions to renew the original privatization contracts. Some state companies, such as FURNAS, boycotted the auctions, which led to low prices after the crisis had been overcome.

In short, aware of the vacuum created during the transition, the Cardoso reform concentrated on finding ways to make adjustments to address the problems identified. These adjustments were made within the political constraints of the time, which prevented deepening the reforms and, more specifically, after recognizing that it would not be possible to move forward with the privatization of generation. The changes made corrected the main failures in the model that became apparent during the crisis. However, the government did not use the opportunity to introduce the improvements recommended by consultants financed by the IDB. Following those recommendations would have strengthened the model by permitting a significant part of the load to respond to price signals. It would also have modified the operating model for the reservoirs to reflect higher rationing costs (von der Fehr and Wolak, 2002). In addition, the government retained the controversial power relocation mechanism (MRE) used to allocate guaranteed power among all plants in the system.

Despite the fact that the crisis was successfully managed, both the domestic and foreign public associated the Cardoso administration with the incorrectly named *apagao* (blackout), ignoring the important lessons that could be extracted from this experience. It is well known that the Cardoso administration's electricity sector rehabilitation program, like that of his successor, did not incorporate the lessons learned regarding the importance of prices or of improving the quota system used during the program to ration consumption without resorting to general blackouts. A recent World Bank publication (Maurer, Pereira, and Rosenblatt, 2005) revisits the details surrounding the execution of the rationing program and its results. Some of these results are summarized below.

Lessons Learned from the Management of the Crisis

An original feature of crisis management in Brazil (compared to the experiences of other regions such as California) is that demand management gave market forces a certain amount of play and permitted each user to adjust consumption without experiencing arbitrary cuts in the service. In other words, there were no blackouts. The World Bank article by Maurer, Periera and Rosenblatt (2005) states that it was not easy for the government to adopt these measures despite the fact that a quota system had been used with some success in Brazil in the past. Support for the measure came from the Associação Brasileira dos Agentes Comercializadores de Energia Elétrica (ABRACEEL), which advocated a quota system at regulated and spot market prices for any surplus over their reduction quota, relating it directly to the market. The main opposition came from distributors, who saw numerous difficulties with the practical execution of the plan. The system finally adopted included consumption reduction quotas that varied by type of consumer.[7] Payment for unmet quota reductions was made at prices close to those of the spot market.[8] Low-income consumers (those who consumed less than 100 kWh per month) who were able to save more

[7] The reduction quotas for residential consumers (except consumption under 100 kWh) and low voltage consumers was 20 percent of monthly consumption in the previous year, while for high voltage users the quota was between 15 and 30 percent depending on the sector (rural 10 percent, and public use 35 percent).

[8] Quota deficits for consumers with over 500 kWh per month paid a value three times the rate, equivalent to the price cap on the market for immediate delivery.

than their established quota received rebates. Other low voltage consumers received rebates depending on availability. The rebates were covered by the surcharges. Those who repeatedly missed to meet their reduction quota were subject to losing power altogether (low-income consumers were exempted from this penalty). Additionally, large consumers who saved more than their reduction quota were allowed to sell their excess savings to other large consumers who had failed to meet theirs, and a market was created for these transactions.

Although the general result is clearly satisfactory and the targets set were achieved, and in some cases greatly exceeded, regrettably it is not possible to disaggregate impacts by each measure because the distributors did not maintain a data bank with detailed information. However, some available data give an indication of the results. The government kept its promise to give rebates to consumers who exceeded their reduction quotas, using budgetary contributions when funds raised through the surcharges were insufficient, thus stimulating savings. In total, 833 million reals were paid during the period, and additional government contributions totaled 405 million reals. This seems to indicate that rebates work better than surcharges, but it is not possible to reach this conclusion on the information available because the base and the amounts of the rebates and surcharges were not symmetrical and the rebates continued for a time even after the surcharges had ended. The strong response from low-income consumers can be explained at least partially by the free distribution of compact fluorescent lamps.

As Maurer et al. (2005) correctly note, the quotas permitted consumers to understand the importance of marginal consumption and, to some extent, respond with greater elasticity. Threats of loss of service were also important. Although it did not affect consumers who used less than 100 kWh, it may have been a decisive factor in the response of high-income consumers.

Another interesting aspect from the market point of view is the trade in quotas permitted for high voltage users. Unfortunately there is no information to quantify the results because most of the trading took place bilaterally through the exchange or other mechanisms established by the distribution companies. Users with capacity over 2.5 MW could participate in auctions organized by the wholesale market exchange, while other high voltage consumers only took part in the bilateral exchanges. The volume traded in the MAE was minimal, reflecting less than 0.5 percent of

consumption in the area affected, but Maurer et al. (2005) offer anecdotal evidence of bilateral arrangements for amounts five times higher than those traded in the MAE.

The program permitted savings that greatly exceeded the targets established for the residential and industrial sectors, and lasted until long after the emergency. Consumption did not return to 2000 levels until 2003. Residential consumption per user in 2003 was similar to the level for 1994. This worsened the financial problems of the distributors, which were already hard hit by the fall in sales during the crisis. The crisis revealed a very important problem in the legal provisions of the system of contract settlements between generators and consumers and the assignment of responsibilities in case of power reductions. Power shortfalls caused enormous wealth transfers between generators and consumers and had a severe and disastrous financial impact on some of them, forcing the government to organize a very controversial bailout program.

In order to facilitate the transition to the new model, the generators committed all their guaranteed power to the distributors by means of so-called initial contracts, with phased expirations starting in 2003. In case of breach of contract, the generators have to cover with purchases on the spot market. In a systemic crisis, it is not possible to generate all the guaranteed power and spot market prices rise to the cost of rationing, which creates incentives for *merchant* plants to sell on the spot market. This procedure would offer an elegant solution to the problem of security of supply if it were possible to build the entire emergency generating capacity required in time, but this would carry a high cost for the generators. If the additional power that could be contracted in the spot market were not sufficient to meet demand, they could continue drawing down until the water runs out, at which point rationing would begin. This policy would result in a general power cut for all the system and cause huge economic hardships. To avoid this, preventative rationing begins when the reservoir reaches a predetermined level. For this reason, and to relieve the problems faced by the generators, legislation was passed establishing that contracts can be reduced by a quantity proportional (but not equal) to the rationing. Under these conditions, in case of rationing the distributors would be left with a power credit that the generators must pay at spot market prices, since it would be impossible to take actual physical delivery. The distributors insisted on this provision because it compensated them for the fall in sales. However, the generators argued that this would lead them to bankruptcy.

Although, in principle, it seems that the generators clearly understood the scope of their responsibilities, Maurer et al. (2005) affirm that the provisions were ambiguous, and led to interminable discussions whose outcome was a government bailout. In my opinion, the generators could argue that the system operator was to blame given that their only responsibility was to have the plants available. Some experts argue that the distributors knew that their contracts were inadequate and should have entered into additional contracts but, as we have already seen, they were not sure that they could transfer their costs to consumers. However, even if these problems did not exist, the residual risk of rationing does not disappear and, although the legislation reduces exposure, the obligations of the generators continue in effect and the solution offered increases moral hazard.

The Lula Reforms

The efforts of the Cardoso administration to solve the crisis were insufficient to prevent an election defeat in 2002, when the Workers Party (PT) won on a platform of fundamental changes to the market model in the electric power industry (which was considered yet another failure of the neoliberal model). This platform (which was presented by a group of experts sympathetic to the government and was coordinated by the Citizenship Institute) was based on the proposals of Professor Ildo Sauer who advocated a return to state control of all processes, particularly investment. Under this proposal, the government would maintain electricity rates low. Fortunately for the industry, the original proposal was significantly changed by the pragmatic minister Dilma Rousseff who, after a long process of dialogue with industry participants, succeeded in getting legislation enacted to establish general criteria for the new model (Law 10847) and set up the new planning body, Empresa de Pesquisa Energética, EPE (Law 10848).[9] The model adopted by the Lula administration, which is described later, retained some of the 2003 reforms introduced by Cardoso. Although it gave much more play to the government in the planning and execution of various measures, it respected the commitments with the private sector linked to the construction and financing

[9] Both laws were enacted on March 15, 2004.

of the new generating plants required to meet electric power demand. The market model is based on segmentation in a regulated market and is known as *Ambiente de Contratação Regulada* (ACR, regulated contracting environment). It covers all small customers served by the distributors and includes a free segment, known as *Ambiente de Contratação Livre* (ACL, free contracting environment) that is made up of large customers. The distributors that participate in the ACR obtain power in two auctions, one for *old power*, which is generated in existing plants, and the other for so-called *new power*, for plants that need to be built and whose number and timing will be defined by EPE studies.

In the model adopted as result of the crisis in the last days of the Cardoso administration each distribution company or large customer bought power through long-term contracts in regular auctions. Today, the power required to supply the increase in demand in all the system in any future year is bought at an auction held some years earlier in which various businesses compete to build plants previously identified and designed by the EPE. This power is shared among the distributors in proportion to their needs. Each generator signs contracts with each of the ACR distributors. Large customers participating in the ACL continue negotiating their power by means of bilateral contracts with the independent generators in the spot market. Box 3.1 summarizes the functions of the institutions responsible for policymaking, regulation and the market in the new model (see chapter annex for details).

The objectives explicitly pursued by the Lula administration are rate stability (which is achieved with the old power auctions that cover most consumption) and reduction of risks for investors in generation.[10] With these measures the government expects that the cost of supply will fall considerably. In addition, the government hopes to eliminate the risk of a supply failure because new investments are guaranteed. The model is very detailed and is based on assumptions that can be difficult to be realized, but in general it has been accepted by agents and multilateral organizations as a compromise that can be achieved given prevailing political conditions, and which could improve with time. In essence, both the revitalization model and the Lula model are concerned about solving the problem of continuity

[10] Investors in generation sell their power in long-term contracts with all distributors and therefore do not assume market risk.

BOX 3.1 Regulatory and Market Institutions

CNPE:	National Energy Policy Council. Approves criteria for supply and "structural" projects.
MME:	Ministry of Mines and Energy. Responsible for concessions; appoints presidents of ONS and CCEE.
ONS:	National Systems Operator. Retains the functions that it has always had but the structure of corporate governance changes.
ANEEL:	National Electric Power Agency. Loses the power to grant concessions.
EPE:	Energy Research Enterprise. Conducts studies for MME.
CCEE:	Electric Power Reselling Bureau (successor to MAE). Performs the same functions as the MAE; organizes auctions; supports contracts between generators and distributors in the ACR.
CMSE:	Electric Power Industry Monitoring Committee. Oversees supply security.

of supply and the need to assign more responsibility to the public sector for monitoring supply conditions, but the latter model assigns a greater role to the public sector in both managing the measures and investment decisions.

In the regulatory aspect, the Lula administration was wary of the degree of independence that should be granted to the regulatory bodies because they saw the institution as an unnecessary outsourcing of government responsibility. After debating various proposals, a bill was presented to Congress to increase the accountability of the regulator by, among other things, appointing an ombudsman, which has been a very controversial measure.

How Viable Are the Model's Assumptions?

At the time of this review, the government had successfully overcome the first challenge of the auction of the so-called old power, that is, 50,000 MW for the 2005–09 period resulting from the expiration of the second group

of initial contracts in the second half of December 2004. Although almost all the generation was auctioned, the prices were not sufficiently high. This fuelled suspicions that the auction had been designed with this result in mind because it coincided with the rhetoric of the Workers' Party. A new auction, which was programmed for early 2005, was postponed because of difficulties in obtaining sufficient candidates with environmental licenses.

The targets set by the Lula model to supply the electricity market at lower cost guaranteeing sufficient supply have been the same as those set by previous governments, both in the statist model and the market model of the Cardoso administration. In principle the proposal picks up many of the measures adopted in the last days of the Cardoso administration and tackles many problems that limited its performance, but success will depend on the plausibility of its assumptions and the way the transition is managed. If the previous models failed because of incorrect assumptions about the behavior of economic agents, availability of resources and the weakness of institutions, these lessons should not be forgotten when analyzing the possibilities of success of the new model.

Under the Lula model, the reestablishment of the planning process guarantees continuity of the service, reassignment of the risk of the generators to the distributors (and in the last instance to the government and the consumers), and permits private investors in generation to offer lower prices. Also, the segmentation of the ACR between old and new power makes possible the transfer of part of the hydraulic rents from existing projects to consumers.[11] However, the simultaneous achievement of the two targets could be difficult. In addition to the difficulties implicit in the model, which are described later, there are trade-offs that have to be resolved. Security of supply can be achieved at the cost of over-installation and a lower degree of effective competition, which does not necessarily favor cost reduction. The signing of new power contracts with each distributor with joint liability can help some weak distributors to contract power but at the cost of increasing the systemic risk and raising the price that private generators demand. The government has to take special care to prevent major disasters that could jeopardize the model in its initial stages. This could happen, for example, if it is not possible to separate the ACR from the ACL, if interest groups are

[11] This was the government argument, although clearly to be able to do this the volumes or bids of the federal companies in the auctions held for that purpose should be manipulated.

successful in imposing the so-called structural projects that do not require competition with other sources at a high cost for consumers, or if the planning activities are not adequate to guarantee a sufficient number of projects to produce effective competition, whether because it is not possible to start an EPE with the required competition or because of other obstacles, such as the difficulty in obtaining environmental licenses. It would also be very serious if the mechanisms to adjust the contracting of the distributors and define what costs are transferred to consumers created an unacceptable risk for the distributors. However, it might be even worse if private participation were reduced to joint ventures with state companies that did not respond to economic incentives due to defective governance.

As is well known, one of the provisions for protecting against undersupply in this model is to use conservative demand projections and offer incentives for over-installation, while charging the cost of errors in the projection to distributors or consumers without giving them sufficient instruments to correct them. This can only result in higher costs for consumers.

The Lula revitalization proposal does well in including a long-term planning process. Regrettably, there is the danger that the structural projects could open a window to projects that favor particular interests or political objectives that are difficult to control. Additionally, in an attempt to prevent the EPE from becoming the only source of alternative projects, the model encourages investors to present their own alternatives. The experience with integrated resource planning (IRP) in the United States shows that these processes can be very complicated and take a long time. It could also be that the measure has little practical effect given the difficulty of properly preparing projects, particularly in obtaining environmental permits. Competition for the lowest rate can also look better on paper than in reality because the bids are based on the EPE studies. These studies may have errors that the proponents could use to justify claims during construction and enter into long and costly litigation and delaying construction of the projects.

Cases in which consensus is achieved on the lower cost alternative to meet demand in the system are very rare. Any analysis is based on a large number of assumptions about the future, many of which depend on the judgment of decisionmakers. International experience has shown that reasonable people can reach diametrically opposed conclusions on the best way to meet demand. When this is combined with the possibility of obtaining attractive economic rents for those who can gain approval for their

favorite projects, then less reasonable people are more likely to get involved in the process and increase the likelihood that projects built will be more costly but politically attractive. This type of project is generally undertaken when no bid contracts for the expansion of structural works are awarded, but there are other ways in which costly but politically attractive projects are approved. To avoid these problems, it is important to establish very clear rules and explicit definitions of the scope of the project in order to prevent unnecessary delays and complications.

Creative solutions were found for many of the problems during discussions of the bill and the regulations. However, difficulties remain at the time of this writing (2005) that require immediate attention to avoid future conflicts. There are several issues of importance surrounding this bill. The first is the definition of guaranteed power for hydroelectric and thermal plants, which depends on fixing technical parameters that are subject to manipulations and further debate. Contracting according to the minimum price per unit of guaranteed power can be a useful simplification of the problem, but for this strategy to work arguments about how it is defined need to be avoided. This is why markets prefer auctions for long-term contracts. To avoid some of the anticipated problems, it should be made clear from the start that minimum cost expansion is simply an instrument to determine blocks of power for contracting and to guarantee a sufficient number of alternatives.

Second, the bill includes a periodic review of economic and financial issues in the contract. The government recently came out in favor of using an index of construction costs for the industry even though companies and academics defend the use of the general consumer price index. A cost index different from that used to index other industry participants undermines investor confidence, as the *Wall Street Journal* reported in January 2005. The problem with the proposed industry index is not the difficulty in estimating it, but the theory behind it. Once an investment is made, the only appropriate index is one that protects against general price increases.

The third problem deals with finding investors (other than state companies) that are interested in the private sector. This could be a crucial question because the market has been designed to address the concerns of potential investors. The model assumes that traditional investors interested in thermal plants will be outside the market for a time and that only local companies (most likely in a consortium with construction companies and equipment manufacturers) will be interested in the short term. State

companies can also invest their profits in joint ventures with private investors, at least initially until sufficient confidence is developed in the model. The problem that appears here is lack of adequate governance in state companies, which lead to unholy alliances that can endanger the competitiveness of the market. The history of the construction cartel responsible for the high costs in the 1980s and early 1990s could be repeated with disastrous results and should be avoided at all costs. One way of doing this would be to guarantee the presence of adequate competition from the thermal plants but, as will be seen later, the situation does not seem favorable for this in the short term.

Although the new model partly corrects important failures in the model that it replaces, its potential for success, measured by its ability to attract investors in generation at reasonable prices, depends on its capacity to solve the problems created by the mechanisms adopted and to manage some persistent problems of the previous model that have not been addressed by the reforms. The new model will simplify life for generators to the extent that it guarantees a timely solution to environmental problems and offers them designs for alternative expansion projects, together with a transfer of the commercial risk to distributors and users. However, the likelihood that these savings will lead to lower rate for consumers will depend on the extent to which the bidding process is effective and problem free, on the strength of the competition in the market, and on the effectiveness of the EPE in preventing the traditional cycles of over- and under-equipping. On the information available it is inconceivable that these conditions could be met. Although at the moment the government has shown flexibility, the model depends on the actions of many administrative bodies and its potential for survival is based on its capacity to adapt and allow the market to take a growing role over time. Moreover, the new model does not offer a solution to the problem of foreign exchange risk, while it seems to increase regulatory risk.

A certain degree of flexibility was introduced during the debate surrounding the establishment of the new model to allow distributors to adjust their positions in line with the trend in demand. However, performance would be considerably improved if the market were allowed to play a greater role in the supply and demand process by establishing day-ahead markets and forward contracts, and by providing opportunities for consumers to respond to prices in the way suggested by von der Fehr and Wolak (2002) in their report to the government. The transition would also be greatly

facilitated by adequate treatment of the asymmetries faced by the thermal plants relative to the hydroelectric plants, as well as indications that, in the future, after approving the model, the two ARC markets would converge into a single type of power auction. Controlling the opportunistic behavior of consumers and generators will not be possible without being able to assign consumers to each of the segmented markets. As already mentioned, the strength of the competition for new capacity will depend largely on the number of investors, which will remain low if limited to locals, and on the ability of the authorities to avoid getting involved in lengthy disputes about the details of the auctions. Considering that the model was designed with the particular conditions of the Brazilian market in mind (which is not favored by foreign investors) and the need to guarantee security of supply, the door should not be closed to a more efficient design once current problems have been overcome. Therefore, it is of crucial importance that the current design should not impose irreversible stranded costs that would be impossible to remedy later.

Lastly, we should recall that although the design adopted has clear benefits given current conditions, it does not necessarily ensure cheaper power in the future. The regulatory and foreign exchange risks, which until now have been the main obstacles for investors, have not been overcome. Unless they are adequately treated, the savings obtained from the elimination of commercial risk for the generators may be offset by increases in the cost of capital due to hedging foreign exchange risks. Although hydroelectric projects have a larger local currency component than thermal projects, loans in local funds can be insufficient and more costly, so it will always be necessary to have some recourse to foreign loans. The transfer of hydrological risk is certainly favorable to the generator, but must be managed by the planner, which, together with the requirements of addressing security of supply, results in higher costs for consumers. The ACL generators will certainly depend on the solvency of the buyers. As mentioned earlier, the method proposed for addressing this problem creates incentives for over-installation whose costs are assumed, in the last instance, by consumers. Making all the errors of the planning process of generating expansion fall on consumers does not permit sufficient control over the body that, in the end, decides which plants will be built, because it accepts no economic responsibility for its errors. There is an implicit bias in favor of responding to the deficits by over-equipping instead of procuring flexibility to allow the price mechanism to function. Moreover, the stigma of

the recent rationing will make the planners very careful not to repeat that error. Although it is true that the previous model failed precisely because it did not address security of supply, to do so necessarily involves greater cost, which increases with the biases of the new model. As was seen during the debate on the model, the distributors did not accept the new risks without adequate trade-offs.

Challenges During the Transition

The experience with rationing in 2001 was key in establishing that a problem-free transition is critical for the survival of any model; in other words, getting off on the right foot is essential. For both new and old models, the key issue in deciding its acceptability is the model's ability to attract investment given the new investment rules that are geared to preventing a repetition of the rationing episode. Naturally, the aim of the government is also to achieve lower electricity rates, but the effects of new contracting may take some time to be felt in lower rates. For the time being, the relatively low prices achieved in the old power auctions can partially offset the higher charges for recently granted distribution, given that old power makes up a dominant percentage of total power available for distribution. Similarly, during the next few years, consumer prices would not rise by much, even when taking into account the quota system established by the Programa de Incentivo às Fontes Alternativas de Energia Elétrica (PROINFA, incentives program for alternative sources of electric energy). The strategy of the Lula administration for dealing with the transition involved contracting about 3,300 MW of renewable energy as legally stipulated, on supply from hydroelectric projects (whose studies and environmental licenses would be made available and issued in advance), and on the use of thermal generation using natural gas. However, in early 2005 this strategy suffered some setbacks that could cause trouble for the government during the transition.

The PROINFA program was part of the price the Cardoso administration had to pay for passage of the reforms after the 2001 crisis. Lobbying by the renewable energy interests (which are different from large-scale hydroelectric interests) facilitated passage of a program for the installation of 3,300 MW of renewable energy to be developed in the short term at a cost that was significantly above market prices. The excess cost would be paid for by all consumers. To satisfy the interests of the manufacturers, the law

fixed quotas of 1,100 MW each for biomass, wind energy, and small hydroelectric plants, and set differential purchase prices that significantly favored wind generation.[12] Not only did this involve additional costs for consumers, it also involved quotas that introduced clear economic inefficiencies because the most natural solution would have been to award through auctions where all the sources selected could participate. Additionally, the sources are not comparable with respect to guaranteed power and involve very different network connection cost. So, while generation based on sugarcane bagasse has a potential of over 3,000 MW at prices close to 60 percent of wind, and it is mostly located in the state of São Paulo, in the very center of the system load, which offers substantial savings in transmission costs. However, wind development takes place in remote areas that require additional investments of over US$150 million in transmission and impose important operating restrictions on the system. To further complicate matters, *Gazeta Mercantil* reported in February 2005 that about 450 MW of the quota established for biomass had not been placed and had been reassigned to other sources. Apparently, the biomass generators protested about price discrimination against them and preferred to participate in the more attractive auctions for new power.

In addition to the higher cost, there is also the problem that this capacity is unlikely to be available to meet the needs of 2007 because the projects are not moving ahead as quickly as would be necessary; thus, other sources will have to be found to replace it. This situation is complicated by restrictions on import of natural gas from Argentina and Bolivia because of recent events in those countries. Fuel will not be available in sufficient volume until 2010, when the Santos basin gas development on the Brazilian continental platform comes into operation.

It could be said that there are still sufficient hydroelectric projects. However, according to information from the Ministry of Mines and Energy, the new power auction planned for early 2005 had to be postponed for some months and the quantity was reduced because of the 17 projects in hand, in mid-October only a few had obtained their environmental licenses from the Instituto Brasileiro do Meio Ambiente e Recursos Naturais Renováveis (IBAMA, environment and natural resources institute), while

[12] Wind energy was valued at R$209 per MWh, while energy from small hydroelectric plants was valued at R$117 per MWh and biomass at only R$94 per MWh.

the rest were still in the hands of the regional bodies. This is bad news since the availability of these studies was proclaimed as one of the important contributions of the new model to guaranteeing a sufficient supply of projects to compete in the new power auctions. Difficulties in obtaining these licenses results from the environmental legislation, which requires approval from local state bodies that do not have uniform criteria. Moreover, local officials are personally liable for potential errors in their decisions. This means that officials are extremely cautious and prefer to respond in the negative rather than risk being sued later. The hurdles that the companies must overcome do not end with the environmental license that authorizes them to build the plant. They also require a license to operate the facility. This imposes additional risks on investors, as witnessed by the recent case of the Barragrande project by the private Vorantim Group, which only obtained a license at great political cost for the government. The solution to this problem is not easy and in no way immediate, although the president of National Electric Energy Agency, Jerson Kelman, told *Jornal de Commercio* (February 22, 2005) that the problems were on the way to being solved.

If these problems cannot be solved in time one can always resort to the installation of thermal generation with dual equipment that permits the temporary use of liquid fuel while obtaining guarantees of future supplies of natural gas. This seems to have been the solution preferred by Petrobrás. This entails an increase in costs and in price volatility in the 2007–2010 period. Another solution would be to consent to the participation of bagasse generators in the auctions for new power, which could make capacity of over 3,000 MW available.

Assuming these problems can be solved, there is still doubt about whether or not the measures are sufficient to whet the appetite of investors. We have already mentioned the adoption of a specially calculated adjustment index when it would have been better to use the general market price index (*Índice geral de preços de mercado*, IGPM), as is done for PROINFRA.[13] The government has promised availability of local credit from the BNDS for up to 70 percent of the cost of projects, but it remains to be seen for how long this promise can be kept.

[13] The IGPM has the advantage of reflecting sudden changes in the foreign exchange rate, although it does so with lags.

Due to the difficulties with available projects, the invitation to take part in the new power auction was postponed and it was only in late August of 2005 when the Minister of Energy presented the terms of reference for the bidding process for plants that have to start production in 2008, 2009 and 2010. Among the important aspects, the local press emphasized (Schuffner, 2005) the government's decision to use the general consumer price index (*Índice nacional de preços ao consumidor amplo*, IPCA) instead of the IGPM as the industry had requested. According to what was announced previously, acquisitions would be made for thermal and hydroelectric capacity separately, but the proposal is for an auction in three phases. In the first phase, bidders submit bids for the 17 hydroelectric plants (or those that have environmental licenses). The bids that fall within a margin of more or less five percent of the lowest bid are selected to compete in the second phase where they will participate with other projects that obtained concessions under the previous system. The second round distinguishes between thermal and hydroelectric plants. Thermal plants will be issued 15-year contracts and will be only on availability because the system operator will define their operation. Hydroelectric bids compete for guaranteed power. The quantities to be selected between hydroelectric and thermal are not known by the bidders until after the award. In the last round, the MME defines an initial price and the bidders have 20 minutes to come in below it.

Again, as in the Cardoso crisis, the message is that transitions offer the highest risks for the sustainability of the model, and governments must guarantee that supply is satisfied at the cost of breaking their promises to cut costs.

Difficulties in Regulating

The establishment of an independent and effective regulator in Brazil has been difficult from the very start in late 1997. The main problems had to do with the weakness of the regulatory system, bureaucratic and legal restrictions, and interventions by the executive. Although regulatory entity included some features that supported its independence, in practice the legal obstacles and restrictions on the use of resources prevented it from being an effective institution. The board of National Electric Energy Agency (ANEEL) is made up of five directors appointed by the president

and confirmed by the Senate for four-year periods. However, the absence of a regulatory culture and the troubled environment in the sector have made this an insufficient guarantee of independence. While the law stipulates that the regulated companies must pay up to 0.5 percent of their sales to cover the expenses of the regulatory body, in practice, ANEEL does not receive the total amount since over 40 percent of it is allocated to cover the public sector deficit or to other fiscal needs. ANEEL cannot legally enter into long-term contracts with its employees or offer them competitive salaries. This is a serious handicap for the agency, and prevents it from hiring the best staff and makes it difficult to keep them after training. When it first started, the agency was staffed with seconded personnel from the regulated companies. This created conflicts of interest and ethical problems in working with the regulated entities. Unfortunately, the revolving employment door between the regulated companies and ANEEL continues.

The first major blow to the independence of National Electric Energy Agency resulted from the supply crisis of 2001 when its authority was subordinated to the Crisis Management Bureau despite the fact that two of the agency's directors formed part of the GCE. By the end of the crisis, the policymaking power of the National Energy Policy Council (CNPE) had increased, and the reforms instituted by the Lula administration further increased the power of the executive. A study for the World Bank (Brown and de Paula, 2004) found that there is a lack of clarity in the distribution of functions between the policymaking bodies and the regulatory agency and that, while Congress and the executive are responsible for major policy issues, ancillary topics should fall within the scope of the regulator (and they do not). In fact, the CNPE was preoccupied with problems that should have been the responsibility of the regulator, including such issues as the details of transmission rates and how the distributors should buy power. The design of the new power auctions is now in the hands of the new institute responsible for planning, the Energy Research Enterprise (EPE).

Despite the limitations, the regulatory agency has weathered the initial onslaught from the Lula administration to limit its independence, even though the problems that limited its effectiveness under the previous administration persist. For example, there are deficiencies in the transparency of the procedures and the accountability of the regulator. There are no legal provisions that require regular public and transparent reviews of the activities of ANEEL by the legislative and/or executive authorities. In addition, the regulations do not explicitly state that all communication between

ANEEL and any other agency, including government entities, on matters currently being considered by the agency should be dealt with transparently and should be accessible to the public. Moreover, there are requirements regarding public hearings in which officials and interested parties can present their cases and debate their merits.

Brown and de Paula (2004) also found shortcomings in the ancillary institutions that hinder the appeals process. Disputes and appeals are not brought before a tribunal of experts but are subject to a single level of judicial review. Given the difficulties that judges have with regulatory matters, the authors recommend the creation of a specialized appeals court for regulatory issues. Brown and de Paula describe the role of the regulatory agency as confusing and they state that it lacks of definition in the way in which it exercises its regulatory control functions. They also emphasize the need for an independent body responsible to monitor the wholesale market and oversee competition.

The supply crisis at the end of the Cardoso administration created problems related to the independence of the regulator as well as to other policy and regulatory matters. The government took direct control of the crisis and relegated the regulator to a secondary role. Although this seems to be an example of the lack of independence of the regulator, it is worth asking whether a crisis of this magnitude and nature could have been handled by a weak and incipient institution mired in the chaos and lack of coordination that existed among government bodies.

The regulator handled the first review of the distribution charges with relative success, although the process was not immune from controversy and strong discussions with the regulated entities. The problem was caused by ambiguity regarding privatization contracts. As will be recalled, privatizations began before the regulator was established. The companies argued that the rate base for calculations of profitability should be the prices paid in the privatizations, while the regulator proposed that it should be based on the most *efficient company*.

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Annex
The Brazilian Electricity Market Model

The model was designed to respond to two main problems: how to attract investment in generation and how to maintain prices low. To attract private investors in new generation projects, the market was segmented into two parts. The first part was known as ACR and involved regulated contracting, in which power is contracted for captive consumers through auctions. The second part was a free environment known as ACL, in which agreements are established between large consumers and generators much like the market in existence until recently, the MAE. Participants in this market include captive consumers (who are backed by previous contracts offered by the independent producers), free consumers, self-producers and resellers. In both markets the current MAE rules continue in force for opportunity exchanges.

All power contracting takes place under competitive conditions in auctions designed for that purpose and led by the EPE. A distributor cannot buy from a related generator in these auctions. The buyer assumes the risk in auctions to purchase "new" (expansion) power (that is, those with contracts for power availability). Whereas the seller assumes the risks in the purchase of "existing" power (serving the current market), with contracts for quantity of power. In contracts for power availability, the distributors pay the generator a fixed amount for the guaranteed power made available and also provide compensation for the additional operating costs in the case of thermal plants. Their objective is to reduce the costs of contracting for the consumer by reducing the risks of the generators; that is, quantity and price risk in dry periods in the case of hydroelectricity, and price risk in periods of abundant water in the case of the thermal plants. Also, the direct absorption of thermal plant operating costs by consumers above a certain threshold, they can benefit from the synergy offered by the operation of the hydrothermal system. Purchase of new power is intended to make expansion through long-term (15 years) contracts feasible, which reduces the commercial risk for investors. It also permits distributors to manage risks introduced by the uncertainty of demand projections, which the distributors

must make, and by the opportunist behavior of consumers with capacity to participate in the ACL through a "portfolio" of short-term contracts with existing generators. Each generator contracted in the auction signs separate bilateral contracts with all distributors. The sum of the guaranteed power contracted with distributors is equal to the guaranteed power of the generator. The bidders compete for the right to build plants designed by the EPE. This is not a single buyer or a classic purchasing group because the government is not involved either financially or as guarantor.

The total increase in the demand of captive consumers in the future will be covered by two auctions: the first taking place five years before (A-5) and the second three years before (A-3) the first year of operation of the contract. This facilitates the management of growing uncertainty of demand as the projection period grows. The distributors report the demand they wish to contract (average MW), an auction is held to contract a quantity x of MW (sum of the information from the distributors), with delivery planned to start in five (auction A-5) or three years (A-3). The EPE studies and opens bidding for projects whose total guaranteed power substantially exceeds the auctioned demand (for example, if an average of 2,000 MW are put out for bidding, the EPE should offer 4,000 MW—double—in projects), and the hydroelectric plants will have environmental licenses. Other agents are free to offer other projects.

Each project offered for bidding will have a rate in R$/MWh of guaranteed power. "R$" represents the bid of the winning investor, while "MWh" is the certificate of guaranteed power of the plant (known with anticipation). The thermal plants also offer R$/MWh of guaranteed power (rules for making the thermal and hydroelectric bids comparable). If there is more than one bidder for the same plant, the one with the lower rate is selected. After establishing the rates (R$/MWH of guaranteed power) for all plants in the auction, they are placed in ascending order (*escadinha*) and the plants are contracted in that order until the guaranteed power accumulated is equal to the demand in the bidding process.

For the old power, auctions are held every year for power quantity contracts in the ACR in which existing generators participate for periods from five to 15 years. Existing private and state generators can contract both in ACR and in ACL and prices are expected to tend to marginal cost. Special rules have been established for the transition stage (until 2006).

There is freedom to contract in the ACL with a requirement that there exist 100 percent contracting. In order to limit uncertainty for dis-

tributors, withdrawal periods for consumers from the ACR to the ACL environment are established according to the following scheme: between 3 and 5 MW, one year; between five and ten MW, two years; over ten MW, three years. A period for return to the minimum regulated environment of five years is established.

The two environments coexist through the operations of the spot market. The Electric Energy Marketing Bureau (CCEE) absorbs the functions of the old MAE. The differences between production and contract of the ACL agents are settled on the basis of marginal operating costs (MOC) (with floor and ceiling). The differences between ACR production and consumption can be bought from/sold to ACL on the basis of the MOC. The MRE is retained and existing contracts and rights are respected. Independent producers can also participate in the auctions for new generation in the ACR provided this is reflected in a lower tariff for ACR consumers than the tariff they would have if they did not participate.

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Chapter 4

The Reform in Colombia

The process followed by Colombia in reforming its electricity sector in the early 1990s was very similar to that of other countries in the region. The main trigger for the reforms was the government's need to raise revenues to close its fiscal gap, which was exacerbated by the deficient performance of the prevailing model in the electric power industry. In addition, the rationing of 1992 also played a role, and facilitated passage of the reform legislation. The reform was also a response to a persistent crisis in the operation and financing of the industry that was caused partly by a lack of clarity in the roles played by the state as entrepreneur, policymaker, and regulator. The conflicts that resulted from this confusion of roles created perverse incentives for administrators in the industry, hindering efficient management, compromising the borrowing capacity of the state, and politicizing the decision-making process at all levels.

