

Inter-American Development Bank

Keeping the Lights On

Power Sector Reform in Latin America

Jaime Millán
Nils-Henrik M. von der Fehr
Editors

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The authors of Chapter Two extend special thanks for the research assistance provided by Mario Nigrinis of Fedesarrollo and for the invaluable comments from consultants Jose Manuel Mejía and Alberto Brugman and from Nils-Henrik M. von der Fehr and Ashley Brown. UPME staff members deserve special mention for their support, and the authors also acknowledge the contributions of present and former Colombian government officials, trade associations, and power sector and public service companies.

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Finally, the editors, as well as all the contributors to this volume, wish to pay special tribute to our colleague, Ulpiano Ayala, who co-wrote the

chapter on Colombia. Dr. Ayala passed away in July 2002. His death represents an irreparable loss for Colombia, as he leaves a vacuum of experience, knowledge, and wisdom that will be difficult to fill. No one knew more about the complexity of the country's political economy. His memory will be well served, however, if the example of his intellectual fervor and honesty and his generous commitment of time and service to others can stimulate a new generation of researchers to follow his lead.

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FOREWORD

Keeping the Lights On: Power Sector Reform in Latin America is one of a series of books and papers published by the Inter-American Development Bank on critical issues involved in implementing infrastructure sector reforms. The reforms aim to improve efficiency by integrating the private sector and promoting competition.

This book is the result of an innovative two-year research project undertaken by the IDB as part of its 2000 Energy Strategy. The strategy mandates that the Bank work with its borrowing member countries to understand the reasons behind the difficulties in implementing power sector reforms, particularly in smaller economies.

Despite the achievements of power sector reforms, many countries in Latin America and the Caribbean are still having trouble implementing them, even after nearly a decade of such efforts. Thus, the timing of this book could not be more appropriate. Recent electricity blackouts and rationing in several countries have cast doubts as to the soundness of the competitive model to assure supply security. Opportunistic politicians have attributed these failures to the so-called "neo-liberal" development model, and many have advocated a return to the state model. Advocates of this extreme interpretation conveniently omit an analysis of the reasons why the state model failed in many countries, or why the few successful examples were not replicated. Still, the difficulties experienced in consolidating implementation of the reformist model call for understanding the reasons behind both the successes and failures.

This book is an initial effort to study the political economy of power sector reform, thereby highlighting the implications when there is a lack of harmony between a model as it is proposed and a given country's institutions as they actually exist. The aim is to draw lessons, formulate general recommendations, and expand the pool of qualified professionals who can contribute to the debate. Most importantly, by setting a baseline, this book opens pathways for institutional economists to embark on further research.

While some readers might expect this book to offer immediate solutions to the overwhelming problems facing the power sector, the scope of the study is conditioned by the research project's objectives and limited availability of resources. Concrete definitions of strategies and policies to tackle the sector's problems would require more detailed knowledge and the willingness of sector authorities and stakeholders to shoulder the responsibility for close dialogue with multilateral institutions.

Three elements contributed to the successful completion of this book:

- 1) Participation of the Bank's central and operational departments and field offices in discussing solutions, alongside governments and other institutions and individuals with a keen interest in reform;
- 2) The ability to include local knowledge (thanks to the participation of consultants), which helped to calibrate analysis of the feasibility of proposals and adequacy of diagnostics from respected international experts; and
- 3) The formation of an internal network of Bank staff interested in fostering more appropriate institutional design.

By making the results of this research available to a broad audience—practitioners, policymakers, researchers and donors—our hope is that people involved in power sector reform in emerging economies will be stimulated to enhance the discussion and pursue leads into more rigorous research. The debate is just beginning.

Carlos M. Jarque, Manager
IDB Sustainable Development Department

ABOUT THE AUTHORS

Ulpiano Ayala, until his untimely death in July 2002, was associate researcher at the Foundation for Higher Education and Development (Fedesarrollo), an economics research institute in Bogotá, Colombia. In that capacity, he wrote extensively about Colombia's economy, including social, infrastructure, and fiscal issues. During the administration of Cesar Gaviria, he was vice minister of finance and served on the boards of directors of several state-owned enterprises. As a member of the National Energy Commission, he participated in the debate that framed the reform adopted by the Colombian Congress in 1994.

Juan Benavides, an infrastructure specialist at the Inter-American Development Bank, conducts applied research and project surveillance and supports operations in regulatory policy and contracting mechanisms. Before joining the Bank, he worked for 11 years in the electric power industry. He has advised multilateral and government agencies, investors, and infrastructure firms throughout Latin America and the Caribbean and has worked in the fields of energy, telecommunications, and transportation.

Ashley Brown has served for the past 10 years as executive director of the Harvard Electricity Policy Group at Harvard University. From 1983-93, he was commissioner of the Public Utilities Commission of Ohio, appointed twice by that state's governor.

Nils-Henrik M. von der Fehr, professor of economics at the University of Oslo in Norway, teaches and conducts research on industrial economics, competition/antitrust policy, and regulation. He has published extensively on electricity market reforms, and was co-author of a 1994 seminal study in *The Economic Journal* on spot-market competition in the electricity industry in the United Kingdom. He has served as advisor to the govern-

ments of Australia, Brazil, Norway, Sweden, and the UK. Currently, he is a member of the Dutch Electricity Market Surveillance Committee and the Norwegian Competition Authority Electricity Market Resource Group.

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Jaime Millán is principal energy economist in the Infrastructure and Financial Markets Division of the Inter-American Development Bank's Sustainable Development Department. He is in charge of coordinating activities and strategies related to the Bank's Energy Policy and conducts research on the sustainability of power sector reform in Latin America and the Caribbean. Since joining the Bank, he has supervised the economic inputs of energy projects, drafted public utilities policy and energy strategy, and initiated a program on sustainable energy.

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Introduction

Jaime Millán and Nils-Henrik M. von der Fehr

The power sector reforms witnessed throughout the developing world during the 1990s were a logical outgrowth of the so-called Washington Consensus. They called for privatization, liberalization, and reliance on market forces. In no other region have reforms been as pronounced and widespread as in Latin America and the Caribbean. A wave of privatization, liberalization, unbundling/de-verticalization, promotion of competition, and creation of independent regulatory regimes has, with few notable country exceptions, swept across the entire region.

The hope was that introducing private capital and unleashing market forces in electricity markets would produce a more commercial, efficient, and customer-sensitive power sector that was less politicized. It was also hoped that attracting private investment to the power sector would free governments from increasingly heavy financial burdens. Once in place, the reforms would become a permanent feature of the sectoral landscape.

As Ashley Brown observes in the epilogue to this book, sector ownership has swung from private to public and back again to private. Understanding the reasons behind such swings—political, economic, and social—is vital to assessing whether the current mood will last. Thus, reform efforts must be viewed against the backdrop of earlier failures.

Conditions Motivating Reform

Lack of or inadequate efficiency incentives and tariff levels that did not reflect actual costs led to poor performance of state-owned enterprises

(SOEs), which accumulated large financial deficits.¹ Inadequate incentives were largely connected to a lack of clearly defined roles in government, which encouraged political abuse by the utilities. Rent-seeking politicians and interest groups were allowed to capture the sector and pervert objectives. Consequences have included general, poorly targeted subsidies, inefficient expansion of distribution, and a sector acting as a form of employment agency, subject to corruption.

Poor performance of SOEs burdened government finances tremendously. Reluctant to increase tariffs because of their inflationary or political impacts, governments made large transfers to utilities from central budgets, which contributed to the more general financial crisis, the social impact of which deepened as the drain on limited resources reduced social-investment capacity. Valuable and scarce human resources have been embroiled in searching for solutions to the crisis.

The financial problem was exacerbated by the macroeconomic adjustments arising from the 1980s debt crisis. Furthermore, emergency solutions introduced as the crisis emerged were not always properly thought out, which tended to create new problems. One example is the power purchase agreements (PPAs) entered into by many SOEs. While PPAs provided a quick fix to insufficient availability of electricity, these contracts also increased companies' financial burden.

Within this context, privatization of the power sector was viewed as an excellent way to fill empty coffers. Furthermore, multilateral funding sources, thrilled with Chile's success in attracting new private investment to meet a growing power demand, became more reluctant to finance an "unrepentant" public sector.

Reforms undertaken in most Latin American countries have been, with the exception of Chile, largely inspired by similar reforms in more developed countries. However, the underlying motivation has differed. Reforms introduced in Organization for Economic Cooperation and Development (OECD) countries—typically attempts to deregulate or restructure the electricity industry to facilitate competition—have been

¹ The failed experience of SOEs is not without exceptions. In Colombia, for example, while service quality, operational efficiency, tariff formulations, and other aspects of the industry were severely lacking throughout much of the country, areas such as Medellín were well served. Similar examples can be found in other Latin American countries.

viewed as a means to achieve the goal of greater efficiency rather than a vehicle to attract new private investors. It was reasoned that effective competition could be achieved if the scale of the individual enterprise were reduced, thereby increasing the number of independent players. To the extent that direct competition could not be relied upon, market competition could be facilitated indirectly by reducing or eliminating entry barriers (particularly stringent government regulations). In this way, markets would “get the prices right,” thereby providing incentives for efficiency and optimal system expansion.

Difficulties in Implementation

Putting power-sector reforms into effect has proven difficult. By mid-2002, two of the largest countries in the region—Mexico and Venezuela—had barely begun the reform process, while countries that had moved ahead, including Brazil, were having problems implementing the new approach. In addition, only five countries had a regulatory authority that had been functioning for more than five years, and only two wholesale markets were performing according to expectations. While privatization is under way in most Latin American countries, large portions of the industry typically remain under government ownership. In many countries, the new regulatory framework has not yet been fully implemented, and appropriate regulatory institutions are lacking.

Reforms are still in their early stages, and, while most stakeholders are surprised by the difficulties in their implementation (see Box), the degree of success cannot be judged by the reformers’ naïve expectations. Thus far, measurable results are not poor, although sustainability cannot be assured.

A Question of Sustainability

Problems with the functioning of reformed electricity markets have caused some countries to question the sustainability of reform. In El Salvador, for example, generators’ exercise of market power, combined with an ill-conceived procedure for passing along wholesale prices to consumers (with a lag of at least four months), has led to high consumer prices and has forced the government to intervene hastily in the newly created electricity market. Chile’s pioneering electricity market experi-

Stakeholder Experience

New investors entering the market have been few and mostly foreign. Competition has been limited, hampered by concentration in both generation and retail. Most private investment, whether greenfield or takeover, has been profitable, particularly old-generation PPAs and certain areas of distribution.

Consumers have benefited from lower prices, but large loads have been the big winners. Expansion of service into new areas has been limited, although quality of service has improved for existing consumers. Security of supply has been satisfactory generally, with the significant, recent exceptions of Chile and Brazil and the never-ending crisis in the Dominican Republic.

The experience of **SOEs** has been mixed. Some have been saddled with social obligations, and others have continued as vehicles for transferring rents to particular interest groups (including politicians). Rather than scaling down, certain SOEs have expanded their participation to a degree that may undermine the entire reform process.

Governments have generally benefited from privatization and fiscal-burden relief.

Society at large may have benefited from the release of public funds.

enced blackouts during 1998-99, which many analysts traced to incompatible incentives of market participants. This episode, together with the failure to transfer efficiency gains to consumers, ignited a political crisis that led to the first major overhaul of Chilean electricity legislation in 18 years. Competition in the Peruvian and Bolivian markets—mirror images of the Chilean model—has not fared any better. In the Colombian Pool (modeled after the England and Wales Pool), there is widespread concern that Pool prices will not provide the long-term signals that investors require to maintain security of supply. In Guatemala, the high cost of PPAs signed prior to reform have become a tremendous financial burden on the

sector, forcing its government to use its remaining assets to buffer the effect on tariffs. Brazil's recent drought led to a state of emergency, whereby its government introduced harsh measures to ration power supplies.

The slow pace of progress reflects the difficulties encountered. Reassigning business functions to the private sector is not simply a matter of transferring ownership of existing utilities. It also involves restructuring functions, many of which can be performed by agents who distribute other consumer goods and services. Moreover, it means that a government's ability to carry out its responsibilities should be strengthened. The task is further complicated by the challenge of extending services to the entire population, integrating regional markets, and achieving results in an environmentally sustainable way. Restructuring the energy sector, while creating new regulatory bodies, is especially burdensome for small countries. Political pressure, along with the economic and social downturn, means that any delays in passing along the benefits of reform to users cast doubt on its feasibility by creating confusion about the true causes of the problems and strengthening anti-reform movements.

These and other similar problems have caused some governments to reconsider the soundness of reform. Recent electricity blackouts in California and Brazil have created doubts about the efficacy of the sector's competitive model; opportunistic politicians are happy to blame what they consider to be the failure of the "neo-liberal" model, and a return to the State model is gaining ground in some countries. Advocates of this extreme interpretation conveniently omit an analysis of the reasons that led to the failed State model in many countries or replication of the few successful examples. However, difficulties encountered in consolidating implementation of the reformist model call for deep consideration of their causes. Contributions of institutional economists over the last two decades show that the difficulties developing countries face in adopting institutional models that have otherwise proved successful in OECD countries stem from inadequate compatibility with the countries' other institutions, both formal and informal (Aoki, 2001; North, 1990).

In short, despite major achievements—the new regime is unquestionably an improvement over its predecessor—important issues, arising from reform packages that are inconsistent with the technological, institutional, and human-resources capacities of these countries, seriously threaten

long-term sustainability. Consequently, rather than using a checklist to gauge progress in meeting reform objectives, success should be measured by assessing the likelihood of attaining these objectives in the future, as well as by reform sustainability.

Institutional Gap

Although their starting points and objectives differ, the reforms share many features with those of pioneering OECD countries. That reform experience depends on a particular country context has been given scant attention. Indeed, reform efforts have been based on ideological considerations that assumed markets could be trusted to solve the problem. This somewhat naïve view has been shared by country reformers, as well as multilateral and supporting institutions.

Latin America faces an institutional gap that threatens consolidation of vital reforms already undertaken and implementation of crucial second-generation reforms. Aspects taken for granted in other countries—rule of law, clear and accepted property rights, independent and competent judiciary, mechanisms for peaceful conflict resolution, contract enforceability, and quality of public bureaucracies and competition agencies—are either missing or incipient.²

A more cautious approach might have been based on the realization that, while some basic elements are essential, no universal model exists; all models have embedded a series of tacit components necessary for success. Furthermore, success of sector reform depends on the timing of associated State reforms envisioned in the new economic paradigm. Unless those implicit elements are replicated or replaced by local versions and reforms are coherent across the economy, transferring a model out of context is a considerable gamble. While blueprints, best practices, international codes and standards, and harmonization may prove useful for specific technical issues, large-scale institutional development requires a process of discovery about local needs and capacities (Rodrik, 2000).

² In an empirical study of institutional development, Burki and Perry (1998) show that, although Latin America has progressed with respect to contract enforceability and expropriation risk, it lags behind other world regions. Indeed, the region has improved little on the corruption and bureaucratic-quality fronts. These results are corroborated by a World Bank study, which indicated that Latin America seems to be behind other developing regions with regard to securing property rights

In most Latin American countries, establishing competitive markets for electricity has become a more difficult task than originally envisaged. The region shares the plethora of implementation problems that have plagued developed-country markets. In addition, Latin American countries have unique difficulties. Constraints stemming from small market size, country risk, and the strategic behavior of large international investors conspire against the minimum number of players needed to ensure market competition. Existing country risk and lack of credible commitment result in a trade-off between liberalizing markets—which may put competitive pressure on prices but also increase investor risk—and the comfort lenders usually seek for infrastructure projects. A growing market and reliance on hydroelectric resources make an energy-constrained system more the norm than an exception, exacerbating price volatility. Lack of human resources, weakness or lack of competition vigilance and regulatory institutions, and the ambiguous role of the judiciary impede oversight of competition and enforcement of other regulatory measures.

Certain constraints may be removed or lessened over time and with effort, thus making feasible the type of workable competition that reformers originally had in mind. For example, in Central American countries, power markets are small; thus, although implementation will be difficult, the medium-term strategy for the region should emphasize creating an integrated market (Millán and Vives, 2001). Although such an institution would have to deal with multiple principals, the exercise of market power would be made more difficult as the number of potential competitors increased. Nevertheless, careful crafting of the transition period is still needed to avoid interest developed during the interim from preventing attainment of the ultimate goal. Other constraints, such as availability of qualified and independent regulators, may be more difficult to overcome in the short term, as has been proven by Colombia's struggle to hire and maintain regulators and by most Latin American countries' efforts to clearly define the scopes for regulation and policymaking.

and judiciary reliability. This study also demonstrates that countries with civil-law systems (especially those derived from the French tradition, which includes most Latin American countries) have generally found it more difficult to provide adequate legal protection to creditors and minority shareholders and thus exhibit shallow, concentrated capital markets that limit investment and growth opportunities.

On the Political Economy of Regulatory Reforms

According to Dixit (1996, 1999), reforms occur amid the interaction of existing and emerging interests. Those currently in power will attempt changes that benefit their interests. Their ability to enact reforms, however, will be constrained by opposing interests from individuals or groups inside or outside the political arena. Consequently, at any given time, reforms will be shaped by the objectives of those who currently hold political power and the constraints imposed by their opposition. Over time, shifts in political power will result in new reforms that modify or alter those introduced earlier; indeed, reforms may themselves unleash political forces that lead to subsequent shifts of regime.

The Reformer's Challenge

The overall reform process can be viewed as endogenous, evolving with societal developments at large. Dominating political coalitions are fragile and change over time, political agreements cannot be enforced through contracts, and entrenched social conventions are difficult to substitute with seemingly superior alternatives. Within this context, the role of the outside analyst is reduced to merely registering developments and analyzing the forces shaping the process. However, reforms are formed not only by political struggle; they are also influenced by knowledge and facts. The current understanding of reform potential will affect which reforms are attempted. A better understanding of what can and cannot be achieved may increase the likelihood that reform efforts succeed. At a minimum, the analyst may make recommendations on feasible changes that maintain the potential for future welfare improvement.