While Colombia's reform benefited from the experience of other countries, it also had to address conditions specific to it. The problems that were unique to Colombia include the fact that about 50 percent of electricity consumption was concentrated in three municipal companies that were not under the direct jurisdiction of the national government; an ongoing struggle between regions to obtain larger shares of central government resources; an interconnection system dominated by hydroelectric generation; and a public service rate system based on deficit financing and cross subsidies. These relatively negative factors for the industry contrasted with a relatively healthy and buoyant economy.

Based on the powers granted by the 1991 Constitution, Congress enacted legislation in 1994 on domiciliary public services (Law 142) and on electricity (Law 143) to govern the sector in the future. Transition to the new model for the industry was facilitated by previous measures taken by the government. A regulatory body and an electricity system operator

began to function in 1993, in line with reform proposals. The design of the wholesale market was initiated at the same time. The government also took emergency measures to enter into contracts to purchase guaranteed power in order to avoid a repetition of the supply crisis of 1992. A little later, taking advantage of the restructuring of some of the companies under its jurisdiction, the government began to privatize some generating companies. However, it did not touch distribution, which for various reasons remained under the control of municipal companies. It also left alone companies in which the state held a majority interest but which local politicians controlled in practice.

The new framework facilitated the participation of the private generating industry through independent producers, which successfully overcame a severe drought associated with the El Niño phenomenon in 1997–98. Furthermore, several events that took place around 1998 seemed to indicate that the reforms were rapidly becoming well established. For example: several independent producers undertook new thermal generating projects encouraged by the high prices that prevailed during the drought and the adoption of the capacity charge that complemented the energy-only market; the resolution of the crisis faced by the vertically integrated company that served Bogotá (Empresa de Energía de Bogotá, EEB)[1]; and the sale to the private sector of a controlling interest in the distribution companies on the north coast of Colombia, which were the most inefficient in the country. However, the boom was short-lived. Beginning in 1999 Colombia's economy entered a deep recession and GDP fell by over 5 percent in one year. This led to a slump in demand that revealed problems in the reform and culminated in a crisis from which the industry has still not completely recovered.

As a result of these difficulties, government plans to continue the privatization of generation and distribution assets stalled. The financial situation of the distributors that remained in state hands, which was already difficult, worsened as Cali's municipal company went into crisis. Ayala and Millán (2003) summarized the situation of the industry as follows: "The reforms of the electric power industry in Colombia are now at a crossroads. The critical financial situation of many distribution companies (both public and private), combined with serious difficulties in the operation of the

[1] EEB was the largest electric power company in Colombia. It brought private capital into the industry through capitalization.

wholesale electricity market, loss of credibility of the regulatory institutions, and questions regarding the legitimacy of the model contribute to reducing incentives for private investment (which were already precarious following the prolonged economic recession and the deterioration of the security situation)." Based on this diagnosis, the authors recommend taking a set of measures to keep the reform afloat (see Box 4.1).

However, three years later, while there is progress on several fronts, some of the threats to the sustainability of the model that were mentioned in the report remain. The performance of the regulator continues to be erratic and there are many unresolved problems. Delays in adopting a replacement for capacity charges have led to uncertainty in the remuneration of the generators, increasing the reluctance of private investors, who believe that the government favors public generators. Delays in issuing new distribution charges and problems surrounding the charges that were finally adopted led to the postponement of the sale of government-controlled distributors, until, on the eve of the 2006 elections, the government suspended its plans to sell state companies. Meanwhile, the private company that bought the Atlantic coast companies experienced difficulties in improving efficiency, and the deterioration of the system of targeted subsidies increased the needs for financial contributions from the government.

As part of an IDB policy loan for the public utility sector, the government and the Bank agreed in 1994 to a series of measures to improve the transparency and accountability of the regulatory process, as well as the qualifications of regulators. The agreement also included improvements in the targeting of subsidies and in the governance of state companies. However, the implementation of these agreements has not been complete.

These events seem to confirm the hypothesis in Ayala and Millán (2003) that, although many aspects of the reform package have been implemented and have yielded the expected results, several assumptions implicit in the strategy were inadequate due to institutional, technical, political and economic limitations. Despite initial success, the model was vulnerable to external factors, such as economic recession and terrorist attacks that affected the industry beginning in 1999. Paradoxically, the opportunities that emerged for investors from the sustained growth in demand during the early years of the reform made it more difficult to ascertain market limitations and regulatory weakness. These flaws only came to light as a result of competition by several groups to acquire the rents offered by the system to compensate for low prices in a depressed market.

BOX 4.1 A Crisis Management Program

The crisis management program has four main areas. The first deals with increasing the legitimacy and credibility of the supervisory and regulatory institutions and involves:

- Reforming the Domiciliary Public Services Superintendence (SSPD, Superintendencia de Servicios Domiciliarios) to ensure that it becomes a specialized agency; increasing the efficiency of the consumer services office; and developing methods for rapid response and resolution of disputes.
- Reforming the Energy and Gas Regulatory Commission (CREG, Comisión de Regulación de Energía y Gas) to separate its functions from those of the ministry; hiring top experts and advisers; improving regulatory approaches; increasing transparency and establishing an adequate system of accountability.

The second area covers actions to improve the operation of the wholesale electricity market in order to minimize incentives for abuse of market power by some participants and guaranteeing continuity of long-term supply without resorting to government intervention. These actions include:

- Establishing simple price-setting rules for special cases in which the security of the network is an issue.
- Reducing confusion regarding which sections of the relevant institutions are responsible for oversight and monitoring of the wholesale market.
- Establishing a market monitoring committee to make recommendations to the CREG and report cases of abuse of market power to antitrust authorities.
- Ensuring that the payments received by generators from the capacity quotas and wholesale spot market prices are sufficient to increase supply to meet consumer demand.

The third portion of the program is aimed at guaranteeing that companies receive adequate income for the service they provide. Three types of actions are required to achieve this objective:

- Establishing appropriate electric power rates for the regulated segments of the industry that adequately reflect the risks and obligations undertaken by the companies. To ensure the stability and credibility to the rates, they should be debated in a seminar by renowned high-level experts and regulators from other countries.
- Establishing measures to ensure that all consumers pay their debts on time. Threatening public institutions with supply cuts is not a credible measure. The

BOX 4.1 A Crisis Management Program *(continued)*

central government must create the necessary schemes so that municipalities and other public bodies pay their debts and do not fall into arrears.

- Establish measures to compel central and municipal governments to pay distributors the subsidies to which they are entitled. The central government can negotiate a payment timetable with the distributor companies to settle arrears and earmark resources to comply with the agreements resulting from that negotiation.

The fourth part of the program relates to the volume, use and origin of the public funds that are allocated to the sector for the next four-year period. It also delimits and defines the role of the state as service provider, including investments and other specific activities required to expand coverage and provide access to the services by low-income residents. Three basic principles for the allocation of public expenditures to the electric power industry should be followed:

- Priority should be given to expanding electricity coverage in marginal urban and rural areas. Revenues obtained from privatizations should be allocated to addressing these needs and solving other pending problems that are holding up industry development. The allocation of public resources to support the electric power industry must be detailed and made known to the public.
- Government resources should not be committed to investment in generating projects. These should be developed by private companies.
- The government must establish a competitive bidding process for selling the distributor companies.

This part of the program includes a set of actions whose objective is to facilitate efficient access by the poor to electric power, specifying the resources that are going to be used and the criteria that govern the selection of investments, along with government measures that tend to limit the volume of state-owned electrical assets and guarantee independent management of the assets that remain in its possession.

While this analysis relies on the work of Ayala and Millán (2003), it does not constitute an update of that report because it takes a different approach. Following an account of the reform process and the problems encountered (especially recent events), this analysis looks into some problems that were not dealt with previously, such as the governance

of state companies and the effectiveness of the targeted subsidy system. Unlike the previous work, this chapter does not provide explicit recommendations.

Gestation and Implementation of the Reform

The reform of the electric power industry came about as a response to the crisis caused by the lack of separation of the government's various roles in the industry, and by the absence of incentives for efficiency in the statist model. That model, which was based on vertically integrated state monopolies, could not raise the resources needed for expansion and operation of the system. That failure, combined with the poor performance of the companies in the industry, imposed a large and unsustainable burden on government finances. Lack of incentives for efficient operation, together with electricity rates that did not reflect the cost of the service caused state

BOX 4.2 Chronology of Electricity Reforms in Colombia

1991	New Constitution is promulgated Model for the sector is discussed in numerous forums
1992	Electricity rationing is decreed and national government control of various companies is strengthened through debt swaps
1993	The first power purchasing agreements (PPAs) are entered into
1994	Laws 142 (Public Services) and 143 (Electricity) are enacted Regulatory and monitoring agencies are set up
1995	Wholesale market begins operation and ISA is restructured
1996	First generating plants are privatized
1997	Private sector capitalizes the companies CODENSA and ENGESA that were part of EEB
1998	The private sector acquires a majority interest in Electrocosta and Electrocaribe
1999	The economy enters into a deep recession
2001	CREG intervenes in the wholesale market to prevent abuse of market power

companies to perform badly and accumulate losses that were reflected in a large government deficit. The confusion of the roles that the state played allowed some dishonest politicians to take control of the companies and distort the objectives of the model. Consequently, subsidies were poorly targeted, expansion of coverage was inefficient and insufficient, investment was concentrated in large-scale hydroelectric projects, and the industry was used as a tool in a system of patronage that offered many opportunities for corruption.

The origins of the Colombian reform cannot be simply attributed to the rationing of 1992, which is a popular interpretation, but rather to the government decision to take advantage of a particularly favorable moment that would probably not be repeated for a long time. The obsolescence of the statist model, acceptance of a new development paradigm by the international development community, and the promulgation of a new Constitution, coincided with a generalized consensus in the industry and the multilateral development banks that the existing Colombian model was not viable, a fact that rationing made clear to public opinion.

The reform of Colombia's electric power industry was part of the set of reforms for modernizing the state and developing the principles of the 1991 Constitution undertaken by the administration of César Gaviria. After unsuccessful earlier efforts at reform, the government and the World Bank organized a workshop to study alternatives to address the problem. The workshop was held in March 1991 in Santa Marta (Colombia), and included the participation of all interested parties: public and private sector representatives as well as multilateral and international aid organizations. The government used the opportunity to frame a policy that was approved by the economic cabinet (CONPES).[2]

During a brief six-month period, and with the support of the World Bank, the IDB and the U.S. Agency for International Development (USAID), the government undertook a sweeping restructuring of the electric power industry and was able to enlist the support of all those involved in it. The fundamental ideas of the reform were outlined in a series of inter-institutional seminars that led to the establishment of a consensus.[3]

[2] The CONPES Secretariat is held by the National Planning Department (DNP).

[3] See the seminar reports, published by the National Energy Commission (CNE), cited in the References.

The New Paradigm

At the same time that it became clear that Colombia's electricity model was no longer serving the needs of the country, international financial organizations and the governments of the region were converging on a new paradigm, known as "the Washington Consensus." Among other things, the Washington Consensus postulated macroeconomic adjustment, economic opening and a rethinking the role of the state as entrepreneur (Williamson, 1990). The electricity sector was a prime target of the new paradigm. In September 1991, the Latin American Energy Organization (OLADE, 1991) held a conference in Cocoyoc (Mexico) with the participation of most of the region's energy and finance ministers to discuss alternatives to the electricity sector's crisis based on the experience of the new electricity models adopted by Argentina and Chile Participants in the conference strongly supported the Colombian government's reform proposals.

The Gaviria administration's economic program advocated this new economic paradigm. The new Constitution, which was promulgated in mid-1991, established the legal and constitutional basis for integrated government reform. The constitutional reform was promoted by a strong executive branch with the backing of the judicial branch. It took place during a period of political crisis (including within the political parties) and brought with it revocation of the mandate of Congress. The reforms changed the structure of rights over the control of public services in a manner that went against the political establishment. Political crises played an important role in similar reforms in other countries, and Colombia was no exception (Graham et al., 1999).

The economic shifts that begin in 1990 helped to create conditions favorable for the implementation of the new model. These economic changes can be grouped into three categories: structural changes, institutional reform and regulatory reform.

- Structural changes to liberalize markets for goods and services, labor and capital, and increase their flexibility, including: opening markets, labor reform, foreign exchange reform, financial market reform, social security reform, and foreign investment policy reform. The latter was especially important for the electric power industry because it established a legal framework that gave equal treatment to foreign and

national investors, and promoted international agreements to minimize the political risk faced by the former.

- Institutional reforms to improve monetary, foreign exchange and fiscal policies.
- Regulatory changes, including the creation and elimination of several entities, the reform of many government organizations, and privatization. These changes had a particular impact on public services, particularly social services.

The general objectives of the public sector reform were to allow the government to concentrate on its essential functions, privatize state-owned companies and promote private investment in areas that were previously reserved for the public sector, deepen fiscal and administrative decentralization, adapt government entities to the new economic model, and make the operation of the public sector more transparent and efficient. The reforms attempted to strengthen some priority sectors, such as administration of justice, security and social services, and promote private sector activity. Changes in the area of infrastructure included the establishment of regulatory agencies and reforms of the pertinent ministries to reinforce their planning and regulatory functions. In an effort to increase their independence and administrative efficiency, some public entities were corporatized.

In addition to economic reforms, the new Constitution introduced other important institutional changes that affected the structure of the public sector and the relationships among public agencies. The new Constitution placed limits on the discretionary powers of regulatory agencies, expanded democratic mechanisms to increase citizen participation, established the popular election of governors, prohibited the participation of representatives of public corporations in regulatory bodies, and strengthened the judicial system.

The Constitution of 1991 made the government responsible for guaranteeing the efficient provision of public utility services and for regulating, monitoring and supervising them. The government could meet this duty directly, or indirectly through community organizations or private providers.[4] Given that public utilities are an integral part of the government's

[4] Title XII, Chapter 5, "The Social Purpose of the State and of Public Services."

social responsibilities, the Constitution established that they should be an instrument for achieving the general welfare and improving the quality of life of the population. The private sector can participate through its own initiatives or by being invited by the government through the creation of new companies, by buying an equity interest in existing companies (including joint ventures, the creation of areas of exclusive service and management, and operating and maintenance contracts).

The new Constitution and its interpretation by the courts (particularly the Constitutional Court) led to notable changes in national regulatory agencies and their management. The new Constitution reiterates the legal basis for free enterprise and corporate social responsibility. The latter are obligations were imposed by what is known as the "Social Rule of Law," which entails long-term *universal* provision of essential services, and the participation of consumers and citizens in tasks ranging from planning to oversight and control.

Reform Fostered by Prevailing Economic Conditions

Power rationing, which lasted 14 months in 1992 and 1993, helped allay any potential political opposition to reform of the electric power industry. The crisis triggered by electricity rationing led the government to declare a state of economic and social emergency and to issue a series of decrees.[5] To deal with rationing, the decrees made contracting by public companies more flexible, permitted the construction and operation of generating plants by the private sector, and promoted thermal electricity generation.

These instruments allowed the government to capitalize and then restructure several companies. The first step was eliminating the commercial intermediation of the Instituto Colombiano de Energía Eléctrica (ICEL), turning it and the Corporación Eléctrica de la Costa Atlántica (CORELCA) into state-owned companies. Empresa Colombiana de Petróleos (ECOPETROL) used its own resources to contract three thermal plants. The government capitalized and assumed the debts of ICEL, CORELCA, Central Hidroeléctrica de Betania (CHB), and Corporación Regional del Valle del Cauca (CVC) in exchange for ownership of some plants, 99 percent of the shares of CHB and all the shares that ICEL,

[5] The most important was Decree 700 of April 1992, which adopted extraordinary measures for public contracting, borrowing, budget and restructuring.

CORELCA and CVC were held in Compañía Interconexión Eléctrica, S.A. (ISA), and the government obtained a 77 percent interest in the latter. With these changes, the government became the majority partner of the distributor companies in the interior of the country. Under its new equity structure, ISA was able to eliminate the veto power held by its old partners and customers, and begin to separate the interests of these companies in the planning and management of the industry. In short, rationing paved the way for reform of the sector.

Although the trauma caused by rationing and the witch-hunt that it unleashed momentarily slowed reformers' efforts, the enactment of Laws 142 and 143 eventually went through in 1994. Although highly contested by interest groups, the legislative process was characterized by its transparency. This was made possible by the debates that took place in the industry working groups headed by the National Planning Department and the Ministry of Mines and Energy), with the participation of the National Energy Commission.

The legislation largely reflected the reform program. However, as is common in these cases, the passage of the legislation required political compromises. In Colombia, these compromises were shaped by the power of the regions and the municipal companies over which the executive power had no jurisdiction. As a result of these commitments, state companies were not required to unbundle their operations vertically and adopt a system of equity ownership (which would have increased the effectiveness of measures to separate the different roles of the state). However, as will be discussed later, giving state companies the option to choose their own management system would have serious repercussions.

The reform was not a direct threat to members of Congress who made wide use of patronage practices. Private participation in generation did not affect their activities and they were initially able to retain the vertical integration of large municipal companies. Their interest lay in being able to maintain their influence over these companies and other regional public distributors. It was also very important that oversight and monitoring efforts not harm their political base, which likely contributed to making it relatively more subject to political interference than other regulatory functions. Because of these political stumbling blocks, when the government has taken an equity interest in a local public company it has not always been able to exercise complete control over it, but usually has to share it with regional and local governments and politicians.

The Implementation of the Reform

After the reform was enacted, the government made rapid headway toward implementation thanks to the preparatory work that had been done ahead of time. The regulatory agency was able to start operations within a relatively short period of time, and hire well-known experts for its staff. In addition, because of ISA's experience in operating the old tiered power pool it was possible to create a technically competent system operator to implement the wholesale market model developed with the help of foreign consultants. Private sector participation in the industry began with the execution of purchasing power agreements (PPAs) in response to the emergency. It continued with privatization and investments in new projects to meet growing demand. Progress was also made in moving toward the new subsidy targets

BOX 4.3 The Colombian Electricity Sector

The nation's demand for electricity is met by over 40 supply agents, which sold 49,000 GWh of power in 2005, 67 percent of which went to regulated customers and the rest to the free market. The agents supplied a maximum demand of 7,951 MW in the middle of that year. Consumption is concentrated (52 percent) in the four major urban centers.

In mid-2005 installed generating capacity was 13,354 MW. The four largest companies controlled an installed capacity equivalent to total system demand. About 66.3 percent of installed capacity was hydroelectric in origin, 28.4 percent was gas, and 5.4 percent was coal. Colombia's natural gas reserves are concentrated in three companies.

The private sector controls 56 percent of generation and 47.5 percent of distribution. The latter is in the hands of the five largest companies, which control over 60 percent of the power sold on the regulated and free markets. Public generation is in the hands of EPM and the companies ISAGEN and CORELCA.

Eighty percent of transmission is through ISA, which is government controlled; the rest comes from vertically integrated companies. Electricity is traded on the wholesale power market, which has been operated by ISA without interruptions since it began in mid-1995. It is a centralized market in the style of the old market of England and Wales, in which the generators make bids that are valid for the next 24 hours, dispatched at the value of the marginal bid and supplemented by a long-term financial contract market.

Final users can opt for the (unregulated) free market when their demand exceeds 100 kW or when their monthly consumption is higher than 55 MWh. As of

BOX 4.3 The Colombian Electricity Sector *(continued)*

September 2005, 4,000 unregulated commercial and industrial customers represented slightly over 25 percent of national demand.

The main institutions that take part in the operation of Colombia's electric power industry are the MME, which is the industry's governing body; the CREG, formed by five independent experts and three ministers, which is responsible for regulating the gas and electricity market; the SSPD, which is charged with overseeing the system, and identifying and sanctioning abuse of market power; and the Mining-Energy Planning Unit (UPME), which prepares the generating expansion plan (not mandatory) and the transmission expansion plan (mandatory).

ISA manages the National Interconnection System (SIN) and is responsible for the National Dispatch Center (CND) and the Trading System Administration (ASIC). The National Operations Council (CNO) is the consultation body for operation of the market. The council is formed by representatives of the generators and distributors. Its main function is to agree on the technical aspects required for the secure and reliable operation of the SIN; it is also the executive body of the operating regulation. The National Marketing Council (CNC) is the consultation body for supply activities.

for the poorest. This momentum collapsed in 1999 with the sharp decline in demand brought on by the economic crisis, which would test the reform. Private participation stalled as a result, the wholesale market experienced some difficulties, regulation lost some of its positive reputation and legitimacy, the government failed as operator of the distributor companies in which it held a majority interest, and, with the exception of EPM, the municipal companies met a similar fate. The strategy of bailing out insolvent companies did not have the desired effects and simply prolonged their agony. Finally, even the targeted subsidies plan began to show signs of weakening.

Although the importance of the crisis on the performance of the industry cannot be underestimated (by 2003 electricity demand had only recovered to 1998 levels), it did reveal some of the problems of the model that had been hidden by a buoyant market and exposed it to external shocks. Technical and institutional limitations, as well as political and economic difficulties, hindered the achievement of several goals and affected the assumptions implicit in the model. The next section describes the achievements and progress of the reform, and explains the difficulties encountered that were largely a result of deficiencies in the institutional framework and lack of coherence between the model adopted and local reality (see Box 4.3 for a summary of the sector and its governing institutions).

Private Investment and the State as Entrepreneur

Although the reformers did not foresee an initial large-scale privatization of government-owned companies, they did expect the private sector to make the most of the new investment opportunities. In view of the fiscal difficulties that limited the investment capacity of the public sector and the perception that the multilateral financial institutions would no longer provide that type of financing, the reform assumed that the private sector would take on most of the new investments in the electric power industry.

The purpose of the reform strategy was to foster private participation in emergency thermal electricity generating projects required to end rationing and to supplement a predominantly hydroelectric system. In view of the absence of a proven regulatory framework and an operating wholesale market, private participation had to initially take the form of contracts with state companies for the purchase of guaranteed power. As the market came into operation and a reliable regulatory framework was put into place, it was expected that private investors would become independent producers and participate in the market through long-term contracts or by selling their power on the spot market. The emergency decree gave the government the power to carry out debt-equity swaps that allowed it to assume control of ISA and CVC, restructure them and (partially) privatize their generating and distribution components in order to expand government investments in other sectors and strengthen competition in the generating market.

Despite these privatizations, a very important part of the generating capacity remained in the hands of the Bogotá and Medellín municipal companies, over which the national government had no control. The expectation was that the new state company regime (for the Bogotá and Medellín generating companies as well as for other companies controlled by the government and by regional bodies) would guarantee efficient management, otherwise the government would intervene and privatized them, since they were subject to rigorous performance programs supervised by the new regulator (SSPD).

Additionally, as part of the negotiations to gain regional support for the reform, important concessions were made whose true cost would come to light later. The government authorized construction of three hydroelectric plants (La Miel, Urrá, and Porce II) that were proposed by some of the state companies, and postponed privatization of the distribution companies (subsidiaries of the old ICEL and CORELCA).

Despite the difficulties, private participation was not insignificant. Foreign investments in electricity reached US$7.3 billion between 1994 and 2003. Private investment covered both existing assets and investment in new generation. Following the purchasing power agreements that were entered into during the emergency, private companies invested in thermal plants, some of which were commercial ventures. Privatization also involved the capitalization of EEEB, the largest company in the country, and the sale of the distribution assets of the old CORELCA in the Electrocosta and Electrocaribe utilities. This substantially increased the percentage of generating and distribution assets controlled by the private sector. As a result of these investments and the establishment of the new wholesale market, the costs of generation and final user rates declined in real terms and Colombia was able to successfully deal with the El Niño phenomenon of 1997 and 1998 without resorting to rationing.[6] However, after the initial boom, private investment began to decline, plunging from US$3.4 billion in 1997–98 to US$279 million in 1999, and US$70 million in 2000.

The declining participation of the private sector not only reflected the reduced need for new investment in the wake of a fall in demand, but also the suspension of the previously announced privatizations of the generating companies ISAGEN and CORELCA. Once the projects of the state-owned companies entered into operation following the reform, public installed capacity increased by 853 MW between 1998 and 2003 (at an average annual rate of 3 percent). However, private installed capacity increased by only 162 MW (0.5 percent per year) during the same period. One of the reasons for this discrepancy could be that recent public projects have been largely hydroelectric ones with long gestation periods, while private investment has generally focused on thermal projects, many of which were postponed because of the surplus installed capacity attributable to the fall in demand. Yet, as demand recovers and new generating projects are required, private participation has been discouraged by the lack of definition in the system that replaces the capacity charges, as well as by government bias in favor of public generation. Additionally, government plans to continue linking private capital to distribution were frustrated by regulatory

[6] Not all investments contributed to this result; some electricity companies signed onerous PPAs.

delays and political matters. After the privatization of Electrificadoras de la Costa Atlántica, only the Caldas and Quindío electricity utilities, which were sold to EPM, have changed ownership.

Government Entrepreneurship and Conflicts of Interest

Despite notable progress in private participation in the provision of public services, the Colombian government still controls over 60 percent of electricity generation, 100 percent of transmission, and 60 percent of distribution through national and municipal utilities. This significant government presence as entrepreneur coincides with restrictions on the regulatory agency and conflicts of interest arising from the participation of three ministers in the regulatory commission (Comisión de Regulación de Energía y Gas, CREG). In addition, there is a lack of clear definition of the policymaking and regulatory activities that have led to conflicts between the regulator and the ministry in the past.

These conflicts of interest result from the government's inability to ensure that the companies under its control are able to provide efficient services at a reasonable cost. The government failed in its attempts to operate the distribution companies in which it was majority shareholder as businesses, and the municipal companies shared the same fate. One exception is EPM which, for reasons detailed elsewhere, performed well. After a brief description of some of the conflicts of interest, this section presents a summary of the performance of the government-controlled companies and describes in more detail government attempts to improve their governance.

A series of conflicts between the roles of the government as regulator and policymaker occurred for three main reasons. First, three government ministers were named to the regulatory commission. Second, the independence of the regulatory institution was limited. And third, there was no clear definition of the areas of responsibility of the regulator versus those of policymaking agencies. In addition, there were times when overzealousness led the regulator to overreach and intervene in areas that are clearly under the ministry's jurisdiction. This happened, for example, when the regulator attempted to establish natural gas exports policies, arguing that because it was the agency's responsibility to oversee regulated electricity prices, it should also establish criteria for the minimum volume of reserves required to permit export of surpluses (Ayala and Millán, 2003). In another

case, government impatience with regulatory delays in correcting regulatory failures in the supply segment led legislative measures in areas (the development plan) that were clearly within the jurisdiction of the regulator. Nonetheless, the emphasis placed on the notion of regulatory independence delayed until recently the adoption of a more transparent method of regulation. In fact, the regulator alleged that these matters were part of its internal regulations, which were its responsibility.

The presence of the government as entrepreneur in companies that compete with the private sector in the provision of the service (such as ISAGEN, CORELCA and Urrá) is seen as a threat by private companies. They fear that the government will assist publicly-owned companies through favorable regulatory decisions, with guarantees, or by enacting measures that give them an unfair competitive advantage by being able to bypass public bidding and competitive bidding requirements. Recent government interventions in favor of state companies have provoked fear among private companies that this is a deliberate pattern rather than an isolated case. The government has repeatedly said that it will not privatize ISAGEN because it is necessary to ensure that it has the capacity to invest in hydroelectric projects to supply domestic demand and export to neighboring countries.[7] The government has also provided its guarantee for an IDB loan for the EPM Porce III hydroelectric project on more favorable conditions than those that could be obtained by the private sector. The private sector believes that this measure tilts the playing field against them. Furthermore, the government has also announced the it will seek to lift regulatory restrictions that prevent a business group from controlling over 25 percent of the market, a move that will allow the company in question to implement its generation expansion program.

The government controls approximately 60 percent of the total electricity generating capacity in Colombia. With the addition of the new Porce III project, and other minor contributions by the public sector, there is practically no room for significant new private participation until at least 2014, as shown by the reference expansion plan published by UPME in 2004.

[7] However, in the last days of 2005 the government announced that it would place with the public up to 20 percent of the shares of ISAGEN as it previously did with the ISA shares.

Management of State Companies

As a result of the negotiations that led to enactment of the reform, local politicians retained effective control over many companies. The problems that this raises were most obviously apparent in the companies where the government was majority shareholder but where for political reasons it did not want or could not exercise the control needed to achieve its objectives. This problem also applied to the municipal companies, although to a lesser extent in EPM. ISA and ISAGEN (companies of national scope) have remained relatively safe from direct political interference; however, as stated above, the government has used ISAGEN to achieve objectives outside its corporate responsibilities.

In view of the difficulties in effectively controlling the problem of political governance and changing the existing system of incentives, the reform addressed these issues in two stages. In a first phase, management and results plans (a version of the so-called performance contracts of the 1980s) were used to force companies in trouble to enter a financial rehabilitation program. If satisfactory results were not achieved and the company experienced serious difficulties, the SSPD would step in and temporarily take over management until the company was rehabilitated or sold to the private sector. The management and results plans, like their predecessors the management contracts (Acosta, 1996), did not attack the root of the problem and were a resounding failure.[8] However, just the threat of intervention by the regulatory agency was very effective in transferring control of two important companies to the private sector. The greatest success was the capitalization of EEEB in 1997.[9] The partial privatization of CORELCA, the company serving Colombia's Atlantic coast, was more difficult, but eventually took place in mid-1998. Despite the fact that the intervention by the regulator was long and painful, economic and political benefits

[8] The management and results plans were devised with the aim of maintaining government control over direct management of the services and promoting government objectives in management via the requirements of the plans. In a context of business decentralization, private initiative and independence for the management of public service companies, the management plans became irrelevant and a simple formal requirement. The SSPD now proposes to eliminate them as a legal requirement and reinforce its capacity to develop effective and timely audits of management and results.

[9] EEB was the largest electricity generation and distribution company in Colombia.

were undeniable. The initial inability of SSPD to manage the intervened companies speeded up their deterioration instead of contributing to the rehabilitation of many of them. We discuss below the difficulties in applying this solution to the rest of the regional distribution companies (problems that persist today).

The government-owned distribution companies (that is, the companies of the interior and the coast) could not adapt to the new model. Although the government controlled and headed their boards of directors, it never really exercised that function properly. Local politicians continued to name managers and use the companies as political strongholds for reelection. Other factors added to the difficulties faced, including: high labor costs due to overstaffing and very high and badly capitalized pension liabilities; significant power losses; corruption; badly executed PPAs and BOT contracts; problems with billing and collection; the failure of the program to eliminate illegal subsidies; unattractive markets; low coverage of spot market risk; high contingencies (litigation, courts); and a fiscal approach to the management of dividends and investments. These problems were exacerbated by the economic crisis that slowed demand growth and affected the sales portfolio in markets characterized by low density, high operating costs, and a heavy concentration of low-income customers.

In mid-2005, the rate adjustments adopted by CREG, a series of measures taken by the Uribe administration, and increased demand (driven by economic growth) defused the crisis but the situation is far from being under control. The government measures instituted are varied and include, for example, the financial bailout of Empresas Municipales de Cali (EMCALI); the capitalization of Electrocosta and Electrocaribe by the government; the purchase of Central Hidroeléctrica de Caldas (CHEC) and the El Quindío electric utility by EPM; special government earmarks for financing the regularization of customers with illegal connections; improvements in the efficiency of government owned regional electric utilities; and regulatory changes to facilitate special actions in areas that are particularly difficult to manage. This led to improvements in the distributor companies under government control; between 2002 and 2004 electricity losses fell from 36 to 29 percent and, although the companies were still operating in the red, there were significant reductions in net losses (from Col$151 billion in 2002 to about half that amount in 2004).

Despite the improvements, there is still a long way to go, and the threats will remain as long as the governance of state companies or their

fiscal limitations are not substantially reformed or until private capital is brought to bear.

Governance of State Companies

The governance of companies in which the central government holds a majority interest is diffuse. Company policies and directives are issued by the president of Colombia through the company's manager who is a direct agent of the president. However, in general, the president is represented by his ministers. In his capacity as industry expert and head of the regulatory committees, the minister acts as chairman of the board of directors. The minister of finance exercises fiscal authority and represents the equity held by the nation in some companies. In addition to the government representative, some boards also include representatives of the workers, customers and local authorities, who in turn wield great influence in the appointment of the manager. Some issues, such as profit-sharing and collective labor negotiations, are the responsibilities of the Consejo de Política Económica y Social (CONPES). Municipal companies organized as state commercial and industrial enterprises are directly controlled by the local mayor, who appoints the board of directors and the manager.

The adequacy of the governance of the companies controlled by the government ranges widely and can be divided into four groups. In the first group is the transmission company ISA where the government is the majority shareholder. However, ISA has been able to encourage an inflow of private capital (which account for approximately 24 percent) through a process of equity democratization. To make this possible the company adopted a modern system of governance that has yielded a management performance that is recognized as excellent. The government has contributed to this success by voluntarily renouncing the chairmanship of the board of directors in favor of a representative of the minority shareholders.

The second group of companies includes most regional distributors. Majority shareholding by the government in these companies is considered temporary until private investment can be encouraged to take over.[10] The objective is to allow the companies to operate independently of local political interests, put a professional management system in place and improve

[10] The move to increase private participation was frozen during a pre-election period.

its performance in order to attract a private partner capable of improving management and bringing in additional capital. In order for this to happen, the management and board of directors must be made up of persons with recognized expertise and an explicit mandate for the transition period. However, depending on the circumstances, they may need to be capitalized to make urgently needed investments to manage losses and improve profitability.

The third group involves companies where, in the short term, the government must remain as the sole shareholder. Each of these companies (for example, EMCALI) has its own specific reasons for the current state of affairs and need to be protected from local political opportunism. This can be facilitated by agreements signed as part of the bailout operation, which is in the final stage of execution.

The fourth group is made up of municipal companies such as EPM and Empresas Públicas de Pereira (EPP), which are organized as state commercial and industrial companies. This makes them dependent on municipal councils and mayors. In addition, they lack adequate entrepreneurial and political governance, but they receive support in the form of loan guarantees. Law 142 introduced a fundamental change in these companies by permitting them to establish a private contracting regime, but it did not eliminate other aspects of the public regime that favors them (for example, their ability to enter into contracts with the government and other authorities without going through a competitive bidding process). These advantages allow these companies the flexibility to achieve certain state objectives.

Aware of these problems, the government is now implementing a series of initiatives to correct them. The initiatives will be contained in a CONPES report that will spell out specific policies to establish who should be the government representative on boards of directors as well as provide mandates for these companies. On a second front, the ministry is coordinating an effort to introduce good governance codes in various companies.

This brief summary of current activities is evidence that although progress is being made in the right direction on various fronts, there is still lack of clarity on the fundamental aspects that guarantee effective corporate governance in government-owned companies, as well as on the type and degree of government participation on boards of directors. The observance of a code of good governance depends on the existence of interests other than political ones to enforce it. ISA has its code of good governance but

the minority shareholders oversee its execution. EMCALI will have a code, but this will only work if it is possible to adopt an agreement that imposes rigorous conditions on the governance of the company. The government cannot completely distance itself from establishing directives for its companies, and the outcome of the initiatives of giving them more independence with respect to accountability is not yet known.

Can the Successes Be Repeated?