The successful reformer will seize opportunities as they become available and use the interests aligned with his or her concerns; at the same time, the reformer will bear in mind the information and power of all groups in order to design reforms that will withstand subsequent political game-playing. To achieve sustainability—economically, financially, environmentally, socially, and politically—reforms must be designed so as to minimize the need for unnecessary revisions. While a gradual process of reform may constitute a sensible strategy, at any given stage, reforms should be sufficiently robust to withstand developments that occur as a

consequence of reform or unforeseen contingencies to avoid reversing the process. Thus, the reformer's challenge is to devise a path of events that does not eventually collapse.

Reform Seen Through the Lens of Mechanism Design Theory

Clearly, understanding the political economy of reforms requires analyzing the incentives of stakeholders: politicians, bureaucrats, industry players, and other interest groups. Realizing that the process of economic policymaking is constrained by uneven information and limited commitment potential, such an analysis may be based on the principles of mechanism design theory (Dixit, 1999). The first step in mechanism design theory is to identify already-formed interests, including their objectives and information. Once these are identified, it is then possible (at least in principle) to formulate incentive constraints for all and participation constraints for veto players (i.e., those who could, if they so wished, block reforms in some way) in the policy game. The last step is to design a reform package (mechanism) compatible with the constraints identified, while, at the same time, being interim efficient.

Participants may face incentive constraints arising from 1) private information (adverse selection) and 2) unobservable actions (moral hazard). In the first case, participants must be given enough economic surplus or rent to induce them to reveal information truthfully. For example, firms participating in the electricity market must find it in their interest to bid their power at prices that reflect cost. In the second case, participants should be given correct incentives based on (correlated) observable outcomes of their actions. For example, managers of regulated firms should be rewarded for running their firms in a cost-effective manner.

Mechanism design theory also emphasizes the importance of not worsening the expected utilities of those agents essential to reform (participation constraint). For example, if the cooperation of regional governments is essential, the central government should design reforms to induce their participation. Similarly, if foreign investment is needed, reforms must not be designed in a way that alienates foreign investors.

It should be recognized that reforms put in place today might create special interests tomorrow. Reforms result from stakeholder negotiation,

which usually requires compromises with and compensation for groups with veto power. Because of the dynamics of the reform process, these compromises and compensation may become obstacles to further development of the reforms or impede adjustments required to accomplish the original reform goals. Reformers may have been correct in assuming that losers would oppose reforms, not because they were losers but because compensation made them winners. Privileges and subsidies resulting from compensation create an interest in a stalled reform that allows players to profit from rent-seeking activities. Co-existence of the old regime with the reformed sector, resulting from compromises or compensation, often prevent the extension of benefits to critical groups, thus weakening the reform coalition and preventing completion of the institutional changes required to make the reform work. The lesson from this experience is that, in order to be sustainable, the reform process should not generate or hold open options for economic compensation that interest groups could seize upon in the future.

While it is not suggested that sustainable reform of Latin America's electricity sectors should be formulated as a mechanism design problem (the issue is far too complicated to be stated as a simple optimization problem), the theory may nevertheless be useful for organizing analysis. The theory suggests the importance of identifying stakeholders and their incentives to participate in the reform process and behave efficiently. Understanding relevant incentive and participation constraints is crucial to assessing the likely result of reforms and suggesting improvements.

Mechanism design theory emphasizes that reforms are constrained by the need to ensure the participation of individual stakeholders and compatibility with their incentives to behave efficiently; in addition, the theory recognizes, either explicitly or implicitly, additional constraints of a technological, economic, or institutional nature. These include education and technology levels that lead to poor performance of administrative and regulatory organizations, the special character of French law, lack of independent judiciary and property rights enforcement, and limited scope for competition resulting from market size. Analyzing such obstacles is no less important than studying those originating from incentive and participation constraints.

Objectives of the Research Project

The goals of this study were to test the extent to which the objectives envisaged in the new economic paradigm are feasible within existing constraints and then identify major obstacles to their achievement. The book includes case studies of Colombia, Honduras, and Guatemala. Because of the complexity of local conditions and state-of-the-art intricacies of power-sector regulation and competition, the studies relied on both experienced national teams knowledgeable about the political economy of the sector and professionals with a broad knowledge of international experience. This called for a cooperative effort that, while centrally coordinated, allowed for incorporating the special features of each case.

The main argument put forth here is that, while reforms have delivered certain expected results and have led to improvements compared to the old regime, lack of fit between the models adopted and institutional and resource endowments raises questions about reform sustainability.

Specific objectives of the study were to identify implicit and explicit policy goals and constraints and discuss their overall and relative importance; analyze how the existing regime (including planned reforms) take objectives and constraints into account and identify major threats to reform sustainability; and implement adjustments and strategies to improve sustainability of reforms.

In principle, these objectives may be treated separately; in practice, however, their interactions and constraints, as well as reforms, must be analyzed as a whole. Because reforms occur amid the interaction of existing and emerging interests, understanding this dichotomy is essential to evaluating the sustainability of the process.

Accomplishing the first two objectives requires a diagnostic of the country and sector both prior to and during reforms, for which much material and evidence are available. The third objective requires more creativity because it involves not only identifying and screening alternative measures; it also makes a coherent proposal for their implementation.

Country-study Focus

While the analytical framework proposed at the outset of the project provided the initial push and a common research approach, the backbone

of the project comprises three country studies. These studies seek to identify major institutional and structural constraints that limit performance of the reorganized power sectors in the post-reform period and that present major threats to reform sustainability. They also aim to draw policy conclusions and outline strategies and actions that can contribute to consolidating the gains made thus far, ensure progress of the process, and avert future threats to sustainability of reforms. Lessons from the case studies may prove useful to other countries that have undergone an initial round of reforms and countries that contemplate future policy changes.

Organization of this Book

This book is organized into six chapters: analytical framework (Chapter One), country studies (Chapters Two through Four), supply security (Chapter Five), and lessons learned (Chapter Six). The chapters are followed by an epilogue. While many readers will benefit from following the logical order in which the chapters are presented, others may wish to skip to those of special interest.

Analytical Framework

In Chapter One, von der Fehr and Millán present the analytical framework for the case studies. The framework outlines a three-part study that 1) identifies and characterizes the objectives and main constraints to the reform process; 2) analyzes governance and incentive structures used to determine how they conform to the constraints identified and the main threats to reform sustainability; and 3) analyzes adjustments and developments and strategies to implement them that may better align incentives with reform objectives.

The authors discuss reform objectives and the nature of constraints that limit their implementation. Understanding the reasons behind the old paradigm's failure can help to identify the movers behind the reform process and the rationale for its goals and objectives. Within this context, one may consider reform elements as a set of actions and institutions compatible with a country's endowments that will allow for attaining the original objectives of service provision.

Country Studies

Chapters Two through Four focus on identifying the main threats to reform sustainability by assessing performance of reform elements and linking it to potential mismatches between institutions, capacities, and constraints. This task requires that the reform package be examined in terms of its institutional, architectural, and structural components. While it is important to identify the rationale behind reform, the main objective is to assess its compatibility with a given country's stakeholder expectations and institutional and human-resource capacities. To this end, one must compile evidence that relates performance criteria to design elements in order to appraise the reform package and identify major threats to its sustainability.

Colombia: It's Not My Fault

In Chapter Two, Ayala and Millán make clear that, while external causes may provoke a crisis, the real threat to sustainability is a sector's inability to resist external shocks. The authors set forth the thesis that, although many elements of the reformist package have been successfully implemented and many expectations have been fulfilled, several of the strategy's implicit assumptions have proven inadequate because of institutional, technical, and political economy limitations. Thus, despite its initial success, the model has become vulnerable to such external factors as economic recession and terrorist attacks.

Paradoxically, during the first few years of reform, the ample opportunities investors envisaged for sustained demand growth made market limitations and weakness of regulatory institutions less visible. They only became evident in the context of groups wrangling over system funds to compensate for low prices of a depressed market. The study reminds one that only leadership exercised at the right moment can transform a critical situation into an opportunity for reform.

Honduras: One Size Doesn't Fit All

In Chapter Three, Walker and Benavides show the cost of forcing a "cookie-cutter" approach to reform design that ignores local conditions

and lacks ownership within the country. While Colombia and, to a lesser degree, Guatemala had domestic support for reform, Honduras did not. The country's reform enthusiasts included multilateral and bilateral donors and perhaps those in distant capital markets. Thus, the political reality of sector reform was that, at best, only a limited domestic constituency supported the changes.

The authors focus on the need to take a gradual approach that allows moving forward and gathering support, while building critical institutions and a regional electricity market that relieves constraints on a more fully working, competitive model.

Guatemala: Caught in the Middle

In Chapter Four, the Fundación Solar team and Rufin allude to the problem of sequencing and transitioning to reforms. They illustrate how failure to address upfront the stranded cost resulting from the PPAs, contracted under pressing conditions before the reform was in place, overshadowed the entire process and remains a major threat to reform sustainability.

Another irony of the new post-reform regime is that many of the issues that destabilized the old regime are being revisited. These include formulation of tariffs and sustainable subsidies, poor governance, and weak sector institutions (particularly with regard to planning and policy).

This chapter also illustrates the crucial importance of the grid as an enabler of competition, as is discussed in Chapter One. Flaws in design of the structure and regulation for transmission in Guatemala compromise efforts to achieve competition and maintain reliable service delivery. After the extensive media coverage of the August 14, 2003 blackouts in the United States and Canada, regulators should need no further reminders that transmission systems in a market environment are much more demanding than in the previous vertical integrated world.

Supply Security

The recent supply crises in California and Brazil were a timely reminder that, no matter who is the service provider, in cases of shortage, a country's government will always be blamed. In the electricity industry, providing an adequate level of supply security is one of the most impor-

tant and difficult problems. Recent events in California and elsewhere demonstrate that introduction of market-based reforms does not necessarily solve the problem; at worst, deregulation may exacerbate it.

In Chapter Five, von der Fehr discusses the nature of the supply-security problem and possible solutions. The author stresses the need for introducing well-defined property rights and establishing institutions to deal with transaction costs. He discusses the practical solutions chosen in the three countries studied herein, and ends by emphasizing that demand-side measures, which aim at introducing more demand flexibility, are essential to achieving supply security in hydro-dominated power systems, like those of Latin America.

Lessons Learned

Given the three countries' diverse experiences with power-sector reform, the task of drawing general lessons may appear daunting. Nevertheless, certain underlying problems are similar and developments, however divergent, share common features. In particular, difficulties associated with introducing market-based solutions, establishing new regulatory institutions, and avoiding haphazard or incoherent political interference in development of the industry are themes common to all three countries.

In Chapter Six, the editors discuss six complementary issues. The first three provide insights into general problems: difficulty of sector reform, relative scarcity of models tried in the countries studied, and political-economy issues that prevent full use of consumer prices and thus limit the reformer's options. By contrast, the next three issues discussed are critical to market reform: need to guarantee supply security, importance of market architecture and competition, and adequacy of regulation.

Epilogue

Finally, Ashley Brown provides a peer reviewer's insights into the issues discussed in this book. His analysis of the three case studies offers lessons from the countries' collective experience, as well as recommendations and critical areas that merit further research.

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CHAPTER ONE

Analytical Framework

Nils-Henrik M. von der Fehr and Jaime Millán

This chapter presents an analytical framework for uncovering the sustainability of electricity market reforms and suggesting improvements in cases where there are threats to sustainability. The approach identifies implicit and explicit policy objectives and constraints and discusses their overall and relative importance; analyzes how the existing regime (including planned reforms) takes objectives and constraints into account and identifies major threats to reform sustainability; and suggests and discusses adjustments and developments that will improve reform sustainability.

While each of the above elements may be treated separately in principle (the approach followed in this chapter), the interaction of objectives and constraints with reforms must be analyzed as a whole. Reforms occur amid the interaction of current and emerging interests; understanding this dichotomy is essential to evaluating sustainability of the process.

Accomplishing the first two tasks requires a diagnostic study of the country and sector prior to and during reforms, using available materials and evidence. The third task requires more creativity because it involves not only identifying and screening alternative measures, but also making a coherent proposal for their implementation.

For analytical purposes, one may postulate that the overall objectives in service provision are the same before and after reform: Delivering electricity the population requires in a financially, economically, socially, politically, and environmentally sustainable way. Success of the model adopted by the earlier paradigm—measured in terms of achieving these

objectives—was based on fulfilling a set of critical assumptions that proved either false or impossible to achieve because of constraints that were too costly to remove. Similarly, success of the new model depends on adequate assumptions underlying its rationality and the cost and feasibility of removing the constraints that limit its performance.

The first step in the analysis is identifying reform motivations, objectives, and constraints and discussing their overall and relative importance. The authors divide constraints into four broad categories—political, institutional, technological, and economic—each of which is discussed separately.

Motivation and Objectives

Since reforms were proposed to solve the problems of the old model, clearly understanding the political and economic context that drove reform efforts can help to make the proposed solutions explicit, identify the degree to which the new model preserves the public-policy benefits that the old model was designed to achieve (e.g., expansion of services and cross subsidies for worthy objectives), and highlight the necessary compromises made, as well as their potential effect on attaining desired results.

The first issue to address is the political motivation for reform. Who initiated the process? Why? Was it mainly a local initiative, based on a realization that the current industry was underperforming? Or did international lenders or investors, dissatisfied with the security of or return on their assets, initiate the effort? To what extent were reforms driven by political ideology? If so, which one? Were reforms part of a broader strategy adopted because of an earlier failed economic paradigm; if so, how do electricity reforms fit into the overall picture? Has there been or is there opposition to reforms?

It is equally important to understand the implicit economic cost of the earlier model and conditions that made it unsustainable, as well as those that helped to shape and sustain it. Together, these will help to establish a performance criterion used in the second step of the analysis.

Thus, a study of reform sustainability should include:

- ◆ Diagnosis of the old model to identify reasons for failure to meet objectives;

- ◆ Outline of explicit and implicit reform objectives, including underlying reasons that moved the government to adopt it;
- ◆ Discussion of the government's commitment to reform as the process evolved;
- ◆ Baseline for appraising reform performance.

Identifying Stakeholders

Reforms that do not reflect political realities have little chance of success. While reform design will necessarily be in line with the objectives of those currently in power, it must also consider the interests of other potentially influential political groups. In short, reforms must be resilient in response to shifts in political interest and power; they cannot be sustainable if they trigger events that oppose the interests of key stakeholders (Box 1.1).¹

One needs to understand which societal actors, with what interests, are attempting institutional change. One also needs to know what resources—financial, organizational, and political—they are capable of bringing to the reform table. Key questions include the following:

- ◆ Who benefits and who loses from current institutional arrangements? Who would benefit and lose from the changes?
- ◆ How were original stakeholders compensated?
- ◆ To what extent have original compensations created new interest in stalling the reform effort?
- ◆ To what degree are new stakeholders interested in consolidating the reform effort?
- ◆ How entrenched are stakeholders who oppose continuing reform? What are the options for compensating them?
- ◆ What are the opportunities for coalition-building and organizing new stakeholders?
- ◆ How have important political or economic interest groups interfaced with regulators and the regulatory process as it has evolved? Are they accessing, bypassing, enhancing, or attempting to sabotage the process?

¹ Of course, no reform process can be completely sheltered from political turmoil. In some Latin American countries, the risk of revolt, with a subsequent change in political regime, is real. Electricity market reforms are unlikely to survive such a shift in political power.

Box 1.1. Key Stakeholders and Their Political Influence

Analyzing the political robustness of reform requires identifying key stakeholders. These include:

Politicians and their patrons (including contractors, entrepreneurs, and foreign interests). They may not only try to benefit from reforms, but may also attempt to help shape them. While local politicians may have their power base eroded by reforms that consolidate or privatize the industry, they may find ways to work around the new system.

Business interests (particularly large industrial consumers in power-intensive industries). They may not only have an interest in low electricity prices, but may also wield considerable political influence.

Current and potential electricity consumers. In many countries, availability of electricity is limited to a fraction of households. Hence, electrification may be an important issue to many voters. On the other hand, electrified households, although limited in number, may be more influential politically and more concerned with obtaining a high quality of supply at reasonable prices than extending service availability to new groups.

Electricity companies. In most countries, the financial viability of electricity companies is a requisite for maintaining reforms. Allowing the financial failure of individual companies may be even more difficult when companies are government-owned.

Foreign investors. Some countries are critically dependent on foreign direct investments or funding from international sources in the electricity industry or other economic sectors. To honor explicit or implicit agreements with such international partners, sustain their presence, or attract their entry in the future, reforms must not endanger their financial interests. In addition, it is important to understand international companies' transnational strategies.

Financial sector. When electricity reforms affect the financial performance of firms, either within or outside the electricity industry, their financial partners' interest may also be affected. Of particular concern are the interests of multilateral lending institutions.

Labor. Labor unions' reach varies considerably among countries. Where unions are strong, it may be difficult to achieve cost reductions that involve layoffs or pay cuts, especially in state-owned enterprises.

Analyzing Sensitive Issues

Complementary to identifying key stakeholders and their potential political influence is analyzing politically sensitive issues, such as ownership. In some countries, privatization is a prerequisite for successful reforms; in others, it may be met with insurmountable political opposition (e.g., from employees). The issue of breaking up existing companies or changing ownership structure may also be met with considerable opposition.

Another potentially sensitive issue is pricing. Experience from many countries suggests that sharp increases in electricity prices are politically unacceptable. Even modest price increases, such as those following a restructuring of tariffs to better reflect underlying costs, may be difficult to accept. Both high and extremely low electricity prices can endanger the financial viability of electricity companies, resulting in considerable political pressure for government intervention in the market.

Inefficiency of utilities has been a driving force for reform; however, the closing of inefficient plants or staff cutbacks may prove difficult. In Latin America and the Caribbean, frequent or lengthy power interruptions are not unusual. Nevertheless, further deterioration in quality of supply, resulting from suspected attempts to manipulate the market or from outright failures, may jeopardize credibility of the reform process.

Facilitating investment in both network and generation capacity is an important goal for any reform program; therefore, failure to achieve this goal may discredit the program. In some cases, unrealistic expectations, possibly caused by lack of experience with operating in a market-based environment, may lead to overinvestment, which subsequently endangers the financial viability of the industry.