Given the success in bringing private capital into EEEB, Electrocosta and Electrocaribe, as well as into ISA, we should ask ourselves why it was not possible to do the same with other government-controlled companies. Similarly, the successful management of EPM and ISA, even before private capital was brought into the latter, merits further review. There are several reasons why this success was not repeated. The jurisdictional restrictions referred to earlier were reflected in Law 142, which allowed the municipalities to choose between two organizational models: "state-owned commercial and industrial company (EICE)" or "equity company." The "equity company" model opened the door to possible privatization or capitalization, while the EICE model left control and ownership in the hands of the municipality. However, this restriction did not exist for companies where the government had control of the equity, making possible the sale of a majority interest to the private sector. This was the case of the old CVC and the companies grouped under the CORELCA consortium serving the Atlantic coast.

In early 1997, both EEB and EMCALI had become equity companies and had restructured their activities. In contrast, the Medellín Municipal Council chose the EICE option, which made the eventual privatization of EPM impossible, but did not prevent the company from participating as a private investor, whether independently or in joint ventures with the private sector, in areas outside its own jurisdiction.

When EEEB entered into bankruptcy and before SSPD intervention, an independent mayor took advantage of the opportunity to unbundle the company into three separate segments and offer the private sector control of ENGESA (the generator) and CODENSA (the distributor), leaving only the transmission segment in the hands of the municipality. The influx of capital was used to payoff the debt and carry out the needed physical works. Private capitalization allowed the companies to completely clean up

their portfolios and significantly improve the quality of the service provided as well as customer relations. The municipality's equity interest (about 50 percent in the distribution and generating companies) allowed it to reverse the flow of funds that had previously been a drain on Bogotá's Treasury, contributing largely to the success of municipal efforts to transform city's transport infrastructure and promote social development (Fainboim, 2000).

In contrast, as mentioned in the section on the performance of state companies, EMCALI has just begun the process of recovering from the most serious financial crisis in its history. SSPD bailed out EMCALI following several years of government intervention.[11] The relatively comfortable financial situation of EMCALI (particularly when compared to the pressing situation in Bogotá) allowed municipal governments to postpone private sector capitalization and leverage the company to finance a municipal development program that led to plundering of the company. Thus weakened, EMCALI could not resist pressures from the labor union to reverse the restructuring and return to the EICE scheme, which closed the doors to transparent private sector participation in the company. The difference between the results in Bogotá and Cali can be partly explained by the difference in municipal leadership and partly by the reluctance of the central government to make private sector participation a condition of its financial support.

For its part, EPM continued to improve its efficiency in the provision of the services under its responsibility, turning a profit for the municipality of Medellín. However, instead of concentrating on the areas under its jurisdiction it focused its strategy on growth. Through aggressive competition policies in the new regulatory framework for public services, and using the revenues from its abundant, low-cost hydroelectric generation, it invested in telephony, water and electricity businesses around the country as if it were a private company. Unhappily, the combination of a public institution with a defective governance structure and vast disposable cash

[11] The bail-out operation is based on the signing of a "financial, operating and labor agreement for restructuring of the debts of EMCALI," which includes renegotiation of the local debt, termination of the PPA, renegotiation of the collective agreement, setting up a social capitalization fund to receive contributions from users to expand coverage, investment and management plans, and recognition of government contributions used to meet part of the company's debt service.

flow created a strong temptation for politicians, who interrupted their long tradition of restrained intervention in company affairs and began to use it for purposes outside its corporate purview. These signs of deterioration led the city's civic leaders to mobilize in 2004 and set up a committee to oversee the company's activities, which succeeded in reestablishing ownership rights by the citizenry. The resulting public debate led to the realization that adoption of the EICE scheme had been a mistake and a study was commissioned to restructure the business. Regrettably, the municipal council resisted changing the scheme,[12] arguing that it would eventually lead to privatization, which was very unpopular in the city. The direct exercise of social control over the company protected it from the opportunist incursions of politicians and, in the last instance, has been the main reason for its good performance. Paradoxically, it has also allowed politicians to invoke the possibility of privatization in order to keep the door open for using company revenues for their own purposes.

Although with many difficulties (mainly caused by the politicization and inefficiency resulting from the SSPD takeover of the companies), the government was relatively successful in selling off a majority interest in Electrocosta and Electrocaribe to the private sector. This was only a partial success, however, because the performance of private entrepreneurs left much to be desired for a variety of reasons (some of which are described in Chapter 8) and raises doubts about whether their participation will be permanent. Nevertheless, the sale did raise significant public revenue and ended local political abuse.

The government's intention of continuing the process initiated with the electricity utilities of the Atlantic coast was hindered by the SSPD's lack of competence and capacity to implement complex processes simultaneously, as well as by the difficulty of adjusting rates sufficiently to attract investors. The process was consequently delayed and coincided with a cooling of investor interest (only EPM was interested in the purchase of the CHEC and Quindío companies), which in turn led to new postponements.

Under these circumstances it is fair to question whether it is possible to extend the success of the EPM model to the rest of the country. The

[12] However, it did approve spinning off telecommunications into a new company controlled by EPM and other municipal companies, which limited its exposure to this business, weakened by the considerable losses that had resulted from its incursions into mobile telephony.

failures of the model in Cali and Pereira in keeping political intervention at bay are convincing proof that the success of the Medellín model was due to very special conditions that would be very difficult to repeat in the rest of the country. In fact, the administrative deterioration of the government-controlled regional distribution companies illustrates not only the weakness of their markets and absence of revenue from a natural resource so abundant in EPM, but also lack of commitment by the population to the companies, and the culture that considers the service to be a right. The tacit pact between Medellín politicians to limit their intervention in EPM prevented it from going down the path of EMCALI, but recent developments have revealed the dangers of this option, even in cities such as Medellín where civic participation is high.[13] If the conditions that have guaranteed that management can remain independent of political intervention in EPM are not maintained, rent-seeking could worsen the situation of the company. Clearly, as long as these conditions are not in place, the governance of the state companies, including EPM, has to be strengthened as discussed in another part of this chapter.

Performance of the Regulatory System

The reformers expected that the new regulatory framework would work together with an independent regulatory agency to protect consumers from the abuses of monopolistic power, guarantee an adequate level and quality of service, and also create appropriate incentives for private investors by ensuring that the government would not expropriate their investments.

Consequently, regulatory success is contingent on the ability for limiting and controlling discretionary government action regarding rate setting as well as potential intervention by the executive and legislative branches in the regulatory process. This is the only way in which regulations will be able to guarantee production and continuity of supply and set efficient prices, even in the face of market imperfections (which will be mentioned later).

Colombian reformers made some changes to the regulatory model in effect in other countries by including three ministers in the regulatory

[13] The role played by community control in the performance of state companies is discussed in Ayala and Millán (2003) and is covered in more detail in Chapter 6 of this book.

commission and assigning the functions of control and oversight to a different institution, the SSPD. These institutions were expected to escape the bureaucracy characteristic of other state agencies, attract the most renown experts in the country, and enjoy independence to manage their affairs despite restrictions.

For a variety of reasons related to the structure of national institutions, it is in this area where the expectations of reformers were the most unrealistic. Regulations to establish markets and competition, control market power, and balance the interests of companies and consumers are alien in a world of politicized state monopolies. This type of regulatory scheme is based on a system of property rights protection and access to markets supported by common law rather than statutory or codified law. Its legal roots are based on different systems of division of powers and administrative law. Moreover, the regulatory plan adapted to the new markets, such as power exchanges, is still in an early stage of development worldwide. Consequently, market regulation based on competition has not only faced obstacles because its objectives clash with the established powers, but has been imposed under conditions that make gradual adaptation necessary.

According to the Constitution, regulatory commissions are an integral part of the administrative chain of the executive branch, even though the latter has limitations with respect to appointments and decision-making procedures, and even though the commissions enjoy relative administrative and financial independence. As a result, the regulatory commissions are not fully independent, but this does not necessarily guarantee coordination with the planning and policymaking bodies. In addition to limited independence, regulatory commissions are hobbled by the conflicts of interest that result from the fact that three government ministers are members of the CREG and that it is chaired by the Minister of Mines and Energy.

Although the separation of the tasks of regulation and control requires a high degree of coordination, these problems are considered surmountable and minor in scope. Other problems that limit the effectiveness of the regulation and control bodies originate in the legislation or legal procedures and in the narrow interpretation of administrative rules. As a result, SSPD and CREG have experienced difficulties in meeting their expenses with the funds received from fees on the regulated companies. Moreover, they face restrictions that prevent them from selecting the most suitable candidates for the positions of commission experts and superintendent. In addition to strict requirements and conflicts that limit the selection of pub-

lic officials (who frequently come from bodies responsible for planning and control functions), bureaucratic resentments and a rigid interpretation of the administrative career system have prevented the regulators from being adequately remunerated.

For constitutional reasons, it is not possible to formally grant budgetary independence to the SSPD and the CREG, and their budgets have been affected by fiscal austerity measures even though it is earmarked. This rigidity has particularly significant impact on the SSPD, limiting its inspection and supervisory programs. CREG's budget limitations have affected activities such as studies and obtaining highly specialized technical advice, which are needed for timely and effective compliance with regulatory functions. In addition, CREG lacks an annual funding plan that would facilitate execution of its budget. These technical limitations are heightened by difficulties in hiring adequately qualified staff because of the low pay, an inadequate regime of disqualifications, and a selection process with little transparency. Lack of effectiveness of the regulatory bodies increases the difficulties that private companies have in participating in the regulatory process, which is reflected in higher charges for the service and in new responsibilities for the government, when it has no choice but to provide the public service in the absence or withdrawal of the private investors.

Competition in the electricity markets is a recent phenomenon and the institutional architecture originally adopted for oversight and control has not been consistent with later developments in this respect. Consequently, there is little institutional coordination for compliance with the preventative and sanctioning functions, as well as duplication, overlapping and procedural gaps between ministries, regulators, SSPD and the Superintendence of Industry and Commerce (SIC). The commissions identify anticompetitive conduct and review the structure of the industry, while SSPD is responsible for protecting the interests of consumers and controlling practices that restrain antitrust activity and unfair competition.

In the wholesale electricity market, SSPD has not been successful in sanctioning antitrust conduct and the lack of institutional coordination has prevented establishing market oversight mechanisms; likewise CREG has had little success in designing preventative measures. The recent efforts of SSPD to establish a modern system of competition oversight in the wholesale market by an independent committee of experts has not been very satisfactory due to financing difficulties and bureaucratic obstacles.

The work of CREG has been very controversial and the focus of continuous disputes with agents and the government. In the opinion of specialists, its procedures lack transparency, and are very complex and unpredictable, which encourages the manipulation of the system. There are no formal channels of accountability, which has created an environment of confrontation characterized by numerous legal actions against the Commission's decisions. The work of SSPD was also very controversial during the early years of the reforms because of political interference, which reduced its effectiveness and created opportunities for highly publicized corruption (Ayala and Millán, 2003). It has only been in the last three years that a total about-face has taken place in the management of the body, which now relies on professional criteria and has recovered its previous prestige. Regrettably, its effectiveness is limited by budgetary restrictions (described earlier).

CREG has also had difficulties with issues related to the wholesale electricity market and setting new charges for distribution and supply. Although the problems experienced in the wholesale power market are minor compared with those of California or Brazil, inconsistent interventions in regulation of the wholesale market have provided arguments for those who are against it and have monopolized the attention of the regulatory agencies, which therefore devote less time to other urgent tasks such as distribution. The establishment of the new distribution charges was very controversial and gave rise to many disputes. Also, the uncertainty about long-term prices (resulting from the lack of clear mechanisms to replace capacity charges) reduces incentives for making new investments in generation.

More importantly, the public controversy between market participants and the regulatory authority discredits the model. CREG's management problems[14] and the controversies with government on liberalization of the natural gas market have contributed to the deterioration of its credibility. Participants in the market frequently prefer to speak directly with higher-ranking authorities to settle disputes. In 2004 the Minister of Mines and Energy organized several workshops with the generators and distributors to discuss the problems of the sector; as a result proposals were presented to enact secondary legislation clarifying regulatory procedures.

[14] CREG's management has been weakened by restrictions on its ability to retain a first class team of experts.

At the end of 2004, as part of an IDB policy loan covering all public services, the government undertook a program to address these problems. In order to solve problems surrounding the transparency of regulatory actions, the proposed reform establishes the participation of parties interested in the regulatory processes and the publication of the actions taken by the regulatory commissions, with due accountability in the form of compliance with an indicative regulatory program and periodic evaluations of regulatory work, with public discussion of the results. Consultation procedures are established for general resolutions and public hearings are held for resolutions related to rate schedules, permitting broad discussion and the obligation of the commission experts to explicitly respond to the comments from the general public. To expand the universe of suitable candidates for the positions of commission experts, the program establishes transparent procedures for the nomination and selection of candidates and the corresponding objective and competitive pay scales in accord with the discretionary powers permitted by law. To guarantee an adequate flow of funds for the regulatory commissions and SSPD the proposal includes bypassing rigid budgetary execution by exempting the regulatory and control bodies from future fiscal adjustment measures after promulgation of Law 617 in October 2005 (which makes budgetary cuts on public bodies) and by adopting other measures to make budgetary management more flexible. To solve the problem of institutional coordination for execution of the preventative and sanctioning functions without duplication, overlaps and procedural gaps between the ministries, regulators, SSPD and SIC, the reform establishes that the SIC should be the only authority responsible for investigating and sanctioning restrictive commercial practices in public services.

These proposals are intended to lead to important improvements in the efficiency of the regulatory, supervisory and control bodies and will be supplemented with other measures that the government is adopting. In particular, these measures include the adaptation and implementation of *management and results audits*, which will improve the transparency of public service institutions, and the establishment of the Single Information System, which will improve access to information on public services by interested parties.

However, although some measures have been adopted (such as the regulation of transparency and accountability), others (such as selection of regulators and adequate remuneration) are bogged down by bureaucratic

inertia or lack of consensus at the highest level, which reflects the difficulty in making improvements when the political will is lacking.

The Wholesale Market

The reformers expected that competition would lead to equilibrium prices and adequate levels of investment in generation. The abundance of natural gas in Colombia offered considerable possibilities for the creation of a competitive market given that the optimal scale of the generating plants has decreased.[15] The new paradigm supported the restructuring of the sector in order to separate the activities in which competition (generation) could exist from the tasks considered to be natural monopolies (transmission and distribution). The prices of the segment that admitted competition would be deregulated and the monopoly services would be separated from the supply of competitive services. In addition, free access to the transmission and distribution networks would be guaranteed in order to eliminate obstacles to entry, which could prevent the development of competition.

However, due to the interest of the Bogotá and Medellín municipal utilities in preserving vertical integration and the veto power that their parliamentary representation wielded over the passage of the reform, Law 143 could only encompass the accounting separation of the activities, although it made the business separation of new companies obligatory. Despite this, it was expected that Colombia would have competition in the generation and supply areas at a level that would allow the setting of efficient prices and protect consumers, and at the same time simplify the task of regulation.

The experience of Colombia and other countries shows that expectations about the viability of establishing a competitive electricity market with little intervention by the regulatory authority were too optimistic. There is a relatively long learning period and frequent adjustments are necessary. However, despite the difficulties and problems, the design, start-up and uninterrupted operation for nine years of the wholesale power market (MEM) has been one of the most important achievements of the reform. (For an outline of the design of the MEM see Box 4.4). Wholesale prices

[15] Technological innovations such as combined cycle plants have reduced the minimum scales for efficient power generation.

BOX 4.4 The Colombian Wholesale Electricity Market

The wholesale power market (MEM), as such, involves agents authorized by law to participate as buyers and sellers in economic activities proper to the electricity industry, such as generation (> 20 MW compulsory, between 10 and 20 optional), wholesale supply, and wholesale transport. The market is divided into two segments: the contract market (or long-term market) and power exchange (or short-term market).

Free market (ML) involves large consumers (buyers) and electricity marketers (sellers). The limit initially fixed by law between the two markets (that is, the point at which a user can opt for the nonregulated category) is a minimum individual consumption of 2 MW/month. The current limit is 0.1 MW/month measured in capacity, or its equivalent in power consumption (55 MWh), calculated with a 75 percent load factor.

The contract market is between suppliers and generators; contracts are defined when the quantity of electricity and the price per hour can be clearly established. Contract length is one day and above. Contracts can be take or pay, pay for quantity demanded, or pay for consumption, and contracts can be for more than one modality at the same time.

There is no restriction on the time horizon for bilateral contracts. The degree of exposure in the spot market is the decision of the marketing agents and generators. However, initially there were rules that required marketers serving regulated users to cover a minimum percentage of their power requirements through bilateral contracts with other agents. These requirements were gradually dismantled and disappeared completely at the end of 1999.

Power exchange is a day-ahead market, in which all registered generators are required to participate. The market has explicit pricing rules, and contract power is independent of the short-term price. The demand side does not participate directly in the exchange. In synthesis, the exchange is intended to minimize the cost of dispatch, which may not coincide with maximization of the welfare of all participating agents.

According to existing legislation, large consumers cannot access the MEM directly. They would have to become public service companies (ESP) to do so. However, they can benefit from opportunities in this market by taking advantage of the competition between the MEM marketers.

Small consumers or regulated users also have a relation with the MEM given that part of their regulated rates depends, first, on price behavior in the MEM; and, second, on the prices at which their marketers make the transactions to supply them.

The National Dispatch Center (CND) is the agency responsible for planning, supervision and control of the integrated operation of the generating, interconnec-

BOX 4.4 The Colombian Wholesale Electricity Market *(continued)*

tion and transmission resources of the National Interconnected System. It is also responsible for instructing regional dispatch centers to coordinate the operations of the facilities to ensure that they are secure and reliable and that they abide by the operating regulations and all the CND agreements.

Settlement of the financial obligations and claims of the participants in the exchange takes place through an agency known as the Trading System Administrator (ASIC).

Generators participating in the wholesale electricity market must submit price bids on the power exchange. The prices at which the generating companies offer power per plant and/or generating unit daily and hourly to the CND must reflect the variable cost of generation that they expect to incur, taking into account Resolution CREG-055 of 1999. For thermoelectric plants: incremental cost of the fuel, incremental cost of management, operation and maintenance, the costs of start-up and shutdown and the thermal efficiency of the plant. For hydroelectric plants: opportunity costs (value of the water) of generating at the time of the bid, taking into account economic operation in the medium and long term of the National Interconnected System.

To determine their bid price, the generators must include as variable cost the Equivalent Power Cost (CEE) of the Capacity Charges (Resolution CREG-116 of 1996). From 2001 to December 2007, pursuant to Law 633 of 2000 (Tax Reform), the generators must include as variable cost in their bid price a charge for the Financial Support Fund for the Electrification of Areas That Are Not Interconnected (FAZNI). In no case, can the exchange price be lower than the CEE plus FAZNI (Resolution CREG-005 of 2001).

However, to verify if the generators' prices follow the criteria defined in the specified resolution, the Commission takes into account the fact that bid prices are flexible and include the effects of uncertainty and the different risk perceptions of the generators.

have remained below the long-term average cost estimated by the Unidad de Planeación Minero-Energética (UPME).[16] About 50 generators and resellers have been linked. In July 2005 volumes of about 143 percent of domestic demand were traded in bilateral contracts and on the spot market.

[16] In the opinion of investors, prices have perhaps remained too low. This could be partly due to oversupply during the period following the fall in demand.

Over 15 different types of contracts are offered on the market. Part of the success was due to the expertise of the technical staff and the experience of ISA in similar tasks before the reform took place. However, there are still problems in the market, including high volatility and lack of response from consumers, market power, and coordination between the short- and long-term price signals.

Volatility and Consumer Response

The volatility of the Colombian electricity market is high, even though it is measured in accordance with the pattern of electricity markets. It is true that part of this volatility can be attributed to transmission constraints originated by terrorist attacks and lack of demand response. But it also arises from cyclical events, such as the El Niño phenomenon, which causes droughts recurring approximately every five years, and La Niña, which brings extreme rains. Due to the high hydroelectric component of the system, continuity of supply in Colombia is dominated by energy constraints, in the case of drought, and not by capacity as in the thermoelectric systems. Also, the use of thermoelectric capacity can vary substantially, depending on climatic conditions. During droughts, thermoelectric capacity is generally dispatched at very high prices on the wholesale market. During the rainy season and the La Niña phenomenon, most demand is met from the hydroelectric plants and prices on the wholesale market can remain very low for long periods. Given that the thermoelectric plants can have low levels of capacity utilization for many years in a row, their income can also be very low for long periods, which causes serious cash flow problems. The combination of these problems with the setting of price caps during periods of shortage discourages investment in thermal generation.

The volatility of the dispatch of thermoelectric plants (caused by the climatic problems described earlier) combined with the rigid conditions imposed by natural gas suppliers (who demand take-or-pay contracts for supply and transport to stabilize the use of the gas pipelines, in view of the absence of a secondary gas market) to make for onerous conditions for the generators that use this fuel. The restrictions on the gas pipeline network can also create a bottleneck in the use these types of plants during periods of drought.

It has been very difficult to increase price flexibility in Colombia. Rather, the objective of the regulations is to achieve stability, so caps are fixed

during periods of shortages. Thus, consumers are not exposed to price fluctuations and cannot respond to them by taking alternative measures, such as self-generation or investments to improve efficiency. The demand from nonregulated users (which is equivalent to one quarter of total demand) is theoretically more elastic because these users have access to substitute fuels and have consumption meters in real time. However, they generally participate in the market through term contracts, which gives them relatively less room for maneuver. Nevertheless, establishing differential prices for the dry season could be a viable option that would give consumers and investors a better market signal. In contrast, the rate formula for regulated users includes the moving average of the suppliers' power purchases from the generators, which, although it yields more uniform prices throughout the year by smoothing out the seasonal differences, prevents the transmission of signals of shortage to consumers.

Exercise of Market Power

In a predominantly hydroelectric system, a concentrated market structure offers numerous opportunities for companies to exercise market power when supply is limited, whether as a consequence of the El Niño phenomenon (which in Colombia takes the form of recurring droughts) or limitations of the transmission system. The high prices during El Niño in the 1997–98 dry season were not entirely attributable to the drought, but were also due to the sudden actions of the regulator, which increased the operating levels of the reservoirs, intervening in supply prices. As a result, some thermal generators were able to exercise a considerable amount of market power and raise prices to increase their profits.

Terrorist attacks against the transmission system during the last decade, which were especially serious in 2000 and 2001, increased constraints to the point of dividing the north coast market from the rest of the country for long periods. These circumstances gave certain generators the opportunity to exercise market power. Also, changes in the regulations concerning the way these events were treated in relation to the remuneration of the generators caused a higher and more rapid transfer of costs to marketers, and finally to consumers. Both factors fuelled a controversy that led CREG to intervene in the market in 2001. This intervention resulted in a significant reduction in the costs transferred to consumers; however, as expected, it provoked great opposition from the generators, who believed that it rep-

resented a shift in the ground rules that deprived them of the revenue to which they were entitled (Ayala and Millán, 2003).

Reliability of Supply and Long-term Signals

The first and most important of the goals of any electricity system is to guarantee continuity of supply: Don't let the lights go out! This is no simple task because it requires a continuous equilibrium between supply and demand in the short and long term. Rationing in California and Brazil confirms the lesson of the 1992–93 rationing in Colombia: whatever the reason for the interruption of supply, the government will always be responsible for reestablishing it, and its survival will depend on the diligence with which it does so. There is the temptation to maintain strict control over the sector, even when economic and other types of argument would support liberalization and privatization. Thus, it is very important to find a solution that guarantees continuity of supply in order to ensure the sustainability of the reform.

The original market design included the mandatory signing of long-term contracts by marketers. A system such as this, if it had been well designed, would have been an adequate solution to the problem of guaranteeing sufficient generation. Regrettably, the obligation to contract was eliminated in 1999. Regulatory measures were adopted only when the operation of the system resulted in high volatility that the generators were unable to support. While these measures were clearly well intentioned, they were not necessarily well designed or the best solution to the problem. The solution consists of three complementary measures: capacity charges, operating minimums, and the rationing code. The capacity charges (known as CPC) are intended to remunerate markets for the reliability that some plants were able to provide during the dry season, in addition to payments for dispatched power. The generators collects the fees based on power sales and distributes them according to the theoretical reimbursable capacity (known as CRT), which is calculated by CREG using a model based on the capacity of plants to generate power under critical hydrological conditions. The collection method for capacity charges creates a floor for the generators' bids in the market (the CEE or equivalent power cost), which should theoretically provide sufficient resources to compensate plants and create incentives for investment in reserve capacity. To guarantee short-term continuity, the operating minimums system

imposes restrictions on reservoir operation, which limits the use of stored power, and so maintains a level of critical reserves until the end of the low-water period. Consequently, the hydroelectric generators lose their ability to respond to market signals. The operating minimums vary each year depending on supply and demand as well as reservoir levels. When a reservoir is below established levels, the hydroelectric plant only dispatches after the last thermoelectric plant has dispatched. In addition to this intervention, another more critical level is established under which a plant cannot dispatch. In this case the programmed rationings come into operation.

Although these three instruments were designed to guarantee security of supply, it is not clear if they are adequate, or if they are an efficient way of achieving this objective. While capacity charges are a clear incentive for building new plants, their importance depends on the monetary value assigned to them. When they are fixed above or below the long-term marginal cost, the reimbursement may be too high and lead to excess capacity, or in the opposite case, to scarce capacity. The method used for the calculation has been frequently questioned, especially since adoption of the parameters for 2001. Criticisms have concentrated on the following fundamental problems:

- It is difficult to justify the capacity to be compensated on the basis of an administrative criterion, even when sophisticated models are used.
- Distribution of resources between generators depends heavily on the assumptions of the model, particularly the methodology adopted.
- The incentives are not clearly associated with security, as demonstrated during the El Niño phenomenon of 1997–98, when the method did not guarantee that the plants would be compensated, which effectively contributed to strengthening the system.

Moreover, changes in the regulations have significantly affected the income of several types of generators, created a dispute for allocation of these resources, and resulted in constant changes to the rules.[17] The calculation of the theoretical reimbursable capacity for 2001 caused a redistribution of

[17] Fifteen changes were made between 1996 and 2002.

compensation from hydroelectric to thermoelectric plants. The hydroelectric generators felt expropriated as a result and took legal action against the CREG. In short, there seems to be a consensus that the administrative system of charges does not create sufficient incentives to guarantee an adequate level of security for the system or an efficient combination of hydroelectric and thermoelectric technologies.

The establishment of operating minimums further complicates the problem. First, there is no obvious need for these regulations; that is, the hydroelectric generators have incentives to reduce their reservoirs to suboptimal levels. When there are expectations of shortages there are strong incentives to retain water in the dam and exploit higher prices. Consequently, efficient operation of the reservoirs is profitable from both private and social points of view.

Second, and possibly more important, expectation of intervention of the reservoirs can create perverse incentives. In preparation for potential declines in generation due to the operating minimums, hydroelectric generators may be tempted to increase their production to prevent the water from being trapped in the reservoirs, which could bring forward the threshold of intervention. In fact, the discretional application of the operating minimums during the El Niño phenomenon of 1997–98 prevented dispatch by numerous hydroelectric plants, which had to meet their obligations by buying on the power exchange at high prices because the thermoelectric generators were able to control the market. As a result, the hydroelectric plants ended the drought period with their reservoirs half full. The measure had the effect of making hydroelectric generators pay the entire cost of maintaining the reserve. Their feelings of being expropriated were, thus, justifiable.

Aware of these deficiencies, CREG hired a consulting firm to propose a methodology that would simultaneously eliminate the need for capacity charges, operating minimums and the rationing code. The consultants' proposal was based on trading in firm power option contracts, supplemented by a futures market (TERA, 2000). The proposal was strongly criticized by the Colombian Generators Association (ACOLGEN), which presented an alternative and argued that the TERA proposal was too complex and that the restrictions and institutional weaknesses of the country would make its application very difficult. However, at its core, this opposition reflected the natural resistance of the generators when faced with the potential decreases in the capacity charges that they receive.

The TERA and ACOLGEN proposals are fundamentally similar, but differ in some aspects.[18] Regrettably, the controversy that broke out regarding this issue did not conclude with adoption of a proposal, but intensified with an alternative proposal from CREG in 2004. That proposal consisted of a reformulation of capacity charges (Wolak, 2005) without presenting an effective solution to the problems of the existing charge. The CREG proposal, together with a parallel proposal to set up an electronic contracts market, was almost unanimously rejected by market agents and its technical deficiencies were revealed in a series of workshops with external consultants that were held in late 2004 and early 2005. The consultants, in addition to criticizing the CREG proposal, presented an alternative that considered the adoption of compulsory contracting (see Chapter 7), and included recommendations for the transition (Wolak, 2005). At the time of writing this (2005), no decision has been taken on the model to be adopted to replace the capacity charges, which expire in 2006.

Subsidies for Poor Consumers

For many years, Colombia has had a system of ascending blocks in public service rates that were an attempt to use the relationship between income and consumption to establish a cross subsidy for low-income consumers. However, the system suffered from numerous problems. For reasons of political economy, which will be discussed in Chapter 8, the system contained major errors of inclusion that created a general subsidy for the residential sector at the cost of high rates on industrial and commercial users. Moreover, it was generally in deficit. In 1968, the National Tariff Board tried to enhance the definition of eligibility for the subsidy, which was based on the consumption threshold, by adding other considerations related to income. To this end, it established that the rates should be a function of property values. In 1984 the Board began to use the classifications of the National Statistics Department (DANE), which classified residential users according to the characteristics of the neighborhood, under the implicit assumption that there was a better correlation between the characteristics

[18] For a discussion of the advantages and disadvantages of these proposals see Ayala and Millán (2003), and von der Fehr in Millán and von der Fehr (2003).

of the home and household income. Despite the improved targeting, the system continued to be in deficit with heavy pressure to maintain generally low rates. Residential users paid only 39 percent of the cost of electricity supply.

An important step forward was taken with the Constitution of 1991, which established that electricity rates should cover the incremental costs of supply and that low-income consumers should receive explicit subsidies from other consumers or from the national budget and/or local and departmental governments. This constitutional mandate was later enacted into law (Laws 142, Public Services,[19] and 143, Electricity) with the formal adoption of a system of six socioeconomic levels on an ascending scale. The first three receive a subsidy, the fourth is neutral, and levels 5 and 6 together with commercial and industrial users and unregulated consumers provide the subsidy. These subsidies only apply to so-called basic or subsistence consumption, understood as the minimum quantity of public service used in one month by a typical residential user at these levels, sufficient to meet basic needs. This level of consumption was initially set by the MME at 200 kWh per month.[20] Law 143 established the amounts of the subsidy along with a two-year transition period for raising the rates to the established level, which could be extended to six years at the discretion of each Regulatory Commission.[21] The methodology developed to establish the stratification takes into account the physical characteristics of residences, their environment and the residential nature of the area. For dispersed rural areas, the stratification unit is not the residence but the land or lot where it is located. Similarly, following the mandate of the law, the MME set up a solidarity fund[22] through which the contributions from surplus regions, and

[19] Law 142 establishes that the rates regime must be based, among other things, on economic efficiency, financial sufficiency, solidarity and redistribution criteria.

[20] Unlike the social programs in which subsidies are awarded using the Single System of Beneficiary Identification (SISBEN), which includes income and household characteristic variables, the public services subsidies are awarded only on the basis of the neighborhoods where the residences are located.

[21] Article 179 of Law 142 of 1994. This term was extended by Laws 286 of 1996 (Articles 1, 3 and 7), and 632 of 2000 (Articles 2 and 3).

[22] The Solidarity Fund administers the solidarity contributions and subsidies that the electricity and gas fuel companies bill and grant to final users. The Fund is regulated by Decree 847 of 2001, according to which companies with a surplus after balancing contributions received with services provided must transfer it directly to the Fund within a specified period.

the contributions from the national budget, can be transferred to deficit regions.[23]

Implementation of the system of rankings (stratification system) is the responsibility of municipal mayors in accordance with a methodology established by the National Planning Department (DNP) and the DANE in 2004 that is updated every five years. The system has been used for public electricity services, water and sanitation, and telephones as well as for property taxes and, since 2004, for the new system for identifying beneficiaries of social services, SISBEN. As a result, there is a perverse incentive for opportunistic manipulation by mayors, who between 1997 and 2003 brought about a considerable increase in the number of homes eligible for the subsidy that could not be explained by increased poverty. This deterioration and the high level adopted (200 kWh per month) as equivalent to subsistence consumption has prompted concern about the suitability of the system for targeting subsidies.

Due to the problems described above and the regional distribution of subsidizing consumers, their contribution is not sufficient to finance the deficit of subsidized users. As a result, transfers from the national budget have been considerable and have grown over time. This has become a reason for concern, particularly because it is suspected that most of the subsidy goes to consumers who do not need it.[24] In fact, the amounts of these transfers will increase significantly in future years due to Article 116 of Law 812 of 2003, the National Development Plan 2003–2006, ("Toward a Communitarian State"), which freezes the tariffs of levels 1 and 2 except for inflation adjustments. A study for Fedesarrollo (Meléndez et al., 2004) estimated that contributions from the national budget would grow from US$77 million in 2003 to US$363 million in 2006.

This large sum does not seem of much concern to other observers (Montenegro and Rivas, 2005), who maintain that the amount is small

[23] Although Law 142 does not require governments to make up the deficient contributions for public services in general, this obligation is expressly established in Law 143 for the electricity sector.

[24] Contributions from residential, commercial, industrial and nonregulated users rose from US$176 million in 2002 to US$289 million in 2004, while subsidies granted to users in income levels 1, 2, and 3 rose from US$226 million in 2002 to US$409 million in 2004. The difference between subsidies and contributions is covered by central government budget transfers and the MEM Solidarity Fund.

compared with the estimates for the early years in the explanatory statement of Law 142 and that the problem could be resolved with small adjustments. However, these authors do not seem to take into account the increases established in the Plan Law and the possible increase in wholesale prices once the current surpluses are used up and/or if a phenomenon such as El Niño occurs. The habitual delay in government payments to the companies should also be taken into account since, in the past, this has caused liquidity problems. The transfers to deficit companies from the national budget and from municipal governments are not always on time because of problems resulting from budgetary appropriations. Transfers from public service companies that receive more contributions than the subsidies they pay because of their structure of users, are similarly not made on time because of lack of adequate mechanisms to allocate the funds to cover subsidies requirements. Delays in transfers from these two sources lead to the short-term erosion of assets in the deficit companies, leading to cash flow problems and arrears. These, in turn, lead to increases in financial costs and in prices of the goods and services necessary for adequate performance of their functions.

According to a World Bank report (2004) on recent economic developments in infrastructure (REDI), which is based largely on the Fedesarrollo analysis and recommendations, the current subsidy system for public services in Colombia, while well intentioned, in practice does fails when four basic questions are asked: (i) Is the subsidy necessary? (ii) How precise is the system of targeting subsidies to the most needy? (iii) Can the system grant subsidies without jeopardizing the financial sustainability of the sector? and (iv) Does the system introduce incentives for perverse behavior?