Pre-reform regimes have typically involved some form of obligation to provide general access to electricity, or to keep prices low for certain consumer groups. Failure to uphold such public-service obligations may have significant economic consequences for the parties affected, leading to popular discontent with the reforms.

Environmental issues may also be politically sensitive. The electricity industry may significantly affect the natural environment because of pollution from thermal generation plants, regulation of water systems to facilitate hydroelectric-power generation, or building of transmission

networks. If electricity reforms result in rapid expansion of the industry, environmental concerns may lead some to question the advisability of reforms.

A study of reform sustainability should therefore include:

- ◆ Classification and description of key stakeholders and politically sensitive issues, including the power base and vested interests of politicians.
- ◆ Discussion of how and to what extent political concerns may constrain the reform process.

Identifying and Overcoming Constraints

Institutional Challenges

A well-functioning market economy requires well-defined property rights and, in cases where such rights are disputed, institutions for resolving conflicts. In countries with a weak judiciary, at least in relation to the electricity industry, market participants may find their operations subject to considerable regulatory uncertainty. Laws and regulations may be unclear, incomplete, or even involve overlapping or inconsistent rules. Judicial and regulatory institutions, to the extent that they have discretion, may lack sufficient resources or powers to allow for efficient and consistent decision-making. Absence of sufficiently strong, corrective incentives may corrupt regulators and consequently invite the inefficient use of resources in rent-seeking activities aimed at influencing regulatory decisions. Indeed, the judiciary may play an active, anti-reform role.

Clearly, inefficiencies in the regulatory environment are not inevitable. Development of consistent regulations and regulatory institutions with clear incentives and sufficient resources may, in theory, overcome them. In practice, however, a country with a weak judiciary (possibly with considerable political interference in the decision-making process) may be unable to solve the problem easily. Furthermore, lack of human resources—people with the necessary expertise and experience in regulating a market-based industry—may seriously constrain the potential for creating a regulatory environment conducive to developing sustainable electricity-market reforms.

Therefore, a study of reform sustainability should include:

- ◆ Overview of laws and regulations related to the electricity industry, including merger and acquisition policy;
- ◆ Overview of judicial and regulatory institutions responsible for the electricity industry, including an analysis of their agendas, powers, and resources;
- ◆ Based on the above findings, evaluation of the judicial and regulatory environment and the extent to which this may constrain the reform process.

Barriers to Competition

Around the world, recent experience with electricity regulatory reform has shown that, in the absence of effective competition, decentralized decision-making does not lead to efficient use of economic resources. On the contrary, threat of market power is real and, where it appears, necessitates regulatory intervention in order to avoid its abuse. Therefore, it is important to identify which areas of market competition can be expected to work or fail.

Technological Obstacles

Imperfect competition may result from technology constraints. For example, individual plants must be large enough to extract the most from existing scale economies. This is true for all types of generation, but particularly for hydroelectric facilities, where plant size is largely determined by site conditions. A small market may have room for only a few generation plants; thus, even if each plant is operated independently, the scope for competition is limited.

Technology may also constrain the opportunity for operating plants independently. This is true for hydropower facilities that operate on the same river. Water-management decisions upstream affect availability of hydro resources downstream, creating an interdependence, or externality, between plants. How important such externalities are in practice is an open question, whose answer presumably depends on both natural conditions and capacity installations. To the extent they are important, such

externalities limit the scope for creating companies that can act independently and competitively.

Competition may also be limited by economies of scope. Operating many plants within the same company can allow for a better use of human resources (including management-level resources), as well as savings on raw materials and capital equipment. Learning at the operating level may be transferred from one plant to another. When such economies of scope are important, there are real costs involved in breaking up companies or refusing to allow mergers in order to sustain a sufficient number of independent market players.

The ownership structure may bar competition, even in cases where technology constraints or economies of scale are of limited importance. If ownership is initially concentrated, it may be difficult to achieve a looser structure. Breaking up private companies, whether owned by local or international interests, is generally difficult, if not impossible. In an industry with considerable state ownership, such restructuring may be easier to achieve.

Weak transmission networks may act as a barrier to effective competition across the market. Especially during high-use periods of transmission capacity, system bottlenecks may, in effect, create local monopolies. Network structure may also affect competitive conditions. For example, in a country where transmission flows are uni-directional, perhaps along a single transmission line, effective competition is less than in a system where power can flow in different directions over a web of transmission lines. Generally speaking, the stronger the transmission network, the better the scope for competition. The net economic benefits of setting up a transmission grid with excessive capacity may be high if the generation segment is to be considered competitive.

Reducing Long-term Barriers

Overcoming technological and market-structure constraints is usually only partial and occurs over time. A study of reform sustainability should emphasize those constraints that cannot be removed within the time frame of reforms. However, regarding the question of timing particular reforms, and, more generally, development of the reform process, it is

important to understand the extent to which barriers to competition can be reduced over time.

In cases where competition is limited by market size, demand growth may allow for more independent agents. Market growth may also affect competitive conditions indirectly, for example, by allowing for new investment in transmission capacity.

Even if the market is growing at a limited rate, entry of new competitors may be facilitated. Small-scale, gas-fired plants, for example, can be built quickly and may be economical, even if the market is fairly balanced initially. Divestiture of existing facilities by privatizing government-owned facilities may also promote entry.

In some cases, interconnecting the national system with those of neighboring countries may allow for expansion that can undermine market power and facilitate competition. International interconnection has its own difficulties associated with agreements on how to share costs and coordinate operation. While market extension through interconnection may be the only feasible option for creating effective competition, such a solution may extend well into the future.

Workable Competition

Effective competition is a matter of degree, not simply a question of “yes” or “no.” The real question is whether it is possible to create “workable competition.” No general standard has been developed for a workable competition market. Some type of qualified judgment, based on an evaluation of competition barriers and market performance, is inevitable.

Moreover, while competition may be impossible to achieve in certain market segments, it may prevail in others. Creating workable competition is more difficult in retail than in the wholesale market. In a small market, where it is difficult to create price competition in supply, it may be possible to create competition for investment in new capacity and operation of existing facilities. Tendering for new investment or contracts to operate existing facilities are potential ways to ensure cost efficiency.

Thus, a study of reform sustainability should include:

- ◆ Overview of existing market structure—including ownership, technologies, and market share (capacity and energy);

- ◆ Identification and characterization of entry barriers—including access to energy sources and transmission networks and planning permission;
- ◆ Based on the above findings, analysis that distinguishes between areas where workable competition is achievable and those where it will likely fail.

Financial Issues

A government's financial capacity may constrain its ability to develop the electricity industry or sustain certain types of market reform. In some cases, budgetary constraints are self-imposed or result from political obstacles. However, in a poor or debt-burdened country, access to finance is an obstacle to economic development.

Such constraints may also result from dependence on foreign companies or lenders, whether private or government-based institutions. Existing obligations, or conditions imposed by such institutions, may limit the set of possible reforms.

One such type of constraint is a government's contractual commitment with private suppliers of electricity through power purchase agreements (PPAs). PPAs are typically long-term and fix prices for purchasing power, often based on take-or-pay conditions. Such contractual commitments may create perverse incentives and limit the potential for creating competition and reducing electricity prices. In some cases, it may be possible to renegotiate contracts in a way that allows for more efficient use of available resources.

A study on reform sustainability should therefore include:

- ◆ Evaluation of the financial constraints on the reform process.
- ◆ Focus on how those constraints define the capital structure of new projects and affect competitiveness of new entry.

Social and Environmental Barriers

Despite efforts to provide universal access to power services, coverage throughout most Latin American countries remains low. For the three cases studied in this book, Colombia has 85 percent coverage, Guatemala

has about 70 percent, and Honduras has less than 60 percent. For each country, percentages in rural areas are much lower than in urban ones. All three countries provide substantial subsidies, to which their respective populations feel entitled. Therefore, any reform must carefully consider the effects on the protected segment of the population.

In addition, environmental constraints may raise the cost of electricity (if observed), or environmental damage may be exacerbated by technology choices dictated by competition (if constraints are violated).

A study of reform sustainability should therefore:

- ◆ Evaluate how universal service obligations are affected by reforms.
- ◆ Study the interplay between environmental constraints and power-sector competition.

Sustainability of the Reform Package

Once reform objectives and constraints have been understood, the second task is to assess the appropriateness of the reform package to particular country conditions and identify major threats to sustainability arising from potential mismatches. Specifically, this part of the study:

1. Outlines the institutional, structural, and design components of the reform package.
2. Relates industry performance to reform components in order to understand a) agent incentives (including political and regulatory) for using economic resources efficiently in the electricity sector and b) ways in which reform has solved sectoral problems and the degree to which stakeholder satisfaction has been met.
3. Evaluates this compatibility with the political, institutional, technological, and economic constraints identified in the first part of the study.
4. Based on this analysis, identifies major threats to reform sustainability.

This section stresses the fundamental importance of defining and distributing property rights. Poorly defined or disrespected property rights distort incentives, causing conflicts to arise. Lack of appropriate

institutions to handle such conflicts undermines incentives for acting efficiently and participating in the marketplace (e.g., by investing in new capacity). Consequently, compatibility between efforts to redefine or redistribute property rights and establish efficient regulatory institutions is crucial to the sustainability of reforms.

Distribution of property rights determines which transactions will be undertaken. To achieve efficiency, reforms must 1) distribute property rights to reduce the need for costly transactions and 2) reduce transaction costs. Thus, sustainability of reforms also depends on the interplay between market architecture (to reduce the need for costly transactions) and market design (to reduce transactions costs).

Institutional Foundations

Regulatory reform affects the rights and responsibilities of individual agents. For example, by transferring ownership of utilities from government to private investors, the government limits its right to directly influence operation of the utilities. Similarly, depending on the exact rules governing operation of the electricity market, individual generators may be given the right to make price and availability bids as they wish. In some regulatory regimes, distribution companies have a right to supply all household consumers in their region (at regulated prices), while, in others, individual consumers are free to choose their suppliers. For purposes of this study, it is important to analyze ownership and allocation of property rights in relation to settling disputes in the new or reformed institutions.

Ownership and Allocation of Property Rights

The Coase Theorem suggests that, from an efficiency point of view, exact distribution of property rights is irrelevant.² When there are trade gains, the parties involved will find it in their interest to make the arrangements necessary to realize those gains. Consequently, well-defined rights and responsibilities may be more important than their distribution.

² Ronald H. Coase, the 1991 Nobel Prize winner in Economics, proposed what became known as the Coase Theorem in 1960.

The above insight holds as long as there are no transactions costs; that is, whenever redistribution of property rights is costly, the question of who holds these rights initially may be important. For example, if consumers have been given a right to receive uninterrupted supply of electricity at all times, then it may be easy for the distribution utility to design a set of pecuniary compensations acceptable to consumers in order to relieve itself from the impossible obligation of maintaining optimum supply quality at all times.³ Furthermore, such a system of compensations provides the distribution utility a financial incentive to maintain reasonable quality. If consumers had no such right and the distribution utility were free to interrupt supply at its convenience, then it may be more difficult to provide an incentive to provide good quality. In this case, consumers would have to agree on a coordinated attempt to negotiate a system of pecuniary rewards with the distribution company for upholding good quality of supply. Given their number and heterogeneity, it could be difficult for consumers to reach such an agreement.

To sum up, both the definition and distribution of property rights is important for reforms to succeed. It is therefore important to assess how property rights are defined and allocated between types of agents. Crucial areas are price determination, supply decisions, quality of supply (including power failures), and network access.

Settling Disputes

In cases where property rights are defined poorly or not at all, conflicts will inevitably arise. For example, if it is unclear whether consumers have a right to uninterrupted electricity supply, whenever a power failure occurs, a conflict will immediately arise over who is responsible and who should make arrangements, if necessary, to compensate those affected by the interruption. Whatever consumers' rights are, it may be unclear whether responsibility lies with the network utilities or generators.

Given that, in practice, it may be difficult to define property rights sufficiently well for all possible contingencies, institutions should be put

³ This option may not be available under French law, which rules out compensations and requires that the good be provided.

in place to handle conflicts when they arise. While the particular regulatory agency responsible for solving such conflicts may have been provided some discretion, consistent and clear rules for handling conflicts will reduce costs.

Institutional Reform

Market reforms involving redistribution of property rights and potential creation of new types of conflict require a review of institutional functions and perhaps establishment of new institutions. Institutions are required to operate the market (including exchanges and systems operation), as well as to monitor, review, and regulate the conduct of competitive and monopoly agents. The credibility and effectiveness of institutional governance and incentive structures depend on their compatibility with the country's institutional capacity—legal, judiciary, property-rights, antitrust, and risk-management.

The critical role of institutions has sometimes been seriously underestimated. Consultants who participated in the design of the recent reforms in Latin America may not consistently have had the necessary expertise in institutional issues. That regulation is a foreign concept under French law may also explain the lack of regulatory culture in many relevant countries. At any rate, relatively little attention was paid to the fact that institutional capacity may be a limiting factor. For example, antitrust authorities are, in many cases, weak or non-existent; property rights are often vaguely defined; and control is not always exercised by the legal owner. Furthermore, the judiciary may be unpredictable or have its own agenda for public policy, financial institutions are weak, and hedging instruments are seriously lacking.

Regulatory capacity is also limited. Established regulatory bodies often lack independence, human and financial resources, and expertise. Functional coherence between regulation and oversight may be lacking, and institutions may be inadequate. These factors and others, such as small countries' scarce human resources and the asymmetric relation with foreign investors, make regulators particularly vulnerable to capture.

It may be useful to describe the reform process as a two-step evolution (Dixit, 1999): Design of rules (rule-making) and operation of newly

established institutions (policymaking). With this format in mind, it can be expected that small countries with weak institutions may be tempted to identify reform with privatization of infrastructure assets and few restrictions on market structure and conduct. If this is the environment in which reform unfolds, it will be no surprise for the first step to result in state capture (Hellman, Jones, and Kaufmann, 2000). Powerful firms can shape the rules of the game to their own advantage, at a high social cost.

Captor firms are likely to be private firms facing a vague delineation of property rights *ex ante*. They will try to hedge against this vagueness and take advantage of their bargaining strength *vis-à-vis* the government. In network utilities, the outcome could be vertical and horizontal integration, increased end-customer prices, and provision contract clauses transferring all risks to the state, yet yielding handsome profits. Political pressure exerted by groups that have lost out on the reform may then induce the government to renegotiate the rules of the game. This is a difficult and costly process because captor firms will request compensation, measured against expected income under the rules of the game they helped to devise.

Governance Structure

Conflicts of interest may arise within the government since it plays many roles with respect to the electricity industry—legislator, regulator, owner, and buyer. Furthermore, various government agencies are typically involved in regulating the electricity industry. As long as agency rights and responsibilities are well defined, multiplicity may not pose a problem. However, in many cases, rights and responsibilities overlap or are unclear. In the case of state-owned enterprises (SOEs), for example, it may be unclear whether they are subject to standard regulatory rules or whether decisions by the industry regulator may be overruled by the ministry responsible for government ownership interests. Similarly, the status of plans for new infrastructure investment set forth by an industry regulator may be unclear if the plans require government funding controlled by the ministry of finance. An efficient government requires that the various roles are separated and that rules clearly define agencies' rights and responsibilities, particularly those involving conflicts between government interests.

Evidence to date suggests that separating the roles of the state has not been easy. Boundaries between policymaking and regulation remain blurred. This is apparent in Colombia's ongoing struggle to liberalize the natural gas market and in El Salvador's lack of initial definition of and institutional responsibility for energy policy. Across the region, lack of independence and competence of regulatory institutions is an issue.

Constraints and Performance

Lack of strong, complementary institutions undermines performance of the reformed industry and may slow the pace of reform. Absence of relevant competition policy and competent antitrust bodies, at best, places the burden of overseeing competition on the regulator; at worst, the task is shifted to unqualified bodies subject to capture. This, in turn, limits the number of workable options for market architecture.

Pool governance by stakeholders is another example of institutional constraints. One obvious problem is the potential limitation of information flows to potential competitors, the government, and the regulator. Chile, which had such a governance structure, experienced numerous difficulties during the last supply crisis because the regulator was kept uninformed until it was too late to intervene.

Legal uncertainty is another key issue arising out of institutional constraints. Such uncertainty may not only discourage new investors; it may also provide them wrong incentives (e.g., investors may seek comfort in the capture of judiciary and regulatory institutions). Nevertheless, the greatest danger to power-sector reform is getting mired in flawed rules; those who profit from flawed rules usually accuse those who challenge them of discrimination.

To summarize, a study of reform sustainability should include:

- ◆ Overview of various participants, including private and public companies, their owners, workers, consumers, and interest groups;
- ◆ Overview of various participants' rights and responsibilities and how these may have changed as a result of reforms. Key questions include to what extent losers have been compensated;
- ◆ Analysis of potential areas of conflict (i.e., where rights and responsibilities are unclear or undefined);

- ◆ Evaluation of institutions created to handle such conflicts, including relative powers of decision-making and regulatory branches of authorities and differences between policy and regulatory institutions. Key questions include: To what extent has the country been able to establish a regulatory office that is well respected by government and industry? How effective has the regulator been in competition and regulatory oversight in monopoly segments of the industry? How effectively has the regulator enforced social objectives? How binding are constraints on attaining the type of regulation envisaged by reformers?

Market Architecture

Market architecture deals with organizing activities (including the vertical and horizontal structure of the industry), as well as demarcating external (market-based) and internal transactions. As such, market architecture involves procedures for providing short-term signals for system operation and long-term signals for system expansion. It also involves the rules and regulations governing interconnections, contractual obligations (including PPAs), and environmental and distributional consequences.

Market architecture necessarily involves a series of trade-offs, such as choosing between competition and regulated monopoly or between “good” and many players. Adequacy of a given market architecture depends on the existence of complementary institutions, as well as technological characteristics of the system. Key questions include: To what extent are the necessary trade-offs made explicit? Are choices sensitive to the specific market context?

Organization of Activities

The task of supplying electricity may be divided, at a minimum, into five categories of activity (Box 1.2). Borders between these categories are not always clear. For example, while electricity is produced in power stations, system capacity for final energy delivery depends on characteristics of the transmission network. The boundary between transmission and distribution is arbitrary; often, transmission refers to that part of the grid in which power may flow in different directions, while distribution consists mainly of

Box 1.2. Common Categories of Electricity Supply

It is helpful to distinguish between the following five categories of electricity supply:

1. *Generation*—Production of electricity in power stations;
2. *Transmission*—Transport of energy along high-voltage cables constituting the main electricity grid;
3. *Distribution*—Transport of energy at lower voltages to final consumers;
4. *Trading*—Business of facilitating exchange of wholesale electricity between generators and between generators and retailers, including handling of the risks involved; and
5. *Retailing*—Business of advertising, branding, contract bundling, and billing final customers.

radial parts of the network. In practice, they are divided according to voltage levels. It is a matter of definition whether consumers who exchange electricity directly with generators are involved in trading or retailing.

Various considerations determine the ways in which activities are organized. These include:

- **Competition:** It is generally acknowledged that some form of separation between potentially competitive and monopolized activities is warranted. For example, workable competition in market-based trading is facilitated by vesting transmission in a separate organization with no interest in generation, trading, or retailing. Similarly, separation between distribution and retailing is necessary to promote workable retailing competition.
- **Regulation:** Regulatory oversight is facilitated by placing various types of activities in different companies. Having a multiplicity of companies performing similar activities may allow for some form of direct or indirect competition or comparison (such as “yardstick competition” or “benchmarking”).

- **Practicality:** Historical or practical reasons may determine who should perform which activities. For example, the distribution organization (i.e., number of distributors and extension of distribution areas) is typically determined by the existing or pre-reform structure. In some countries, metering is considered an integral part of retailing, while, in others, distributors undertake the task (in principle, metering could also be performed by independent companies).

Markets versus Hierarchies

In addition to organizing activities, market architecture also decides which transactions should be market based. This issue is linked to activity organization, as separation of activities requires external, rather than internal, transactions. For example, if transmission is separated from generation, then generators must transact with the transmission company; however, if the activities are undertaken within the same company, the corresponding transactions are internal. Even if transactions are external, they need not be market based. For example, transmission rights may be negotiated between the transmission company and network users or allocated by an administrative process. Thus, while determining which transactions should be market based is closely linked to organizing activities, separate issues must also be considered.

Many transactions will be conducted in a market-based fashion; this includes financing new investment, purchasing equipment and construction services, and employment decisions. Various transactions typically are not market based; these include developing new generation facilities (which tend to be subject to government approval) and infrastructure access (where both prices and rights of use are generally regulated). Of course, there could still be competition for setting up new facilities, for example, by some form of procurement auction.

The issue of market-based transactions is most open-ended in the areas of *physical exchange of power* (determining how much each generator should produce and each consumer should consume at any given time) and *risk management* (handling of risk associated with income or payment streams). With regard to physical exchange of power, the administrative solution makes physical decisions according to a centralized opti-

mization procedure, based on demand forecasts and information on costs and availability of generating capacity. By contrast, the decentralized solution delegates dispatch decisions to the individual generator, perhaps based on bidding in a spot market for electricity. With regard to risk management, long-term, take-or-pay contracts shift risk completely from electricity generators to consumers. However, a wide range of contracts, with varying degrees of durability and coverage, can be imagined.

In theory, there is no necessary connection between handling of transactions related to physical exchange and risk management. For example, while dispatch may be completely centralized (and cost-based), trading in (financial) contracts may be entirely market based. Conversely, it is possible to protect both generators and consumers from most risk by using an appropriately designed set of financial contracts for differences, while, at the same time, basing dispatch decisions on voluntary bids in a power pool. In practice, however, choice of mechanism for physical power exchange may have consequences for how risk trading is organized. For example, if trade in long-term physical, fixed-power contracts is accepted, some form of short-term, spot-market trading is necessary to allow for efficient dispatch. Market architecture therefore must consider the resulting need for both efficient power exchange and risk management.

Spot-market participation is often restricted to generators, with no opportunity for demand-side bidding. While transaction cost occasionally justifies such restrictions, the real reason may well be an insufficient understanding of the importance of demand flexibility. If allowed to participate in the spot market, buyers may condition their purchases on prices, thereby reducing incentives for suppliers to exploit market power. Demand-side bidding consequently reduces the problem of imperfect competition and, as a result, improves market performance.

Constraints and Performance

Failure of electricity market reforms can often be traced to poor market architecture. Perhaps the most obvious examples are those in which too few competitors have been established before market-based exchange is introduced. This may be caused by not understanding how market structure affects competition or, possibly, by an unwillingness to impose

needed structural changes. However, given industry structure, market failure may also result from excessive optimism, with respect to the types of decisions that can be efficiently decentralized.

Struggling Latin American countries lack reasonably competitive markets. This can be explained, in part, by concentration of ownership and contractual arrangements, as well as by the limited number of players in small markets. For example, weak industrial bases and small, per-capita residential consumption limit the scope for retail competition.

It is unclear whether the unbundling of activities that occurred in some countries prior to privatization will persist. In Guatemala and El Salvador, vertical and horizontal re-integration are not limited. In Colombia, various integration and public- and private-ownership models co-exist, and limitations to concentration have been legally challenged. Re-integration makes it more difficult to control anti-competitive behavior, imposing added burdens on regulators.

The vertical relationship between generation and upstream fuel supply poses another problem. The extent to which competition in the electricity market is impaired when supply of a key resource, such as natural gas, remains a monopoly is an open question. Another issue involves the potential competition problem of vertical integration of generation and natural gas downstream.

In fact, electricity markets in Latin America can hardly be called competitive. With the exception of Colombia, power pools are cost based; system operators undertake dispatch using an optimization algorithm fed with technical information, and fuel cost is provided by thermal generators and cost of water for reservoirs. While details vary by country, the power pool functions mainly to price exchanges among generators. Nonetheless, even this limited spot market can easily be captured and manipulated in a concentrated market with poor governance, as has been shown in Chile. Among reforming countries, only Panama has adopted a two-step liberalization approach, including an initial five-year transition period during which the grid operator buys all energy on behalf of suppliers and consumers.

Universal service obligations, typically levied on distribution companies, are hampered by both political and economic constraints. In such countries as Colombia, many distribution companies, located in poor

areas with low service coverage, have limited managerial and payment capacity and are prone to political manipulation. Subsidies are often poorly targeted, highly distorted, and politically administered.

Regulated Activities

Electricity transmission and local distribution involve large sunk costs and capital equipment with significant environmental effects. These stages of electricity supply are usually considered natural monopolies. Typically, each country has one company to operate the transmission network and multiple regional monopolies to operate the distribution networks. With the exception of certain ancillary services, the scope for competition in providing electricity transportation services is limited (although benchmarking may be possible).

The natural monopoly character of the network business implies that some form of regulation is necessary. The regulatory regime may take many forms, but some form of incentive regulation is required in order to achieve an efficient outcome; purely cost-based regulation is unlikely to produce cost efficiency. Regulations must consider incentives for both short-term operation of existing networks and longer-term network extension.

Short-term network operation requires efficient use of existing capacity and maintenance of installations. To achieve such efficiency, regulations must provide incentives for both cost control and supply quality. A regulatory scheme that emphasizes cost control reduces incentives for making the efforts needed to maintain quality of supply. In principle, some form of economic incentive may be provided for supply quality; however, investment in a stronger grid than that dictated by supply-quality considerations alone may be desirable because it may be the cheapest way to cope with market power.

Tariff structure plays an equally important role in the efficient use of networks. It should reflect underlying cost characteristics, taking into account costs of operation and capacity constraints. At the same time, the tariff system should contribute to financing network investments and providing incentives for industry development.

Network capacity and quality may represent a bottleneck for the overall supply industry. Low tariff rates or a small tariff base may hinder

financing such investments with tariff revenue. Coordination of network investment with capacity expansion in other parts of the system—including network, generation, and consumption—is also needed. The regulatory regime must ensure that necessary funding for network investment and coordination of capacity expansion is forthcoming.

System Operation

An unusual feature of the electricity industry is the ongoing need for physical balance between generation and consumption. Ignoring the cost of information and processing, this balance could be achieved in a well-functioning market in which participants make decisions based only on prices. What is called for in practice is a centralized balancing mechanism, whereby demand and supply are rationed.

For small supply or demand shocks, balance is achieved by automated adjustments of generation. For larger shocks, a system operator must intervene in individual decisions, ordering generators and consumers to adjust their loads. System operation could be based on voluntary agreements with some or all participants. One example is a regulation-power market, in which participants bid on compensations required for adjusting supply or consumption plans.

Maintaining continuous supply quality is an inherently short-term activity; however, planning the activity may be based on longer-term considerations. In an industry in which shortage of capacity may develop—caused by market growth or temporary imbalances resulting from extreme supply or demand conditions—it may be necessary to ration large amounts of demand in order to achieve balance. For example, in a hydro-dominated system, low levels of water inflow (perhaps caused by drought) can lead to severe electricity shortages (if consumer prices are not allowed to increase sufficiently fast), which may necessitate rationing. Efficiency requires that needed instruments are available to handle such situations. One option is to enter into long-term agreements with large industrial consumers so that they reduce their consumption when needed.

In addition to maintaining physical balance in the network, the system operator may be responsible for ensuring that other ancillary services, such as re-active power, are provided to the network.

It was thought that decentralized, market-based production decisions would make system operation difficult or even impossible. This fear, which underlay much early opposition to electricity-market reforms, was unfounded; there is little or no evidence to suggest that supply quality has been reduced as a consequence of reform. However, this holds true only so long as system operation is based on a clear mandate, including the system operator being provided with the necessary instruments to conduct business. If this is not the case, system operations will be made more difficult, with the result that supply quality may deteriorate.⁴

To summarize, a study of reform sustainability should include:

- ◆ Overview of how activities associated with general electricity supply are organized;
- ◆ Description of transaction modes, distinguishing between market-based forms and those subject to administrative rules;
- ◆ Description of organization of transmission and distribution activities, including an overview of regulations;
- ◆ Evaluation of incentives for efficient operation of networks, including upholding supply quality, as well as extending and maintaining networks in relation to user network needs;
- ◆ Evaluation of system operation, including system-operator instruments and powers;
- ◆ Analysis of overall efficacy of market architecture, focusing on relevant transaction costs and internal consistency and coherence of market architecture.

Market Design

While market architecture is concerned with market structure, market design concerns rules governing market conduct. Thus, while market architecture should be based on comparing transaction costs across organizations of activities and modes of transactions, market design may be viewed as minimizing the level of such costs for a particular type of

⁴ Arizu, Dunn, and Tenenbaum (2000) discuss system-operation models, emphasizing the importance of independence from ownership and control by market participants.

market-based transaction. To solve this problem, rules governing market operation—including participation, contract types, and trading procedures—must be chosen carefully.

The debate over electricity-market reforms has focused on spot markets or electricity pools. In most countries, this market has been organized as a form of auction, although details vary considerably by country. In some countries, participation is limited to major generators; in others, participation is open to all, including consumers and traders. In certain countries, spot-market participation for large generators is mandatory; in others, electricity may be freely traded outside the pool. The bidding format varies enormously with regard to time period (hourly or daily), price offers (single or multiple), and detail (plant and generator location). Market prices may be uniform (e.g., according to the marginal successful bid) or discriminatory (according to individual bids), sometimes containing payments for capacity and other services. In some countries, additional auctions are held for regulation power and ancillary services.

Countries across Latin America have adopted diverse designs for their spot markets. Colombia, for example, uses an England and Wales (pre-reform) type of pool, while El Salvador uses one based on the Nordic model. Pools used in other countries are, for the most part, cost-based.

The importance of market design for the performance of electricity spot markets is not entirely clear. What is clear is that failure of certain markets is caused more by abuse of market power than by market design; indeed, it is impossible to design markets to overcome underlying market-power problems. This is not to say that choice of market design is unimportant; it may well be sensible, given the inevitable threat of market power, to include safeguards against its abuse (e.g., by capping price bids).

Retail markets have also received much attention. It is generally acknowledged that it is too costly to base retailing of electricity on households and other small consumers on continuous metering (e.g., on an hourly basis). Some countries succeeded in “profiling,” whereby the time profile of consumption over a longer period is determined according to pre-determined, regulated schemes. For such markets to work properly, attention must be given to various design issues, notably settlement procedures between distribution companies and external suppliers.

A study of reform sustainability should therefore include:

- ◆ Design description of relevant markets.
- ◆ Analysis of market performance, with a focus on developing prices, costs (if available), outputs, and supply quality. Supply-quality measures may be based on outage statistics, consumer complaints, internal reports, new connections, responsiveness to consumer requests, or other direct or indirect indicators. One must ask: What has restructuring led to in terms of market performance in general and supply quality in particular? Financial performance of various market participants and the potential implication for industry restructuring (including ownership changes) should also be considered.
- ◆ Evaluation of market power, using available information on price-cost margins. While an examination of basic pricing patterns and trends, as well as reliability and unit availability before and after reform, may be called for (at least conceptually), sophisticated theoretical or econometric studies are not warranted, at least not as part of a preliminary study. Based on findings of market structure and performance, detecting whether market power is a real problem may be straightforward; however, in cases where raw data is insufficient, more sophisticated analyses may be warranted.

Strategies to Overcome Threats to Sustainability

The third and final step of the analysis is to propose and discuss actions and strategies to overcome identified threats to reform sustainability. Determining relevant actions and strategies will depend on each country's particular circumstances; therefore, they will vary considerably by country. While it is pointless to devise a general scheme for this part of the analysis, it may be helpful to outline issues that appear relevant to at least some Latin American countries and possibly countries in other regions. Any study of reform sustainability will likely discuss one or more of these issues.

Design and Implementation

Since the starting point for any reform path is the actual state of the world, it is of little or no use to devise ideal states that are unachievable. Any suggestion for developing or adjusting the reform process must consider the context of the current situation. Indeed, the reformer must be content with the modest role of proposing and implementing institutionally feasible modifications of the status quo. Occasionally, policy changes will have to wait until the disturbing factors dampen enough to become manageable. Successful reforms require a coalition to defend the resulting welfare gains, taking into the account the required compensations to veto players who otherwise would lose during the process.

It is more difficult to mobilize reform winners than losers for several reasons. First, potential benefits are uncertain and potential beneficiaries are difficult to identify, while potential costs are usually more certain and losers identify themselves. Second, potential beneficiaries are usually numerous, dispersed, poor, uninformed, and unorganized (known as “latent interest groups”), while potential losers tend to be more concentrated, rich, informed, organized, and vocal. Organized, vocal groups that benefit from the existing institutional setup usually invest resources to mobilize opposition against institutional change (through lobbying, campaign financing, and the media). Third, sequencing of reforms from a technical standpoint may be time-inconsistent from a political-economy point of view. For example, initial reforms may fortify interest groups that can oppose later reforms more efficiently.

To overcome obstacles to reform, mobilization of potential beneficiaries can be enhanced by carefully crafted, public-information campaigns, in which information about potential reform benefits and likely beneficiaries (and even losers) becomes public knowledge. In this way, the asymmetric-information problem that commonly inhibits potential winners from taking collective action for institutional reforms can be mitigated. Similarly, resistance from losers can be overcome, or at least reduced, through various compensation schemes. Reformers may alter the technically optimal design of the reform in order to improve its political viability. Finally, in cases where optimal technical sequencing may create political problems, governments may attempt to lock in their future commitments

through international agreements or constitutional changes that increase exit costs, thereby enhancing the credibility of commitments.

Borrowing from central concepts in institutional economics and political economy, Burki and Perry (1998) provide a set of recommendations for institutional reformers. First, one should pay systematic attention to the nature of *prospective winners and losers* from institutional reform. Factors that separate winners and losers may be regional, sectoral, or based on social classes linked directly to their position in the productive structure. In any event, one must closely monitor the nature and intensity of support or opposition as manifested by public-opinion polls, proclamations of interest groups, and public demonstrations.

Based on well-informed assessments, one should attempt to craft *compensation schemes* that are politically viable and thus credible. In addition, it may be necessary to make promises about future compensation schemes, which may be key ingredients for both effective and politically sustainable reforms. One way to enhance the credibility of compensation schemes is to raise the exit costs by future governments through adherence to international treaties or other similar commitments, such as signing summit declarations.

Empowerment of beneficiaries is good policy and smart politics. Graham and Naim (1998) have suggested that institutional reforms are more likely to be supported if potential beneficiaries participate in the design of new institutions. In the terminology of Hirschman (1970), this can be achieved through voice, a feedback device principals use to exert control over the decision-making process of their agents and organizations. It is also safe to argue that beneficiaries will welcome such policies. In the context of financial reforms, protecting minority shareholders' rights is also a voice strategy for reform, which should not face severe political obstacles on the part of public opinion.

Empowerment assertions also apply to providing beneficiaries' *choice* or exit strategies. If principals are not satisfied with the quality of service provided by their agents or organizations, they can search elsewhere for services. The threat of exit complements and strengthens providing voice or empowerment strategies for institutional reform.

Public-information campaigns should be part and parcel of reform efforts. One issue that frequently emerges from the political-economy

perspective is that latent interest groups are politically inactive, in part, because of the cost involved in collecting information about potential costs and benefits of particular reforms. If reforms are viewed as a collective good, however, there is clear justification for reformers to spend resources explaining the details and likely consequences of proposed policy initiatives. This role is particularly important within the context of democratic regimes, where voters have political voice and exit strategies available but may not use them to defend their interests effectively.

Reformers should pay careful attention to *political support* for prospective reforms at the intermediate level, particularly among key political leaders and party organizations. One needs to assess the potential for deals and trade-offs among them. It is particularly important to be aware of the political cycle; that is, how windows of opportunity for institutional change might open or close, depending on upcoming elections.