Having already discussed financial sustainability and the system of perverse incentives, the remainder of this section focuses on the need for the subsidy and the sectors that should be targeted. The REDI study leaves no doubt that without the subsidy an important group of the population (at least the first quintile[25]) would spend 17 percent of their income on public services and would have to drastically cut consumption if it were unavailable. Consequently, the answer to the first question in this case is that the subsidy is necessary. Fedesarrollo extends this limit to the first four

[25] The information for all the studies related to the destination of the subsidy is based on the DANE quality of life survey.

deciles. It could be argued that the subsidy is valid for the population living below the poverty threshold, which in Colombia is estimated at around 50 percent.

The precision with which the subsidy is targeted is influenced by the minimum level of consumption to be subsidized and by stratification. REDI considers that the value of 200 kWh per month is too high a level for domestic subsistence consumption and that it could be reduced by 30 percent. In fact, around 90 percent of consumers in the subsidized strata consume less and average consumption in strata 1 and 2 is barely over 100 kWh per month. With respect to stratification, the study confirms that, although it is based on national patterns, it is very arbitrarily applied and not well maintained. As evidence that the precision of the system has deteriorated over time, the study shows that the number of households that meet the conditions for the subsidy soared from 75 percent in 1993 to 90 percent in 2003, a rate that is not explained by the increase in poverty. As Montenegro and Rivas (2005) note very well, given that stratification depends on the quality of the residence and not on income, this trend clearly shows a deliberate effort by mayors to expand the eligible groups. Although the variables that define the stratification are statistically significant for explaining poverty, the set only relates to ten percent, so its power is very poor. However, although the low strata are badly classified, they are distributed more or less uniformly over all income quintiles, and the contributor strata, 5 and 6, are well classified because only two percent of the poor are included in them. This assessment is verified by the "Poverty Mission" project (DNP, 2005), which compared the results of a quality of life indicator. It found that 80 percent of households in strata 4, 5 and 6 score over 70 on the index, and 92 percent and 78 percent of strata 1 and 2, respectively, have scores lower than 71. In contrast, 43 percent of households in stratum 3 scored over 70, which indicates that the problem is concentrated there. In fact, the contributions of strata 5 and 6 covered slightly over ten percent of the cross subsidy in 2004 (CONPES, 2005) and most is covered by the contributions of nonresidential users, who are mainly nonregulated.

Although the Fedesarrollo study reveals that the subsidy only excludes two percent of the poor, the inclusion error is high because between 50 and 60 percent of the beneficiaries are above the 50 percent of the income distribution. The study on the incidence of social public expenditure on income distribution and poverty reduction, carried out as part of the Poverty Mission project (DNP, 2005) using the same data as the Fedesarrollo

study, estimated inclusion errors of 50 percent for electricity and 48 percent for gas. These are the percentages of nonpoor who receive electricity and gas subsidies. Worse still, only 30 to 35 percent of the subsidy funds go to the poor. The study also shows that the error of including poor persons as contributors are relatively few, which indicates that, although the system is not regressive, it is inefficient in targeting subsidies to those who need them most.

These studies have made some recommendations to improve the system, which have been partly accepted by the government. As a result, in 2004 the government reduced the threshold that defines basic subsistence consumption and in October 2005, in a CONPES resolution, established an action plan for targeting subsidies on domestic public services (CONPES, 2005). The recommendations of the analysts and the government actions are discussed below.

Reducing the Subsistence Level

According to REDI this proposal improves the fiscal situation but does not affect the inequality of the classification. However, simulations by the author of this work indicate that the financial impact could be significant without increasing exclusion too much, depending on how the threshold is reduced. The reason for this is that the reduction in basic consumption would not affect the vast majority of poor users who, in any event, consume less than the ceiling, but it would affect all those who are classified as poor but are not. A decrease of the size approved by the government of 15 or 30 percent, depending on the geographical area to accommodate differences in consumption patterns, which would be done gradually over four years, does not increase exclusion and would only affect a small number of subsidy beneficiaries (between 20 and 25 percent), who are likely to be badly classified. In some places, such as Medellín, where for various reasons people in strata 1 and 2 cook with electricity, the measure could be supplemented by targeting the subsidy to facilitate access by these households to natural gas.

Improving Stratification

REDI suggests that residence characteristics are not sufficient to define poverty and that other indicators must be used to supplement this information. The alternatives discussed include:

- Requiring additional proof such as evidence that the person also receives state social assistance.
- Using the SISBEN. The simulations showed that the old system substantially improves the targeting. Regrettably, the system was changed in 2004 and now depends too heavily on stratification, so it could have the same defects.
- Creating a new index. Simulations indicate that it would be a considerable improvement but there is the problem of its cost.

In its conclusions, the Fedesarrollo study is more categorical when promoting the transition to a new method, which involves other indicators, beginning with stratum 3 as pilot. In this case users must demonstrate that they meet the conditions for receiving the subsidy, which would have an exploration period. Montenegro and Rivas (2005) favor this measure and propose some additional measures to simplify the procedure, such as reduction to only three strata: one receptor, composed of existing strata 1 and 2; another neutral, strata 3 and 4; and another contributor, strata 5 and 6 and nonresidential users.

Limit the Arbitrariness of the Definition of Strata and Audit Them

This measure is recommended by all analysts. Montenegro and Rivas (2005) recall that the government has instruments available to create incentives for municipalities to comply with the methodologies by making transfers from the Solidarity Fund conditional on the results of strict audits. This would be a first step in the right direction although it would be interesting to know why the application of such an obvious measure has been so difficult.

The CONPES document of October 10, 2005 makes some of the same suggestions. In particular it asks that based on the results of the new national population and housing censuses, DANE prepare a new methodology to improve targeting. To this end, it suggests that the DNP should lead an effort to evaluate the capacity of the stratification system to target subsidies to those who most need them. It recommends evaluating the previously proposed alternatives of eliminating the subsidy for stratum 3 and granting it only when there is a surplus after meeting the needs of strata 1 and 2 and/or when recipients show that they are eligible by proving their classification in individual targeting instruments used in other

sectors. It also proposes studying a single system for SISBEN and public services.

The ideal solution would be to devise a new procedure for establishing eligibility for all state subsidies. However, Montenegro and Rivas (2005) believe that this would be too costly in economic and political terms. More decisive action may not come from the public service sector but from the impact on state finances of a significant increase in the inclusion error for social expenditure resulting from inclusion of the stratification in the new SISBEN.

Government Commitment to the Reform

Although the government supports partial privatization of the distribution companies and has defended them from the onslaught of a hostile regulator, this has not been its position on critical issues for sector reform, namely strengthening regulation and control over institutions and incentives for private participation in electricity generation.

With regards to strengthening the regulatory bodies, the government is reluctant to grant them more independence, perhaps because of the bad experience in the case of the review of the distribution rates, which led to sharp polarization between the experts and the government representatives to the point where the government had to rely on the development plan to legislate the needed reforms. But perhaps the biggest obstacle is government opposition to establishing a wage system for the commission experts in order to attract a staff with more expertise that is more suitable for the task at hand. This opposition is evident among the middle management of a badly paid state bureaucracy that opposes a privileged regime for regulators, but supports the presidential style of austerity in the pay of officials to maintain fiscal equilibrium. Although an adjustment to the pay of the commission experts was discussed with the multilateral banks, both the amount and timing will be decided by the government and the objectives are not expected to be fully achieved.

More contradictory is the government position on private participation in electricity generation. Private sector fears of a bias in favor of the new EPM and ISAGEN generating plants that are being built by the public sector have already been mentioned. The government has justified its preference by putting forth strategic considerations and placing emphasis on

its responsibility for ensuring sufficient electricity supply. The government believes that Colombia has a great hydroelectric potential and that major projects could be developed, including the Pescadero-Ituango project with over 1,800 MW capacity, which could supply not only the national market but also exports to neighboring countries. Given its size, this project cannot be developed by the private sector alone. The government has repeatedly stated the need to maintain ISAGEN in state hands to undertake these projects. However, it has also insisted that under current circumstances the private sector would not be capable of executing the projects required to meet national demand, and that these should be measured not only by their financial results but also by their regional impact. The latter argument seems like a return to the rent-seeking conflicts that characterized the sector before the reform.

It could be argued that this preference for state participation in electricity generation is due to lack of interest by the private sector in undertaking costly hydroelectric and even thermal projects with the price signals that the market is currently giving, as well as to reasons of public interest. Thus, the government has to fill this gap at the risk that not doing so might result in power rationing with its attendant damaging economic and political consequences. Indeed, this was the argument presented by the government for financing Porce III. However, this argument does not seem to be very coherent for two reasons. First, it would have to be convincingly demonstrated that lack of private participation is not due to regulatory problems or problems of market design which could be resolved with a suitable reform. Second, if it is proven that it is not possible to reform the market to create incentives for private sector competition in the expansion of generation, then the government must tackle the problem head on and adopt a reform that takes into account intervention in the market and an emergency plan that makes efficient state investment possible until the problem has been resolved. A market intervention of this type would necessarily require compensation for the companies that decided to invest on the basis of rules of the game that are drastically changed.

Maintaining the pretense of a competitive market while the government participates in major generating works could facilitate new investment but it would be difficult to avoid compensating investors for the effect that such a major investment would have on the spot market and electricity prices. To make this strategy viable the following minimum assumptions

would have to be made: (i) an export market in line with the size of the new projects and/or an adequate solution to the problem of arbitrage between two segmented interconnected markets with important implications for domestic prices; (ii) private investors accept these changes to the rules of the game without protest; (iii) multilateral banks continue to finance state investments; and (iv) the government contributes the necessary matching funds and/or guarantees joint ventures with the private sector.

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Chapter 5

The Reform in El Salvador

The pragmatism that had been a constant in regional electricity reforms gave way in El Salvador to ideological considerations that led the Republican Nationalist Alliance (ARENA) government to propose one of the most audacious reforms of the time. With the support of foreign academics, reformers paid little attention to critics and in 1996 succeeded in enacting the General Electricity Law (LGE). In addition to the new design of the electricity market, this legislation included provisions for restructuring the electric power industry as well as setting up regulatory institutions and the wholesale market.

The market design adopted granted maximum freedom to generators, distributors, marketers and large users to undertake power transactions, with the centralization and supervision required to guarantee the reliable and secure operation of the interconnected system. The wholesale market permitted confidential bilateral contracts (financial or physical), which determined the initial dispatch of the contracts, and a spot or opportunity market (MRS) with bid prices for both supply and demand, for variations with respect to the program. The design permitted freedom of entry into the electric power industry, freedom of access to transmission and distribution networks, free import and export of power, and freedom for all consumers regardless of size to negotiate supply prices with the marketer of their choice. The transfer price for power for final consumers was the MRS price. The LGE permitted vertical integration (except transmission) and horizontal concentration, subject only to the accounting separation of the various activities. The transmission company was only responsible for the operation and maintenance of the system.

In compliance with the legislation, the government restructured the distribution activity of the Comisión Ejecutiva Hidroeléctrica del Río

Lempa (CEL) into four companies that were sold to the private sector in 1998 in a public bidding process generally considered to have been successful. In 1999, the CEL's transmission and generation activities were unbundled and the companies Geotérmica Salvadoreña (LaGeo) and Empresa Transmisora Salvadoreña (ETESAL) were set up. In addition, two other institutions were created: the General Electricity and Telecommunications Superintendence (SIGET), and the Transactions Unit (UT), which operates the contracts market and the spot market. SIGET is the regulatory agency responsible for overseeing compliance with the law and approving electricity rates. At the end of 1999, Duke Energy purchased the thermal generating facilities and in 2002 the Italian company ENEL Green Power won an international bid to join CEL as investing partners in LaGeo under an innovative risk capitalization scheme. The hydroelectric generating assets owned by CEL were not sold and are still owned by the government for strategic reasons.

Transactions in the MRS began in late 1998. Initially, only the generating companies associated with CEL supplied the wholesale market from their own generating plants as well as the Nejapa thermal plant owned by El Paso. The Nejapa plant had operated since 1995 under a 20-year purchase power agreement (PPA) contract with CEL. Duke Energy only began to operate in the wholesale market in September 1999 with the thermal plants that it had purchased from CEL. Later, in 2002, El Paso began to operate as an independent generator when the PPA with CEL was rescinded. As a result, by 2003 the electric power industry was highly concentrated (see Table 5.1).

As could have been expected, the market did not perform satisfactorily and the government took over shortly after it began operations. Since then it has operated with restrictions and has been subject to several modifications, the last of which is still under consideration. Notwithstanding these difficulties, the reform has had a number of successes. For example, despite the rise in oil prices, real electricity rates have increased very little since 1998 when the main reform measures were adopted.[1] In addition, although installed generating capacity increased by only 13 percent during the 1998–2003 period, its composition changed to include more efficient

[1] However, there was a substantial increase in rates between 1990 and 1998 when the average rate rose from only US$0.03 per kWh to around US$0.10.

TABLE 5.1 Breakdown of the Electricity Market

Generators (capacity in market as of June 30, 2003)			Distributors (Sales Jan-Oct 2003)		
	MW	%		GWh	%
Grupo CEL	572	56	Grupo AES	2,430	68
CEL	411	40	CAESS	1,442	40
LAGEO	161	16	CLESA	550	15
Duke	291	29	EEO	355	10
El Paso	144	14	DEUSEM	83	2
CESSA	10	1	DELSUR	823	23
Total wholesale	**1,017**	**100**	Large consumers (ANDA)	219	6
Mini-hydroelectric plants (3)	12	11	Marketer indep. (5)	72	2
Co-generators (5)	101	89	Marketer depend. (3)	41	1
Total retail	**114**	**100**	**Total**	**3,585**	**100**

units.[2] Maximum demand during the period grew at an average annual rate of under two percent due mainly to the impact of the 2001 earthquake on the country's economy. Also, privatization raised government revenue by around US$720 million, of which US$586 million was related to distribution. Finally, coverage of the service increased by about ten percentage points.

However, the delay in establishing a new design for the market that was better adapted to the country's circumstances, at a time when new investment was urgently required, weighed heavily on the reform. This chapter discusses the gestation and later performance of the wholesale market, as well as reform efforts. It also emphasizes some features of the regulatory system adopted and the progress achieved with respect to expansion of service coverage, a critical aspect for increasing the legitimacy of the reform.

[2] Duke Energy withdrew 163 MW in gas turbines, 75 MW in 2001 (in Acajutla) and 88 MW in 2002 (in Soyapango and San Miguel). The capacity withdrawn was partially replaced by 150 MW of new medium-speed diesel engines in Acajutla, operating with bunker C.

Gestation of the Reform

It is clear that reform of the electric power industry in El Salvador was motivated by ideological considerations, which led the ARENA government, under the advice by foreign academics, to support an extreme market model that had not been tested anywhere else in the world at the time. The reform was strongly questioned by the multilateral organizations that financed the process and by internationally recognized consultants. The model that was proposed initially (Spiller et al., 1996) championed absolute freedom in all generation, transmission and distribution activities, ignoring the existence of a natural monopoly in transmission and distribution, and leaving practically all the functions of market organization in the hands of the Transactions Unit (UT), a private entity in which the existing generation, transmission and distribution companies were shareholders. The regulator's role was limited to settling disputes between operators and acting as an appeals body with no powers of oversight or control of competition, and to holding auctions for concessions for the use of hydroelectric and geothermal resources. As neither transmission nor distribution was considered a natural monopoly, no regulated rate was established for the services and the problem of free access was resolved through bilateral negotiations between agents. If no agreement was reached, the regulator settled the dispute. The absence of restrictions on ownership of the segments facilitated capture of the UT by a business group, giving it the freedom to do as it pleased with market regulations and set up barriers to entry for future competitors.

The proposal was very controversial from the start. It was only after many discussions with consultants under contract to the IDB (Moen, 1996; Ruff, 1996) as well as with Bank officials that some changes were introduced that clarified some points but did not substantially modify the proposed model. As a result of these efforts, an agreement was reached to recognize some monopolistic characteristics of transmission and distribution services, as well as the need to regulate them, and broader powers were given to the regulatory agency. Yet, the main shortcomings of the model remained and, as will be described later, led to its failure. The proposal did not include the consultant's recommendation to require companies to enter into long-term contracts for most of their power so that all consumers remained able to choose their supplier. Moreover, no limits were placed on cross ownership and no provisions were made for the creation of an entity

to take responsibility for policy and planning. Box 5.1 summarizes some of the recommendations made by the consultants that studied the proposed law.

The supporters of the new model ignored the experts' critique, which considered it too audacious for such a small market in a country with such fragile institutional development. To the contrary, supporters were proud of their modern model, which allowed more play of market forces and minimized the discretionary powers of the regulator as well as its potential capture by the government.[3] The leftist opposition, enemy of everything that had to do with the private sector and the market, blindly opposed the model leaving little room for an intermediate alternative.

It was only after events revealed the inadequacy of the model that the government made some changes. The crisis of 2001 forced the executive to revise its position by permitting the government to partially resume its regulatory role through the Ministry of the Economy, and to study solutions to the problem of volatility and lack of investment incentives, as described below.

The Wholesale Market

The UT dispatches and manages transactions in the wholesale electricity market, in addition to other functions that are not normally the responsibility of this type of an entity. It is a limited liability company whose shareholders are distribution, generation, and transmission companies, as well as final users with demand of over 5 MW. Each representative group of shareholders has two votes. The exception is the representative of the transmission companies who only has one vote. The wholesale market consists of a long-term confidential bilateral contracts market,[4] which can be financial or physical in nature. The operators enter into the contract but the

[3] Ana María Majano, coordinator of the restructuring and privatization activities of CEL, replied in this way to a question from *Project Finance Monthly* on the sale of distributors: "This privatization process is really part of a more complete reform process. In the long term what we really want to achieve is benefits for the consumer through competition [...] With three different operators with different management styles and approaches to the market, we hope to achieve genuine competition in the short term [...]"

[4] The UT must be informed of all transactions contracted, but not their price.

BOX 5.1 Consultants' Comments Regarding the New Model

Jan Moen (1996)

[...] The world of electricity has changed dramatically in ten years. Model 4 [wholesale and retail competition] is the world of the future. However the institutional problems are as important as the technical ones [...] Direct access to the market can in practice be limited to only a few large consumers who threaten to withdraw from the system, while the bulk of consumers remain effectively monopolized.

[...] In the proposed process the regulator cannot guarantee that the efficiency targets will be achieved [...] [...] The "Club system" seems to be open for all players and, if large producers are permitted to participate in "transmission affairs," there is the risk of vertical integration, which is a problem that must be avoided in a competitive environment.

[...] In the negotiating process there is no guarantee of achieving the targets for transmission prices. Both price and investment rules can be distorted. The "Club system" can also favor the large players at the expense of the small and new members [...]

Larry Ruff (1996)

[...] The law of diminishing marginal returns implies that, after a certain point, it is better to live with the recognized imperfections of a limited monopoly than to try to create the sophisticated arrangements needed to enable competitive markets to manage the intricate details of the system. The bill seems to move in the direction of much more competition than would be cost effective for a small and simple system such as El Salvador's [...] [...] To attempt to treat transmission (and to a lesser extent distribution) as a competitive activity instead of a natural monopoly is risky in the best of cases. Although competition in investment in the network (but not transmission services) is possible in principle, the complex network of externalities and free riders makes it essential to specify clearly what is competitive and what is not, design sophisticated price mechanisms and property rights, and develop complex processes of coalition building, group decisions and dispute settlement.

[...] The creation of efficient and effective competition is much more difficult for electricity than for other basic goods; it is not a matter of simply promulgating a law to eliminate legal monopolies and then waiting for the markets or "the invisible hand" to solve the problem. The information requirements of the system, operational rules and commercial arrangements must be defined to deal with the type of problems outlined above. Initial contracts and regulatory rules must be defined to prevent the exercise of market power and guarantee that prices for consumers do not exceed political expectations. Systems of measurement

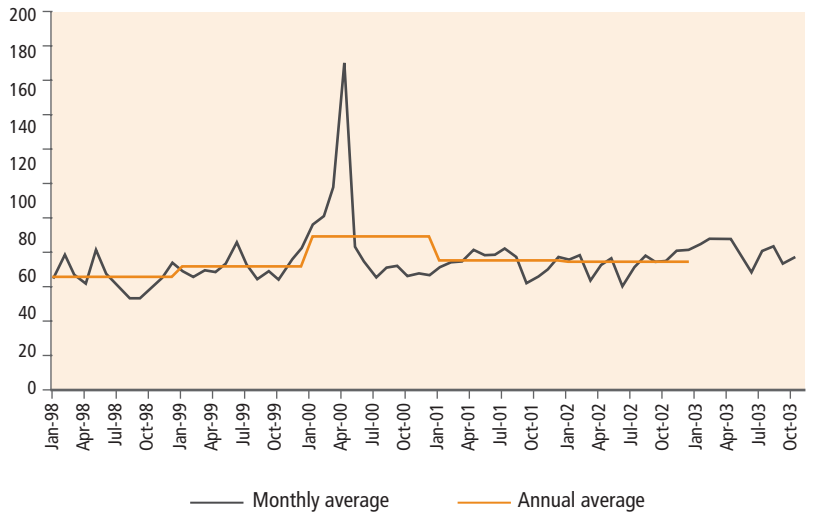
BOX 5.1 Consultants' Comments Regarding the New Model *(continued)*

and control and reconciliation must be designed. All this has to be previously tested together with adequate training of all possible participants. The more sophisticated the markets and contractual arrangements required (which are, thus, more difficult to design and operate), the greater the dependency on competitive market forces in comparison with the residual monopolies. Although the benefits decline more or less in proportion to the size of the system involved, the time and cost required decrease more slowly, which explains why most small systems usually opt for more limited and simple forms of competition than those proposed for El Salvador.

UT dispatches it. It is a short-term or opportunity market in which daily transactions balance supply and demand after dispatching the contracts. In the short-term market (known as the system regulating market or MRS), generators, distributors and large consumers bid to purchase and/or sell power, thus establishing the equilibrium price of the market as well as dispatch. A glance at Table 5.1 shows that in 2003 the wholesale market was small and highly concentrated, with an installed capacity of approximately 1,000 MW, four business groups responsible for generation (two private, one public and one joint venture), two private business groups responsible for distribution, two large consumers and five independent marketers. Two business groups controlled 83 percent of generating capacity and two marketers groups controlled 91 percent of sales.

Experience very soon demonstrated the inadequacy of the regulatory design as well as of the restructuring and design of the market. The intended independence of the regulator was rapidly set aside when the government removed three regulators in a short period of time. The inadequacy of the market design was revealed when the government had to take control of the first private operator (Duke Energy) only three months after it began its participation in the market because of excessive prices, which when passed on to final consumers had a large impact on public opinion (Figure 5.1). Although Duke Energy alleged that it was not exercising market power but simply trying to recover fixed costs that could not be recovered in any other way, a study commissioned by the government showed that: (i) the market was highly concentrated; (ii) there was a high potential for exercising market power using tactics such as strategic bids and withdrawal of capacity;

FIGURE 5.1 **Annual Average Price**
(US$ / MWh)



and (iii) price bids and prices in the MRS were considerably higher than the cost of marginal power during the period studied. It should be borne in mind, however, that the potential for exercising market power does not apply to a single company: most generating companies had market power during conditions that could occur with some frequency and, in fact, these opportunities enabled the CEL to assume the financial burden of subsidizing rural electrification operations.

The operation of the wholesale market in the 1998–2003 period showed that, as the critics has warned, it had fundamental design faults. As designed, there is a high potential for the exercise of market power because there are no term contracts to moderate volatility or incentives not to exercise market power. In addition, marginal thermoelectric plants have difficulty in recovering their investment costs in a market that does not directly remunerate reserve capacity. Market demand is limited and it is difficult to reach agreements between market operators on expanding the transmission network for the common good. The consequences of these failures were serious and gave rise to government interventions to smooth out rate volatility and placate market participants. As a result, in 2000 the

government ordered CEL to contract capacity reserve with the private generator to remunerate the available capacity in plants with low plant factor and reduce price peaks in the MRS. This mechanism was institutionalized in 2003 with the adoption of the cold reserve for reliability service. The formula for calculating rates was changed to cushion the impact of changes in MRS prices. But market performance very quickly revealed the need for a sweeping reform of the model to deal simultaneously with all the problems detected, including the price signals required by private investors. In 2003, the Legislative Assembly passed a set of substantive changes to the LGE, included in Decree 1216/2003, which is in process of being regulated. Yet again, this proved to be insufficient for achieving the desired objectives.

A Difficult Model Adjustment

The difficulties experienced during efforts to regulate the changes established in the law (and in making other adjustments that will be discussed later) originated in the natural resistance of established market participants who were not willing to give up their advantageous positions for the sake of the future development of the market without adequate trade-offs. These difficulties are even greater when negotiations for adjustments to the model have to take place at times when there is an urgent need to build new capacity to guarantee supply, and when certain participants appear to have veto power over the nature of the solutions. This section discusses an ongoing process at the time of writing (2005), whose only certain outcome is that it will be costly for consumers.

The changes made to Decree 1216/2003 strengthen the electricity and telecommunications superintendence (SIGET) by granting it powers for oversight and control of competition, as well as authority to obtain the required information. These changes were mainly an attempt to facilitate the adoption of measures to control market power, increase investment incentives and reduce price volatility. The decree adopts a cost-based market when there are no competitive conditions, and remunerates the cold reserve for reliability (RFC) service to compensate occasionally utilized capacity. It also attempts to reduce volatility by permitting the transfer of the average half-year price in the MRS to electricity rates, establishes a compensatory fund, and permits the transfer to electricity rates of supply contracts approved by the regulator and arrived at through a free and competitive

processes. Finally, the decree corrects some errors in the original design by assigning responsibility for planning, building and maintenance of the transmission network to the transmission company, and strengthens the role of independent marketers by linking them as shareholders of the UT.

Although the general direction of these changes is healthy, their effectiveness is very debatable because of the compromises that had to be made to take into account the interests of participants, which left important contradictions in place. Although permitting transfer of term contracts can decrease volatility, this will only happen with an incentive for contracting. Given that the intention is to maintain retail competition, distributors would have no interest in contracting unless they are protected against market risk. The distributors also argue that the discount on the MRS prices implicit in the existing long-term contracts is a simple compensation for the reselling costs that the law and the market regulations do not allow them to recover. Since the operations of the MRS are settled every six months, the generators incurred important financial costs and were willing to grant a discount in exchange for receiving a monthly payment from the distributors. In other words, the so-called long-term contracts were no more than an arrangement between buyers and sellers to share the financial costs imposed by defective market regulation. However, as will be seen later, although this error should be corrected at its source by a simple regulatory change, this is not easy to do in practice because the distributors cling to it as a negotiating instrument for obtaining favorable conditions. At present the distributors want any new contract to retain the discounts. Similarly, the reform omitted the institutional problem of the UT and, although it expanded its base, this body continues to be in danger of capture by established agents, who retain the possibility of participating in different segments of the industry.

While the regulator is responsible for these changes, it soon became evident that a more integrated market reform would be required. In late 2003, the government decided to hire consultants to assist with strengthening the recent reforms in the electricity market in order to guarantee short-term price stability and long-term power supply. In the first stage of this project, a consultant made a general diagnosis of the problems of the wholesale market model in El Salvador, analyzing options for the conceptual design of the changes required to the market and proposing a general design for the new model. In the second stage, several consultants were

commissioned to prepare the detailed design of the new model and the detailed changes to the legal and regulatory framework that governs the operation of the market.

The diagnosis of the wholesale market (Dussan, 2003) concluded that the changes introduced by the government were well oriented to solving the main deficiencies of the market identified in the diagnosis. However, it also concluded that the reforms represent an important change in the rules of the game for attracting private investors into the electric power industry and have generated many concerns among private investors. In particular, there are concerns about the discretionary power of the regulator, the risk that unsustainable fixes could be made to the current model, lack of stable rules, the fairness with which the transition to the new model is managed, taking into account the impact of the changes on existing investments, and the difficulties of strengthening the reforms in an election year in which it could become even more politicized.

Discussions between the consultants and the operators as well as other entities involved in the electric power industry regarding a second report gave rise to opposing interests. The second report analyses options for the design of the wholesale market to correct the deficiencies detected in its operation, preserve the achievements of the existing model, and strengthen changes in favor of the long-term sustainability of the ongoing reform of the electric power industry (Dussan, 2004). The reactions of market agents to the reform were predictably in line with their individual interests. The generators did not want to change the model on the basis of bids, while the distributors did not want compulsory contracts unless they are compensated for the additional market risk and allowed to maintain the discounts to the MRS (which they consider a fair compensation for their reselling costs). For its part, the regulator looked favorably on any system that reduces its policing role over the market.

Taking these observations into account, the consultant submitted a report on the general design of the wholesale market, which succeeded in reconciling the positions. However, given the restricted terms of reference, the consultant refrained from spelling out the real trade-offs and, as a result, the report presented an incomplete solution and had some contradictions. The starting point for the report is an acknowledgement that there is an urgent need to develop long-term power supply contracts to mitigate market power, cushion the impact of MRS prices on electricity rates, and guarantee the expansion of supply in order to meet demand on a reliable basis. The

report also states that it is necessary to establish a compulsory market of financial contracts to meet most of the demand from small- and medium-sized consumers who are not in a position to freely contract supply. Yet, it maintains freedom of choice for all consumers, and promotes the activity of independent marketers and competition for supplying power to final consumers, which necessarily restricts the volume subject to term contracts and creates new risks for the distributors. Although the report recommends the adoption of a cost-based market model, it places as a condition for adopting it the decision of a market oversight committee on the need for intervention. The model also includes rules for declaring the variable generating costs for dispatch, and an instrument for remunerating the contribution of firm capacity to the system, which should be centralized.

In addition to these recommendations the consultant's report also proposes measures to guarantee competition in contract markets and recommends the transfer of generating costs to regulated consumers. It also suggests the need to review rationing and other costs as a way of reducing the need for the capacity charge.

The general design of the market includes a phased-in implementation process. In the first phase, the market continues operating on the basis of price bids. The long-term contract market, the cost declaration model, the market supervisory mechanisms and the criteria for price intervention are designed and regulated at the same time. In the final stage, once the new design goes into operation, the compulsory long-term contracts are used as primary instruments to smooth price volatility.

All this has to be completed in a very short time if the intention is to use the new model in decisions on capacity expansion in the short term. The transition process faces further difficulties caused by the regulation of Decree 1216/2003, which must be analyzed in the market design stage. These include the transition of the bilateral contract market to the compulsory contract market, as well as from the cold reserve for reliability remuneration scheme to the new mechanism for firm capacity in case price intervention is necessary.

To implement a reform program of this nature would be extremely complex even under normal conditions. When this is combined with the urgent need to commit new generating resources, the interests and veto capacity of some agents, simultaneous negotiation of the rules of the new Central American regional electricity market, as well as the limitations of the government team, including capacity to contract top ranking design

consultants, there is a serious risk that an inadequate transition could become a burden for the future development of the market.

Reflecting the different timing and needs of government organizations, additional consultants were hired after discussing the results of the study. First, SIGET, which was responsible for regulating the changes established in Decree 1216/2003, could not wait for the conclusion of the second stage of the studies of the legislative reform ordered by the Ministry of the Economy (MINEC), and proceeded to commission consulting studies to design the implementation of a system of long-term contracts within the existing framework at the end of 2004. Almost at the same time, MINEC proceeded to enter into contracts for the studies programmed for the second stage of its structural reform plan in order to permit the adoption of long-term contracts, dividing them, in turn, into two phases. The first involve setting forth the adjustments to the General Electricity Law, and carrying out the analysis and design of the compulsory contract market. The second stage consists of a detailed review of regulations and rules, and adaptation of the simulation models and information systems required for implementing the reform in the wholesale power market. Additionally, the government had entered into contracts with consultants to develop an oversight system for the wholesale market. These studies need to be closely coordinated and sequenced, because the design of the oversight system cannot precede the design of the market.

The SIGET report was ready before the start of the MINEC study and, although it provides useful suggestions for long-term contracting, it concluded, as expected, that it was not possible to implement a system of this nature before making additional changes to the legislation.

Although the consultants' report for the first phase is not yet available, the content of the discussions has become known. These indicate that, despite some improvements, a comprehensive treatment of the main problems of the market model adopted in El Salvador will not be possible at this time.

The proposals discussed are based on the immediate adoption of a cost-based wholesale market supplemented by a capacity charge similar to that used in Chile and other countries of the region. The only innovation is a system of long-term contracts of varying durations with contracting prior to delivery depending on duration. To overcome the reluctance to contract shown by the distributors, it is proposed to implement mandatory contracts to cover 50 percent of the demand projected for the next three

years. Similarly, to prevent free-rider problems, consumers must remain with a supplier for a minimum period (to be designated). To facilitate selection of the contracts, all bidders must offer a given capacity and associated power at a load factor equivalent to that of the system. It is not considered necessary to have a centralized contracting system, which should be done by each distributor, although some of them could be associated. The existence of contracts with three-year delivery time is sufficient to prevent the temptation for self-contracting. Finally, it is proposed that contracts for capacity and power should be executed. The capacity would have an equal value for all and would be equal to the value determined by the SIGET for sales on the MRS, while the power would be indexed (alternative indexing formulas should be considered).

The obligation to contract with the method proposed reduces volatility only partially given the low volume of the obligations and ongoing indexation. Despite this persistent volatility, the type of contracts proposed does not correct important defects in the old system, such as the fact that it is impossible to transmit to consumers seasonal price changes originating from the annual hydrological cycle.

As was previously noted, although the adoption of a cost-based market attenuates extreme peaks, it does not prevent prolonged periods of high prices or eliminate opportunities for exercising market power. The distributor's obligation to contract is not sufficient to guarantee a decrease in the incentives for exercising market power by a generator with a dominant position. Likewise there is no obligation for the generator to contract a percentage of its generation.

While ingenious, the concept that underlies capacity charges as compensation for exclusion of the costs of shortages in the spot market is not conceptually correct (see Chapter 7) and suffers from many problems. The proposed estimation methods leave a large margin of error and in the best of cases are crude approximations. Moreover, the proposal does not present a specific alternative to limit the opportunistic behavior by distributors wanting to exploit their position in favor of their subsidiary. If the decision on when to enter into contracts is left to the discretion of the distributor, it is possible that they could be manipulated.

The imposition of a special format for contracts based on a capacity with associated power may seem convenient, but transfers risk management to the generator for which it is not prepared, because it has to give a quantity of power that is not necessarily compatible with the characteristics of

its plant. A system of auctions by various standard contracts managed centrally could clearly select the best combination to meet demand, and there are adequate computational instruments for making the comparisons.

As in the case of the initial adjustments to the model, it seems that difficulties are caused by reluctance to give up some initial errors in the design, such as assuming that all consumers could have complete competition in the market. If this possibility is eliminated and limited to large consumers, distributors will be less reluctant to contract, although experience has shown that a centralized system of auction by contract can be more convenient. The objectives would be achieved more transparently and with fewer distortions by a system of centralized auctions which requires contracting a high percentage of demand that decreases over time with sufficient anticipation to permit the entry of new generators, supplemented by a reserve market (although this also raises its own problems, as discussed in Chapter 7).

The Interests at Stake

The development of this process cannot be understood without a more detailed analysis of how the interests at stake interact and how the institutional restrictions and the urgency of taking decisions conspire against the implementation of a change in the model that, at first sight, does not seem to have any problems. A brief but illustrative discussion follows focused on the incentives and interests of the main actors: the government (MINEC and SIGET, but also CEL); the private companies AES, Duke, and El Paso; and multilateral banks.