One should also clearly understand the *constitutional environment*; that is, formal or governmental facilitators and obstacles to institutional change and reform. This includes the potential for introducing reforms via presidential decree, scope for reform in situations where a strong legislature shares important powers with the president, and potential for creating autonomous or semi-autonomous agencies as relatively nonpolitical enclaves within the formal government structure. Such a seemingly simple, yet critical, understanding could facilitate ex-ante calculations of the feasibility of institutional reform. With a clear understanding of the constitutional forces in play and their close relationship to partisan forces, particularly in the legislature, one should think creatively about how to exploit opportunities and overcome constraints.

Finally, one should focus on reforming *incentive structures*. Perhaps the most difficult reforms to undertake, from a political standpoint, are those that aim to change or reduce the size of public employment. This is the case for two reasons: 1) losers become the human symbols of the costs of such reforms and 2) public jobs are often part of the political game by which supporters of certain leaders are rewarded. Consequently, reforms of the civil service and societal organizations should focus on incentive structures rather than changing personnel or installing the latest technology. This approach may not only be more politically viable than wholesale changes in personnel; it may also be the most appropriate

approach from a technical standpoint because of its emphasis on incentives by the new institutional economics.

A study of reform sustainability should therefore include:

- ◆ Analysis of the implications of political-economy concerns for reform design and implementation;
- ◆ Suggestions on how proposed reforms can be implemented.

Improving Institutional and Governance Structures

A major hypothesis of this project is that Latin American countries lack certain political and regulatory institutional conditions for supporting the types of reforms that have recently been introduced in these countries. To the extent that this hypothesis is supported by the findings, one should devise adjustments and developments to make reforms and institutional conditions conform. These changes may aim at improving institutional conditions, such as strengthening regulatory institutions and developing human-resource capacity. Alternatively, reforms can be modified to better fit institutional conditions until existing constraints can be overcome.

Key questions in reforming institutions and governance structures are:

- ◆ What are the interests of the political actors, including those in the bureaucracy?
- ◆ How do these interests translate into policies and institutions that advance the objectives of these actors?

Privatization Issues

The “grabbing-hand” viewpoint regards the government as interfering in the interests of SOEs to pursue political or bureaucratic interests rather than the economic goals of the company (Shleifer and Vishny, 1998). The issue of privatization should start by asking why the SOE is still publicly owned and how privatization can isolate it from future inefficient intervention in its activities. Privatization design must focus on restricting potential future influence on privatized firms through subsidies, regulations, and even minority ownership. Consequently, the privatization strategy may aim more at complete de-politicization than merely reori-

enting allegedly benevolent government intervention in companies.

While government interference in operating private companies may be a real problem, the converse may also result; that is, government may become an agent of private principals. As suggested above, small countries with weak institutions that identify reform with privatization of infrastructure assets and few restrictions on market structure and conduct may end up with state capture, whereby powerful firms shape the rules of the game to their own advantage. In network utilities, the outcome could be vertical and horizontal integration, increased prices, and provision of contract clauses that transfer all risks to the state but yield handsome profits. Political pressure exerted by groups that lose out may induce the government to renegotiate the rules of the game. However, this is a difficult and costly process, given that captor firms will request compensation, measured against expected income under the rules of the game that they helped to devise.

To develop a consistent and foreseeable regulatory environment, the aim must be to create regulatory institutions that are sufficiently independent to withstand pressure from particular groups, including politicians. At the same time, these institutions must have limited powers so that they do not unduly interfere in the operations of industry players.

Studies of bureaucracy should start from the observation of what they do. On the one hand, one should realize that many regulations are introduced to enrich and empower political interest groups. On the other hand, a certain degree of regulation is unavoidable. To minimize abuse, individual decisions-makers (bureaucrats) must have limited discretion in exercising their powers. This is a typical agency problem that has been studied extensively in the literature (see, for example, Laffont and Tirole, 1993); the problem is compounded by the presence of multiple principals, tasks, and agents. Meanwhile, the practitioner faces the pressing problem of designing a regulatory framework that minimizes transaction costs (Estache and Martinot, 1999).

Country Lessons

The California experience demonstrates that designing electricity markets is an unfinished business. Because adjustments are inevitable, the challenge is to create a system that ensures efficient rule changes. Other U.S.

states and Panama have adopted similar approaches, setting up market surveillance groups of independent outside experts to institutionalize change (Arizu, Dunn, and Tenenbaum, 2000). Their experience suggests two lessons. First, experts must be perceived as independent and objective. In small- and medium-sized countries, this probably means hiring foreign experts. Most knowledgeable people within the country will be perceived, at least initially, as biased because of past industry connections. Second, experts must have a broad mandate. They should be charged with assessing not only market performance, but also performance of the system operator and regulator. In addition, they should be able to recommend structural and rules changes.

Corruption may be viewed as a result of poor selection of officials (low morals) and inadequate incentives. According to this view, solving the problem may consist partly in hiring better people and in improving their incentives. The UK, for example, has appointed regulators that have little or no previous connection to the industry, sometimes coming from other industries or academia. The term of appointment may also be limited, perhaps with the possibility of renewal if performance is deemed acceptable. However, this may be a naïve approach to the corruption problem, particularly with regard to the constraints facing developing countries; a limited term may be a necessary but insufficient condition. An alternative solution is to establish regulatory boards with international representation, perhaps as a scheme of international collaboration for parallel improvement of institutions in various countries.

A study of reform sustainability should therefore include:

- ◆ Analysis of the extent to which reform has succeeded in attracting private investors of the quality and quantity required by the adopted model, sustainability of their participation, and ways in which it may be improved;
- ◆ Discussion of how well the description of state capture fits and suggestions for reducing the problem of such capture;
- ◆ Suggestions for improving the quality of regulatory institutions and governance structure.

Price Volatility

Deregulation, virtually by definition, leads to more price volatility. When price controls are lifted and pricing decisions are decentralized, it is expected that prices will react more rapidly and with greater amplitude to shifts in underlying supply-and-demand conditions. This expectation has been corroborated by experience from most deregulated electricity markets, including those in England and Wales, Scandinavia, and, more recently, El Salvador and California.

Understanding the Causes

To combat this problem, the first question is: What are the underlying causes of price volatility? Three prominent candidates are 1) volatility in demand or supply conditions, 2) market design flaws, and 3) market power. Obviously, the solution depends on which of these causes are relevant.

Given the peculiar characteristics of the electricity sector (i.e., inelastic short-term demand and supply constraints), it is no surprise that prices fluctuate considerably as a result of changes in demand or supply conditions. Changes in weather, general economic conditions, or fuel supply affect electricity prices almost immediately. In a deregulated market, such price fluctuations are not only unavoidable; they are also desirable as signals for the efficient use of a scarce resource.

On purely efficiency grounds, therefore, economists tend to advocate that price volatility resulting from fluctuations in supply-and-demand conditions should not be hampered. To the extent that price volatility is considered a cost to market participants, there are instruments to hedge the associated risk. In response to market-price fluctuations in most deregulated electricity industries, secondary markets have developed the required hedging instruments (e.g., fixed-price contracts, futures, and forwards).

Unwilling to expose consumers to the full consequences of the market and often reacting to popular discontent, both politicians and regulators have responded by re-introducing price regulations or in other ways to reverse the deregulation process. Clearly, without hedging instruments, such a response may be reasonable. However, by modifying price movements, the incentive to develop hedging instruments is correspondingly reduced. Only when development of such instruments is unlikely, owing

to, for example, weak financial markets, can price regulation be advocated as a means of protecting market participants against the costs of price volatility. Moreover, dampening of natural price movements may increase those shortage problems that were the original concern. For example, the incentive to maintain hydroelectric reservoirs depends on the expectation of future prices; if prices are capped, the incentive is correspondingly reduced. Nevertheless, in order to avoid unnecessary disruptions to the market-reform process, it may be advisable to introduce temporary measures to protect against price volatility.

Market-design Flaws or Market-power Abuse?

Obviously, market intervention is less controversial if excessive price volatility is caused by market-design flaws or market-power abuse. It is then important to decide which of these causes is relevant. It is of little use to tamper with market-design elements if the true cause is market power. The debate in England and Wales (von der Fehr and Harbord, 1993), as well as more recent discussions in California (Borenstein, 2001), may have been misdirected for exactly this reason. This is not to say that either of these systems was optimally designed, only that the seriousness of the market-power problem exceeds what can be solved by market design alone.

The market-power problem may be exacerbated by other industry features. For example, in hydro-based systems with limited storage capacity, abuse of market power may increase the possibility of extreme shortages in dry periods, with consequent lengthy duration of high prices, rationing, or both. Such problems are more likely to occur when entire regions are affected by the same shock, such as the El Niño and La Niña events.

A study of reform sustainability should therefore include:

- ◆ Description of observed price volatility and forecast of price development;
- ◆ Analysis of underlying causes for observed and expected price volatility;
- ◆ Discussion of measures to improve the functioning of markets, including those for hedging instruments;

- ◆ Evaluation of systems for price regulation, with possible complementary measures to correct for incentive failures caused by such regulation.

Competition in Small Markets

Electricity market reforms in Latin America have been based on a rather optimistic view about the potential for effective competition. This is perhaps surprising, given that most of these markets are quite small. Because of inherent economies of scale, sufficient opportunity for establishing many independent players is limited; indeed, one must ask whether market concentration is inevitable in such markets. If so, the key question is not whether there are measures to make competition effective, but what can be done to mitigate the consequences of imperfect competition.

Improving Current Conditions

Before concluding that concentration is inevitable, however, existing measures to improve competitive conditions should be given due consideration. First, it may be possible to split existing power companies into multiple smaller, independent entities. Desirability of this option depends on the trade-off between economies of scale and enhanced competitive pressure, which results in lower prices and greater efficiency. In particular, there may be a trade-off between “good” players and number of players. Efficient operation of a competitive electricity business requires expertise in diverse areas, including economics, marketing, and business administration. While the number of power plants may be large enough, the limiting factor determining the number of potentially efficient companies may be availability of such expertise.

Second, even if the number of existing players is limited, it may be possible to increase their number by allowing for new entry. Generation technologies can support efficient, small-sized plants, including gas, hydro, other renewable energies (such as wind and solar), and burning of waste material. By accommodating such technologies, a number of independent, albeit small, producers may be established to put competitive pressure on larger market players.

Third, competition may be increased by market integration. In some cases, the physical infrastructure required for such market integration, such as transmission links, already exists. In these cases, what is required is establishing institutions for handling operation of an integrated market. The Scandinavian experience suggests that, at least in some circumstances, this is fairly straightforward. To what extent this experience is relevant to Latin America requires further study. If the physical infrastructure is lacking or too weak to provide effective interconnection, market integration will necessarily take longer to succeed. In such cases, market enlargement may present a longer-term solution to the problem of imperfect competition.

Market-power Mitigation: Mechanisms and Key Issues

If markets lack workable competition, then market-power mitigation mechanisms must be put in place. These aim to limit the scope for abusing market power by restricting the actions of players. Regulations may cover short-term decisions, such as price-setting and capacity availability declarations, as well as long-term decisions about entry, exit, and investment.

A key question is: When the scope for market competition is small, should the single-buyer model be revisited? For example, Panama has adopted the single-buyer model as an interim solution toward a more full-fledged competitive market. However, establishing a single buyer does not solve the market-power problem as long as 1) price-setting and capacity declarations are at the discretion of producers and 2) the buyer is committed to serve all demand. A market-power problem occurs when players have the ability to raise prices, either directly or indirectly, by limiting supply. To work, the single-buyer model must therefore involve regulation of price and output decisions. To address the market-power problem, the question of one or more buyers is less important than introducing appropriate price and quantity controls (Levin, 2000).

The ultimate question is whether attempting to establish competition in small power markets is futile. Is it not dangerous to unleash the force of profit-motivated private agents without being reasonably certain that this force will be tamed by competition? The risk is that strong companies monopolize the market, not only to raise prices, but also to control market

institutions. At one extreme is the potential for state capture, with private players succeeding in capturing regulatory bodies, the judiciary, and even the political decision-making process. At the other extreme is the argument that creating strong, independent private companies is absolutely necessary to counter bureaucratic powers and other political interests. Imperfect competition is better than none, the argument goes, and, if some companies secure profits, this is a small cost compared to the alternative of inefficient SOEs.

To summarize, a study of reform sustainability should include:

- ◆ Discussion of the extent to which competition has succeeded in reducing the regulatory burden and improving efficiency within existing constraints;
- ◆ Analysis of the extent to which constraints are binding on the attainment of a workable competition model and how easily they could be removed, if at all;
- ◆ Discussion of whether benefits of a market process for investment can be captured without incurring short-term losses experienced under radical restructuring.

Investment Incentives

Perhaps the most serious problem in Latin American electricity industries is insufficient capacity and the poor state of certain existing installations. Small generation capacity and weak transmission and distribution networks limit the opportunity for providing reasonable quality of universal service. New investment is required in order to improve both quality and service availability. Effect on investment incentives is crucial to the success of any reform effort.

A central goal of reform has been to attract private capital to finance new investment. Evaluating the expected return on their investments, private investors are concerned with investment costs, output prices, and, perhaps most importantly, the risks involved. From the government's perspective, incentives may consequently be improved by reducing investment costs, securing favorable output prices, and reducing associated risk.

Reducing Costs and Securing Favorable Prices

Given that the financial burden of the electricity sector has been a major problem for most governments, it appears improbable that investment costs will be reduced by direct outlays. In some cases, favorable tax treatment or other benefits may be part of an overall package to attract investors to a particular project. However, it is unrealistic, and perhaps inadvisable, to make investment in the electricity industry dependent on public money.

Securing favorable output prices appears to be a more important objective than reducing investment costs. Achieving this, however, is not necessarily straightforward. Electricity prices are, in many cases, highly distorted. Redistribution concerns and compliance with popular pressure have meant that prices do not always reflect underlying costs. Improving profitability will therefore be necessary to rebalance electricity prices. To what extent this is possible depends on various political constraints. Room for maneuvering, as well as the exact relationship between feasible re-balancing of prices and investment incentives, should be made clear.

From the standpoint of investment incentives, and given that under-investment is the initial problem, there is perhaps little risk that re-balancing prices will go too far. A system with supply shortages may have a conflict between the short-term goal of cost-reflective prices and the long-term goal of increasing supply. From this perspective, imperfect competition in the electricity market, and the associated upward pressure on prices, is a lesser problem. Indeed, high prices in the spot market may be exactly what are needed to attract new capacity, thereby mitigating problems of supply shortage and market concentration.

In many Latin American countries, electricity supply is largely based on hydroelectric power. Hydropower systems differ to the extent that they include reservoirs. The ability of water storage imposes an inter-temporal optimization problem that has important implications for price volatility. Furthermore, in a hydro-dominated system, increasing demand growth may affect both supply security and generation reliability. In this context, some have questioned the ability of a spot market to provide long-term price signals required for new investments.

Economic theory suggests that this ability is, in fact, quite good as long as prices reflect short-term demand and supply conditions and investment

are based on profitability considerations (Crew and Kleindorfer, 1986).⁵ Evidence from deregulated electricity markets appears consistent with the theoretical prediction (Bergman et al., 1999). Admittedly, the evidence is not conclusive, partly because of the generally limited experience with market-based electricity industries and because markets with the comparatively longer histories were originally plagued by over-investment, not under-investment. Nevertheless, it appears safe to assume that the market's ability to provide investment signals is not the main problem.

Managing Risk

In practice, other constraints may prevent the market from fulfilling its role. In addition to potential price distortions, a critical constraint is available means for handling uncertainty and risk.

Risk is inevitably associated with long-term decisions, such as capacity investment. Risk should be considered whether investment decisions are viewed from the private-investment standpoint or from that of society at large. For example, in a market with considerable uncertainty about future development of market prices, it is advisable to choose more flexible technologies (i.e., with small fixed costs), such as gas-fired plants. To reduce risk, the investor should enter into some form of long-term contract that shifts risk to other market participants.

To improve investment incentives, one should encourage market institutions that allow for risk management. It is also essential to reduce regulatory or political risk. One could argue that a weak government, susceptible to capture by industry interests, would provide an environment conducive to private-sector investment. However, there is little

Ensuring Coordinated Investment and Capacity Development

An additional task for regulatory authorities is to ensure coordination of investment in infrastructure with development of supply-and-demand capacity. The difficulty is not only planning and timing infrastructure investment, but also financing it. Are transmission and distribution tariffs

⁵ For a treatment of hydro-dominated industries, see von der Fehr and Sandsbråten (1997).

at levels sufficient to cover the cost of new developments? If not, to what extent is it possible to ensure private contributions to government projects? Or perhaps the responsibility for infrastructure investment could be privatized completely? While the latter solution may be too optimistic, it will most likely be necessary to enlist the participation of private capital in order to achieve warranted network extensions and availability of service.

A study of reform sustainability should therefore include:

- ◆ Discussion of whether electricity market prices provide adequate incentives for new investment, and, if not, what can be done to improve price signals;
- ◆ Evaluation of regulatory and other types of risk that may affect new investment and suggestions for how such risks can be reduced;
- ◆ Analysis of what is needed to secure balanced industry growth, with particular focus on coordinated investment in distribution and transmission networks and new generation capacity.

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CHAPTER TWO

Colombia: Coping with Reform Crisis

Ulpiano Ayala and Jaime Millán*

Colombia's power sector reform is at a crossroads. The critical financial situation of many public and private distribution companies has been worsened by the wholesale market's operational difficulties, failing credibility of the sector's regulatory institutions, and eroding legitimacy of the reform model. These factors have further weakened already precarious incentives for private investment, stemming from a prolonged economic recession and deteriorating security. This scenario was unlikely as recently as 1998, when incorporating the private sector into Bogotá's electric utility offered a clear alternative to consolidate reform, and expectations for economic growth attracted many private investors to a competitive generation market.

This development is all the more regrettable in light of the progress already made. Expectations for the reforms were justified in 1994, when the National Congress passed Public Utilities Law 142 and Electricity Law 143. The reform aimed to counter a steady crisis in the sector's financing and functioning, resulting, in part, from the State's failure to clearly separate its roles as entrepreneur, policymaker, and regulator. Conflicting State

* Ulpiano Ayala died July 13, 2002, when the Colombia study was close to completion. While Ayala was not an energy specialist, his long experience with state finances and institutions was crucial to the successful completion of this study. As Vice Minister of Finance during the Gaviria administration, he learned firsthand of the burden imposed on state finances by SOEs' poor performance. As a member of the National Energy Commission (CNE), he participated in the debates that framed the reform adopted by Congress in 1994. Subsequently, he played a key role in the Alesina and Poterba Missions, landmark studies on the country's current institutional and fiscal challenges, which provided him a unique perspective on assessing the progress of power sector reform. The editors wish to pay him homage for his invaluable contributions.

roles helped to create perverse incentives, hindered efficient management, compromised the State's ability to incur debt, and highly politicized sectoral decisions at all levels.

Origins of the Colombian reform cannot be attributed merely to the rationing of 1992, as many interpretations assert; rather, it resulted from the government's decision to take advantage of a unique opportunity. Erosion of the State model, acceptance of an emerging international-development paradigm, and adoption of the 1991 Constitution executed by the Gaviria administration, which welcomed the new paradigm, coincided with a consensus among sectoral agents and multilateral banks that the old reform model was no longer viable.

Thus, the 1992 rationing was symptomatic of this nonviability. In short, Colombia's power sector reform is part of a larger set of reforms intended to modernize the State and implement the principles of the new Constitution.

After nearly a decade of effort, Colombia, like many other Latin American countries, finds it difficult to implement reform, despite its many achievements (Millán, 2001). Although many elements of the reform package have been successfully implemented and many expectations have been fulfilled, several assumptions implicit in the strategy have proven inadequate because of institutional, technical, and political-economy limitations. For these reasons, despite initial success, the model has been vulnerable to external factors, including economic recession and terrorist attacks. The ample opportunities investors envisioned, as evidenced by a sustained demand growth during the first few years of reform, obscured market limitations and weaknesses of regulatory institutions. These became visible only when groups began wrangling over system funds to compensate for low prices of a depressed market. This explains why the current electoral period finds the reform coalition weakened by crisis and allows opportunist politicians—foes of the reform—to attempt to reverse its achievements.

To test this thesis, this chapter analyzes the reform rationale, objectives, measures taken, implementation strategy, and implicit assumptions and then relates these factors to observed performance, clearly specifying the extent to which performance has been affected by institutional, technical, and political economy constraints. Understanding the degree to

which the reform has met expectations also makes it possible to assess its effect on interest groups and design constraint-compatible strategies to tackle sectoral threats.

The chapter concludes that, while much of the reform agenda has been implemented, the mismatch between the model's assumptions and institutional and financial realities has weakened it, bringing its sustainability into question. Long-term sustainability can be achieved only by replacing the reform-reversion projects currently being discussed in Congress with a clear program to guide sectoral development over the next four years. Such a program would seek support and consensus from electricity-sector stakeholders and include measures to strengthen institutional legitimacy and credibility, determine public expenditure earmarked for the sector, and provide a stable framework for private-investor participation that respects the long-term objectives of the reform. Congressional approval and public disclosure would enhance the program's chances of success.

Reform and Threats to Sustainability

By 1950, Colombia's electricity service was being provided by municipal and national utilities. The country's private sector, like others across the Latin American region, was unable to expand service beyond the most profitable markets or to meet the challenges of a growing nation, forcing the State to assume these responsibilities. Over the next three decades, the model, based on vertically-integrated, State-owned companies, relied on multilateral banking to develop the country's hydroelectric potential and meet increasing power demands. As a result, by 1990, 78 percent of the population had been electrified.

Unlike development in other Latin American countries, Colombia's approach was highly decentralized, with two vertically-integrated, municipal companies generating and distributing about 40 percent of total energy. The remaining 60 percent was provided by State-owned, regional companies,¹ a national-order company owned by these regional compa-

¹ Colombian Electricity Institute (*Instituto Colombiano Electricidad - ICEL*), Atlantic Coast Electricity Corporation (*Corporación Eléctrica de la Costa Atlántica - CORELCA*), and Regional Corporation of the Cauca Valley (*Corporación Regional del Valle del Cauca - CVC*).

nies, and owner of the interconnection grid and considerable generation capacity.² Despite these achievements, or perhaps as a result of them, the sector became nearly bankrupt, accounting for 30 percent of total foreign debt and 33 percent of nonfinancial public deficit.

The power sector's ongoing operating and financial crisis was caused, in part, by not having separated the somewhat conflicting roles of the State as entrepreneur, policymaker, and regulator. This lack of role separation led to providing perverse incentives, hindered efficient management, compromised the State's ability to incur debt, and politicized sectoral decision-making at all levels.

Response of the 1990s: New Economic Paradigm

The Colombian power sector reforms of the 1990s, which responded to this crisis, were part of a larger family of structural reforms undertaken in Latin America during the last decade, resulting from a change in the economic paradigm. In the infrastructure sector, these reforms limited the State's role to policy definition and regulation, leaving the entrepreneurial role to the private sector. This new paradigm sought economic efficiency through competition (in segments where it was feasible) and regulation (in segments with monopoly conditions). Financial sustainability was to be attained by attracting private investment and cost-recovery pricing. Social sustainability would be achieved by establishing transparent subsidies aimed at target populations that did not distort tariff signals. While Colombia benefited from the experience of pioneering countries in the region, it faced unique conditions: nearly 50 percent of consumption concentrated in three municipal utilities not directly under State control; a high degree of regionalist interest and wrangling to obtain transfers from the central government; an interconnected system dominated by hydroelectric generation; an indebted public utilities tariff system at the mercy of cross subsidies; a relatively healthy economy; and a power system that, until the 1991 rationing, had not undergone any major service delivery crisis.

Colombia's constitutional reform of 1991 facilitated a radical transformation of the country's power sector. In 1995, it changed from an ex-ante,

² Electricity Interconnection, S. A. (*Interconexión Eléctrica S. A - ISA*).

planned scheme (administered by technicians and controlled by legislators) to one open to agents, with a regulatory commission, a competitive market in the business segment (generation), and regulation of non-competitive segments (transmission and distribution). The new order began to operate with a publicly-owned sector (mostly local or regional), whose privatization started with the purchase of existing assets and stock participation in generation companies initially and later in distribution companies.

In retrospect, the reforms were a giant leap that reduced the economic and political costs inherent in a service that, for more than two decades, had been publicly managed, with most incentives wrongly directed. Nonetheless, nearly a decade after their initiation, the reforms are far from consolidated. A reformist fatigue has started to set in, coinciding with a particularly difficult period in the country's economy.

Electricity Market and Its Regulation

In 2000, more than 40 traders sold 42,460 gigawatt hours (GWh) of energy, 75 percent to regulated customers and 25 percent on the open market; by the end of that year, they serviced a maximum demand of 7,722 megawatts (MW). Sectoral demand is concentrated in the country's four major urban centers, which account for more than 52 percent of total demand. Generation is provided by plants with installed capacity of 12,580 MW and is equally concentrated; four large companies control an installed capacity equal to system demand. Currently, hydroelectric power accounts for about 70 percent of generation (8,275 MW).³ This represents a 10 percent reduction since 1992, when the country's severe, El Niño-related drought led to 14 months of rationing, which crippled the sector and led to congressional passage of government reforms.

The private sector controls 56 percent of generation⁴ and 47.5 percent of distribution (concentrated in five large utilities that control more than

³ Thermal generation is mainly gas-fired (3,585 MW during 2000) and coal-fired (720 MW). Natural-gas reserves, which equal 6.7 Tera Cubic Feet (TCF), are concentrated in three companies: Ecopetrol (State industrial and commercial enterprise), Texaco (Texas Petroleum Company), and BP (British Petroleum).

⁴ Public generation is concentrated in Medellín's public utility and in the State-owned ISAGEN (a spin-off from ISA) and CORELCA.

60 percent of the energy sold in regulated and open markets). ISA, a State-controlled enterprise, controls 80 percent of the transmission grid; while most of the remaining 20 percent belongs to vertically integrated utilities. The extent of vertical integration in distribution and generation is also significant. Bogotá, Medellín, and the Cauca Valley (Valle del Cauca) are served by vertically integrated utilities either directly or indirectly (by sharing a common owner).

Electricity is traded on the wholesale energy market (*Mercado Mayorista de Energía - MEM*), which, since its inception in 1995, has been continuously operated by ISA with a high degree of professionalism and efficiency. The market is centralized, in the style of England and Wales, where generators bid on the next 24 hours, are dispatched with the price of the marginal offer, and are complemented by a market of long-term financial contracts.

When their power demand exceeds 100 kilowatts (kW) or their monthly consumption is greater than 55 megawatt hours (MWh), end users may select the open, unregulated market. As of September 2001, about 3,000 unregulated commercial and industrial customers comprised more than 25 percent of the country's total demand. As unregulated customers, they can choose their supplier without restrictions; as a result, rates for end users have dropped significantly (25 percent since MEM initiated operations).

The Ministry of Mines and Energy (MME) is the principal power sector authority; in addition to policymaking, it oversees power companies in which the State is the major shareholder. Institutions that participate in regulation include the Energy and Gas Regulatory Commission (*Comisión de Regulación de Energía y Gas - CREG*), which is in charge of regulating the electricity and gas market; Superintendence of Residential Public Utilities (*Superintendencia de Servicios Públicos Domiciliarios - SSPD*), which is in charge of sector oversight and identifying and penalizing market-power abuse; and Mining and Energy Planning Unit (*Unidad de Planeación Minero Energética - UPME*), which is responsible for preparing expansion plans for generation and transmission.

In addition to operating the National Interconnection System (*Sistema de Interconexión Nacional - SIN*), ISA is also in charge of the Energy Control Center (*Centro Nacional de Despacho - CND*) and Administration of the Financial Exchange System (*Administración del Sistema de Intercambios*

Comerciales - ASIC). The National Operation Council (*Consejo Nacional de Operaciones* - CNO) is the consulting arm for market operation,⁵ and the National Trading Council (*Consejo Nacional de Comercialización* - CNC) performs similar functions for trading. The Colombian Association of Generators (*Asociación Colombiana de Generadores* - ACOGEN) and the Colombian Association of Distributors (*Asociación Colombiana de Distribuidores* - ASOCODIS) are the trade associations advocating generator and distributor interests.

Key Threats to Sustainability

Ten years after the inception of power sector reform, and despite accomplishments, a series of recent events have again placed the sector in the spotlight of public scrutiny. Several problems, whose solutions were in incipient stages, have since worsened, becoming threats to reform sustainability. Thus, the critical financial condition of most public and private distribution companies; the privatization program's slow progress and obstacles; MEM management difficulties; and the crisis of regulatory, supervisory, and control institutions have all contributed to a climate of uncertainty. Local politicians, taking advantage of this instability, have favored populist proposals for tariff intervention and reform reversal. Combined with the country's current economic crisis and increased insecurity, this uncertain climate has turned private investors away from power sector participation and all other productive activities. Four key threats, including their origins and reasons for being considered threats, are briefly described below.

Critical Financial Condition of Distribution Companies

Most distribution companies (DISCOS) are nearly bankrupt.⁶ The 13 regional distribution companies under control of the national govern-

⁵ Constituted by representatives of generators and distributors, CNO's main duty is to agree on the technical issues of the SIN's safe and reliable operation and to act as the executing arm of Operations Regulations.

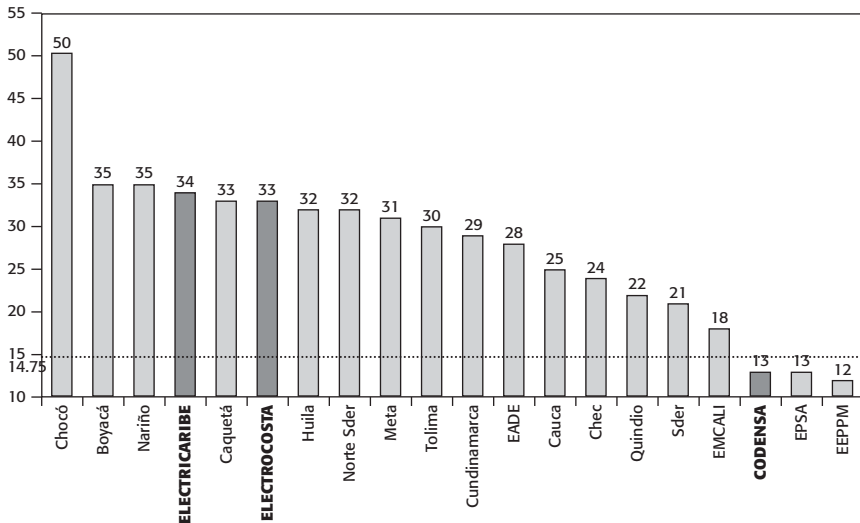
⁶ Exceptions are Medellín Public Companies (*Empresas Públicas de Medellín* - EPM); Pacific Energy Company (*Empresa de Energía del Pacífico* - EPSA), a private utility serving the Cauca Valley, excluding Cali; and the Bogotá Distribution Company (*Empresa de Distribución de Bogotá* - CODENSA), a private company serving Bogotá and 94 neighboring municipalities.

ment, known as DISCOSEG, are currently undergoing privatization; they provide services to 33 percent of the country, cover 36 percent of the total population, and represent about 18 percent of total energy sales demand. The national government considers them financially nonviable. The Municipal Companies of Cali (*Empresas Municipales de Cali - EMCALI*) is the utility that provides the country's third largest city a range of services: water supply, sewage, telephone, electricity distribution, and trading. With 7 percent of the domestic electricity market, EMCALI is bankrupt and under SSPD intervention. The government may soon take control of the Pereira Energy Company (*Empresa de Energía de Pereira - EEP*), the utility that serves the municipality of Pereira. The recently privatized ELECTROGOSTA (ECO) and ELECTROCARIBE (ECA) serve the Atlantic coastal region. With 19 percent of the market, they have ceased payments to generators and, at the time of this writing, were seeking to refinance their overdue debts.

Many reasons account for the deficient performance of these State companies. These have included cronyism of regional politicians and their management intervention; high electricity losses of up to 35 percent; inadequate, nontransparent contracting practices of power purchase agreements (PPAs) and build, operate and transfers (BOTs); low labor productivity; and lack of provisions for pension funds. Added to these reasons have been inadequate distribution regulations, nonpayment of bills by government enterprises, delay in payment of subsidies agreed to with the national government, and excessive exposure to the spot market. These problems have been underscored by the economic crisis, which has slowed demand growth and affected accounts receivable in markets characterized by low density, high operational costs, and high concentration of low-income users.

The number of employees per thousand customers for DISCOSEG (1.5-3.7), EC (2.14), and ECO (2.40) contrast markedly with that of CODENSA (0.69). Average level of losses are 30 percent for DISCOSEG, 34.4 percent for EC, and 32.7 percent for ECO, compared to a national average of about 20 percent; regulations recognize only 14.75 percent in tariffs to regulated users. These indicators compare poorly with those of CODENSA, which, within three years of privatization, reduced its losses from 23 percent to 11 percent (Figure 2.1).

Figure 2.1. Comparison of Energy Losses, December 2000
(In percent)



Source: Ministry of Mines and Energy (MME).

At the end of 2000, DISCOSEG's total past due accounts receivable amounted to COL\$306 billion (nearly US\$150 million), half of which corresponded to official entities (the accounts most difficult to collect from). Accounts-receivable turnover is 165 days for EC and 111 for ECO, compared to the national average of 68. On December 31, 2000, EMCALI's past-due-accounts receivables were US\$40.8 million or 137.2 percent of its current assets. Service quality is also unsatisfactory; while the allowable range is 5-16 for service interruptions and 10-20 for frequency of service interruptions, those of some DISCOSEGS are as high as 30. With such poor indicators, it is no surprise that these companies have a negative image, again contrasting with that of CODENSA (59 percent of users rated the private utility favorably in an August 2001 survey).

DISCOSEG tariffs for residential users are 173.3-226.8 COL\$/kWh. By contrast, CODENSA's residential tariff is 171.3 COL\$/kWh. Additionally, its distribution and trading remuneration is relatively low in comparison with private companies in other countries of the region, particularly Peru

and Argentina.⁷ Traders also face cash-flow problems caused by the lag between paying generators and invoicing consumers, which, in times of rising prices, works against them because of the method used to transfer energy-purchase prices. These problems were intensified by delay in recovering constraint costs in the transmission system. Although the problem is being addressed, outstanding payments to distribution companies during 1998-99 totaled COL\$145 billion (nearly US\$75 million), owing to contribution shortages to the Fund for Solidarity and Income Distribution. Similarly, according to ASOCODIS, high unemployment and the flood of refugees from violent regions have led to increased outstanding service payments, as well as about one million illegal connections, representing annual system losses of US\$220 million.

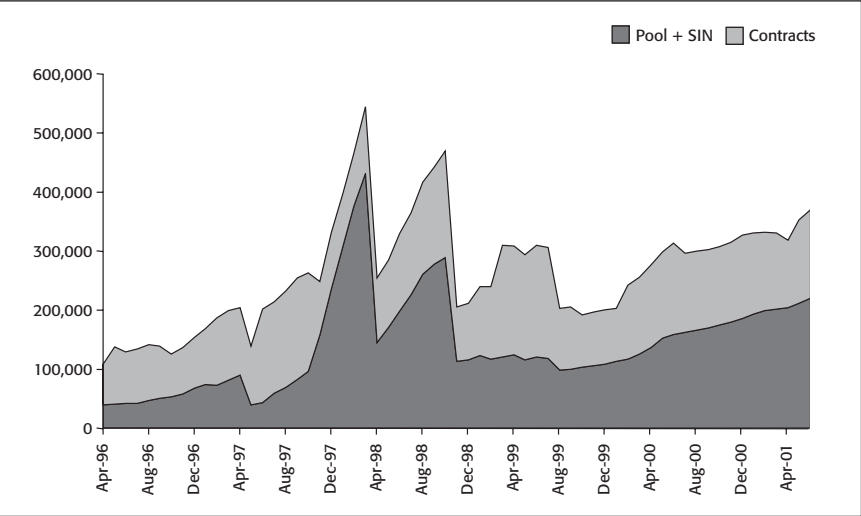
Because of their lack of solvency, distribution companies have accumulated a large and increasing volume of outstanding debt with MEM (Figure 2.2). This debt demonstrates the lack of mechanisms guaranteeing MEM's solvency and weakens incentives for future investment in generation. On the other hand, in times of election campaigns, service restrictions to debtor utilities, because of nonpayment, have created public-order disturbances that have been deftly exploited by politicians opposing the reforms. Moreover, there is growing acceptance among the media and politicians of the need for a financial rescue operation by the national government as the only alternative to difficulties experienced by ECO and ECA. This would compromise the State's resources and would postpone the capitalization solution by the private sector.