The Government

Mindful of being ultimately responsible for the security of supply, the government would prefer to reach agreements with each agent to reassure the established generators and guarantee investment in generation in the short term. However, these agreements are not easy to achieve satisfactorily because the conditions needed for a comprehensive solution cannot require concessions from established distributors and generators that have veto power. Scrutiny by the political opposition, which is likely to oppose any transaction, would also complicate the matter. Given the time available, contracting for the power required in the short term could not wait for

enactment of the reforms but would have to be done as permitted under Decree 1216/2003. Yet, the study undertaken by the consulting firm hired by SIGET found that any change that requires distributors to contract but does not address the fundamental problems of contracting without changing the law has very little likelihood of success. Additionally, in view of the urgency of guaranteeing new generating resources, a consensus with market agents does not seem possible without increasing electricity rates for consumers. In any event, it would be necessary to guarantee the compatibility of this regulation with what might emerge from a more complete design, as well as being clear that this would be a short-term solution to improve the position of market agents.

In these circumstances the regulator must decide if it is worth regulating the contracts now rather than waiting for promulgation of a law that tackles the problems in a more comprehensive way. If it regulates now it could only cover the contracts that the agents submit to it, because under the existing framework only marketers can originate contracting. The regulator cannot invite bids or organize auctions.[5] It is not clear how much room to maneuver the regulator has for regulating term contracts in the short term without entering into agreements with each agent. Could an intervention be justified if the conditions for competition in the contract market are not in place? Could the regulator establish the percentage that the distributors should contract? Could it limit participation in new generation? If these conditions are not possible, emergency measures will be needed until it does become possible to change the legislation to permit comprehensive market reform.

The Companies

In a highly concentrated market like that of El Salvador, the likelihood that agents could simultaneously participate in distribution and generation makes it even more difficult to control the exercise of market power. The leading private agent in the sector is AES, which controls 70 percent of distribution. AES has shown a strategic interest in also participating in generation, initially through the El Faro generation project in Honduras that exports to the Salvadorian market, but more recently with a coal-fed thermal plant in El Salvador. Generation is in the hands of established gen-

[5] AES presented an unsolicited proposal for a conventional PPA with a 20-year term.

erators, Duke and El Paso, both of which own thermal plants, and CEL, which owns hydroelectric and geothermal plants in joint ventures with private companies. Each of them has interests that are in conflict with those of others and require trade-offs in order to reach agreements.

AES

According to the legislation in force, AES can decide the volume, timing and conditions of the auction, as well as who participates in it. It has the advantage of being the only generator with a project that had been evaluated and could come on line in time to have a positive short-term impact on the supply crisis. Even so, the company has stated that it has no interest in participating in auctions to buy power in which other competitors participate. Its strategy is to negotiate directly with the government to sell the power from a 200 MW coal plant. It argues that no other company can offer comparable generation that could compete in an auction with it.[6] AES would oppose any change to the status quo because it would imply the loss of advantages that it currently enjoys. In other words, AES would not agree to this initiative without receiving other benefits in return. According to the law, the regulator would have very few instruments to control market power in a contract market. AES has always advocated vertical integration. Given its position on both sides of the production chain, even if it contracted all the power from its plant it would still have incentives to exercise market power. This would increase MRS prices and, therefore, the price of transferring a large part of its power to the consumer. AES could then choose how much it contracts, how much it sells and how much it purchases from the MRS. A contract market that limits these possibilities would naturally meet with its opposition.

To understand the scope of a possible agreement, it is necessary to be clear about the conditions that AES puts on participation (without which it would prefer to withdraw from the business), and to understand the conditions under which it has veto power over the reform. It could be assumed that AES would withdraw its opposition to long-term contracts if it were offered a guaranteed captive market, which would reduce demand uncertainty. However, it would also be necessary to find out on what conditions AES would be willing to postpone its participation in the coal plant until a

[6] This could be true given that there currently are no established rules.

clearer and more transparent framework for new power auctions is put into place. Similarly, it would also be important to know on what conditions it would be willing to organize power auctions for customers other than its own, taking into account that 200 MW represents a significant part of the demand in that segment.

Duke and El Paso

Both of these companies have stated that they would be willing to participate in the contract market provided a temporary arrangement is reached that allows them to operate normally during the transition. However, there are restrictions on reaching an equitable arrangement given the difficulty of designing a really competitive auction in the short term in which only established generators can take part, including CEL. Also, given the restrictions on the volume to be contracted, the participation of established generators in an auction that meets future needs would run the risk of leaving new generators out. An alternative would be to invite established generators to bid for two years and hold another auction in which all agents would compete for delivery after 2007. However, this would require adoption of a new framework, which is not being currently considered. Given the system's lack of flexibility, there does not seem to be an elegant solution or one that avoids assuming stranded costs.

Comisión Ejecutiva Hidroeléctrica del Río Lempa (CEL)

CEL wants to build hydroelectric projects to guarantee supply and for which there is a lack of private interest. Given that the agreements with the International Monetary Fund do not allow CEL to make investments, the government is looking for ways to enter into leases with the private sector to build and finance the project with CEL as operator reselling the power. The question that this raises is why build the CEL hydroelectric project and not others selected by competition.

The Multilateral Organizations

The multilateral development banks (MDBs) have a very large interest in El Salvador's electric power industry. However, as the adoption of the current model despite criticism from MDB experts shows, their influence

may not be as much as some would believe. Indeed, in their case, their participation was limited to financing some of the consulting studies and making comments.

In short, the current law limits the ability to implement a system of free competition for contracts and guarantee a reasonable transition. This could only be accomplished if additional changes were made to the legislation, which would take a long time and require building a consensus on a set of fundamental principles. Those principles are listed below.

- The requirement to contract part of the load. Distributors and large consumers are required to contract 100 percent + *x* percent of estimated power demand in a relatively long time horizon. The value of *x* is positive in the first year of delivery of the contract, representing the reserve, and becomes negative as the delivery date becomes more distant. Similarly, in order to guarantee participation of new generation there must be a time lag between the time of contracting and the delivery date.
- The requirement that generators with potential market power must have a high percentage of their generation in long-term contracts to mitigate their incentives to exercise market power.
- The need for the system operator to be responsible for the centralized contracting of a portfolio of contracts with an adequate mix of maturities and a position on the load curve that guarantees a basket of efficient generation. It could include the requirement to contract ancillary services. This also requires the design of rules to allocate contracts to various marketers. A marketer that has existing contracts with physical guarantee can use them to cover its obligations. Similarly, if the load is willing to accept an interruptible service it would have no obligation to contract.
- Additional measures required to eliminate regulatory defects that prevent their execution: the obligation to remain with a marketer for a minimum period and to equitably remunerate cost of resale, and to establish timely settlements of the MRS and contract markets.
- The need to move directly to a cost-based system and not hold the potential to do so as a threat over the system. The market oversight system is an additional concern, which cannot be addressed independently of the market design.

These problems will have been solved one way or another by the time this goes to print, but they will necessarily involve a cost that the consumer must pay sooner or later. The costs stem from inadequate market design that has given some market participants too much influence, and also from the urgency with which those deficiencies had to be addressed in order to avoid a supply crisis which could have put the entire model at risk. The government's strategy has been dictated by the apparent need to guarantee a consensus solution that avoids the appearance of changing the rules of the game and triggering a stampede of potential investors. These fears can be a little exaggerated because experience has shown that markets require continuous adjustments to achieve their original objectives, and that any arrangement that was obtained under pressure from the need to meet demand, will ultimately be questioned politically. As a result, the government's strategy will only be complete once it undertakes a comprehensive examination of the costs and benefits of relaxing the restrictions that it has voluntarily imposed. This requires considering the government's intervention in the market for the time necessary (two or three years) to be able to carefully study the changes and the start-up of the new model.

The Roles of the Government and Regulation

Despite the initial rhetoric, the government continues to intervene in the market through its ownership of the transmission company (CEL), and as partner in the geothermal company. The sector model adopted did not establish a regulatory role for the government and assigned some of these functions, such as planning, to the UT. In fact, CEL had been exercising several policymaking functions until the market crisis of 2001 revealed the need to assign them to a unit within the Ministry of the Economy. Yet, the government continued using the state company as an instrument to develop its policies. Thus, although the Electricity and Telephony Investment Fund (FINET), which is fed with the proceeds from privatization, should be responsible for social programs, it used its income to fund subsidies and its technical competence to resolve the problems it faced as well as for programs to expand the service. As mentioned, CEL is now preparing electricity investment projects as a way of averting a possible supply crisis.

In contrast to the design of the electricity market, the reformers adopted a multi-sector regulatory body that was better adapted to the

country's institutional and human resource limitations. SIGET is an independent public service regulatory agency responsible for applying the rules contained in international treaties, laws and regulations that govern the electric power industry. The functions of SIGET include regulation of the charges for use of the distribution and transmission networks, as well as the charges of the system operator, antitrust functions, technical regulation and granting concessions for use of hydroelectric and geothermal resources. Its other functions include dealing with complaints and claims from final users and operators, and settling disputes between operators. SIGET's electricity department is responsible for naming experts to take part in dispute settlement. The president appoints the general superintendent for seven years and, in turn, the superintendent appoints qualified and independent managers for electricity and telecommunications to serve for a period of five years.

As in other countries of the region that experimented with new institutions, the introduction of regulation in El Salvador was not immune from problems and difficulties. In the early years the regulator was not completely independent. The government dismissed three regulators when it was not in agreement with their decisions, but the difficulties intensified due to inadequate powers granted by the law. It was not until 2003 that the functions of competition oversight were assigned to the regulator, and the government directly managed the crisis of 2001. It also had difficulties in managing the transfer of prices to consumers as well as volatility.

On other fronts its performance has not been so controversial. Despite the problems described in Chapter 2 with the application of the Distribution Value Added method (VAD),[7] this has not occurred in El Salvador. A report on the regulation of distribution systems in Central America (ECLAC, 2003a) emphasizes that, compared with other countries, El Salvador has made important progress in the measurement and control of electricity failures. This system is indispensable for compensating users for deficiencies in the service as established in the law. Customers were paid US$1.3 million in 1999 and US$1.5 million in 2000 for electricity failures. In the cases analyzed by ECLAC, only SIGET has succeeded in integrating a monthly record of failures into the distribution circuits of

[7] This is a combination of regulation methodologies (benchmark competition and regulation based on a model efficient company) that permits distributors to obtain reasonable profits on the assumption that the distribution networks operate efficiently.

each company, which improves control over the service. The control and oversight of complaints and claims are also significant.

The companies have also responded to the incentives for limiting losses despite the initial increase in distribution losses reported in the ECLAC study between 1998 and 2002. Compañía de Alumbrado Eléctrico de San Salvador (CAESS), which has 47 percent of the market, posted distribution of around ten percent, which is considered reasonable. Only the losses of the company that covers rural areas have increased since the reform, which reflects difficult rural conditions and expansion of coverage.

Expansion of Coverage and Subsidies

According to ECLAC, the 1990 rate of US$0.075 per KWh represented three percent of average income in El Salvador, and this percentage was maintained in 2003 despite an increase of almost four times in the rate. However, the Salvadorian system addresses the payment capacity of low-income users through subsidies on consumption and on expansion of coverage.

The law establishes the rational and efficient use of resources, development of access to electricity supply for all sectors of the population, and protection of customer rights, but it does not set specific coverage targets for distributors. Likewise, it does not establish a specific use for the proceeds from privatization, although it does allocate part of them to social investment. In 1997 approval was obtained for the creation of FINET, whose functions include subsidizing electricity infrastructure works and electricity consumption in low-income rural areas. But these are exceptions in a policy of gradual reduction of subsidies over a three-year period until they are significantly reduced, subsidizing only the low-income population.

The trust amounts to US$333.6 million, which includes part of the proceeds from privatization and the funds and financing obtained by the government. These funds are used entirely for transmission investments (lines and substations) and the rural electrification program that was completed between 1999 and 2004. The specific target is to connect 280,639 new users in 2,633 communities. It is estimated that around 1.7 million people will gain access to electricity services, raising the level of electrification by 15 points (ECLAC, 2003b).

When privatization took place, the subsidies protected residential users (those with consumption up to 500 KWh per month), pumping water for use by the state company Administración Nacional de Acueductos y Alcantarillados (ANDA) and rural cooperatives, as well as the taxes on these billings. Since August 2000 subsidies have been limited to users with consumption under 99 KWh per month, ANDA and the rural cooperatives. The VAT subsidy continues for residential users with consumption under 300 KWh. Compared with other countries of the region, the subsidy threshold guarantees a reasonable inclusion error. According to ECLAC, between 1998 and 2001, CEL paid out about US$167 million in subsidies. The government currently covers the subsidies through FINET. Since they accrue to specific groups, there are no visible distortions. Residential users who consume less than 99 KWh per month represent 20 percent of the total number of families with service, only 20 percent of residential consumption, and 7.7 percent of distributor billing. All users pay fixed charges and municipal taxes, so the unit cost of small consumers is always high. With respect to ANDA, because of its status as a subsidized company, its service has come under CEL marketer.

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PART III

The Devil Is in the Details

The political stumbling blocks to beneficial institutional change in many poor countries may have more to do with distributive conflicts and asymmetries in bargaining power... [which] explains why agents who are in a position to receive subsidies in any case are often observed to support particular methods of redistribution that appear to make everybody (including themselves) worse off....This result illustrates a more general incongruence between the purely economic and political-economic definitions of winners and losers of reform...

Pranab Bardhan
Scarcity, Conflicts and Cooperation:
Essays in the Political and Institutional Economics of Development
MIT Press, 2004

Any prescription for good reform must depend on some explicit or implicit idea of what constitutes good government. Indeed the issue is often put as "markets versus government," or more generally, the optimal size of government. This is simplistic; the quality of government is more important than its size.

Avisnas K. Dixit
Some Lessons from Transactions Cost Politics for Less-Developed Countries
Economics and Politics, 2003

While there has certainly been a lot of progress made in creating good competitive wholesale market institutions, and there has been a lot of valuable learning from experience, there is still a lot more work to do.... Creating competitive wholesale markets that function well is a significant technical challenge and requires significant changes in industry structure and supporting institutional and regulatory governance arrangements. It requires a commitment by policymakers to do what is necessary to make it work...

Paul Joskow
Markets for Power in the United States: An Interim Assessment
AEI-Brookings Joint Center Working Paper, 2005

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Chapter 6

State or Market

The history of the electric power industry in Latin America has been dominated by a constant search for the most appropriate model to meet its needs. After a more or less long honeymoon period, difficulties often arise that bring into question the pertinence of the model. As a result, the ideological debate about whether the government or the private sector should provide electricity services resumes. As mentioned in the introduction, the private sector model ran out of steam in the middle of last century when governments decided that it was not responding fast enough to pressing development needs. The public company model that replaced it achieved significant progress until it, in turn, became outdated in the 1980s. The cycle has repeated itself and now it is apparent that neoliberal reforms[1] based on privatization face stumbling blocks that are exacerbated by public discontent following five years of scant economic growth. As a result, the popular rejection of neoliberalism and privatization extends even to places where such reforms have been successful (Shirley, 2003).

This volume has maintained throughout that the difficulties encountered are associated with an institutional environment that does not offer adequate incentives for market participants, yielding results that are at odds with original intentions.[2] It has also emphasized that, despite popular belief, government involvement in the electric power industry in the role of entrepreneur continues to be very important in almost all countries, and that the performance of the various models is not uniform. Some conjectures have been presented to explain the reasons underlying these differences and a more analytical treatment has been promised for later.

[1] This is not restricted to the electric power industry but applies as well to reforms in other sectors.

[2] The examples presented appear to corroborate this.

This chapter takes up again the central problem of the appropriate selection of the model for the electric power industry in the context of recent publications on institutional economics that deal with the justifications for government intervention in the role of entrepreneur. It also examines the reasons for the success of certain models and the reasons for popular discontent with privatization.

Justification for the Entrepreneurial Role of the State

Analysts distinguish two arguments to justify state ownership in the presence of market failures and/or externalities (Perotti, 2004). The first relates to lack of *public commitment*, or the inability of governments to commit themselves to appropriate tax regimes and regulatory policies. This discourages private investment (because of fear expropriation) and results in government investments to substitute for the private sector. This is the case of government investment in infrastructure, which can be attributed to the political inability to produce a credible commitment that the government will not intervene when it would be politically expedient to do so. The second argument relates to lack of *private commitment* and results in situations in which, given the nature of the service, the regulator has great difficulty in controlling the decisions of private business owners that have a critical impact on the provision of the service without resorting to direct control of the company. This is, for example, the case of prisons.

Since it is not possible to have complete contracts, ownership of the assets is used to supplement them by assigning to the owner a set of residual rights of control over non-contracted or regulated contingencies. In this case, state ownership could be justified when it is difficult to apply a specific regulation due to non-verifiable contingencies. It should be noted, however, that private ownership only reduces the degree of discretional control that the government can exercise over private assets, and does this only in relation to the constitutional protection of private property. Since laws can be changed, the scope for private control can be reduced indefinitely by means of new legislation.

With these clarifications in mind we can now ask whether lack of public or private commitment explains the nationalization of private companies in the middle of last century and the persistence of public ownership in the electric power industry in the region. It could be argued that the

nationalizations of the twentieth century are a classic case of lack of public commitment if one accepts that the private companies were nationalized because they were limited to providing this service in the most profitable centers and it was not in their interests to expand the service to places where they would have operated under loss conditions without specific government compensation. Nonetheless, governments predictably argued, that they intervened because of lack of commitment by the companies to provide the service on the conditions required for the development of the country when the government was not capable of adequately regulating very powerful companies. Lack of public commitment was not necessarily the case in urban centers because, for a long time, contracts were undertaken and there were few cases of flagrant violation. But lack of public commitment was very clearly the case with reference to expansion of coverage because the government could not guarantee that it would be able to remunerate the companies in a market with limited payment capacity. It could be speculated that an alternative for maintaining private investment would have been a transparent subsidy for poor consumers so that private investors could recover their investments. However, with fragile institutions and lack of capacity to efficiently manage a subsidy, this alternative would perhaps have not been viable at the time.

Ongoing public ownership 15 years after the reforms were first begun could be explained in several ways. On the one hand, it is no secret that private businesses refused to invest in Argentina after electricity rates were frozen and the government intervened in the market in what was a typical case of lack of public commitment. On the other hand, the refusal of private companies to invest in new generation in Brazil at the end of the second Cardoso administration (see Chapter 3) was not due to lack of public commitment, at least in the official version, but to difficulties in establishing the necessary investment incentives during the transition. Later, the Lula administration halted any further privatizations for ideological reasons, but pragmatically accepted the establishment of a framework to create attractive conditions for private investments in new plants to meet expansion needs. In contrast, when private companies in Colombia were not anxious to invest in new generating plants in a depressed market with few long-term incentives, the government's response was to stimulate public participation arguing that lack of private investment threatens continuity of supply. Although it could be inferred that the government is not responsible for the lack of incentives, the regulator maintains antagonistic

relations with it and has unnecessarily delayed the issue of the instruments to replace capacity charges, so the market perceives a clear lack of public commitment. If the private sector has no appetite for investment because of lack of public commitment or capacity to create the necessary incentives, there is no alternative but public investment.

It could be argued that the degree of private commitment is always partial because all contracts are necessarily incomplete due to the existence of *bounded rationality*, but the same could be inferred with respect to public commitment, given that legislation is also incomplete. The difference, according to Perotti (2004), is that a sovereign State has more discretion and therefore more room to abuse its power. Consequently, maintaining the ownership of the company in order to exercise residual rights of control in places where public commitment is limited can result in high social costs that are not offset by the resulting gains.

Politicians have many concerns other than fair regulation. Although government ownership can contribute to correcting market failures, the problem is that scrutiny or oversight by citizens is insufficient to guarantee coherence between politicians' intentions and public welfare. In reality, it may turn out that dispersed citizens are left with the responsibility of dealing with the difficulties of intervening in a state-controlled company to guarantee appropriate corporate governance. One of the great problems of government ownership is that, even when justified, it is very difficult to reverse.

In view of the difficulty presented by the propensity of the government to behave in an opportunistic fashion, the need arises for the gradual development of institutions to separate direct political control from production decisions. However, the particular characteristics of the electricity service make any government uncomfortable about giving up discretionary control when its hold on power is at stake. This is the case of rationing given that, ultimately, the electorate tends to always hold the government responsible for the service. As a result, governments do not feel comfortable about regulation as a residual instrument of control.

What Explains the Success of Some State Companies?

Recognition of the obsolescence of the statist model was an important part of the justification for the new market paradigm that took root in the

region in the 1990s. This was not merely an ideological issue. Indeed, it also resulted from the poor performance of the great majority of electric power companies in the region.[3] There is ample literature attributing the failure of the state as entrepreneur to lack of efficiency incentives, lack of competence by the government and/or corruption, and use of companies for political benefit (McKenzie and Mookherjee, 2003). Yet, there is little in the analysis about the conditions that led to the success of one institutional arrangement compared to another. Similarly, the defenders of the statist model frequently quote the successes of some state companies as proof of the superiority of their model, overlooking the specific reasons for that success. While not attempting an exhaustive analysis of this issue, this section discusses two articles that in this author's opinion provide the required framework for validating the conjecture (Perotti, 2004; Djankov and others, 2003).

Ayala and Millán (2003) find that the factors that explain the relative success of EPM in Colombia include a combination of the rent from the hydroelectric resource and the people who developed it. But the fundamental fact is that the citizens of Medellín exercised a form of control over company management that prevented it from being used for political purposes. These same factors also played a role in Costa Rica and in Paraná, Brazil. In Costa Rica, the ICE is considered one of the nation's jewels, to the point where the population took to the streets *en masse* to protest against an incipient intent to open the electric power industry to competition and private participation. Paraná has also benefited from a high degree of citizen participation.

While these characteristics could explain the differences in performances, their continuance over time is not a sure thing. Ayala and Millán (2003) warn that the increasingly rich companies can become a temptation for local politicians who could erode citizen control and take over management. Regrettably this prediction was about to become reality during the administration of Mayor Luis Pérez in Medellín. Only a fearless and widely publicized campaign led by the city's civic groups succeeded in uniting citizens to defend their rights. Although the new mayor and the new manager have reestablished transparent management of the company, the danger has not yet been averted because institutional measures to permit

[3] The exceptions were EPF, COPEL and ICE, as mentioned in previous chapters.

improved corporate governance have not been adopted by the city council. In Brazil, a new state government moved away from the traditions of the previous government of Paraná, shelving projects to involve the private sector and dispensing with existing PPAs and other measures. This lead to deterioration in the financial health of COPEL. Public opinion in Costa Rica is still reeling from the bribery scandal involving the French firm Alcatel, officials of the ICE telephone business and even two former presidents of the country.

A comparison of these experiences suggests that a good part of the success of state companies can be attributed to the fact that local citizens exercise their rights over the companies to ensure continuity of the service, even at the cost of short-term benefits (for example, lower consumer rates). To move from these conjectures, which although attractive are only that, to more solid statements regarding the reasons for the success of some state companies, a further literature review is required.

Djankov et al. (2003) study the factors that determine the performance of different institutional arrangements for social control of companies. The authors define *civic capital* as the capacity of members of society to cooperate among themselves in pursuit of the common good. The concept is related to the more well-known notion of social capital but has broader connotations. Putnam et al. (1993) noted that *social capital* (defined as the experience of cooperation in small groups or informal associations among members of a community) refers to the capacity of community members to cooperate in efforts to obtain public goods. Other authors also identify additional factors such as culture (Landes, 1999), ethnicity, human capital, resource endowment, and climate, which in turn determine the type of economic activity and the initial distribution of wealth, human capital and political power (Engerman and Sokoloff, 2002).[4] As a result, societies with abundant civic capital tend to reinforce the incentives to mobilize its members to defend their common interests.[5]

[4] Other explanations attribute the effectiveness of structural reforms to the quality of the policymaking process (Bergara and Pereyra, 2005), or economic progress to the reduction of distributive conflict (Acemoglu et al., 2004). These explanations imply the existence of civic capital, in the first case, or contribute to creating it, in the second.

[5] North (1990) notes that these unwritten rules are part of the institutional resources of a society.

Following this line of thought, the qualities exhibited by Antioquian (Medellín) society in the case of EPM, and Costa Rican society in the case of ICE, demonstrate a high level of civic capital. Various studies by economic historians identify in these societies aspects that reveal an accumulation of civic capital. Engerman and Sokoloff (2002) emphasize the examples of Costa Rica and Uruguay in arguing their thesis on the importance of the initial distribution of these resources. Similarly, López Toro (1970) and Twinam (1985) suggest that the conditions of the physical environment in Antioquia (alluvial mining which lends itself to small-scale development and absence of good quality land which could be exploited with abundant manpower) are at the roots of the entrepreneurial spirit in this region of Colombia. On this point it is not easy to resist the temptation of extending the analogy to the high participation of European emigrants who from the 19th century onwards colonized the fertile land of Paraná state in Brazil.

Djankov et al. (2003) use the concept of civic capital to explain the difference in social costs that a given institutional arrangement for social control can have in different societies. They look at four institutional arrangements in ascending order according to the degree of implicit "dictatorship": market discipline, litigation, regulation, and state ownership. In reality there is a continuum of intermediate arrangements. Each one has an associated level of "disorder" and the associated increase in dictatorship needed to control it, which can have different costs depending on the civic capital and degree of monopoly in the industry. For example, in places with high civic capital, effective government, greater transparency and press freedom, the social cost of an increase in government action to control disorder would not be so high. In places with good market discipline, atomized ownership and few tendencies toward monopoly, an increase of dictatorship would not cause big reductions in disorder.

The optimum arrangement for each country and sector is where the social cost of the marginal increases in dictatorship does not result in corresponding reductions in the social cost of disorder. For example, a system where there is only market discipline would have a minimum of dictatorship but, depending on the country or sector, the associated disorder could give rise to higher or lower social costs. In a highly competitive industry of a country with very high degrees of civic capital, the cost of disorder would be minimal. The market for foodstuffs in Sweden would have these characteristics but not, say, the market for electricity in Ethiopia. Because

developing countries lack civic capital, a dictatorship solution does not contribute much to reducing the cost of disorder. To the contrary, it could produce higher social costs because of the inability to control the very strong incentives of bureaucrats or those who profit from the contracts. This is the case of the typical state companies described in this work. In Norway, the system of public ownership in the electric power industry did not have a large associated social cost even before the market reforms. Despite public ownership, the low level of concentration in the industry permitted the introduction of competition and so increased efficiency, which is consistent with the thesis that in a country with sufficient civic capital the social cost of the dictatorship implicit in public ownership would not be too great, although some degree of efficiency could be sacrificed depending on the degree of competition in the industry. In this context it is possible to understand how the existence of civic capital in Medellín and Costa Rica permitted state ownership (which is a solution that implies a higher degree of dictatorship) to function even in the absence of market discipline and the interests of the private sector. The idea then is how to choose the appropriate scheme in such a way as to move toward more efficient arrangements as restrictions on dictatorship are eliminated, without this leading to higher disorder costs.

In the case of developing countries with scarce civic capital, Djankov et al. (2003) conclude that private property would be an even better institutional arrangement than public ownership. Here, lack of civic capital suggests that the abuses of dictatorship are more costly than the abuses of monopoly or the inability to address externalities. The facts described in Chapter 1 suggest that these costs are very high, but it is important to bear in mind that, without adequate regulation, the costs of private participation in systems with little scope for competition are also very high. The point is to establish good regulations, but this is not easy in a country with incipient institutional development. Deficient development of the legal system and the weakness of ancillary institutions could make it difficult to offer the guarantees needed for private investment, or could attract only firms that try to exploit the situation through unorthodox mechanisms. That is, it could lead to lack of public commitment, which would apparently justify state ownership. But it is precisely in these cases that the problem of public commitment is most serious and the social costs could be higher.

There does not seem to be any alternative to continuing to build the regulatory institutions that make any type of public or private commitment

possible. Institution building is an indispensable task in any system, and we should begin this work as soon as possible, since the alternative of creating civic capital is not an available option in places where it does not exist. But developing institutions can take a long time, as can the creation of the facilitating environment that would make it possible. As a result, countries with weak institutions will inevitably have to bear the social costs associated with these deficiencies for some time, whether through the high costs of private participation or the inefficiency and opportunities for patronage inherent in public ownership. The great challenge is to find the appropriate mechanisms so that a particular country can achieve a minimum of institutional strengthening in order to give guarantees to private business and take advantage of competition without incurring in excessive costs for the consumer.

Perotti (2004) states that in some critical circumstances of lack of essential institutions to support or regulate private activity, rapid privatization could lead to unacceptable loss of control of the economic system. In such cases, state control could be necessary, although it would be temporary and an intermediate step. When capture of privatized companies is inevitable, corporate governance can be weakened and produce a loss of control of the process, and ultimately of the objectives pursued. In these cases it may be necessary to maintain state control while the required institutions are developed. However, as Perotti (2004) warns, the structure and function of this residual ownership must be designed from the start whatever the duration of the transition, because without an explicit commitment by the government to hand over control under certain conditions, the process of institutional development would never begin.

Public Opposition to Privatization

Why does the public not seem to be satisfied with the government exercising residual rights to control through regulation and in some cases prefers public ownership (such as EPM or ICE) despite recent strong evidence of the dangers of capture by politicians? It could be argued that the public perceives that a privatized company would charge more than a public company, but regardless of the fact that this is an illusion[6] it is not sufficient

[6] EPM offers the lowest rates for electricity, but not so for drinking water.

to explain the phenomenon. In addition to lower utility rates, behind this public preference is recognition of the long tradition of efficiency that has characterized the company, and reflects their satisfaction with the quality of the service, which provides them with a certain amount of assurance that things will continue to function in the future. They do not see any advantage in changing a proven system in which they can exercise social control directly without intermediation by politicians for the uncertainty of regulation, which can be unknown and seem remote. In addition, they are not clear about how the funds from the sale of the company would be spent.

Where public companies have not been efficient, consumers who receive the low-quality service at prices that are significantly below costs, seem to fear that privatization would only results in hikes in the utility rates without improvements in the service. This could be partly due to limited dissemination of information about successful privatization experiences and exaggerated propaganda about the failures. For many years the residents of the municipality of Soledad on the north coast of Colombia, which is served by the municipal company, had very low water rates but minimum coverage and quality. In contrast, in neighboring Barranquilla private participation significantly increased coverage and improved service (see Chapter 8). So it is not surprising that the people of Soledad mobilized to demand the privatization of their company because anything was better than the existing chaos. It is hardly necessary to note that the social control of the type exercised in Medellín never existed in Soledad, and that with the exception of the local politicians who managed the company for their own benefit, no one was willing to defend it.

This opposition to participation by the private sector and to reforms in general is less easy to explain in places where the reforms have produced tangible results that directly benefit a large part of the population. In a review of recent public opinion polls about sector reforms in infrastructure, Shirley (2003) finds that the negative results cannot be explained by lack of consideration of the needs of the poor because many reforms produced tangible benefits with significant improvements in access to the service. The author also finds that those results cannot be explained by possible failures in design that failed to recognize highly sensitive matters related to the political economy, such as lack of legitimacy of the regulatory institutions, untimely and/or unjustified price increases and others. The opposition is

more deeply rooted in general popular attitudes, particularly those of the poor, who mistrust the promises of reformers and think that they will be deceived as they have been in the past. Shirley explains this conjecture in the context of the ultimatum game, in which two people negotiate to share a sum of money with the result that though one always receives a net gain, he feels deceived because he thinks the other will take a bigger share. Shirley (2003) says that this mistrust is particularly high in Latin America and is pessimistic about the likelihood of finding short-term solutions. Bardhan (2004) expresses this idea as lack of public commitment to the government because of the large inequalities in income. According to this author, the only modern societies that have had success with reforms have been those with low levels of inequality, such as Korea and Taiwan, where people are willing to invest in the reforms because they have confidence that they will share its benefits.

This line of thinking is shared by Graham and Felton (2005) in an analysis of the Latinobarómetro opinion polls: "Summarizing, inequalities seem to have negative effects on public support for privatizations in the region, probably because it strengthens the perceptions (and in some cases the reality) that the rich always win and the poor always lose. Because privatizations have the (unjustified) reputation that they benefit a few privileged groups at the expense of the unemployment of many (who in reality are often reemployed) and of users (who often benefit), this reputation can have more credibility in contexts with high degrees of inequality." Carrera, Checchi and Florio (2005) reach a similar conclusion using the same data: "[...] disagreement with privatizations is more probable when the person who responds is poor, the privatization is large and rapid, involves a high proportion of public services such as water and electricity, the country suffers major macroeconomic shocks and there is great income inequality." However, other authors (Boix, 2005) suggest that opposition is more associated with the short-term situation of the economy than with inequality.

Although these results are as good as the data on which they are based (there are many doubts about the Latinobarómetro procedures) it could be concluded that inequality is a critical aspect of the acceptance of structural reforms of the economy. Does this mean that until this problem is solved, it is only possible to think about marginal improvements in the designs of the reforms or address some of the problems of political economy?

What to Do?

Public ownership as a means of maintaining residual rights of control runs the danger of being captured by politicians and/or bureaucracies, while private ownership runs the danger of capture of the regulator by businesses.

Assuming that this reasoning is applied, we could conclude that if for a specific country, it would be best to adopt a specific model (such as private business participation with state participation limited to regulation and establishing policies) the implicit assumption is that the politicians' degree of commitment is sufficient guarantee to the private sector that they will not take advantage of opportunities to expropriate it. This decision will also imply that the company would have a degree of commitment to avoid taking decisions that could jeopardize the system itself. In other words, the dangers of capture by the companies can be controlled, and/or the degree of competition, by and in the market, is sufficient to limit the opportunities to exercise market power without compromising sufficiency of supply.

When this is not the case, a residual degree of state control, instead of the direct exercise of ownership, can play an important role if there are no relevant institutional mechanisms. This role should be gradually reduced[7] by creating more focused regulatory institutions that can weaken direct political control over decision-making. This is nothing new because it has already been addressed in the discussion of the need to separate the various roles played by the state as well as in the discussion about the corporatization of companies. It is important that despite occasional failures, progress should be continuous in order to create a dynamic reduction in the exercise of the residual rights of the government based on ownership of assets through greater exposure to market discipline and incentives, at the same time that transparency and accountability are increased. The solution adopted by ISA in Colombia (bringing in private minority shareholders) and lease agreements are examples of measures consistent with this position.

But we have seen that there are cases in which the government always reserves the possibility of intervening as a last resort, either to maintain control over generation, which permits it to respond to lack of private investment (thus demonstrating its lack of confidence in the commitment of

[7] Although there is no guarantee that this gradual reduction will not diminish in the absence of mechanisms that provide feedback to the process and reinforce its dynamics.

business), or to maintain an additional control over the regulatory bodies to guarantee that they will not be captured by the industry or that its own social program will be executed. These types of intervention have their costs because they discourage private investment or, what is worse, encourage businesses to seek direct arrangements with the government, sidelining the formal institutions. Are there legitimate degrees of government intervention? If so what would be the least harmful way to go about it? Or better yet: how can opportunities for the government to take advantage of opportunities to intervene be avoided? The options to be discussed in the next chapters can be understood as initial steps in this direction.

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Chapter 7

The Challenge of Wholesale Markets

Chapter 2 presented a summary of the problems faced by the electricity wholesale markets that came into being following the reforms, but did not enter into a detailed discussion of the various schemes used around the world or discussed the international debate on the relevance of this type of design. The description of the experiences of wholesale markets in some countries (presented in earlier chapters) illustrates the complexity of the problem and the lack of consensus, which highlights the importance of undertaking a more thorough discussion.