Disturbances in MEM

High dependency on hydroelectric generation and relatively low storage capacity make the Colombian market extremely volatile, a condition worsened by opportunities for the exertion of market power whenever supply is limited by an El Niño/Southern Oscillation (ENSO) event or transmission-system constraints. Figure 2.3 illustrates this behavior during the 1998 ENSO, and recently, as of the second half of 2000, on occasion of the trans-

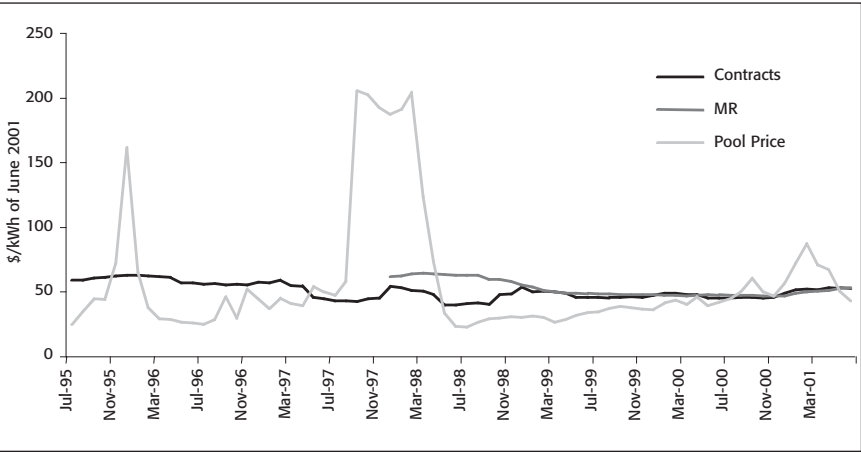
⁷ Distribution value added for 1999 tariffs was 17.9 US\$/MWh in Colombia, versus 33.6 in Argentina and 30.8 in Peru (see COCIER Bulletin, June 2000).

Figure 2.2. Total Generator and ISA Accounts Receivable
(In millions of pesos)



Source: Interconexión Eléctrica S.A. (ISA) (2001).

Figure 2.3. Pool, Contracts and Regulated Market Prices



Source: ISA (2001).

mission-system constraints caused by terrorist attacks. Although pool prices are volatile, prices to regulated consumers, MR, have been relatively constant, thanks to smoothing procedures involved in the formula. However, because of regulation changes, constraint costs are now transferred to a greater extent and more quickly to distributors; this has added to the difficult economic situation, contributing to the political debate that forced CREG to intervene in the market.

CREG's intervention measures (through resolutions 026, 034, and 096 of 2001) modified the system of bids and erratically established limits to constraint-on plants. While such measures controlled the phenomenon and stabilized prices, they led to angry protests by generators, who viewed government intervention as a change in the rules of the game and regulatory taking. Several lawsuits followed. Some generators threatened to retire plants from the market. Moreover, long, weather-induced price cycles, combined with price caps in times of shortage, do not provide enough stimulus to invest in thermal plants, unless they can be compensated by capacity charges (CPCs). The regulator has addressed this problem randomly, giving rise to many clashes among generators who try to take over the rents implicit in such charges in a depressed market.

Even though MEM's problems are minor, compared to those of California or Brazil, they supply ammunition to the enemies of reform and overburden the regulator's attention, leaving it little time for other urgent matters, including distribution. Likewise, price uncertainty, combined with lack of consensus on CPCs, weakens incentives to new investment in generation. Most importantly, the polemic nature of disputes among market members and the regulator contribute to discrediting the model, which further diminishes the regulator's credibility.

Crisis of Regulatory Institutions

CREG's difficulties with MEM's management appear at a time when the institution is weakened after a strong confrontation with the former MME, caused by discrepancies over its jurisdiction and independence. This highly publicized dispute, which ended with renewal of all of CREG's experts, distracted the Commission's attention and helped to align the opposing interests of political sectors uncomfortable with the concept of

independent regulation. According to ACOLGEN, CREG acted rashly, without thoroughly considering the influence of its decisions, giving rise to complaints and legal actions; during 2000, the Commission received 9,300 communications, 2,300 of which were legal actions initiated by agents against a particular resolution.

The weakest link of the regulatory chain is the SSPD, widely known for its lack of agent capacity, and the national government, which has tried in vain to reform it. The SSPD's intervention in utility performance has been poor; it has failed to supervise competition, focusing instead on social control and replacing other entities that could play this role more efficiently. Because of its structure, the SSPD is subject to political pressure and has often been accused of corrupt practices. The handling of ELECTRANTA's liquidation and the subsequent TermoRío scandal led to the former Superintendent's resignation and detention, along with some of his aides, by the Office of the Prosecutor General.

Weakness of these regulatory institutions, at the very moment they should be strongest, cannot be overemphasized as a danger to reform. The dwindling of institutional legitimacy feeds populist proposals for reform of Law 142 (Residential Public Utilities Law) and Law 143 (Electricity Law); unfortunately, the proposals are not aimed at improving the laws' weak points.

Weak Investment Incentives

To date, private investors have been reluctant to initiate new power-sector investment projects. Only the State-controlled ISA has carried out construction projects of new transmission lines. As noted earlier, some generators threatened to dismantle their plants and take them to more profitable markets. Moreover, private investors are not interested in executing investment projects in off-grid regions (ZNI). In addition to the above-mentioned crisis of regulatory institutions, factors influencing reluctance to invest in Colombia include increased risk, including an upsurge in security problems; lack of adequate, long-term signals for investment in generation; uncertainty about distribution regulation; new multinational, global strategies; and threatened State participation in new large-scale, hydroelectric projects.

A difficult socioeconomic situation discourages foreign investment. In recent years, direct foreign investment in Colombia has declined systematically. Both domestic and international private agents perceive the country as insecure; their perception worsens with each guerrilla attack on electricity infrastructure. In addition, recent evolution of the international power market has created fewer participants—resulting from acquisitions, alliances, or strategic market distributions. Thus, in Colombia, the main private actors are two international groups that expressly prefer vertical integration.

Investment in generation is faced with uncertainty, with regard to gas-sector regulation. Recent criticism—that it replicates electricity regulation—suggests a revised model for appropriate sector development. Current gas prices are low and do not spur exploitation of BP reserves or exploration of new fields. Additionally, the State plans to invest in two large-scale hydroelectric projects, Sogamoso (800 MW) and Pescadero-Ituango (1,600 MW). Although it can be argued that a return to State investment is impossible because of private actors, the situation is not so clear from a foreign analyst's standpoint.

The presidential delegation of its constitutional responsibility for public utilities to a Regulation Commission may, in principle, revert at any time. Law 143 provides a mechanism by which the State exercises its ultimate responsibility for the service and establishes its obligation to invest under UPME's plans in the absence of private investment. SOE participation in power generation lends credibility to the threat of substituting private investment and reduces its entrance rate. Special-interest representatives may take advantage of this possibility, as confirmed by the recent intent of establishing, under law, a special charge to finance construction of coal-fired generation plants to give the market increased "firmness." Paradoxically, although threats of investments with State guarantee are not credible, lack of private investment may make them a necessity.

Reform Rationale, Expectations and Constraints

Like reforms in other Latin American countries, Colombia's power sector reform of the early 1990s responded to the old model's failure to deliver

financially sustainable power. Understanding why the earlier model failed helps to explain what motivated the new model, expected achievements, and constraints to success.

Reasons for Paradigm Failure

The ongoing operational and financial crisis of Colombia's power sector was brought about, in part, by the State's disparate roles as entrepreneur, sectoral policymaker, and regulator. This lack of separation between somewhat conflicting State roles created perverse incentives for sectoral administrators, inefficiencies, and highly politicized decision-making at all levels of the sector, leading to non-sustainability (Vergara, 1991). Rent-seeking politicians perverted the model's objectives, whose consequences included poorly allocated subsidies, inefficient and insufficient coverage expansion, concentrated investment in major hydraulic projects of doubtful convenience, and a sector acting as a job pool with ample opportunities for corruption.

Based on vertically integrated, State monopolies, the model failed to produce the resources necessary for system expansion and operation; poor performance of the sector's utilities imposed excessive fiscal burden on national government coffers. Lack of incentives for efficient utility performance, along with tariffs not reflective of the costs of service, led to poor performance of State-run utilities, with losses resulting in a large fiscal deficit.

In mid-1991, the Minister of Mines and Energy eloquently described the crisis (Box 2.1). Details of his diagnosis are amply documented in studies of that time, including a World Bank assessment carried out at the request of the Colombian government. Subsequent studies have expanded on analyzing the reform, putting it into perspective (Fainboim, 2000). Figure 2.4 clearly shows the evolution of national-system power losses. However, utility behavior was not uniform; for example, EPM required no government fund transfers to cope with demand, becoming a paradigm of efficiency.

Box 2.1. Causes of Colombia's Crisis: Perspective of a Former Minister of Mines and Energy

At a 1991 conference organized by OLADE and the World Bank, Luis F. Vergara, then Minister of Mines and Energy, gave a speech to the Ministers of Finance and Energy, explaining why Colombia's power sector crisis occurred:

"The Colombian power sector grew too fast over the last two decades...from 40 percent coverage in 1970 to about 80 percent in 1990. This development took place in an isolated way; that is, the energy development process depended solely on electricity, abandoning all other possible forms of supply. This explains our typical electric energy-consumption structure: here, almost 50 percent goes to household use, compared to [less than] 30 percent in other countries.

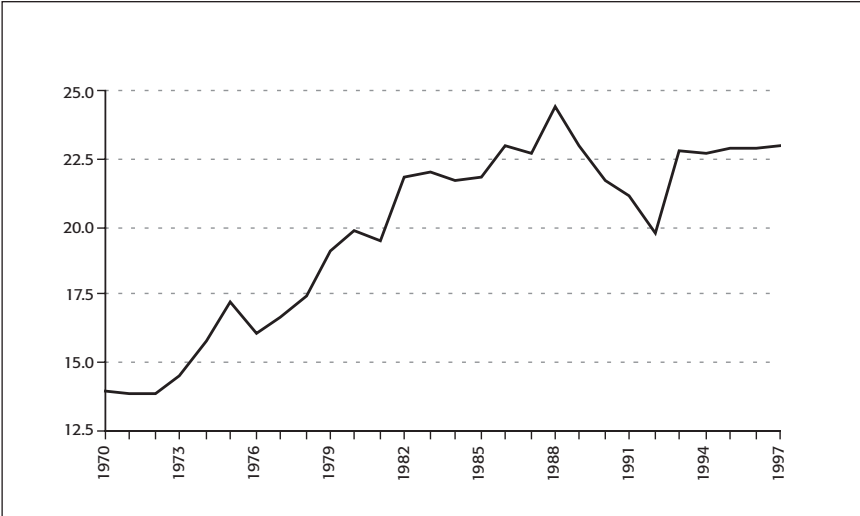
"At the same time, tariff management was quite erratic. Tariffs were frozen several times and subsidies for home use were established, partly compensated for by tariffs above cost for non-household use, such as industrial and business. This measure, which was not complemented by explicitly non-sector funding, deteriorated the utilities' situation, creating in them a contradiction between subsidies and self-financing, with highly negative financial results. Nevertheless, [recent] efforts have been made to rationalize the tariff system. The methodology of long-term, incremental average cost was adopted, and there is a program to [readjust] tariffs at their economic costs.

"Additionally, demand growth has been lower than expected when investment was first planned. Hydraulic generation was emphasized, currently accounting for 80 percent of the country's total installed capacity of 8,356 MW. The power sector has significantly affected the handling of public finance. Its current debt is more than 30 percent of the country's public debt, and the investment level absorbs a considerable percentage of total public investment.

"Due to mismanagement, electricity losses amount to over 21 percent, and this, added to tariff insufficiency and high level of debt, has cornered the sector's finances into a critical situation because internal generation of resources does not suffice to undertake required investment, and, in the next four years, it would only be enough to cover 44 percent of debt, without any investment, or 80 percent of investment, without servicing debts."

Source: Vergara (1991).

Figure 2.4. Evolution of Energy Losses, 1970-97
(In percent)



Source: ISA (2001).

Shleifer and Vishny (1998) refer to the “helping hand,” a key school of thinking favored by multilateral organizations in the 1960s and 1970s that thought the government should intervene to compensate for market imperfections; this description of government behavior contrasts with the “invisible hand,” which advocated non-intervention. During the 1960s, the Colombian power system consisted of isolated regional utilities competing for State resources to finance their projects, creating major duplication. The helping hand sought a solution to this problem through system inter-connection; creating ISA to build lines, as well as large, national-scope generation projects; and rigorous, least-cost central planning.

However, regional politicians quickly learned to bypass these technical constraints to include their own generation projects in the plan, at the country’s expense (World Bank, 1990). Concurrent with the sector’s financial crisis—reflected in electricity losses and administrative inefficiency—a more sophisticated version of the helping-hand paradigm identified the problem as one of entrepreneurial governance. To control the crisis, it proposed a rigorous, fiscal-adjustment plan, with performance

agreements for State utilities as a condition for IDB and World Bank financing. Despite efforts from both the banks and the Colombian government, the situation only worsened. The helping-hand paradigm failed to identify the true source of the crisis, which was political, not entrepreneurial, governance.

Seeking a way out of the problem, the government of Colombia and the World Bank held a workshop in Santa Marta, Colombia in March 1991 to study proposals of all interested parties, which included private sector, multilateral, and development assistance organizations. The Santa Marta workshop helped the Colombian government to define a policy to be approved by the National Council of Socioeconomic Planning (*Consejo Nacional de Planificación Económica Social* - CONPES).⁸ Within only six months—and supported by the World Bank, the IDB, and the U.S. Agency for International Development (USAID)—the Colombian government set up a thorough, power-sector restructuring program, summoning all the parties involved in it. Through inter-institutional seminars, the basic ideas were threshed out and consensus was reached (CNE, 1991 a, b).

Exhaustion of the model occurred at a time of policy convergence, followed by international financing institutions (IFIs) and the Latin American countries—the so-called Washington consensus—establishing macroeconomic adjustment, foreign-trade opening, and rethinking of the State's role as entrepreneur (Williamson, 1990). The landmark conference held in Cocoyoc, Mexico in September 1991 offered Colombia alternative power sector models that had been adopted by Argentina and Chile and enhanced the Colombian reform debate. On the economic front, the Gaviria administration's program advocated the new paradigm, and the new Constitution of 1991 provided legal and constitutional grounding to implement comprehensive State reform. Moreover, 14 months of power rationing in 1992-93 helped to ease political opposition.

Constitutional reform was promoted by a strong executive branch, backed by the judiciary and mechanisms considered “extra-constitutional.” The reform occurred at a critical political and partisan moment, causing the congressional mandate to be revoked; it also changed the valid

⁸ The economic body whose Secretariat is operated by the National Planning Department.

structure of control rights in utilities, in opposition to the established political power.⁹ This drastic reform was facilitated by political crisis, which similarly played a major role in reforms of other countries (Graham et al., 1999).

The economic transformations begun in 1990 helped to create the conditions for implementing the new model. Such transformations can be grouped as follows:

- ◆ Those seeking structural changes to liberalize and increase the flexibility of goods, labor, and capital markets: economic opening and reforms (labor, exchange, financial, social security, and foreign-investment policy, which generated a legal framework equating foreign investors with national ones and adopted international agreements to minimize political risk for private investors).
- ◆ Institutional reforms to realize monetary, exchange, and fiscal policies.
- ◆ Regulatory changes, establishment and liquidation of entities, and privatization processes. (A specialized analysis of these types of changes, which have concentrated on public and social-services areas, is the aim for the power sector.)

Public sector reform generally has tried to help the State concentrate on its essential functions, privatize entities and open space formerly the sole domain of the public sector for private investment, increase fiscal and administrative decentralization, adjust State entities to the new economic model, and make public sector operation more transparent and efficient. Reforms have given precedence to strengthening such sectors as justice

⁹ The 1991 constitutional reform radically transformed Colombia's power sector—from an ex-ante, planned scheme administered by technicians whose residual control rested on congressional interests to a modern sectoral one that separated the State's policymaking, regulatory, and entrepreneurial roles. The private sector assumed investment in generation, while distribution was controlled by local political interests. If the utilities failed in their performance, SSPD could intervene or they could be privatized. Together with CREG, SSPD would foster competition and regulate segments controlled by natural monopolies (e.g., distribution and transmission). At the same time, a unique market model, similar to that of England and Wales, was adopted to allow competition in the electricity generation segment. In retrospect, the reform reduced the economic and political costs inherent in public management of the service, where many incentives pointed in the wrong direction.

and security, as well as social sectors, opening up significant space for private interests. In terms of infrastructure, regulatory commissions have been created, sectoral ministries have been transformed to reinforce planning and regulatory functions, and certain State entities have been turned into State commercial enterprises to achieve more administrative independence and flexibility. In addition, environmental policy entities have been upgraded.

Concurrent with economic reforms, the Constitution of 1991 introduced major institutional changes that affected the public-power structure and relations among power organs, thereby modifying their capacity to set discretionary limits for regulatory institutions. Democratic participation mechanisms were broadened, popular election of governors was mandated, participation of private corporation officers in regulatory institutions was banned, and the judicial system was strengthened.

With respect to public services, the Constitution (Title XII, Chapter 5) imposed responsibility on the State for direct and indirect securing of efficient supply from organized communities and private providers and enforcement of provider regulation, control, and supervision. It was established that, because public services are inherent in the social ends of the State, they must work for the population's general well-being and improve its quality of life. Private sector participation—through private initiative or State invitation—could create new enterprises; involve shareholders in existing enterprises (including mixed-economy ones); create exclusive-service areas; and manage, operate, and maintain contracts.