At the time of writing this chapter (2005) there is no consensus among the experts, academics, consultants and operators on the type of wholesale market design that would promote economic efficiency through competition without undermining security of supply (the reformer's promise). The debate is often confusing because the objectives and assumptions inherent in all market designs are not always explicit. Consultants familiar with a particular model tend to repeat it regardless of the characteristics of the market to which they want to transfer the experience. Professional bias is also a problem: engineers educated in the culture of the old power pools tend to favor a system managed with the help of mathematical models designed to optimize operation, and are very likely to adopt simplifications that are only valid in regulated markets. At the other extreme, some academics see no limits to treating electricity markets as if they were markets for commodities such as cereals.

This chapter does not attempt to resolve existing differences or offer alternatives. Its purpose is to organize the information on the subject to guide the reader in the analysis of the copious existing literature, and reflect concerns about the application of some of the proposals in the markets operating in the region. It does not attempt to be exhaustive in its treatment and concentrates on some of the issues at the forefront of the

current debate, such as controlling market power while maintaining the investment incentives to guarantee supply. Other critical topics, such as the treatment of ancillary services or instruments for managing congestion in the network, are mentioned only in passing. The chapter begins with a recapitulation of the principles that guide the design of wholesale markets and continues with a description of the problem of market power and the way in which different market designs dealt with it. Following this is a critical review of the existing literature on the measures used to complement short-term price signal in a competitive market in order to create incentives for investment in new generation. The chapter ends with a discussion of the application of some of the proposals in the countries of the region.

The Market Design Problem[1]

There are a number of possible designs of competitive wholesale electricity markets, but not all explicitly state the specific objectives pursued and the constraints that the market design addresses. The problem of the market design consists in finding a mechanism (for a particular industry structure) to compensate suppliers and charge electricity consumers so that the actions taken by each participant (operating to satisfy its own interests) leads to the results desired by the designers. Wolak suggests that a concrete objective of market design should be obtaining the minimum annual average price consistent with long-term financial viability in the industry. This means that suppliers are not able to exercise significant market power unilaterally. It is also clear that an optimal design must achieve an average price that is lower than the price obtained by existing alternatives. Otherwise it would make no sense to adopt it. Note that the previous formulation does not include service provision at all times or a specified quality as a constraint, but these conditions could be included in the definition of the product and in the price. In economic terms, it is about maximizing the consumer surplus provided the marginal firm obtains an economic profit equal to zero.

That problem is, then, to maximize the objective function (which depends on the results of the market) defining: the number and size of the

[1] This section and the next one are based on Wolak (2004a).

participants and the rules to determine each firm's income subject to the constraint that all participants choose their strategies for maximizing their benefit in line with the rules imposed by the designer (*incentive constraints*). It is clear that each participant's behavior will be guided by the incentives and potential allowed by the rules, and each will use them for his own benefit as far as possible. So, it would be utopian to expect a private operator to deny himself the opportunity of obtaining higher prices for altruistic reasons, or to expect that a public operator will resist political pressure to maintain prices low, if the system permits these things.

As a result, the market designer faces different challenges depending on whether the firms in question are private or public. The problem for private firms is to prevent them from acquiring too much market power, while for the public firms the issue is ensuring efficiency and preventing the government from using it for political purposes. Because of the nature of the utility[2] an adequate market design for electricity is imperative. That is, it is not a matter of choosing between markets and regulation, as some claim, but rather, of when and how to regulate. Market liberalization[3] is an alternative regulatory mechanism for obtaining better value from the objective function than from the existing alternative. For this reason, it is not sufficient that the market's design yield the benefits of competition in the short term by controlling market power, it is also necessary for the system to create incentives for investment in socially desirable new generation, and for the benefits of adopting this system to be greater than all the costs involved in its implementation. Naturally the implicit assumption is the existence of the institutions, human resources and political conditions required for it to work, otherwise it would be no more than a simple academic exercise.

Designs That Help Control Unilateral Exercise of Market Power

From the point of view of market design, the task is to find the model that minimizes incentives for exercising market power. This would avoid costly and prolonged litigation to prove that a firm has exercised such power to the detriment of consumers. Initially, some reformers thought that only *a pos-*

[2] Electricity is a good that cannot be stored, transmission networks play a fundamental role in the industry, and there is little short-run response to changes in prices.

[3] A misnomer, since we are really talking about a restructuring of the market.

teriori control would be needed. However, experience showed that this was not a very promising option even in the most sophisticated legal systems, such as the United States. As indicated in Chapter 2, there is a consensus that, given the complexity of the markets, even a design that does not create incentives to exercise market power requires a thorough system of market monitoring to identify irregular behavior.

It is not easy to identify when a firm is exercising market power because not all cases of relatively high prices can be attributed to uncompetitive behavior. It could, for example, reflect scarcity when demand is greater than available supply. The problem is that it is difficult (especially for consumers) to know when price increases are the result of uncompetitive behavior or legitimate market conditions. To find designs that minimize incentives to exercise market power it is necessary, first, to understand how firms bid to maximize profits within a given set of market rules, and how firms exercise market power. This defines the set of constraints that the designer has to deal with when maximizing the objective function.

Firms will seek opportunities to benefit from the market. The notion of *individual rationality* leads us to assume that profits are sufficient for firms to continue to participate in the market or, otherwise, they would not do so (*participation constraints*). The concept of the residual demand curve is useful to understand how producers maximize their profits in a market of price bids. The residual demand curve represents an individual producer demand curve after all other producers have made their production decisions. Because of uncertainty about demand and about the actions of competitors, the residual demand curve is unknown at the time of submitting bids. As a result, its elasticity is a random variable (Wolak, 2004a). To maximize profits, a firm must obtain a price in the market that is higher than its marginal production cost. This means that its optimal bid curve depends on the probability distribution of the elasticities of its residual demand function. If the residual demand for a given firm is relatively inelastic, then the firm can maximize income by limiting its supply in the market if it then obtains a higher price. So, the solution for a market design that tries to limit the market power of firms is to make the residual demand curves perceived by all participants as elastic as possible. Generators with an infinitely elastic residual demand curve cannot cause an impact in the market with their supply, so their optimal strategy is to bid at their marginal cost curve, which would lead to market prices close to the optimum intended by the designer.

Most of the recommendations for controlling market power that appear in the literature can be understood as ways of making producers accept more elastic residual demand curves. According to Wolak (2004a), the following will result in producers perceiving more elastic residual demand curves: reducing concentration by forcing the sale of assets; requiring generators to sell a considerable portion of their generation in long-term contracts so they have incentives to compete more aggressively in the spot market; establishing a more robust transmission network to prevent opportunities for exercising local market power; active participation by demand in the market; and regulatory credibility.

It might be similarly thought that a market based on cost instead of price could yield the same results, but this is only partially true. In fact, the system does not eliminate all incentives for maintaining prices high, it only limits the possibilities for doing so when demand is close to capacity, but does not affect opportunities for maintaining prices high over longer periods. Moreover, cost-based systems have numerous opportunities for manipulating costs or raising prices through capacity retention (Arizu, 2003; Pollitt, 2004).

Clearly each system has specific constraints that require individual treatment. Likewise, the measures are not exclusive but complementary, so the appropriate combination is an empirical matter. Some solutions, such as unbundling can be limited in small markets and, as already mentioned, consumer resistance to being subject to natural price volatility is very strong and difficult to overcome, let alone the difficulties of having a credible regulatory process. Similarly, although long-term contracts (which are universally considered as an indispensable instrument for electricity markets) reduce incentives to exercise market power in the spot or short-term markets, this transfers the problem to the long-term market, where, in principle, elasticity is greater. Nevertheless, a careful system of contracting is required to ensure that this is the case.

Academic analysts insist that demand must participate in markets because otherwise part of the benefits of efficiency attributable to competition would not be achieved. It is frequently argued that including final demand in the wholesale market can only be achieved with sophisticated and costly systems of measurement. However, regardless of the progress made in recent years in this respect, this explanation does not have the same hold in systems where generation is predominantly hydroelectric and there is low price volatility during the day in comparison with fossil fuel-based sys-

tems. Price volatility for hydro-dominated systems occurs throughout the year[4] and could give adequate signals on a monthly basis. High opportunity costs for reservoir water implies high electricity prices in future months or periods, but unfortunately, as already mentioned in Chapter 2, it has been difficult to establish this basic principle of charging at marginal cost in the region. All this despite the surreal spectacle in Chile when prices and reservoir levels fell simultaneously in the 1998 crisis described earlier.

Long-term Price Signals for Creating Investment Incentives

As frequently explained (Oren, 2004), in a competitive energy-only market, the scarcity rents that generators capture would be sufficient to amortize their fixed costs and create the necessary incentives to make the required investments to supply the power demanded by consumers at the prices set by the market. Examples are the successful cases of the Scandinavian and Australian markets and the existing market in England and Wales, where there have been no problems in attracting the required investment. However, it is also argued that the idiosyncrasies of the electricity market (that is, absence of storage capacity, high volatility and political acceptability, weak demand response, characteristics of public good of the network, structural price cycles caused by inflexible supply and demand, and long-term investment), as well as the requirements of the financial markets, mean that the prices in the energy-only spot market are insufficient to produce incentives for investment in new generation and/or reduction of consumption to adjust to capacity constraints. Consequently, a surcharge on the prices of the energy-only market is needed to finance the investment required to maintain long-term supply, which has been termed sufficiency of supply. This takes the form of capacity charges or capacity markets.

Before continuing, it is important to recall the difference between security and sufficiency. Security means the capacity of the generation and transmission system to respond to contingencies (sudden outflows from plants or lines) without affecting the service. It relates to the short term and has a connotation of public good because a collapse of the system affects all market participants equally. Sufficiency, on the other hand, is the capacity to supply all consumers at all times, now and in the future, and

[4] Wolak (1999) provides evidence of this in the Nordpool and New Zealand markets.

relates to the long term. Instead of sudden failures, sufficiency is affected by uncertainty in future demand and by the entry times of new plants. It has the characteristics of a private good because each consumer could, in principle, choose his own tolerable risk level and consequently procure a means to cover it. Although it is agreed that security is a public good, the type of solution that guarantees sufficiency depends on the degree to which it is accepted that sufficiency is a private good in which each participant procures his own coverage.

Those that accept that sufficiency is not a public good argue that these characteristics of inelastic demand, high storage costs, capital intensity, and long-term construction also exist in other industries (such as air transport, health and mobile telephones), which have no need for these instruments because consumers are protected from the risks by forward contracts or because they can bear the cost of rationing. According to Wolak (2004a), the two best arguments to justify the need for additional actions to guarantee the sufficiency of a competitive power market are a legacy of the old regime; that is, rates that are designed so that consumers cannot take advantage of the benefits that a real-time system would offer them, and price caps in the short-term markets that are below consumer willingness to pay to reduce consumption. These factors lead to a limitation on the potential of producers to take advantage of high prices, and on the interest of the load to cover the price risk through forward contracts.

Following this line of thought, Joskow (2005) suggests that a set of existing limitations on the designs of the markets in the eastern United States would explain why energy-only markets have not been sufficient to remunerate the fixed costs of peak units. According to the author, these limits include the price caps and the type of mechanisms used to mitigate market power, low prices when operating reserve are low due to difficulties of execution, use of administrative measures instead of prices for rationing, and another series of measures that are the result of excessive valuation of the security criteria in generation. Joskow (2005) concludes by recommending that the first line of activity should be to continue working to eliminate these constraints. However, given the length of time that it can take, some regulatory interventions of the capacity-market type described later could be temporarily acceptable as a safety valve.

The regulatory interventions recommended by experts are far from uniform, and are subject to ongoing controversies. They range from the capacity charges existing in some countries of the region (such as Argentina,

Bolivia, Colombia, Chile, Peru, and the Dominican Republic), to variants of capacity markets (short term in the eastern United States and medium term in Guatemala and Panama) as well as long-term contract markets or the use of other hedging instruments (Wolak, 2004a; Oren, 2004) or purchase of very long-term contracts through periodic centralized auctions of the type recently adopted by the Brazilian government and described in Chapter 3.

Capacity Charges and Capacity Markets

If we accept that installed capacity can be considered a different product from the energy that it produces, then additional incentives for new plant construction could be channeled through prices by means of capacity payments (what Finon, 2004, calls the Pigouvian solution), or by defining quantity through capacity obligations that can be acquired in a market for the product (the Coasian solution according to that author). Table 7.1 summarizes some characteristics of models that use these modalities. Examples of the use of prices include the uplift charge of the old markets of England and Wales, and the Latin American variants which, following the Chilean example, consider a capacity payment equal to the cost of the efficient unit for supplying the peak. Some of these charges are granted simply for having capacity available and others for power generated. The capacity markets used in the eastern United States and Guatemala are examples of the quantity solution, although the modalities are different.

Capacity Charges

Oren (2004) examines the rationale for using capacity charges. It was first introduced in design of efficient electricity rates within the framework of a regulated monopoly developed by Boiteaux (1949). Boiteaux assumes two factors of production, power and capacity, and concludes that the optimal rate should be equal to the hourly marginal cost of generation plus a capacity charge in the peak period. In a balanced system, where the costs and sizes of generating plants exactly match demand, the shadow price at the peak would be equal to the cost of the marginal unit. Later, the author introduces the concept of uncertainty and defines the products as power and reliability thus justifying payment during all hours of the day, even to plants that are not in use but that contribute to reliability, as occurs in the

TABLE 7.1 Comparisons of Capacity Payment Methods

	Charge	Price Definition	Quantity	Incentives
Capacity Charge				
Chile	Payment by all loads withdrawing power	Cost of gas turbine	Maximum value of annual demand including reserves. Assigned among generators that bid according to their efficiency	Compensation for installed capacity irrespective of whether it is used at critical times. Does not offer incentives for controlling market power.
Argentina	Overcharge to power in peak hours. Transferred to consumers uniformly	Cost of gas turbine	Received by those that are dispatched	Distorts the power market. Generators offer below market prices in order to be dispatched. Does not offer incentives to control market power.
Colombia	Payment for all demand as an overcost	Cost of gas turbine	Projection of demand plus a margin. Assigned to generators dispatched in simulation of extreme hydrological situations with additional adjustments	Paid monthly; obligation to bid. Loses payment if dispatched and not available. No incentives to control market power. Dependant on highly disputed parameters.
Capacity Markets				
Guatemala	All consumers	Public bidding for contracts for one year. Market of capacity adjustments	Maximum demand projected. Received by the winners of the bidding process	Opportunities for exercising market power.
PJM	All the load	Result of monthly auctions. Price of marginal unit	All who participate in the market and whose bid is accepted	There is no sanction for nonavailability when needed. Prices are zero or infinite. Opportunities to exercise market power
LICAP (Locational installed capacity)	Load at each location	Price function defined a priori, maximum twice cost of GT. Price defined by available capacity	All whose bid is accepted. The bid does not fix the price	Despite correcting some problems, it does not impose sufficient sanctions nonavailability.

uplift concept used in England and Wales (Chao, 1983). In a deterministic context and with a system in equilibrium, it is possible to demonstrate that if a market compensates each generator according to the marginal costs at any time, then payments will not cover all the fixed costs of the system because there would be a shortfall equivalent to the fixed costs of the peak technology for each capacity unit (Oren, 2004).

Starting from the assumption that in a system in equilibrium the marginal cost of a unit of capacity would be equal to the cost of the established value of the power not used, it is argued that the payments needed to compensate all generators for all their costs could be any of the two values. Note that the capacity payment would be unnecessary if the generator were paid the cost of the unused power during the hours of failure, which in the specialized literature is known as VOLL (value of loss load). In this case it would have better properties because when a capacity charge is paid it is received irrespective of whether the plant delivers power or not, which could give rise to surplus installed capacity. Also, if compensation is made only during periods of failure, load has the incentive to participate in the market because, if there is no failure, the overage in costs does not have to be paid. However, rigorous determination of the VOLL is very complicated and there would be no certainty that the correct signals are being given. This could lead to an over or underestimation of the investment, and makes it susceptible to manipulation, as occurred in the old England and Wales system and led to its elimination. Oren (2004) argues that the utilization of reserves to satisfy sufficiency needs by paying for them at the marginal cost of power of the reserves is equivalent to a subsidy from security to sufficiency.

The solution of independently remunerating firm capacity services based on the cost of the peak unit (which was proposed initially in Chile) could at first appear to be a more suitable approximation than that used in the old England and Wales system. However, it shares the problems commonly identified in this type of solution. Although it is true that it contributes to make up for the capping to scarcity rents received by producers in a cost-based market, it is not intended to facilitate the entry of new competitors but to compensate those who are already established. There are differences between the incentives to prevent a plant from being withdrawn from the market and those for the construction of new units. Capacity is not a real problem because it has no intrinsic value, its demand is fixed administratively, it does not reflect a commitment to deliver power at a given place and price, and lacks strong incentives to make the generating

units available when required by the system. The divorce between capacity and energy creates incentives for opportunistic behavior by generators and can depress the price of energy leading to increased consumption and the installation of more plants than needed. When capacity remuneration is associated with dispatch, as in Argentina, it encourages generators to report costs below marginal cost in order to receive the capacity charge, producing a need to perpetuate these charges. In other places, like Peru, where generators cannot declare below marginal cost, the scheme has led to the installation of more equipment than needed. A common criticism of all schemes of this type is that they ignore the nature of the product required. Load does not demand capacity; rather it demands energy at specific times and places. Thus, the solution must be to serve the needs for energy. A hydraulic system is constrained by lack of energy during periods of drought even though it may have sufficient capacity to meet daily peaks.

The way the charges are assigned to the generators can yield undesired results in the configuration of generating capacity, as well as being highly controversial and causing disputes between generators over their allocation. To accommodate the concept to the situation of a predominantly hydraulic system affected by pseudo-cycles of drought caused by the El Niño phenomenon, Colombia designed a complicated administrative method to simulate the operation of the system under critical hydrological conditions to remunerate the generators that were dispatching in the dry months. As indicated earlier, the method was not immune from manipulation and controversy regarding the nature of the parameters that had to be used because small deviations produced large wealth transfers between thermal and hydraulic generators. Also, payments to the generators and the absence of sanctions for noncompliance did not guarantee that these were available at the times required.

To apply the concept, it is first necessary to define the capacity to be remunerated and then find a way to prioritize its allocation among existing generators. Proponents of the Chilean system suggest remunerating a capacity equal to the maximum annual demand required and defining the firm capacity needed for a specific reliability for each plant independently. As will be seen later in the discussion on capacity markets, this determination is arbitrary and does not represent the probability that a specific capacity will be available when called for dispatch. The estimate of total demand for remuneration also represents an arbitrary decision with an implicit VOLL value. When total firm capacities is higher than maximum

demand they propose allocating the latter to the most efficient plants, and alternatively suggest that it could be pro-rated to individual capacities. An allocation in accord with the first method clearly leads to a distortion of generating capacity. This was the case in Colombia, as mentioned earlier where a thermal generator with gas turbines decided to add a steam cycle during a period of excess capacity and power in order to qualify for the capacity charge. The capacity charge under the system in Chile also covers reserve needs and there is no independent remuneration for ancillary services. This is an important defect that discriminates against hydraulic plants (see Pollitt, 2004).

It is often held that capacity charges are necessary to permit short-term markets with low price caps. However, this ignores the fact that other instruments exist to achieve this objective, as will be shown later. The argument is also made that over-installation does not matter because there is asymmetry between the cost of over- or under-equipping. This argument ignores the fact that the problems have occurred not because of lack of capacity but because of lack of power.

Capacity Markets

In the system adopted in the markets of the eastern United States, wholesale buyers, marketers or large loads must maintain contracts for sufficient capacity to satisfy their needs (known as ICAP or installed capacity), and acquire it in a market established for that purpose. The way in which the obligation is determined as well as its period of effectiveness vary across markets and have evolved over time. Proponents argue that in a system in which the capacity demand curve is vertical and the supply curve horizontal, it is better to wield control through quantity rather than by price. This leads to suggestions for establishing obligations for contracting.

The markets that adopted this system, including PJM, the largest in the eastern United States, have experienced major problems implementing it (see Ort, 2005). Installed capacity is something that cannot be significantly varied except in the long term through investments. However, existing markets were conceived to operate in the very short term. In the short term, prices in a capacity market are zero or infinite depending on availability, which produces violent price fluctuations and creates opportunities to exercise market power (Creti and Fabra, 2004; Cramton and Stoft, 2005). Also, as in the case of capacity charges, they are established in

an arbitrary manner, making mistakes very easy. Determining the quantity that will be contracted is based on engineering reliability criteria that have little to do with users' willingness to pay and market conditions. A very high VOLL value can lead to excess remuneration of capacity and depress spot market prices. There is also the problem of determining the reliable capacity to be remunerated to each generator. Most of the systems in the United States and Latin America use a criterion that does not measure the effective availability of the plant, but instead measures its availability relative to expectations. A plant that is never dispatched could have a very high remunerable capacity compared with one that does dispatch. This is in no way indicative of the probability that the former is available when called on to dispatch. As in the case of capacity charges, the wrong product is remunerated, and generators that receive the charge are under no obligation to bid or have power available at any given time.

Capacity markets have been changing in response to criticism. For example, among other changes, the contracting term has been extended from daily to seasonal. A proposal in California recommends changing the product for one that better reflects the concept of reliability, known as ACAP (available capacity), which would have varied durations and would be offered on the day-ahead markets, either by generation or load management. Despite attempts to improve the product, critics do not consider it an effective solution in the context of the market (Wolak, 2004a; Oren, 2004).

Despite the problems presented by this type of solution, some authors recognize that, while insufficient progress is being made in remedying the fundamental failures of the existing markets[5], it would be desirable to temporarily adopt a capacity obligation[6] that is consistent with a criterion of reliability in order to guarantee income to generators provided they meet certain characteristics (Joskow, 2005). In the author's opinion, this obligation should: (i) be consistent with the continuous evolution of the spot market and with the participation of demand in the market; (ii) the price paid for the capacity (peak unit rent) must be low when actual capacity is greater than a desirable threshold, *K*, and must be high when capacity is significantly less than *K*, being equal on average to the cost of peak capacity;

[5] Existing markets prevent the appropriation of legitimate scarcity rents to recover unit costs and adopt adequate risk coverage.

[6] The capacity obligation would work as a safety valve and not become a permanent mechanism.

(iii) capacity payments must be net of the scarcity rents of peak units; and (iv) demand must observe a payment consistent with the VOLL underlying the reserve margin and with the assumptions of the cost of the peak unit.

In 2005, the U.S. federal regulator, the Federal Energy Regulatory Commission (FERC), approved a new proposal from the New England market administrator that is known locational installed capacity (LICAP), which uses an administrative procedure in response to the criticisms of capacity markets (see Cramton and Stoft, 2005). The authors argue that their proposal contributes to solving the problems mentioned in existing capacity markets and satisfies some of the conditions suggested by Joskow (2005): (i) it only remunerates the capacity that contributes to the reliability demonstrated by performance during times when there is an operating reserves deficiency; (ii) responds to market conditions, growing when and where capacity is scarce and decreasing to zero when it is abundant; (iii) prevents market power in the capacity market from paying the price related to real capacity instead of offered capacity, so that generators cannot increase prices by withdrawing supply; and (iv) controls appropriation of rents at peak hours (short-term gains from power and from reserve of a reference unit are subtracted from the capacity payment), thus suppressing market power in the spot market.

In short, the Cramton and Stoft (2005) proposal is equivalent to a charge that restores to generators the expected value of the scarcity rents they would have if the market operated effectively through administrative procedures that try to simulate the conditions in which they would receive them, but which moderate and minimize incentives to exercise market power. The proposal establishes procedures to guarantee that the generators that receive the payment are effectively available at the times and periods when the market requires them, to select the generators, to estimate the size of the scarcity rent captured by the generators which receive the payment, and to moderate payments through a demand function. As always, the problem is in the details, as we see below.

Some critics (Oren, 2005) note that, although the LICAP is a step forward compared to existing designs, it does not solve all the problems common to this type of obligation because the asymmetry between the obligations of the capacity provider and the consumer remains. In fact, if the generator is not available when it is dispatched it only loses the payment for that period and does not stop receiving payments at times when it was available but its participation was not dispatched, which Oren compares

with the situation when a car is stolen from a parking lot and all the owner receives as compensation is a refund for the cost of parking the car. Similarly, its application requires complicated estimates of availability in order to define payment, which was paradoxically criticized in the initial designs.

These authors explain that, although the proposed mechanism provides an incentive for investment by compensating for the impossibility of capturing scarcity rents in the power market, there is no certainty that it is a least-cost alternative for achieving the objectives and it is not clear which product is purchased. Also, although it provides incentives for established generators, it does not directly tackle the problem of new investments.

Oren (2005) believes that the demand function determined by LICAP has a similar shape to that which would result from a system of risk coverage based on financial options. The objective of this shape is to permit the system operator to contract additional capacity (over and above what is needed to cover uncertainty) at lower prices. But, unlike an option, these prices do not reflect an intrinsic value because the product sold represents an option that is always exercised. This is so because the power produced will be offered at the spot market price and, therefore, does not represent an opportunity cost for the seller. Similarly, unlike the case of the option, in which its value can be realized by selling the option and selling power at prices equal to or lower than the strike price (or simply selling power at the market price, whatever it might be), the value of LICAP can only be realized by selling obligations to the system operator. The system operator is required to buy all the capacity offered and transfer its cost to demand. In the case of the option, the system operator can impose obligations to meet the requirements of reliability and any excess capacity; although this affects the opportunity cost of the option and its price, it realizes its value through the spot market because it is not subject to the strike price limit.

In response to these criticisms, Cramton and Stoft (2005) note that although there are other proposals to supplement the spot market price signal, some of which are detailed later, no pure market solution will exist until demand can participate significantly in the market and consumers can buy the level of reliability that suits them best. Any other proposal would require the use of administrative measures of one sort or another. Capacity markets require an estimate of the level of reliability, while long-term contracts require a definition of the requirements for contracting and fines for noncompliance. In contrast, solutions that involve demand do not produce incentives for a reliable level of investment but provide reliability for

a series of investments and induce a level of minimum cost investments. In this case reliability is the result of a response of the load in real time, unlike the case of the use of operating reserves in which the level of reliability is obtained through an administrative process and not the market. Both authors recognize that other alternatives of the type discussed in the next section, which use options, are attractive but would be difficult to put into practice in a market like New England's, which consists of various states with very different conditions. In particular, Cramton admits that the type of solution proposed was determined by the constraints imposed in the consultants' terms of reference.

In some countries of Latin America, such as Guatemala and Panama, the wholesale markets adopted other capacity obligation modalities and the possibility of establishing a secondary market, which differs from the modalities adopted in the eastern United States. In Guatemala, the entire load, including large consumers and marketers that sell to unregulated customers, must have capacity contracts at least for one year in advance. Anyone not entering into a contract will have to bear spot market costs and will be at the head of the line in case of interruptions (although this threat seems difficult to enforce for scattered customers of a marketer given the current development of the network). There is a market for capacity differences in which both load and generators can adjust their positions. This modality is not exempt from some of the problems described, but at least it produces a longer term signal and has created incentives for new investments. In Panama, there is a requirement to enter into a longer term contract (six years) for capacity or capacity and associated power, which is more like the obligations of the long-term contracts discussed later.

Despite all the problems that capacity markets have, their critics are willing to accept them as a temporary alternative solution of last resort with some conditions. Oren (2004) suggests that if some type of compensation is necessary to supply the signals for investment in generation, it is preferable to establish capacity requirements accompanied by a secondary market than to have capacity charges.

Proposals Based on Risk Management

The Californian crisis yielded numerous lessons that have led to a consensus on some of the conditions required for a competitive electricity market

that is effective in practice. The most important conditions are that the market should have abundant generating supply, use long-term contracts to purchase most of its power, and adopt strict measures to mitigate market power in the short-term market. Following this line of thought, in 2003 the U.S. Federal Energy Regulatory Commission proposed what it called the standard market design (SMD), which includes specific proposals to guarantee abundant generation but gives each system operator freedom to design its own markets for installed or available capacity (ICAP or ACAP), recognizes the importance of long-term contracts, and proposes procedures for automatic mitigation of market power (AMP). This proposal has received numerous criticisms, particularly regarding the measures proposed to guarantee sufficiency and control market power for the reasons stated earlier. The critics propose alternative solutions that simultaneously tackle the problems of sufficiency and market power and volatility through the use of long-term contracts and other hedging instruments that cover the risks implicit in short-term markets, which if applied would make measures such as capacity charges or capacity markets unnecessary.

As already mentioned the incentives to reduce market power decrease significantly as the generator commits an important part of its production in long-term contracts by transferring transactions to the long-term market, which is supposedly more elastic. The risk coverage that permits these contracts facilitates the entry of new generators, and/or increases installed capacity, and reduces volatility, thus resolving three problems with a single instrument. Oren (2004) argues that if the problem is seen as finding adequate hedging for risk and there is a market that pays for operating reserve in real time, capacity charges are not necessary. Ideally, the concept of sufficiency as a private good means that each consumer looks for the coverage that suits his capacity to support the risks, but accepts that in the absence of the conditions to make this possible, it is desirable for the system operator to organize auctions to offer this service to the marketers and participants who demand it.

According to Wolak (2004a), the problem becomes how to create incentives for the load so that the quantity of energy contracted is sufficient to meet supply at all times. This can mean requiring marketers to maintain a minimum coverage for their estimated load. The obligation could be covered by different types of coverage, for example, by swaps that guarantee a single price or caps that guarantee delivery below a given price and in return require a premium payment, options or others. The combination of

instruments would depend on the nature of the market and the development of financial markets.

In principle, there are two ways to create incentives for generators to enter into forward contracts: higher prices than average or rebates on the spot market price. The problem is that these alternatives favor established generators without addressing the needs of new generators. The challenge, therefore, is how to develop a contract market that produces incentives for entry of new generators. It is also necessary for marketers to have incentives to contract. To a large extent this depends on the design of price transfers to regulated consumers, but in general it requires stronger incentives such as an obligation to contract.

Wolak (2004a), and von der Ferh and Wolak (2002) propose that the regulator hold periodic auctions of standardized products such as base capacity (1 Mw/h—24 hours all week) or peak capacity (1 Mw/h—16 hours six days a week), delivered to specific network nodes to meet obligations. These auctions should be held well in advance of the delivery to permit new generators to participate. They also require legal instruments that commit the generator. One way of ensuring the seriousness of the bids would be for the contracts to be initially financial, becoming physical as the earliest delivery date approaches. In these cases bidders bid for the right to supply power. According to these authors, the procedure permits generators to finance new projects while the prices obtained in the auctions are used as reference for setting rates to consumer in the regulated segment.

So that this solution does not produce a simple transfer of the problem of market power from the short term to the long term, it is necessary to organize an adequate procedure for acquisitions. This procedure could be similar to the auctions used for suppliers to customers who decide not to make use of the option to choose their marketer in some U.S. states. This implies adoption of standard rules, constraints on the actions of bidders, and the elimination of obstacles to participation in the auctions. In their work for the Brazilian Ministry of Mines and Energy, von der Fehr and Wolak (2002) suggest a phased system in which obligations to contract would begin around 100 percent in the first year of delivery and decrease each year for a period of *n* years. Purchases would begin in centralized auctions in which multiple sellers and bidders participate. For this to be feasible the system must also include a secondary market that permits buyers and generators to adjust their positions, and offers guarantees to marketers that contract for regulated consumers that opportunist behavior by the latter

(entering and leaving the market at will) will be prevented. Preventing opportunistic behavior by consumers could be achieved with measures such as fines or minimum periods of permanence in the market but, in any event, the cost is the degree of competition that is possible in the retail market. However, given the apparent consensus among most experts (Hunt, 2005; Newberry, 2005; Wilson, 2005) on the scant potential that the benefits of retail competition will exceed costs, with the exception of large consumers, these constraints on the retail market do not seem to be very important.

The advantages of using the energy options as hedging instruments are described in Oren (2004 and 2005) and in Chao and Wilson (2004). Chao and Wilson conduct a detailed analysis of what is needed to achieve the three objectives (control of market power, investment incentives, and volatility) that would result from the adoption by demand (large customers or marketers) of a portfolio of options covering a wide range of *strike prices*. The spectrum of strike prices places a cap on the spot market price, which depends on demand, and for each price the residual demand of the lowest price options is more elastic than aggregate demand. This maximizes welfare if each company maintains a significant portion of its load covered by options. Market simulation exercises with the STEM model (which was developed for that purpose, see Entriken, 2005) show a significant reduction in incentives for exercising market power by generators when this type of design is adopted.

Like Wolak (2004a), Chao and Wilson suggest that each contract should have physical backing to protect against opportunistic behavior and weak judicial systems. They also suggest that the seller should be required to bid in the spot market at lower prices than the strike price of the option. In addition, they propose holding an annual auction for a quantity of long-term obligations within the range of strike prices. However, unlike the proposals that would require marketers to maintain long-term contracts for a significant proportion of their load, Chao, Oren and Wilson (2005) propose measures that make long-term contracts more desirable for the distributors that serve as marketers of last resort. Recognizing that the great majority of customers prefer stable payments because they are not able to manage their risk and there are no financial instruments in the market for this, the authors assert that distributors are in a better condition to provide this service than pure marketers, provided that the regulator guarantees them the reimbursements and financial costs implied by a stable consumer rate. This would, in turn, guarantee the possibility of obtaining

funds in the financial market at lower costs than their own capital. However, it is difficult to ensure that distributors will contract efficiently in the market because it would be more convenient for them to simply transfer the costs of the spot market. If they contract long term they run the risk of quantity, because consumers could move to other marketers in periods of low prices, as well as price risk. The authors suggest that this can be remedied by establishing charges on customers when they change provider in order to compensate for the risk of quantity, and by a system of regulation based on performance that permits them to share in the gains from contracting below the spot market.

Finally, in a response article, Finon (2004) of the Centre International de Recherche sur l'Environnement et le Développement (CIRED) in Paris, agrees with long-term contracts, but insists that the problem is how to make them sufficiently long without having a captive market, because this would require integration between generation and marketing. According to the author, in less mature markets priority should be given to the need for expansion. If competitive models are adopted, these should include long-term contracting. The author argues that given that the single buyer model requires special conditions and the vertically integrated monopoly lacks efficiency incentives, it is necessary to continue to implement hybrid solutions that attempt to coordinate investments in the long term and reduce the risk to the investor by giving him an outlet for the products; in other words, a solution of the type adopted by the Lula administration in Brazil.

Practical Problems in Adapting Markets in Latin America and the Caribbean

As indicated in Chapter 2, many Latin American and Caribbean countries are now reviewing their initial market designs to make adjustments that will allow them to better achieve the three attributes: control of market power, lower price volatility, and greater investment incentives. Chapters 4 and 5 describe in detail the difficulties experienced by Colombia and El Salvador in making these adjustments because of the importance of the initial conditions and the rigidities that they introduce. It is not possible to modify the initial design without incurring in stranded costs and having to compensate those who feel that their interests are harmed by changing the

rules of the game. The specific characteristics of each market also limit the design options available. It has been often mentioned that the viability of any market design depends on the existence of the supporting institutions that are needed for market to operate.

With these considerations in mind, Wolak (2004a) recommended not to implement markets based on price bids without first trying some adjustments to existing markets based on cost declarations. Those adjustments would include, for example, no longer using very low rationing costs in the models that determine the cost of stored water.[7] Wolak also recommended the inclusion in mechanisms that reflect the cost of the service to the consumer (particularly in hydraulic systems with their seasonal variations) and the need to design a transmission network based on economic criteria.[8] Naturally, the author recommended using much more aggressive long-term contracts as instruments to reduce incentives to exercise market power and to guarantee adequate investment signals compatible with the discussion in this chapter. However, to implement this type of adjustment it is necessary to verify compliance with the conditions that make them viable, such as those described below.

Although there have been few problems in the region with power exchange settlements, when these took place the consequences have been very serious.[9] Although the existence of mechanisms to guarantee the performance of contracts is indispensable for all types of markets, it is more critical in some than others. Very long-term contracts are rare even in the markets of developed countries with their good legal tradition. In general, the existence of transaction costs imposed by the fact that all contracts are incomplete and that it is impossible to cover all risks means that their duration rarely exceeds ten years, and when it does it is through complicated and inflexible PPA arrangements (Chao, Oren and Wilson, 2005). Chao, Oren and Wilson (2005) state that the systemic risks that affect the electricity sector inevitably imply that the results of contracts *ex post facto* may

[7] Using very low rationing costs in the models that determined the cost of stored water implied an appetite for risk that was not compatible with the political implications of rationing.
[8] That is, one that takes into account the opportunities for exercising local market power instead of engineering considerations.
[9] For example, such as the problem mentioned earlier of the resistance of FURNAS (the state-owned generating company in Brazil) to pay higher spot market prices to cover the unavailability of its nuclear power plant, which led to a delay of almost two years in the settlement of transactions in the wholesale energy market.

seem unfavorable compared with transactions in the spot market. Thus, greater participation of long-term contracts depends on the design of innovative contracts with options to mitigate such risks.

These difficulties increase if contracts can only be performed after new plants have been built to supply growing demand, or when the seller lacks the necessary financial backing in countries with weak institutions in which the rule of law is not well established. This is the reason that von der Fehr and Wolak (2002) suggest to initially institute financial contracts that become physical contracts as delivery time nears, together with the measures adopted in the new Brazilian model to contract new generation from among all regulated distributors in proportion to their load. Although the problem will become less severe as the legal system strengthens, supplementary mechanisms are still needed to protect against this risk.

Another concern about using options as a hedging instrument in a cost-based market is that the price caps implicit in them make it difficult to establish the cost of the option. In these cases it would be necessary to establish special requirements on the type of contract portfolio that each marketer should have in order to include some that protect against these eventualities and recover the cost from peak units, or supplement the system with a reserve market operated by the system operator.

In some markets of the region, such as Guatemala, demand is required to contract capacity for at least one year. In Panama the periods are longer but they can contract by capacity only or by capacity and associated power. Some argue that the advantage of contracting by capacity is that it avoids the problem of comparing different sources of power whose variable prices are difficult to predict, in particular fossil fuels. However, as previously noted, the product that interests the load is not capacity but power delivered at a specific time and place. But for energy only contracts to be feasible the question remains if generators will be capable of assuming the risk coverage of fuel prices for very long contracting periods required by the needs of project finance.

The generators complain that it is not possible to obtain coverage for fuel risk for times compatible with market needs. As a result, they prefer the risk to be assumed by consumers through phasing provisions. The conventional response is that the risk must be assigned to the party that is best able to bear it, and clearly in this case it would be the generators. Also, when analysts talk about long-term contracts they mean a maximum horizon of four or five years, a period that seems insufficient for financing

projects that are not backed by investors' balance sheets. Until now investors that use this type of financing risk a relatively small amount of their own capital (25 percent of the cost of capacity investment), which in the case of gas turbines also represents a small proportion of the total cost of the electricity, and the lenders ask for a minimum commitment in long-term contracts of an amount that covers the operation and debt service. If the contracts are for energy, lenders also try to include the cost of hedging the fuel risk.

There are a range of variables for adjusting the financing equation that do not necessarily require the extension of contracts, which in any event include uncertainty as demonstrated in the past in the case of the PPAs that have had to be adjusted for macroeconomic reasons in various countries. As mentioned before, the requirements of lenders decrease as investors assume greater risk, whether with the backing of their balance sheets or by increasing the contribution from their own capital, clearly needed for hydroelectric projects in which most costs are investment. When both the regulatory and market risks are low, lenders can be willing to reduce their term requirements. The adjustments to the equation probably imply higher costs but they have to be compared with the alternative costs of coverage for the fuel prices obtained in the market.

Some countries are discussing pass-through of the energy component irrespective of its origin, with reference to the trend of a specially-developed fuel index. This would transfer a very important part of the risk to the consumer and create the danger of distorting the selection of projects if the index is not properly selected, particularly when there is a large hydraulic or renewable component. Paradoxically, under these conditions uncertainty in fuel prices is a very important consideration in the preparation of capacity bids for hydraulic generation and/or renewable sources other than thermal generation. Naturally the importance of these distortions depends on the share of each source in the inventory of possible future alternatives.

The importance of independent institutions for market oversight has been emphasized on several occasions (Wolak, 2004b; Arizu, 2003). However, adequate design of market oversight mechanisms is not easy. In a market where some generators have strong incentives to exercise market power, they will do so at the first possible opportunity and there will always be doubt, regardless of the degree of sophistication of the model used to demonstrate it. It has been mentioned that this process is always contentious and should be avoided as far as possible by eliminating opportunities

for exercising it. Assuming that everything has been done to achieve this, there remains the problem of what procedure should be used given the institutional and technical capacities of each country. In general, as previously noted, even when the technical capacity exists, there will always be doubt about the objectivity of monitoring, so it would be desirable for the process to be supervised by highly prestigious international experts. Next comes the decision on how much to spend and whether or not adequate models are being used. The state of knowledge is in continuous flux and every day there are new advances so there is the danger that countries could make very large investments in computer programs that rapidly become obsolete or spend more than necessary given the characteristics of their problem. Another risk is that too much is invested in data processing when the final objective, which is to make the information transparent and available to all interested and affected parties so as to produce internal control, is not achieved or the interested parties are not able to use the information obtained.

Lessons

- Competition is not guaranteed simply by guaranteeing property rights and taking the government out of the market. Given the specificity of markets, to be productive, competitors have to devote all their efforts to competing for profits at the margin through improvements in productivity or technology and not spend time trying to obtain rents or get around the system to exploit its possible errors. This means that markets have to be carefully designed so that competitors have the correct incentives; otherwise resources would be spent on oversight and sanctions with debatable results.

- The adoption of a particular solution in most markets is dominated by the initial conditions and by the challenges that have to be addressed. However, because of inertia, these solutions tend to be perpetuated even when the context changes and be repeated in other contexts that do not necessarily have the same constraints.

- The problem of a defective market is that any attempt at correction will meet strong opposition from the organizations that benefited

from the incentives system proposed by this design. It will not be easy to convince them without providing some type of trade-off. They will always argue that the rules of the game are being changed and that this will make the future participation of the private sector even more difficult. The point here is how to make changes that do not give this impression and that attract new participants without having to pay excessive rents to the beneficiaries of a defective original design. The problem is worse if existing institutional endowments represent an experience that is not favorable to change.

- In a competitive electricity market with an adequate structure in a country that also possesses developed financial instruments, payments for energy-only would be sufficient to create incentives for investment in socially desirable new capacity. Consumers and producers would have the opportunity to select the risk hedging instruments that would provide the stability required by the investor. However, given the technical and political constraints in the markets, it would be naive to think that the Promised Land can be reached without passing through the desert of regulatory interventions.

- Capacity charges supplementing the spot price contribute to facilitating investment but at the cost of other undesirable effects that do not guarantee that they are the best solution to the problems. Capacity markets have similar problems.

- Hedging instruments also give signals to investors and limit market power but are not immune from administrative interventions. The proposal to establish hedging obligations with decreasing proportions over time, and/or simultaneous auctions for long-term power with financial contracts that become physical as delivery approaches, accompanied by a market for reserves and ancillary services (Wolak, 2004a), although not proven in our environment, could be a good option provided their design is consistent with existing constraints on contracting and include a well-conceived transition process.

- The proposal of Chao and Wilson (2004) for a portfolio of options, with a range of strike prices with different terms but with physical obligations is theoretically interesting, although it requires more

development of the operating part for it to be effective. It could be considered in a more advanced phase of market development.

- The challenges present in the region, particularly those that stem from institutional weaknesses, require pragmatic solutions and attracting investment as a priority. The problem of the minimum terms that would make financing possible reflect a failure in the financing models of the projects adopted and a lack of credibility in incipient markets. In short, the problem is how to assign the risks to those who are in the best conditions to assume them, taking into account that all hedging has a cost, and to continue working to strengthen institutions in order to reduce the protection cost in the future.

- The new design of the Brazilian market reduces the risk to new investors at the cost of loss of flexibility. It is intensive in administrative management and susceptible to collapse by failures in the implementation of critical aspects of the model. However it should be seen in the context of the political viability of the alternatives available at the time of its adoption and as an exercise subject to further adjustments as circumstances permit.

- Oversight of the market by independent monitors and the noncompulsory views of experts on regulatory measures can help to give more credibility to the regulatory process and reduce risks for investors. Cost-based markets are less demanding in institutional terms, at least in their initial stages, but they are not exempt from manipulation.

- Whatever the regulatory intervention adopted to guarantee investment without impairing the efficiency of supply, it is crucial to offer market participants a coherent view of the principles that will govern its future development. This would include a work program that exposes consumers to price signals, guarantees free access to markets to those who are able to participate, and guarantees adequate regulation that provides risk coverage for consumers who are not able to provide it for themselves. It also requires working to eliminate constraints on long-term contracting and avoid decisions that close opportunities for progress in the future, once some of the present constraints have been eliminated.

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The Political Economy of Payment for Services

The inability of governments to set electricity rates that cover the cost of the service and provide incentives for distribution companies to take effective measures to control electricity losses was a major reason behind the decline in the reputation of the statist model of electricity service and contributed to the reform efforts of the 1990s. For this reason, despite the successes of many private companies in controlling electricity losses and improving arrears, their obvious failures in some countries, together with the inability to control opportunistic behavior by governments in setting electricity rates, are cause of concern for reformers. To some extent and in ways that are not always transparent and equitable, governments have prevented the transfer of all service costs to consumers, and experience has shown that purely technical solutions are not sufficient to control electricity theft even when companies have incentives to do so. Some consumers take exception to having to pay for a service that is widely considered to be an entitlement that should be provided by the government free of charge.

At the root of the problem are the incentives for opportunistic behavior by governments, users and even the private companies, which is exacerbated by institutional deficiencies. Governments engage in opportunistic behavior when they do not keep their promise to set rates that will cover service costs. Thus, as rates decline relative to costs governments are de facto expropriating the private company. This type of behavior is generally due to the difficulty of maintaining time consistency, as well as to changes in regulations, or control of the regulatory body or of the electricity company (Rufin, 2004). Consumers and private companies can also behave opportunistically. For economic, cultural and historical reasons and because of the lack (or irrelevance) of a legal framework with effective sanctions for irregular behavior, users are often able to receive electricity

fraudulently and/or refuse to pay their bills. The prevalence of this type of behavior implies that it cannot be attributed just to inability to pay or bad management on the part of the company. In turn, this behavior can be exacerbated by the opportunistic behavior of companies that try to maximize their income by exploiting the weaknesses of the regulator. Although it can often be argued that electricity rates were initially more than satisfactory when the public distributors were sold to private companies; that information asymmetries and the technical weakness of the regulator has occasionally resulted in rates that are higher than cost; that buyers should know very well what they are buying before making their bids; and that very often the lack of success in controlling losses can be attributed to a mistaken strategy of the company, the direction of the causality is not always clear. It could be said that opportunistic behaviors feed on each other.

When government and consumer opportunism prevail, which is not always easy to establish, the remuneration for the private company is less than that legitimately expected at the time of making the investments and state-owned companies increase their dependence on the public purse to cover operating and/or expansion costs. The finances of the companies also suffer when the government or state-owned companies do not pay their bills, when the government delays making agreed-upon payments to finance the subsidy to low-income consumers, and when mechanisms to establish cross subsidies deteriorate.

Opportunistic Behavior by the Government

Electricity rates in Latin America and the Caribbean vary substantially between and even within countries, reflecting the relative cost of producing and distributing power. A comparison of national averages published regularly by OLADE can indicate the order of magnitude, but cannot be interpreted adequately without a good idea of the many factors that affect the estimated average for each country. The data for any year have a large variance that can be due to legitimate differences in the cost of providing the service, price manipulations by governments and/or short-term hikes in fuel prices.[1] For example, in 2002 electricity rates ranged between US$0.04

[1] Caution is advised regarding the formulations based on these data in recent publications such as Foster and Yepes (2005).

in Argentina and US$0.16 in Jamaica. The average was around US$0.09 and the median US$0.08. The low prices in Argentina reflect not only the country's access to relatively cheap energy resources, but also to the fact the government froze rates to deal with the economic crisis at the start of 2002. Rates in the Dominican Republic should not differ much from those in Jamaica except that there is a general fuel subsidy in that country. In turn, average prices in Guatemala conceal large differences between types of consumers and range from US$0.06 to US$0.24.

The differences between the cost of the service and the value received are sometimes absorbed by the government through transparent appropriations to satisfy the needs of the poorest sectors, or through cross subsidies between rich and poor consumers, so that company finances are not impaired. However, at other times the private company is flagrantly expropriated. Alternatively, the government might subsidize consumers regardless of whether or not they are poor, financing the subsidies by making the public power company bear the cost or from budget transfers. In both of these cases, which were common before the reform, the Treasury bears the impact.

Argentina provides a classic example of opportunistic behavior by governments. The successful development of the electric power industry was interrupted by the economic crisis, which led the government to freeze rates and enter into negotiations with each company individually. There was little transparency in these negotiations. In addition, the government withheld legitimate payments to the companies and required them to make investments with the earnings that were thus withheld. It would have been naïve to think that after a devaluation of this magnitude the government would adjust electricity rates to make investors whole. But the government did not give any indication that it even intended to reimburse companies for the cost of future investments needed to expand the service. On the contrary, it presented public services legislation to Congress that was clearly incompatible with the private provision model (Urbiztondo, 2006).

A similar problem occurred in Nicaragua as a result of the regulator's reluctance to keep commitments regarding rate schedules. The regulator did not transfer fuel price hikes to consumer electricity rates and, as a result, the distributor defaulted on payments to generators. This, in turn, led to power cuts similar to those experienced in the Dominican Republic (Murillo, 2004). The government argues that the distributor had not met expectations with respect to coverage of the service and investments

to control losses and improve quality.[2] However, its proposal for increasing rates paid by high-income consumers met with political opposition and was initially rejected by the Legislative Assembly. In a climate of open confrontation, which threatened the stability of the government, the Assembly made changes to the legislation, tacking on populist amendments that jeopardized the survival of the model.

Perhaps the most well-known case is that of the Dominican Republic, where the government tried to cushion consumers from high fuel prices through a poorly conceived subsidy plan for which no budgetary appropriations were made. In addition, it also neglected to make the agreed-upon budgetary transfers to generators who refused to post a financial loss. This caused an electricity crisis of singular proportions (Rufin, 2004). In this example, there was a combination of opportunistic behavior by the government, private companies and consumers combined with weak institutions, all of which led to the withdrawal of private distribution companies that served two thirds of the market.

Pressures to maintain prices low coupled with the political power of the middle classes have created difficulties for countries whose policies include the provision of subsidies only for the poor. Colombia is a case in point (Ayala and Millán, 2003). Cost coverage and the rationalization of the existing cross subsidy system,[3] including a timetable for the transition, were required by legislation (Law 142 of 1994); however, they were repeatedly postponed by legislative action.[4] Nevertheless, particularly rainy years and the slump in demand caused by the economic recession of 1999, have kept power prices relatively low. The Colombian case is complex because the regulator has shown a predilection for preventing increases in rates for private companies in circumstances under which the government would be willing to administer them to maintain investor confidence.

In some countries that have adopted the market model and promoted private participation in the electric power industry the government

[2] These accusations cannot be rejected out of hand because, as in other countries, private companies underestimated the size of the investments required. In addition, they faced strong incentives for ensuring short-term profitability to meet shareholder expectations.

[3] The industrial and retail sectors and high-income consumers subsidize low-income consumers, who are classified as such by means of a system that ascertains the characteristics of the residence.

[4] Real electricity rates for the poorest consumers were recently frozen for a period of three years.

has nonetheless retained ownership of a significant share of generation and has used this to reduce rates for everyone or for a specific population group. In Guatemala, the Electricity Law did not initially include explicit subsidies for poor consumers, but increases in fuel prices placed pressure on Congress to pass the so-called Social Law, which granted a subsidy of approximately 50 percent of the electricity rate to residential consumers whose usage was below 300 kWh per month. This usage rate implies that 95 percent of consumers are eligible for the reduced rate. The government covers these costs by selling power from its hydroelectric plants at below market costs (Rufin, 2004). In Honduras, the power generated by the state-owned El Cajón hydroelectric plant is sold at a rate that is significantly below market prices. This helps keep the lid on prices but, unlike Guatemala, it is not targeted at a specific group of consumers. In El Salvador, the state company that controls hydroelectric generation has been accused of not operating according to market rules (although, as discussed in Chapter 5, this is not always done to lower prices). In Honduras, Guatemala, El Salvador and the Dominican Republic, the state-owned transmission network is reimbursed below cost in order to reduce electricity rates. In Colombia, Empresas Públicas de Medellín (EPM) seems to show some preference for sales of generation to its own market. Government interest in maintaining state generating companies has been interpreted by many as a way of keeping the lid on potential increases in wholesale prices.

The new model of the Brazilian electricity sector (which is promoted by the Workers' Party) is based on the segmentation of the market in which almost all existing state-owned hydroelectricity capacity is resold in separate auctions (apart from new investments) in order to obtain a lower average price for regulated consumers. Difficulties in adjusting the new distribution rates and the restrictions on the regulatory bodies denote even greater government intervention.

In countries where the government control of the sector persists, electricity rate policies typical of the statist model remain in effect. For example, following a long-standing tradition, consumer rates in Venezuela's Compañía Anónima de Administración y Fomento Eléctrico (CADAFE), the largest electricity distributor in the country, represent less than 40 percent of the cost of the service; only 50 percent of the power sent to the network is billed and only 30 percent of power billed is collected. Despite progress, Mexico must make up a large deficit resulting from rate policies with direct

transfers from the national budget.[5] In Paraguay, electricity rates have been frozen for the last three years. In Costa Rica, which has a long tradition of efficiency, electricity rates that do not reflect the incremental cost of the service have jeopardized expansion of the system. Finally, the Ecuadorian government recently decreed a unilateral rate rebate without making the corresponding appropriations.

Power Theft and Payment Arrears

Not all electricity losses are due to lack of investment in the network. When levels of losses exceed a certain reasonable threshold, the excess is certain to consist of fraud and failures in the billing system. The rapid progress made by certain private companies in reducing losses (see Chapter 2) can only be explained by the significant reductions in non-billed power either due to commercial defects or theft. However, the performance of private companies has not been uniform in this field.

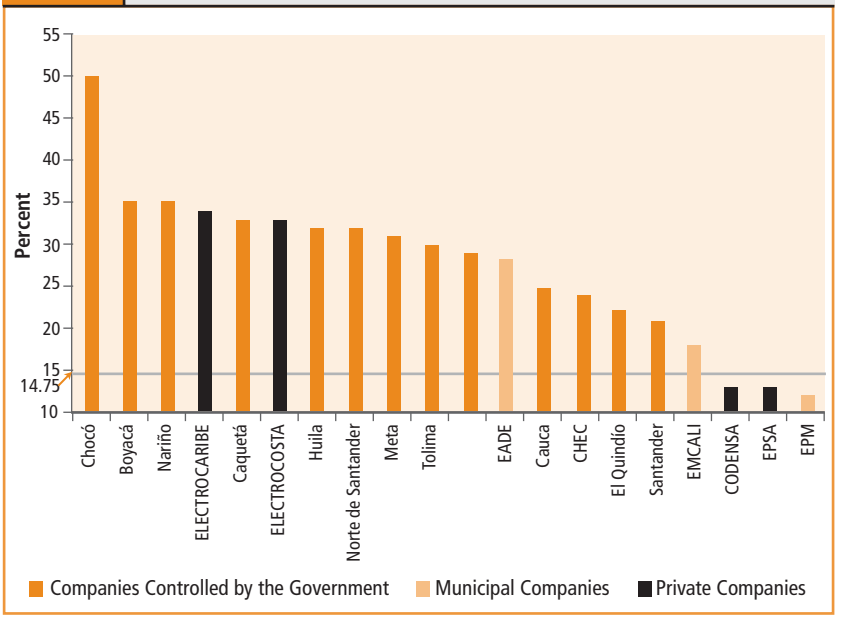
Prior to the reform, electricity losses in Colombia averaged 27 percent. These losses declined in several companies following the reform, but it did not decline in all of them. Regional distributors remaining under government control (with the exception of the EPM) continued to post losses as before, while not all privatized companies were able to attain the same level of efficiency (see Figure 8.1).

Although some private companies in Colombia have managed to reduce losses, others have found it particularly difficult to do so even when the companies in both categories belong to the same group (Unión Fenosa).[6] It should be noted that, although theft is not limited to a particular class or category of customers, the region has a long-standing culture of nonpayment, and it is presumed that a large part of the fraud takes place in the industrial and retail sectors and in high-income residential areas.

[5] In 2005, Compañía de Luz y Fuerza, which serves the Federal District received transfers from the federal government to cover its operating expenses, which were equivalent to 68.5 percent of power sales.

[6] The companies that reduced losses are CODENSA in Bogotá, which reduced losses from 24 percent before privatization in 1997 to 13 percent in 2000, and Empresa de Energía del Pacífico in Valle del Cauca, whose losses fell from 21 to 13 percent. The companies that were unable to reduce losses are Electrocosta and Electrocaribe.

FIGURE 8.1 Electricity Losses in Distributor Companies (Colombia, 2000)



However, the problem has been most apparent in shantytowns lacking legalized service and has increased considerably due to the conflict that affects the country. However, Acueducto y Alcantarillado de Barranquilla (AAA), which is also controlled by foreign investors and serves the same market as Electrocosta, has achieved very satisfactory results. Although the performance of the Costa and Caribe electric utilities (Electrocosta and Electrocaribe) has improved notably in the last 20 months, the underlying reasons behind the different performance of the drinking water company and the electricity company help identify actions that should be taken to reestablish a culture of payment.

While EPM (the municipal company in Colombia) succeeded in emulating the performance of the private companies in reducing losses, these cannot be replicated elsewhere. Despite its public ownership, the company had a good reputation before the reform was implemented. Competitive pressures following the reform probably played an important part in EPM's performance.

The difficulties experienced by Unión Fenosa's Electrocosta and Electrocaribe companies in Colombia were repeated by its companies in the Dominican Republic and Nicaragua (but not in Panama). The reasons why some Unión Fenosa companies did well while others did not lies in the institutional and cultural conditions of the countries and in their civic capital (see Chapter 6), as well as in the initial conditions and commercial strategies of each company.

The distributor in Rio de Janeiro (Brazil) was relatively successful in reducing fraud and increasing collections following privatization. However, in part because of the impact of rationing in 2001–02, the coercive actions used to yield these results could no longer be undertaken (Smyser, 2004). This company (Light Distribution Company) was mired in controversy when it began operations following privatization. Consumers were annoyed by significant power cuts that were attributable to lack of investment. Almost 20 percent of the company's residential users are located in *favelas* (slums).

The performance of most state-owned companies in the region was similar (or in some cases worse) to the situation before the reform. In Mexico, although the CFE did not post particularly large losses, its performance did not improve following the reform. Compañía de Luz y Fuerza continues to experience losses of over 30 percent, even though over 70 percent of its load is concentrated in the industrial and commercial sectors. The same is true in Paraguay[7] and in several state-owned distributors in Brazil. Costa Rica is an important exception. Its strong cultural and institutional traditions are reflected in the efficiency of the electric power industry (see Chapter 6).

In Search of Explanations

The assumptions made by reformers that the cost of the service could be recovered at the same time that the needs of the poor are being served proved to be a little optimistic. Similarly, it was too naïve to expect that governments would refrain from intervening in setting electricity rates when it proved politically convenient to do so. Despite the successes of

[7] The state company (Administración Nacional de Electricidad, ANDE) has posted losses of 32 percent.

some private companies in controlling opportunistic behavior on the part of consumers, this has not been the case in general.

The fact of the matter is that payment for public services arouses strong public reactions in most of Latin America, regardless of whether the service is publicly or privately owned. This has serious political repercussions that make it difficult for governments to keep their commitments to enforce property rights and not to intervene in setting utility rates. The more fragile the political institutions and the more deep-rooted the culture of political intervention, the more intractable this problem becomes. Generalized subsidies during the pre-reform period have led consumers to consider any price adjustment as a reduction in welfare. This is particularly the case when price increases are not accompanied by improved quality and access to the service. As a result, consumers do not acknowledge the independence of regulators and do not believe that it has their long-term interests at heart.

Although it is clear that the lackluster performance of the economies of the region during the first five years of the new century have weakened the payment capacity of a large part of the population, it is less clear to what extent electricity prices effectively represent an impediment to consumption and, if so, what the size of the government subsidy should be.

It is frequently argued that the ability of consumers to pay is at the root of the problem and that it is not possible to charge for the total cost of providing the service until incomes have improved substantially. While this is an attractive argument, it does not completely explain this complex problem. This challenge requires effective responses to reinforce a culture of payment for service and ensure that government intervention in utility prices responds to the needs of the poor without jeopardizing its finances.

The resistance to paying for services is often rooted in past experiences of poor quality service as well as the predominant view of utility services as an entitlement. These notions are not limited to low-income consumers. In fact, a relatively large part of the theft is carried out by high-income consumers and even retail and industrial users who consume significant volumes of electricity. In addition to being narrow-minded, thinking of theft and nonpayment as problems that predominantly affect low-income consumers ignores the potential for controlling theft relatively quickly and without incurring in significant expenses to increase collections. Many companies that have made rapid progress in controlling losses have done so by concentrating their efforts on industrial, retail, and

high-income residential users. The reason why this experience is often not replicable has to do with the cultural environment as well as to the political influence of the powerful.

For this reason the introduction of more effective systems for solving the problem of lack of income is only the first part of the solution. As illustrated earlier, resistance to paying for the service combines with other cultural aspects related to the development of institutions that are not limited to the poor and that cannot be ignored. The difficulties experienced in the region to establish a limited system of subsidies for those who need them, reveals the crucial importance of the distributive conflict in the design of electricity rates. In the past, middle-income users benefited the most from low utility rates. Despite the fact that they were a minority, middle-income consumers were able to appropriate a significant part of the subsidy thanks in part to their disproportionate (as well as noisy) political representation (Benavides and Dussan, 2005). There is no other way of explaining opposition to reform efforts that maintain the subsidy for the poorest but reduce it for middle-income consumers.[8] The issue of public utility rates remains a favorite political topic, particularly during elections. Strengthening the government's commitment to keep politics out of public utility services can only be achieved over time as interest groups emerge and gain force to successfully advocate against interventionist measures. Clearly, one of the ways in which political opportunism can be countered is by making progress in improving the ability to pay of the poor, but it is not enough to make the poor allies in a coalition to ensure the sustainability of utility services. It is also necessary to make the poor into reliable customers, which requires investment to built the kind of company-customer relationship described later in the chapter. It may be also necessary to provide compensation to groups affected by a readjustment of utility rates or make the long-term benefits of a more efficient service more readily apparent to the populace (Benavides and Dussan, 2005).

Ability to Pay

A World Bank study (Foster and Yepes, 2005) summarizes the information available on ability to pay and subsidy systems in Latin America and the

[8] This was the experience in Colombia and Guatemala.

Caribbean, and undertakes a preliminary analysis that shines some light on the problem. The authors define ability to pay as the share of family income devoted to a basic level of consumption, which is defined as 120 kWh per month and valued at the average regional rate of US$ 0.11 per kWh. A calculation of ability to pay in current terms at the prevailing market exchange rate shows that the first quintile of the urban population spends over 5 percent of its income on electricity and would, therefore, be unable to pay for the service. However, the problem disappears when measured in terms of purchasing power parity (PPP). Nevertheless, taking into considering the fact that electricity rates also depend on international prices, such as the price of oil, the authors conclude that between 30 and 50 percent of the urban population lacks the ability to pay for electricity. These figures are only an estimate given that the actual situation in each country depends on local conditions and electricity rates.

The solution proposed by reformers is to design a targeted subsidy system that allows low-income populations access to a minimum, sociable desirable, electricity consumption. However, despite attempts to implement these solutions, results have been mixed. Most countries use volumetric rates and maintain a rate system based on incremental blocks of consumption. Nine South American countries offer parallel rates plans. The criteria that consumers need to meet in order to be eligible for a subsidized rate (a so-called "social rate") are generally dictated by an upper limit on consumption that varies between 75 kWh in Paraguay and 500 kWh in Venezuela. Colombia, Brazil and Argentina place additional criteria on eligibility. In Colombia, neighborhood characteristics, which define basic subsistence consumption, are also applied to electricity use. In Brazil, families must show that they receive state social assistance in order to become eligible for the electricity subsidy. In Argentina, households must show that they meet the requirements to receive a subsidy. Subsistence consumption also varies between 25 and 300 kWh.

Unlike other utility services (such as water), electricity consumption has a stronger correlation with household income because the latter determines the number of domestic appliances that a family has, which, in turn, use electricity and determine consumption. So, there is some rationale behind the adoption of incremental blocks. However, the pressure to be in the subsidized block is very strong and, in general, all the plans contain large inclusion errors. The stranded costs of the reform process in Guatemala are concentrated in a small group of users with very high rates, leaving out

nonregulated consumers, and providing a substantial subsidy to all consumers with monthly use below 300 kWh (95 percent of households). Foster and Yepes (2005) report the large errors of inclusion that result: between 60 and 65 percent of beneficiaries are not poor, and between 80 and 90 percent of funds go to beneficiaries who are not poor. When regulators issued regulations to establish a system of increasing blocks within the limits of the 300 kWh, those affected by the change lobbied against it and the Supreme Court revoked the provision.

Difficulties in maintaining a system of targeted subsidies in Colombia and the fact that, despite subsidies, power theft and payment arrears are endemic in some parts of the country, have already been mentioned. In the mid-1980s, Colombia established an innovative system of classifying households into six strata based on the characteristics of the neighborhood and the residence. This system was to establish a cross subsidy by means of which industrial and retail users as well as the two highest residential strata contributed to subsidizing the consumption of the three lowest residential strata. As stated in Chapter 4, it was not possible to adequately maintain the system because of administrative failures and lack of incentives for mayors (who are responsible for its implementation). As a result, the inclusion error has increased significantly, forcing the government to contemplate further reforms. However, the political implications of any reform to the income redistribution system prevent a radical change and limit its scope.

It is interesting to note the different response of distribution companies to changes in the subsidy. In Guatemala, the company was enthusiastic about the reform because it balanced loads between users and reduced a too-high utility rate for users who consumed over 300 kWh (providing incentives to seek solutions in the nonregulated market). However, some Colombian companies opposed lowering the subsidy threshold because of perverse incentives that resulted from failures in the design of payments.

Beyond the Subsidy: The Poor Are Also Good Customers

The relationship between low-income consumers and the service provider can take several forms. Some consumers have no access to the service but live in areas where the company has jurisdiction. Other families live in poor areas that lack normal distribution networks but are able to obtain electricity fraudulently through an intermediary whose networks do not

meet technical and safety standards. The final group involves families that live in areas where there is regular electricity service provided by the company and billed regularly. Some households in this group pay their bills on time; others make the payment and often find themselves in arrears. Still other consumers have had their service disconnected due to lack of payment. Some of these consumers have fraudulently reconnected the service. Finally, some users modify the meters and/or bribe meter readers to lower their payments. Each group represents a special situation and its behavior affects the company differently. The companies have an arsenal of resources to prevent theft, ranging from shortening the length of low voltage cables to using special types of cables and tamper-proof meters. However, these solutions are not always effective.

It might be thought that a program to facilitate access to electricity services to people who currently lack it, coupled with an adequate subsidy would solve the problem of power theft and arrears, but even countries with significant subsidies on consumption continue to experience these problems. Two recent studies describe the experiences of public service companies in the region and in the world. Manzetti and Rufin (2006) describe the results of IDB-sponsored workshops in which electricity and water distribution companies from the region participated. At the same time, USAID carried out a comparative study of the experiences of several companies around the world, including some in Latin America and the Caribbean. The USAID report looked at the provision of utility services to residents of slums and other very low-income urban areas, where illegal connections predominate (USAID, 2004). More recently, encouraged by these experiences, USAID, the World Bank and the IDB worked jointly with private companies to organize a workshop on how to address the electricity needs of the urban poor. The remainder of this chapter brings together some of the analyses and conclusions of these studies and seminars.

Providing services to the poor acquires special characteristics when they are squatters or reside in marginal neighborhoods or slums that lack infrastructure and adequate property deeds. Private companies may be reluctant to serve these areas because of low levels of consumption, rising marginal costs, lack of legal recourse for collecting on bad debts, risks to employees, and opportunistic behavior by politicians. However, the companies cannot ignore the problem because residents often resort to clandestine service hook-ups that increase losses. Governments will frequently not acknowledge their responsibility for this problem and ignore violations

without taking measures or offering alternative solutions. Consumers also face important impediments that make it difficult for them to accept the normalization of the service. Lack of property deeds is a frequent obstacle, but more important is the inability to pay connection charges and difficulties in making regular payments given the irregular pattern of their income. Depending on the regulations in force, a company may be required to extend the network to all users who request it within a certain area. However, connection charges to the secondary network, meters and internal wiring of the residence are the responsibility of the user. In some cases these costs are financed by the company, but in general this initial investment is an important obstacle to access to the service. Lack of adequate property deeds in squatter or slum neighborhoods, and/or city regulations, means that the company may not be legally required to provide the service. Nevertheless, because of the burden of illegal connections in terms of losses and deterioration of quality, the company may have an incentive to normalize service even in such neighborhoods.

The existence of a tradition of poor service by the state-owned company, combined with a culture of nonpayment promoted by local politicians and the belief that the government should provide the service free of charge, means that people have no qualms about adopting illegal solutions. When this is coupled with payment difficulties and the indifferent attitude of employees, the few existing incentives are rapidly exhausted. Nonetheless, the case studies show that power theft also has a cost for the consumer because, in addition to the disadvantages and dangers of an irregular connection, the service was frequently provided by unscrupulous intermediaries who charge users for providing the fraudulently acquired power.

These problems demand a special treatment. Behind all successful initiatives to normalize the service provision in marginal areas is a deliberate effort by the private company to regain consumer confidence. The aim is to turn these users into reliable customers with obligations and rights by adopting measures to address the difficulties that they face. The initial investments required to do this will later yield a return in the form of fewer losses and an improved portfolio.

Efforts to regain the confidence of consumers begin with a commitment to improving the quality of the service as well as customer relations. In addition, the company must reward consumers for paying their utility bills on time. These efforts should also include activities that benefit the community. For example, in Colombia, the electricity distribution com-

pany helped establish locally owned microenterprises to act as agents of the company. Improving customer relations is a fundamental step in regaining consumer confidence. This involves more than dealing promptly and adequately with consumer complaints. Efforts should be made to facilitate the process of making payments for electricity services, which can often imply a heavy burden for consumers in terms of the time and money spent in traveling to the company's offices. The water supply company in Barranquilla posted a substantial increase in collections by setting up mobile payments centers and allowing consumers to make partial payments.[9] As mentioned, the inability of poor users to bear the cost of connection charges and wiring the home is another problem that stands in the way of normalizing electricity services in marginal areas. Distribution companies would do well to provide credit or otherwise assist these customers to finance these costs.

Once service is normalized in marginal areas distribution companies will face the problem of cutting off service to consumers who are in arrears. There will always be some customers who fall behind on their payments (even though they may be receiving subsidies) and are unable to pay off their arrears. Distribution companies should also establish measures to assist these customers. Recent pilot projects carried out by several companies show that measures that adjust payment to the consumer's ability to pay (such as prepayment and load limiters) are acceptable and viable options that have shown concrete results. However, before embarking in programs of this type, distribution companies should secure the cooperation of the regulatory body because, in some cases, regulations may prevent treating different consumers differently.

Some companies have reported significant results through individualized work to promote conservation practices and facilitate the acquisition of energy efficient electrical appliances by their poorest consumers.[10] In Brazil, electricity distribution companies are legally required

[9] Allowing partial bill payments or payments in installments is particularly important because the uncertain and irregular nature of the income of the poor makes it difficult for them to make relatively large payments all at once. Local lenders and sellers of electrical appliances already provide poor customers with the option of paying for their purchases in installments. The repayment systems popularized by the mobile telephony companies in Argentina, Colombia and Venezuela are another option.

[10] This was one of the suggestions made in the Bank's energy strategy.

to devote one percent of their billings to programs that promote the efficient use of power. These programs were focused on helping low-income consumers to make use of efficient lighting options during the supply crisis of 2001. COELBA, a private distribution company in northeast Brazil, designed a program to reduce theft and improve collections that focused on improving the efficiency of the consumption of the poor (Pinhel, 2005). The first phase of the program included a detailed survey of consumption patterns in the *favelas* that was conducted by local residents who received training from social workers and COELBA employees. As a result of this study, the distribution company developed a US$2.5 million program of improvements to internal wiring and installations in poor homes and donated efficient lighting systems. As a result of this effort, electricity use by the poor was reduced by 25 percent and payment arrears fell by over 50 percent. The program was coupled with a detailed follow-up of savings and regularization of connections, for which long-term credit was offered on reasonable conditions. The program is now in its second phase, which includes the replacement of inefficient refrigerators and the continuation of the lighting program. COELBA is expected to obtain carbon credits for the emission reduction associated with the energy savings.

Despite the fact that these types of programs yield obvious benefits to the distributors,[11] they do not generally engage in them voluntarily. Moreover, in most cases these programs require the support of the government as well as regulatory reforms. In Colombia, the government had to allocate additional funds for the normalization of refugee settlements and carry out regulatory reforms to allow the distributors to provide different services to different types of consumers according to their ability to pay (Manzetti and Rufin, 2005). More innovative solutions were sought in many Colombian localities where distributors helped set up local microenterprises to manage the service provided to the communities and collect payments. According to Unión Fenosa, while this proved successful, it was not exempt from dangers. The Colombian press recently reported that the offices of a microenterprise were burned down by customers protesting against poor service.

[11] The benefits include portfolio improvements, reduced power losses and theft, lower costs associated with the interruption of service, and improved customer relations.

Lessons

In some countries, the privatization of distribution companies has not resolved the problem of below-cost electricity rates or high losses from distribution and payment arrears. Opportunistic behavior by governments has prevented adjustments to electricity rates. Moreover, some governments prefer to spend their efforts (including financial resources) in ensuring that higher fuel prices are not passed on to consumers rather than in establishing a balanced system of subsidies for the neediest. Regrettably, when there is no financial capacity to meet commitments the results are crises and rate hikes. One of the consequences of opportunistic behavior by the government is that it feeds the same type of behavior in businesses. Thus, companies prefer to make arrangements with the government instead of working through legally established institutions to recover their losses. Maintaining a long-term commitment to resolve the problems of the electric power industry has proved difficult, partly because of the legacy of patronage and the fear of making unpopular regulatory decisions.

Although opposition to rate hikes could be said to be universal and governments have great difficulty in resisting the temptation to intervene when rate hikes threaten their voter base, this problem is greatest when institutional deficiencies and lack of civic capital hinder popular expression through formal channels. It is also the case when new institutions lack legitimacy and standing.

Despite some partial successes, it has been very difficult to introduce a system of transparent subsidies targeted to the neediest consumers while, at the same time, addressing the needs of the urban poor who live in marginal communities. However, some efforts have had promising outcomes that are worth studying and replicating. The successful experiences combine the carrot and the stick: the stick is found in conventional methods of combating theft, while improved service and customer relations represent the carrot. The point is to restore trust between the distribution company and electricity consumers or to create this link between supply and demand in places where it has never existed.[12] All these measures involve the community in one way or another and try to develop business models adapted to

[12] In the latter case, companies must understand the environment in which they are operating as well as the economic behavior of the poor in order to be able to turn them into customers.

the particular conditions of the customers. They also operate in the shadow of the law since they try to avoid resorting to legal enforcement of collections and litigation. However, strong regulatory incentives, well-targeted subsidies and careful implementation are needed if companies are to follow this route. Finally, but no less important, the cooperation of the national and municipal authorities is fundamental for the success of any plan.

As a final lesson, although some of the causes of the difficulties (such as macroeconomic factors and political patronage and economic cycles) are outside the ability of industry players to affect and are difficult to manage, others (such as ability to pay, cultural and legal attitudes in the application of the law, the behavior of the regulatory agency, the company's image, internal corruption and problems typical of the retail sales management) are within the area of influence of the electric power industry and can be resolved, as demonstrated by the experiences described.

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Chapter 9

Final Comments

This volume offers information and arguments to back the thesis that the problems that both the statist and the market models have faced in the Latin American electric power industry are due to the same causes; namely, the inconsistency between the demands implicit in some models and the institutional and other resources available in the country; and the difficulties of governments of all types in assuming the obligations and costs implicit in the models adopted. In principle, this seems to impose excessive demands on any model because it would require that, to be effective, the model should make correct predictions regarding the suitability of institutions, the effectiveness of technical instruments, and the incentives that determine the behavior of governments, bureaucracies, market agents and consumers. However, because it is impossible to anticipate the complex interactions that actually occur (that is, because of what economists call *bounded rationality*) all models are necessarily incomplete. Fortunately, as shown by experience, it is not necessary that all model assumptions be correct in order for it to yield a reasonable performance. However, it is necessary there should be a minimum degree of consistency in order to prevent the problems from becoming cumulative and leading to the collapse of the model. The advantages of one model or the other in a particular context depend on the likelihood of achieving that minimum degree of consistency that would permit it to operate successfully. It is also a function of the robustness of the model's performance relative to the performance of critical variables, and on its ability to adapt to new circumstances.

Although this book identifies problems that affect both models equally, both the intensity of the shortcomings and contradictions as well as the power and structure of the incentives implicit in each model depend on their own peculiarities and on conditions in each country. As Djankow

et al. (2003) note, in a country with abundant civic capital and appropriate institutions either of the two systems could guarantee the robustness needed for the reasonable operation of the industry, and the differences would be due to the greater or lesser degree of efficiency achieved. However, a model can fail in a specific context for many different reasons. Paraphrasing Tolstoy in *Ana Karenina* one could say that all the successful models are successful for the same reasons but each fails for its own particular reasons.

The Statist Model

The statist model, based on a concept of the role of the state appropriately named by Schlifer and Vishni (1998) as "the helping hand paradigm," assumed that state intervention would resolve market failures and internalize the externalities implicit in the private participation model, which until the middle of last century limited the provision of the service to a few urban centers. In view of the lack of interest of the private sector in providing services in markets deemed unprofitable,[1] it was argued that the investments needed to expand the service to all the population could only be undertaken by the government. The government could obtain the resources for these investments from a combination of taxes, user fees, and private or public credit.

The sustainability of the statist paradigm depended on meeting two basic conditions. To keep the lights on the government had to plan, contract and execute the investments required to meet demand in a timely manner and operate them competently. To pay for the service, it had to establish a system of rate charges that, when combined with government transfers and credits would be sufficient to cover expenditures without violating public expectations of the cost of the service or their payment capacity.

The state paradigm assumed that in the absence of competition, centralized planning implemented by a motivated, competent and honest bureaucracy with the support of a battery of analytical tools would lead to the execution of the projects required to meet demand, and to the operation of the system in such a way that the economic cost of service provision

[1] The lack of interest was predictable considering the lack of public commitment to guaranteeing private investors that they would receive a return on their investments.

would be minimized. Similarly, the introduction of a rate system based on marginal costs combined with subsidized rates for low consumption and rural electrification would maximize the net benefits for society associated with electricity consumption.

The need to keep service costs down to a minimum meant that the government would not impose additional burdens on companies' budgets originating from objectives other than the provision of the service,[2] that political considerations would not distort the process of selecting projects, and that incentives could be created to promote efficiency and help reduce electricity losses and the costs associated with overstaffing. But compliance with these assumptions was not sufficient for the lights to stay on. It was also necessary to have financial resources available when needed; otherwise the investments could not go ahead as planned or be subject to delays, preventing them from meeting forecasted demand.

Although reducing costs to a minimum contributed to reducing financial requirements, it was not sufficient to guarantee the availability of the needed funds. To do so it was also necessary to ensure that users would pay their utility bills in a timely manner and that the government resources and financing would also be available. It was also necessary to ensure that customers would pay their bills and refrain from stealing electric power; however, this alone was not enough. In addition to payment capacity, customers had to have incentives to make their payments, such as good quality service, reasonable electricity rates, absence of alternatives that would give them free access to the service (patronage), and penalties for theft. Moreover, these incentives had to apply to everyone, including government agencies and companies. There is also a clear and close relationship between fiscal policies and policies regarding utility rates because what cannot be collected through taxes has to be recovered through user fees. The probability of obtaining loans depends on the capacity to repay them, which in turn depends on the financial performance of the sector. The latter is a function of the size and efficiency of the investments made, the resources that the central government has available, and the ability to collect payments for the service.

Naturally no country could comply strictly with these assumptions, but under some particular conditions, as described in Chapter 6, state com-

[2] These might include, for example, the requirement to create jobs, award contracts to specific persons or companies or other such activities to curry political/electoral favors.

panies may deliver the services efficiently. Thus, at issue is not the particular type of model to adopt, but rather a good understanding of the reasons for the difficulties that governments have in maintaining consistent policies over time. It is also important to understand what motivates bureaucracies, managers and employees to improve efficiency and, when possible, to prevent local politicians from exerting undue influence on state companies. This helps explain why almost no government has successfully resolved the conflict between short-term electoral interests and the sustainability of state-owned public service companies.

Chapter 1 showed that, with very few exceptions, the performance of the statist model was very poor in all countries of the region. Rather than efficient service provision, the results were high investment and operating costs, and large electricity losses (both technical and non-technical). Instead of providing the resources needed to expand service provision, governments set rates at levels that were very much below the cost of the service and provided general subsidies. As a result, the electric power industry accounted for a disproportionate share of public borrowing, becoming a burden on government budgets. In addition, periodic rationing was required and service coverage was generally low.

In this book's introduction, we noted that the real reasons behind the failure of the model are its inconsistencies with respect to the institutional and human resources available in the different countries, as well as with the physical conditions that limit technical options, and with the ability to channel or control the incentives that a specific application produces. While validating these hypothesis, the analysis identified another much cited reason for the failures, namely economic crises or other events outside the industry's control. While these cannot be ignored, particularly if they hit at vulnerable times for the system, it must be noted that the crisis of the 1980s was a natural outcome of the statist model established in the 1930s, which also generated half a century of prosperity (Lora, 2006).

The 1950s, 1960s and part of the 1970s, were the glory days of the statist model. With support from the multilateral banks and abundant external resources, almost all countries made impressive progress in increasing service coverage, developing their hydroelectric potential and connecting their systems. During these years, the regional economy grew strongly, interrupted only by the debt crisis precipitated by the Mexican devaluation in 1982, marking the beginning of Latin America's "lost decade." The crisis and the difficult years that followed aggravated many of the problems that

had been brewing, revealing the weaknesses of the statist model and the lack of conditions for sustainability.

Chapter 1 notes that, starting in 1972, the problems associated with low electricity rates became endemic in Colombia. Long before the beginning of the crisis, the opposition of regional politicians, motivated by the rents they were able to receive from the construction of major projects, hindered the adoption of efficient solutions to the problem of expansion of supply in Brazil and Colombia. Power rationing was frequent during the 1970s in many countries and the politically-motivated disorderly expansion of the network was well known. Despite the resources that were committed to expanding coverage, only Costa Rica and the oil-rich countries (such as Mexico and Venezuela) achieved significant successes. In addition, lack of effective competition in the construction of major hydroelectric plants in Brazil, and the use of state companies for political purposes during electoral seasons, were frequent. Major hydroelectric schemes were conceived in the 1970s as a strategy to protect against high oil prices, although the difficulties that the state companies faced in managing these projects would become evident at a later date.

The debt crisis accelerated the financial difficulties of the companies that had to repay their large investments, and contributed to government reluctance to pass real electricity prices on to consumers. But political exploitation of the companies and their use as a source of patronage and electoral favors continued, as did ongoing delays in plant construction and rising electricity losses. The model lacked incentives for efficiency, and because the various roles of the state were not separated, the sector was vulnerable to the government's lack of commitment to a consistent program over time.

Yet, not all state companies performed poorly. As shown in Chapter 6, there are examples of good management and performance in various countries. The successful companies (both in good times and in bad times) were ICE in Costa Rica, EPM in Colombia, and COPEL in Brazil. All three have common characteristics that are difficult to repeat in the rest of the region. One of their common features is the ability to exploit natural rents resulting from low-cost hydroelectric resources, and the availability of trained staff to make this possible. The three companies also shared the community's sense of ownership, which mobilized to protect them from the ambitions of local politicians (this is not easy to find in other countries). However, it is difficult to maintain these circumstances permanently, as was

shown by the events of recent years in these companies, which threatened the continuity of their management.

In short, the statist model that emerged from the failure of the private sector to address national economic growth needs, which was due partly to lack of political commitment, was equally vulnerable to the lack of commitment to maintain a consistent policy over time and prevent opportunistic behavior based on short-term electoral interests that are potentially harmful to the viability of the system. In the best of cases, governments underestimated the cost of opportunistic behavior or considered it necessary for their short-term survival, thinking that there would always be opportunities to make amends in the future. For a long time, governments were able to get away with this, but when the macroeconomic crisis of the 1980s brought to light the true costs of these policies, they had to face up to the problem and implement radical reforms.

The Reforms

The reformers of the 1990s clearly identified the failures of the old model and tried to correct them with the implementation of a new market model that placed limits on the role of the government and made an effort to include private participation. The new model addressed the problem of lack of government commitment by adopting institutional solutions, such as independent regulatory commissions. It responded to the lack of incentives for efficiency with the introduction of competition in segments where it was possible and desirable, assigning the role of entrepreneur to the private sector and regulating monopolistic segments. Similarly, the problem of guaranteeing access to the service for the poorest consumers was addressed by establishing a transparent and efficient system of targeted subsidies financed directly from the national budget.

Supporters of the new model maintain that private provision of services has yielded many benefits. Many private companies provide the public with better services at a similar or lower price than their government-owned predecessors and have also increased coverage. Private investors have built needed new facilities that governments could not afford to finance. The case of Empresa de Energía Eléctrica de Bogotá shows that it is possible to transform a bankrupt company into a source of financing that enables the municipality to move forward with reform of the urban transport sys-

tem, which has transformed the city. Privatized companies have achieved important improvements in productive efficiency and, despite difficulties, markets have maintained service costs below the level that would have been likely under the statist model.[3] Additionally, contrary to what many of those who were opposed to the reforms argued, the reforms have expanded coverage in many places. However, after a decade of reforms and despite these achievements, many countries in the region are having difficulties consolidating them.

If a stranger, who had visited the region in 1998 to find out about the progress of the reforms in the electric power industry, returned in 2005, he would have difficulty in understanding the reason for the fundamental change in expectations about the future of the reform. In 1998, there was great enthusiasm in all countries regardless of the stage of their process of reform. Private investment was mobilized to acquire existing companies and to undertake new electricity generation projects. Privatized distribution companies reported substantial increases in efficiency, which in turn fed the appetite of foreign investors to take part in the privatization processes in Brazil and Colombia. The wholesale market in Colombia had overcome the difficulties faced as a result of an unexpectedly severe drought associated with the El Niño phenomenon, and competition in the Argentine market offered significant reductions in wholesale prices. The recently privatized distribution system in Guatemala provided funds to reduce the gaps in service coverage that the old system had not been able to bridge, alleviating the fiscal burden. Economic growth expectations were very high and the business climate could not have been better. Thus, it is difficult to understand the current situation after the collapse of the sector in Argentina, withdrawal of private investors from that country and the Dominican Republic, the lack of appetite of the private sector for new investment, the crisis initiated by rationing in Brazil, and the difficulties experienced in many wholesale markets.

As was the case of the statist model, supporters of the reforms are quick to point out that the economic crisis that began in 1999 could be largely responsible for this change. While they are partly correct, particularly in the case of Argentina, this explanation is not sufficient. The saying that a high tide raises all boats, but a low tide reveals the condition of their hull, clearly applies in this case. The economic crisis shone a light on problems that the

[3] Prices rose in some cases as indiscriminate subsidies were eliminated.

boom of previous years had concealed and that required immediate attention. These problems, which under other circumstances would have been addressed with less urgency, became obstacles for the progress of the reforms. In any event, many of these problems would have emerged in due time.

Clearly, uncertainty about the economic outlook coupled with energy-related international scandals such as Enron and the California energy crisis, contributed to weakening the appetite of foreign investors. It is also clear that a depressed market revealed failures in the instruments that guaranteed the investment required to meet long-term generating needs. For some time, investors had been willing to put their money into a growing market and did not hesitate to build plants without long-term contracts, but the boom could not continue indefinitely. Lower than expected demand resulted in lower income for distributors, who then redoubled their efforts to obtain rate hikes as compensation. At the same time, weak purchasing power made these increases politically more sensitive and revealed the weakness of the regulatory institutions in managing these problems. Likewise, the fight between market agents to appropriate the reduced rents sometimes led them to exploit deficiencies in procedures, which the regulators were either not capable of detecting and correcting or made mistakes in doing did so, which increased the confusion.

But the difficulties that all types of governments faced in keeping their commitment not to intervene when their political position is threatened (by the public holding them responsible for high electricity prices and problems with continuity of supply), cannot be attributed to the crisis, particularly after the highly publicized experiences of California and Brazil pinned the blame for the problem on the market model. Likewise, it cannot be responsible for the lack of preparation for the transition to the new system, or for the problems that arose from the existence of private and state companies with very different incentives, or for the lack of a regulatory culture and institutions, or even for the conflicts of interest of governments.

However, the economic crisis did have an impact in several important ways: it affected the options for correcting the problems uncovered, and had a direct negative impact on the welfare and economic security of the population. As a result, people blamed the neoliberal model for these problems and rejected sector reforms even in places where significant progress had been made. The effect was even stronger in places where the reform had not done enough to become socially legitimate by implementing efficiently targeted subsidies to facilitate access by the poor.

Throughout this book, I have noted that the root of the problem lies in a serious underestimation of the role of institutions in creating new markets and a lack of consistency between the demands of some models and national institutional and human resources. In addition, shallow markets and the particular characteristics of electricity markets also had important impacts, which varied by country.

As with the statist model, the success of the reforms also depended on satisfying its implicit assumptions. Although in many ways the reforms were innovative and took local conditions into account (as was the case with the design of some wholesale markets), the model adopted had many of the features of the models employed in the developed countries and placed heavy demands on institutions. At the time, this was not a matter of concern for the reformers because they assumed that reform of the electric power industry would form part of a broader set of complementary reforms designed to correct institutional deficiencies, and that the transition could be carried out rapidly without major problems. Moreover, it was also necessary for reformers to assume that persons as well as companies would be able to assume the higher costs that the reform imposed on them in the short term (such as paying for the service), accepting in return vague promises of a better future when state resources would be freed for used on social spending.

It was assumed, then, that in most cases political opportunism would not have a place in the new system. More importantly, strengthening of democracy, the virtues of private participation and new institutions were expected to neutralize the inevitable reaction of the political class, which would accept the loss of rents resulting from the new system without incident.

The new paradigm also meant assuming that there were wholesale market models that guaranteed competition without weakening security of supply. This led to the understanding that it would be possible to achieve an adequate market structure. Another implicit assumption was that a system of regulation by "price cap" incentives could be introduced to maintain order in the regulated segment of the industry.

While the early reformers believed that a clear and transparent regulatory framework with credible and well-respected regulatory institutions was essential to the success of the reforms, they were naïve in believing that this could be accomplished simply by transplanting successful models from other countries. In their zeal to take advantage of the opportunities present-

ed to them, in some countries, establishment of the regulatory framework was postponed until privatization was completed. But even where this was not the case, little attention was paid to what Professor Rodrik (1999) once called the "small print;" namely, that every model has fundamental assumptions and prerequisites (including carrying out complementary reforms in other areas), which if not met risk failure.

The problem created by transplanting a model from more developed countries can be particularly difficult. In addition to the different social, economic, political and cultural environments, transplanted institutions can become "contaminated" during the process, giving rise to a hybrid that does not respond to the objectives pursued. For example, one could speculate that transplanting a regulatory system developed under a common law system to a country with a legal tradition based on the civil code would not be an easy matter and, indeed, might be wrought with difficulties.[4] Similarly, the tendency to centralization of civil code systems can lead to the establishment of much more detailed regulations than would be the case under common law. In addition, regulatory institutions in the developed countries do not operate in a vacuum, but do so within an environment that includes other essential complementary institutions, such as property rights, antitrust agencies, appeals courts with specific knowledge of the area, and a regulatory tradition and culture.

Latin American reformers have long held that the main requirement for a successful reform process was an independent regulatory system, which implied separating the executive from the regulatory commissions. However, sometimes they neglected to clearly separate the functions of policymaking and regulation. They also neglected the fact that there are levels of coordination at which it is not only possible but desirable to know the executive's opinion, provided it is given transparently. Other points that also did not receive adequate attention were the importance of dispute settlement mechanisms, appeals bodies, and the need for an accountable regulatory agency.

The importance of having staff with the necessary expertise to carry out the work of an economic regulatory body was also underestimated, but to a lesser extent. The work of economic regulation was initially conceived as an extension of technical regulation; thus, supervision was delegated to

[4] Some of the essential elements of Anglo-Saxon regulation, such as transparent processes and the notion that regulatory commissions are legislative and judicial bodies, could be lost.

professionals who had previously worked in state supervisory bodies, underestimating the importance of bringing in professionals who were more qualified in the economic and legal areas. In some extreme cases, the regulatory commissions were staffed by professionals on loan from the companies that were subject to the regulation.

The inability to recognize the need for adequate remuneration to attract the best staff has been an endemic problem in the region. Worse still, many regulators lack the resources to hire top ranking consultants with skills comparable to those employed by the regulated companies, increasing the asymmetry between the regulator and regulated. Moreover, the financial independence of the regulator is constantly threatened. It was rather optimistically thought that a few brief training courses would be sufficient to improve the capacity of the regulators to carry out their work, failing to recognize that regulation is a permanent process where innovations are taking place almost daily, and that it requires the highest analytical and intellectual skills to assimilate these changes.

As has been pointed out throughout this book, it gradually became apparent that many of these assumptions lacked solid grounding in reality. This became obvious during the process of introducing the reforms, and in some cases adequate measures to correct shortcomings were put in place. Some of the shortcomings that were recognized included, for example, difficulties in setting up competitive wholesale and retail markets without sacrificing incentives for long-term investment, finding independent and capable regulators, and strengthening credibility by means of independent market supervision mechanisms. Other problems that were recognized were opportunistic behavior by the private sector and the government, difficulties in targeting subsidies to the neediest, and the fundamental importance of the latter to ensure the legitimacy of the reform. A problem that has been recognized only reluctantly is the persistent lack of commitment by both the government and the public. However, the fact that problems and shortcomings are understood and recognized does not mean that solutions have been found for them or that the costs of addressing them do not involve limiting expectations regarding the potential outcomes of reform.

Despite the initial caution expressed by some reformers, the magnitude and persistence of the difficulties experienced by many countries during the early years of this century surprised many and increased the ranks of the skeptics. However, the range of opinions is quite broad and goes from a belief that the neoliberal model has proved itself to be a failure, to calls for

returning to the past, to recognition of the need to continue relying on the government as entrepreneur, to those who are certain that the problem is only transitory and will soon be overcome.

A cold analysis of the results, not all of which have been referenced in this work, reveals that, while far from achieving the expectations of reformers, significant progress has been made in implementing the current model in a weaker institutional framework than had been hoped for. It is clear that a return to the past is not an option and, in most cases, would be impractical. Proponents of this as a solution often overlook the underlying conditions that led to the obsolescence of the statist model and/or the likelihood that successful cases could be repeated elsewhere. The considerations raised in this book can point the way to a constructive debate about the assumptions implicit in the reform model as well as the conditions that need to apply for it to be successful. The point is not to return to a model that has been proven unsuccessful, but rather to use the experience during this first phase of reform to scale down expectations and adapt procedures and models to the actual limitations faced by the countries of the region. The appropriate model for each country will be the one that offers the best opportunities for achieving the objectives of economic efficiency and equity without making demands or using assumptions that, if not achieved, would lead to the irreversible deterioration of the electric power industry.

The Challenges

The electric power industry faces a set of challenges in order to move in the right direction while taking into account the burden that the initial conditions impose. A challenge common to all public and private systems is how to design mechanisms that reinforce the government's incentives to keep its commitment not to intervene, while keeping its obligations as guarantor of service provision. This naturally involves developing institutions and a political culture, but it also implies adopting measures to minimize politicians' temptations to intervene in the industry with damaging consequences. Among the latter measures are ways of linking private business to the development of the industry, which also contribute to generating benefits for society as a whole, creating competitive markets that prevent supply crises, and legitimizing the reforms by addressing the needs of the

poorest consumers without an excessive increase in the financial burden of the government.

The Institutions

Throughout this book, I have touched upon the long list of actions that could be taken to improve regulatory effectiveness. These range from the procedural to the substantive, but perhaps the most important is the need for a transparent process to educate consumers, companies, governments, judicial bodies, the media and, of course, politicians about the regulatory process in order to establish a culture of regulation. Regulatory institutions can gain respect and support by means of their performance, but hiring people with the necessary expertise and leadership abilities can also help achieve this objective.

Experience has shown that absolute regulatory independence is not essential. What is required is to convince investors that the government will not use its regulatory capacity to expropriate their assets. In addition, we must ensure that the needs of consumers are served in both the short and long term. This fundamental principle can be implemented through various institutional arrangements depending on actual conditions in each country that, in turn, create their own requirements. In the words of Rodrik (2004), there is no single institutional application of a principle but, on the other hand, not every application is valid. It should be recalled that institutional credibility and respect will not spring up spontaneously, but have to be earned.

Yet, it is not simply a question of training regulators. Regulatory success also requires that producers, consumers, the media, the judicial agencies and analysts understand the rationale behind the model being implemented and must participate in its development. The key is creating a true regulatory culture that is able to adapt to the conditions of each country. This is an intellectual challenge of considerable magnitude, which has to overcome many obstacles.

However, the region lacks the academic capacity to meet the practical demands of implementing regulations, managing public-private joint ventures, and defining the processes and strategies surrounding concessions. Several well-known Latin American universities currently offer courses in project financing and the elements of privatization, and some have begun to teach aspects related to the regulation of public services.

But the region's schools do not yet offer programs on the practical aspects of dealing with these issues, nor do they offer sufficient training programs.

This long list of measures to improve the capacity of institutions disregards the fact that it cannot take place in the short term, and that for the time being we have to make do with what we have. This leaves a gap that must be filled between the requirements of foreign investors and what governments are able to provide. Investors are used to the systems that operate in their countries of origin. They will not commit their money without adequate guarantees that governments will not expropriate their assets or offer appropriate compensation in a transparent manner. For their part, governments are torn between meeting popular expectations of services at reasonable prices and the weakness of the instruments available given the social and economic situation and the country's institutional development. While, as Rodrik (1999) states, it might be possible to conceive of institutions that are able to provide these guarantees, investors are not able to individually verify or establish the equivalence of such systems to the ones they know. A challenge that requires immediate attention is how to use international financial organizations to strengthen the credibility and respect of institutions with a short track record that do not enjoy investors' trust and are often bypassed as investors try to resolve their problems directly with the government. In fact, one of the arguments frequently used to justify the additionality of IDB loans to the private sector is that the Bank is able to mitigate the regulatory risk because of its close relationship with the country and its knowledge of the sector.

The task would be much easier if there were an expeditious way of monitoring the performance of regulatory institutions and demonstrating (by peer evaluation) their adequacy and the level of guarantees that they offer at any time. A country that voluntarily submits its policies and regulatory bodies to scrutiny under agreed criteria would give a very clear signal to investors. This signal would be similar to (and at the same time, complement) the signal that comes from a positive evaluation of its economic policies by international financial institutions. Naturally, the first step is to build a clear consensus on the criteria that would raise investor confidence. These criteria would not necessarily recreate the conditions prevailing in the investors' country of origin, but would validate the appropriateness of the substitutes proposed to achieve the same ends.

Public and Private Investment

The experiences of Brazil and Mexico have shown that despite the problems caused by the participation of the private sector in the electric power industry, it has been essential to mobilize the investments needed to meet demand. Today's investors are not necessarily the same as in the past, many of whom have abandoned the region. However, like other investors, they require a stable business climate that favors investment as well as better guarantees that the government will not take advantage of opportunities to expropriate their assets. Clearly, there must also be guarantees that investors will not abuse their dominant market positions or their natural monopoly status to engage in rent-seeking or disregard their environmental obligations. In order to perform this task adequately, the regulatory agencies have to have credibility and legitimacy, which not only requires stronger regulatory institutions but also commitments from both sides. Also important is the creation of appeals bodies to complement national institutions that are still in the infant stage, and minimize opportunities for the government to engage in opportunistic behaviors that discourage investment.

Thus, countries have to study the lessons from schemes, such as private sector capitalization, that were so successful in Bogotá.[5] Under such a system, the public sector would retain ownership of 50 percent of the electric power company and realize profits proportionately. In principle, this arrangement makes it possible for the poorest to share in the benefits of private participation through the profits realized by the government, which it could make available to the poor through transfer programs. However, this has not been made clear to society as a whole and to low-income persons, in particular, and they have not been enlisted to support the reform.

The countries where the government must continue to play the role of entrepreneur (for whatever reason) face a great challenge; namely, to ensure that the various roles that the government plays remain separated and that the mistakes of the past are not repeated. Some countries have tried out corporate governance schemes with this in mind, but experience has shown that success depends on the extent to which groups with a genuine interest in the financial integrity of the company are involved. An interesting example is the experience of the Colombian company ISA. The government

[5] These schemes were not as successful in the Dominican Republic and were not tried in other parts of Colombia.

retains equity control in the company, but relies on the private minority interest to support implementation of an effective system of corporate governance. This has proven so successful that the government guarantees are no longer required for borrowing on international markets and the IMF does not consider ISA's debts when tallying up the national debt. However, this option requires a minimum level of performance and explicit commitments to attract the participation of minority investors.

The Markets

Investors in generation need a market that provides adequate investment signals and an allocation of risk that allows them to obtain financing. These requirements can come into conflict with the principles of a competitive market, but as we saw in Chapter 7, it is possible to adapt to local realities and achieve some degree of competition. However, it is still important to make progress in designing contracts that make it possible to allocate risk among producers, consumers, and governments in an appropriate manner that also satisfies the needs of financiers. In addition, minimizing transition costs is not an insignificant problem, as recent experiences have shown. In small markets it does not seem to make much sense to insist on a model of competition *in the market*, and it is necessary to move forward with the implementation of systems of competition *by the market*. Likewise, it does not make much sense to insist on retail competition with low-voltage consumers when this has shown to be irrelevant and when it can become an obstacle to establishing the long-term commitments required to minimize opportunities to abuse market power in the wholesale market and providing adequate signals to investors.

Investors in distribution require guarantees that they will have the legal support needed for their retail management as well as fair price reviews. To accomplish this, the system of regulation by price setting existing in the region has to be reformulated, and regulators must be given the resources they need to improve price regulation in the monopolistic sectors.

The Legitimacy of the Reforms

Perhaps the greatest challenge is to establish instruments to guarantee that the poorest segments of society will have access to electricity services. This is of vital importance if the reforms are to be viewed as legitimate. It is

fundamental to make headway with systems to improve the targeting of subsidies and reduce errors of inclusion without increasing those of exclusion. To do this, the public sector, private enterprise and the community have to join together to help the urban and rural poor to adapt their consumption of electricity to their ability to pay for the service, which would be increased by means of subsidies. In addition, obstacles to access, such as the cost of initial connection and internal wiring, should be reduced.

The experiences described in Chapter 8 show that there are ways of dealing with the quality of customer service and adapting charges to the special conditions of the poor. They also show that doing so can make institutional change possible. Users have to perceive the tangible benefits that will make them willing to pay for a service that, until now, they considered to be a vested right that should be supplied free of charge by the government. The sustainability of the system depends on creating a climate of confidence between the company and low-income consumers so that they can become customers with all the rights and duties that this implies. Although this is crucial for reinforcing consumer incentives not to behave in an opportunistic manner, it is a task for the government (through subsidies) and the regulators (by facilitating experimentation to identify the best instruments for this) as well as the electric power company. These actions would help the public to appreciate the true role of the government as regulator and policymaker, and perceive the advantages of using institutional channels to satisfy their needs without resorting to the type of intermediation that has been the norm in the past.

To conclude, after over 23 years of being associated with the Inter-American Development Bank, I cannot ignore the challenges facing multilateral financial institutions in their work to help countries build their institution using all the resources and instruments at their disposal. It is a task in which we have not been very effective, but without which it would be impossible to attract the capital needed to provide reliable and accessible public services, which are vital to the development of our economies and the welfare of our people.

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ENERGY

Market or State? Three Decades of Reforms in the Latin American Electric Power Industry provides a rich account of the region's experiences with state-run and market-oriented electricity services. The author emphasizes the implicit assumptions in the implementation of each of the models as well as the mistaken assurance of their proponents regarding the correspondence between theory and practice, what should be and what is. Rather than trying to defend or condemn a particular model, the author leads the reader in a conversation about the limitations of each one and the impacts of those limitations on outcomes. Jaime Millán brings to this endeavor his long experience in the sector, a large part of which was from the privileged vantage point of the Inter-American Development Bank. The discussion is enriched by a thorough discussion of the current literature on electricity services. The author illustrates his points by means of in-depth descriptions of the experiences of three countries and a discussion of key issues that the sector is currently facing. Because of the richness of the information provided, the integrity with which the experiences are presented, and the variety of disciplines and topics that the author cites, *Market or State?* is a mandatory reference for persons interested in the future of the electric power industry in Latin America and the Caribbean.

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