Along with its development by the courts, particularly the Constitutional Court, the new Constitution has also involved noticeable changes in the State's intervention methods and entities. In addition to stressing principles of freedom and social responsibility, duties under the so-called "Social Rule of Law" have been imposed, which ultimately include universal coverage of essential services, along with user and citizen participation in all aspects, from planning to supervision and control.

The crisis sparked by power rationing caused the government to declare a state of economic and social emergency and to issue a series of decrees; the most important of these (Decree 700 of April 1994) adopted exceptional measures for public contracting, indebtedness, and entity restructuring. To address blackouts, contracting by public utilities became

more flexible, and private sector construction and operation of generation assets was permitted at the same time that installation of thermal generation was promoted. With these instruments, the country capitalized several utilities and started to restructure them.¹⁰ While disruptions and the search for scapegoats during the rationing period temporarily slowed the reform, a coalition of sector agents, under the leadership of the DNP and CNE, was instrumental in reaching the final agreements that led to approval of the Residential Public Utilities Law (Law 142) and the Electricity Law (Law 143) later in 1994.

Breaking the Vicious Cycle: Model Expectations

Under the new power-sector development model, the private sector was given entrepreneurial responsibility, while the State focused on defining the regulatory framework and sectoral structure to assure investors, while promoting efficiency and protecting consumer interests through competition in segments where possible, and adequately regulating monopolistic segments. In addition, the State guaranteed the population access through a coherent and transparent subsidy system and a new strategy to increase service coverage (Vergara, 1991).

Private Sector Commitment

Having the private sector assume the bulk of investment aimed to fill the vacuum left by the government's failure to mobilize the required resources. This became especially critical when the IFIs changed their financing priorities, and the government's financing strategy shifted to short-term bonds. The new strategy sought to involve the private sector in emergency, thermal-generation projects needed to firm up a predomi-

¹⁰ ICEL's commercial intermediary was eliminated, and ICEL and CORELCA were converted into State commercial enterprises. ECOPETROL (*Empresa Colombiana de Petróleos*) contracted construction of three thermal plants from its own coffers. The State capitalized and assumed the debts of CORELCA, Betania Central Hydropower (CHB), ICEL, and CVC, in exchange for property of certain utilities, 99 percent of CHB stocks, and stocks in CORELCA, ICEL, and CVC, which translated into 77 percent ownership of ISA stocks. Thus, it also became a controlling stockholder in most DISCOG. ISA's new stockholder participation permitted elimination of veto power of its old partners and customers and separation of its entrepreneurial interests from those of sectoral planning and management.

nantly hydraulic system and ward off rationing. Without a proven regulatory framework or a functioning wholesale market, that involvement should occur initially through PPA contracts with then existing State utilities. At later stages, after an operating market with a reliable regulatory framework had been established, private sector involvement was expected in the form of merchant plants participating in the market through long-term contracts or selling their power on the spot market. Government trading of debt for stocks through emergency decrees permitted it to restructure and privatize generation assets of ISA and CVC and strengthen competition in the generation market.

Even so, a significant portion of asset generation remained in the hands of Bogotá and Medellín—utilities over which the government had no control. With these, like other government or regionally controlled distribution utilities, it was expected that the new regime of State enterprises, in which the utilities would undergo strict performance programs supervised by the new SSPD, could guarantee their efficient management or, in its absence, intervene and eventually privatize them. However, as part of the haggling to secure reform support from the regions, important concessions were granted, whose real cost would become evident only later. Three SOEs were authorized to construct the hydroelectric plants they had been promoting—La Miel, Urrá, and Porce II—and privatization of distribution utilities affiliated with former ICEL and CORELCA subsidiaries was postponed.

Competition Benefits: Equilibrium Prices and Optimum Investment in Competitive Segments

Colombia's abundance of natural gas offered ample potential for creating a future competitive market, given the reduction in economies of scale.¹¹ The new paradigm called for restructuring the sector to separate potentially competitive activities (generation) from tasks structurally considered monopolies (transmission and distribution). The competitive segment's prices would be deregulated, while prices in the monopolistic

¹¹ Technological innovations, as well as combined-cycle plants, have reduced the minimum scale for efficient energy generation.

segment would be regulated. Free access to transmission and distribution networks would be granted to eliminate entrance barriers that prevent free development of competition. However, given the interest of Bogotá and Medellín's municipal utilities in preserving vertical integration and the veto rights that their congressmen had in the reform approval, Law 143 could achieve no more than separating accounting activities, despite its mandated entrepreneurial separation of whatever new companies might arise in the future.

Even so, Colombia was expected to have competition in generation and supply, which would favor efficient prices and consumer protection, while making the regulatory burden less painful. ISA's experience and professionalism in managing the Energy Control Center and in exchanges among utilities guaranteed the existence of elements to create an efficient and competent market operator.

Regulatory Incentives for Efficient Investment Levels and Consumer Protection

Independent regulation would protect consumers from monopolistic power abuses, guarantee adequate service levels, and guarantee investors that their money would not be expropriated by opportunistic government action. (The risk is that, once investments are made, the government could take advantage of the changed rules of the game.) As long as such opportunism exists, private investment will be insufficient or investors will tend toward the most movable assets or the shortest redemption terms; as a result, quality will tend to decrease. In short, this risk stabilizes only State property, thereby reverting to the familiar governance and financial problems that motivated the search for private investment.

Thus, added to the usual regulatory tasks—guaranteed production, efficient pricing, and continued supply in the face of market imperfections—is the requirement for delimiting and controlling government discretion, both in pricing and access and in the executive and legislative capacity to change or overrule regulatory entities. Colombia diverged from the existing regulatory model of other countries by including three ministers in the regulatory commission and assigning supervisory and control functions to the SSPD. It was expected that, despite the above-

mentioned restrictions, these institutions would escape the bureaucratic handling of other State entities, attract the country's most renowned experts, and enjoy autonomy in handling their affairs.

Universal Coverage and Service Efficiency

Achieving universal coverage of service would add legitimacy and credibility to the reforms. This would require sufficient funding to avoid resorting to lower efficiency and quality of service or price distortions stemming from cross subsidies—that is, it would need to be financed with general tax funds, obtained with the least possible distortion, and be enough to remunerate generators and distribution companies for adequate quality levels for all consumers.

Assumptions versus Reality

Certain market and economic assumptions are implicit in fulfilling the expectations described above. Table 2.1 suggests that, when compared with reality, some assumptions turn out to have been overly optimistic.

Constraints to Success

At the time the model was adopted, its proponents apparently failed to perceive the limitations to achieving the above-mentioned expectations. This host of constraints—institutional, political, economic, technical, and investment—are described below.

Institutional Heritage

Although their starting points and objectives differed, Colombia's reform process followed in the footsteps of those of pioneering OECD countries; for example, the power-pool design resembled the original England and Wales model. That their experiences depended on the particular country context seems to have been given scant attention. A more cautious approach might have recognized that, while certain basic elements are essential, no universal model exists and that success depends on the institutional setting and timing of the associated reform. Unless these implicit elements are replicated or replaced with local versions, and unless reforms

Table 2.1. Reform Assumptions versus Reality

Assumption	Reality
State reform would permit legal and juridical frameworks compatible with sectoral reform.	While foreign-investment provisions have facilitated the participation of private capital, juridical uncertainty has been created by an activist constitutional court and actions to restore fundamental rights (Tutela).
State roles would be effectively separated; a regulatory framework and appropriate institutions would be established.	The MME presides over CREG and the SOE boards. The SSPD fell into crisis because of its inability to solve problems. CREG is limited in hiring ability and lacks prestige.
The State would gradually abandon its entrepreneurial activities and adopt entrepreneurial practices for its companies (or subsequently intervene to privatize them).	Despite a positive start, privatization has stalled. SSPD intervention mechanisms have been inadequate, and DISCOSEG, with the exception of EPM, are in trouble. EPM performance and successful private-sector capitalization of EEB have not been replicated.
The State's fiscal contribution would be limited to complementing subsidies; it would meet its obligations on time.	The State continues to extend credits; as guarantor of SOEs, it was forced to capitalize them and is currently paying the PPAs. Subsidy contributions have been late (except for 2001); the sector's major defaulting debtor is the State.
The private sector would undertake the majority of new investments.	Until 1998, the private sector seemed ready to embrace the reform; however, given the current crisis, there are few prospects for facing country and sectoral risks.
A competitive wholesale market would make marginal changes to the sector's structure and have solvent market agents.	Despite design limitations, wholesale market has functioned well; however, regulatory entity's slowness in solving market-power problems—operating under constraints and capacity charges—has limited its credibility. Solvency is threatened by distributors' default on payment.

Table 2.1. (Continued)

Assumption	Reality
Short-term results of the model would bring defenders of the reform together. Productivity increases would be transferred to users through increased quality and decreased tariffs.	The model attracted private investment at critical moments, thereby avoiding another rationing. It also made it possible to keep prices low in real terms. However, people do not perceive the benefits of lower rates because of the gradual abolishment of subsidies. Although significant, the benefits of EEB's successful privatization have not been publicized enough. Attention to off-grid areas has been delayed.
Transparency of the process, the new regulatory framework, private investment, and control mechanisms would reduce corruption and eliminate cronyism.	Local interests maintained ownership of power companies and used the new reform mechanisms to extract rents. On the positive side, opportunistic legislation to benefit private interests, disguised as national interests, failed to pass.
Constitutional reforms would ensure the country peace and economic growth.	Currently, the country faces its worst political and economic crisis; implications for model sustainability are serious.

are coherent across the economy, transferring a model to another context is risky. Indeed, while blueprints, best practices, international codes and standards, and harmonization may prove useful for narrower technical issues, large-scale institutional development requires a process of discovery of local needs and capabilities.

Regulation to establish markets and competition, control market power, and balance the interests of utilities and consumers, is, of course, an imported practice totally alien to a world of politicized monopolies. Moreover, its technology derives partly from a system of property and market access protection based on common, rather than statutory, law;

and its legal roots are founded on different systems of power division and administrative law. On the other hand, regulation technology appropriate for new market forms, such as energy pools, is still at an early stage of development worldwide. Obstacles remain for the structuring of competitive market regulations: its objectives clash with established powers under conditions that require gradual adaptation.

The former public-utilities regime confounded the roles of policy formulation, ownership, and management, as well as regulation (understood as supervision or vigilance and control activities). Utilities, even municipal ones, were subordinated to the State, because municipal administrations and the entire executive chain were subject to the national order (i.e., the president of the republic). He and his ministers formulated sectoral policies. Supervision was solely the president's function; he could delegate it and had done so in regulatory bodies of other sectors that had confounded ruling, supervision, and control functions in a single body.¹² In public utilities, delegation was made ad hoc only through management and necessary legal procedures.

Antitrust policy must be designed in keeping with the organizations or institutions in charge of enforcing it. This advice becomes even more critical in the case of Colombia, where institutional features taken for granted in other countries—rule of law, clear and accepted property rights, independent and competent judiciary, mechanisms for peaceful conflict resolution, contract enforceability, and quality of public bureaucracies and competition agencies—are either missing or incipient.

In Colombia, constitutional reform is relatively recent; it has not yet achieved relative stability with respect to division of powers and checks and balances. A common argument is that the Constitutional Court usually co-legislates and co-governs without restrictions or appeals. Its determinations are unstable, with examples of concept and mandate reversions. In its isolation, it has sometimes overlooked economic conditions and budgetary constraints, and has intervened through regulation in what should be a matter of laws or decrees.

¹² This was the case, for example, in the financial sector's Superintendence of Banks. Such regulatory bodies answered directly to the president; however, in practice, they were politically aligned with the ministries.

Weak, fragmented political parties, along with cronyism, have caused the legislature to fail in representing the electorate and controlling the government. The legislative process has centered excessively on haggling over individual aspects, the results of which have been concessions and rents, rather than political reordering and definition. Recent political reform attempts have failed, significantly affecting the quality and coherence of laws (Alesina, 2000).

Selecting and signing on the best regulators are constrained by serious obstacles that prevent regulators from working efficiently. These include:

- ◆ System of administrative career and judiciary norms that inadequately remunerate regulators. The civil service is designed for mid-level positions, not for decision-making officers.
- ◆ Inabilities and incompatibilities that grant exclusive eligibility to public officers, often from entities with planning or control functions, giving ample room for biased orientation.
- ◆ Investigation and control mechanisms that result in paralysis, delay, excessive red tape, and fear of introducing needed radical changes and measures to handle emergencies and major crises, without any transparency or accountability.
- ◆ Actions for restoring fundamental and petition rights that have taxed the workload of regulators.

According to the Constitution, the regulatory commissions form an integral part of the executive management chain, despite their apparent lack of autonomy and assurance of sufficient coordination with other government functions, including planning and policymaking. The regulatory commissions' powers and responsibilities are delegated by the ministries' administrative structures, while those of the SSPD are delegated by the president. In practice, this has led to conflicts and lack of coordination, making supervision vulnerable to politicization and corruption.

Clearly, it is not possible to avoid all of the inefficiencies of a regulatory framework. However, a regulation consistent with regulatory institutions (particularly with supervision capability), along with an adequate and transparent incentive structure and sufficient resources, can, in principle, overcome or minimize such inefficiencies. In practice, however, a

country with weak judicial institutions and a tradition of intervening politically in judicial decisions is less likely to overcome such inefficiencies.

Regional Political Power

Most utilities were formerly local, owned mainly by municipalities or departments; the largest were vertically integrated and located in the two largest municipalities (Bogotá and Medellín). In the power sector, only ISA, CORELCA, and ICEL were national. Although both national and municipal utilities were under the executive line of public power, there was no guarantee of policy coherence or control of local and contractor interests.

Congress and council members have been involved in utility deal-making, which persists in non-privatized utilities. This has been part of the booty of local municipal elections, which has resulted in over-dimensioning, low tariffs, scant investment in expansion and maintenance, and lack of control over distribution losses. Breaking this cycle has required electing far more independent mayors.

At the local level, political control of utilities lies with the availability of jobs for electoral cronies and discretion to award contracts for works, supplies, and services. Sectoral, labor, and pension reforms, together with privatization, have posed a great threat to utility stability and worker benefits, resulting in regional and local alliances between worker unions and politicians, aimed at preserving their perks and political presence.

As long as they could maintain control over large municipal utilities and other regional, public-electricity companies, congressional members and their cronies did not feel menaced by a reform that opened spaces for the private sector in the generation segment and that initially preserved their vertical integration. For this reason, as well as the initial urgency dictated by rationing, the reform did not start with distribution. At that point, supervision and control mechanisms did not take on these political bases, resulting in relatively higher politicization of this regulatory branch. Consequently, the national government assumed ownership of local utilities, but not their control, which is usually shared with local and regional administrators and politicians. The SSPD has failed to delegate and externalize its intervention and management and to submit to autonomous supervision.

Technical Limitations

The high cost of power storage demands maintaining a balance between real-time generation and consumption. That power demand varies widely between hours of the day and days of the week makes the task all the harder.¹³ Power grids lack the switching systems of phone networks, where a supplier can deliver service from one point to another without affecting the whole network. These features make the transmission system not only a simple network but one involving complex system-coordination tasks, whereby efficient grid management encompasses coordination of all generators with the system's consumers. Moreover, significant challenges arise in adequately measuring power sales and purchases and in establishing financial obligations between distribution companies and generators.

Power supply is usually constrained at times of peak use. Generation plants have capacity constraints that push marginal costs up when production levels approach full capacity, while power demand is virtually inelastic in the short term. The end user has hardly any technology with which to observe—let alone respond to—real-time prices, reflecting real-time variations in system-generation costs (the cost assumed by the generator). Thus, it is not possible to reach equilibrium on the demand side unless the system coordinator cuts consumption.

Power-storage cost and lack of transitory capacity limit deliverable power at any given time. Inelasticity of supply and demand at short-term prices makes spot-market prices extremely volatile—an even graver situation without a completely competitive market. Many studies show that a limited power supply, with respect to demand, gives generators a market-power edge that permits them to manipulate prices over their equilibrium level. A predominantly hydraulic system under random threat from ENSO creates an added complication. These systems usually present capacity over-dimensioning, while remaining vulnerable to energy shortages during droughts; this, in turn, makes pool prices more volatile, thereby distorting short- and long-term signals.

¹³ Because of the transmission system's technical characteristics, imbalance between supply and demand anywhere along the grid may seriously threaten stability of the entire system.

As discussed above, power-industry characteristics present several issues that the regulatory scheme must consider. First is the need to control and prevent monopolies in generation and commercialization activities. Second is ensuring free access to transmission and distribution networks. The third issue involves the trade-offs between efforts to maintain system reliability and stability of stock-exchange prices—a job further complicated in cases of few market participants or vertical integration. Maintaining a posteriori control over market power is virtually impossible.

Investor Strategies

Initially, the reform process attracted generation-asset investors—especially skilled ones—with organizational know-how and operators under the PPA contract scheme. While some represented the interests of multinational companies seeking to position themselves ahead of the comprehensive reform, this did not happen until 1995, after the new scheme's basic laws were passed and regulatory entities were put in place. However, significant involvement of major international players only came with the privatization processes brought about by events at the Bogotá and Caribbean coast utilities.

Therefore, diverse international investors participate in all stages of the reform process, using corresponding entrance and operation strategies. While these players may respond to positive or negative local incentives, their decisions are motivated primarily by regional and global strategies. In this context, Colombia has been a more erratic than powerful player. International investors, in particular, prefer conditions where vertical disintegration, a top priority of Colombia's reform agenda, has not occurred.

Something similar happens with successful utilities, at least under the differential rules and guarantees they enjoy. This has been the case for both EPM and ISA. The former is a comprehensive, public-services company that is vertically integrated, with a national power-and-communications scope. The latter is a virtual transmission monopoly, which, until now, has managed the Energy Pool and Dispatch.

Political and Economic Challenges

Colombia's power sector reform has had to respond to two unanticipated events, both of which have deeply affected the sector's functioning and policy evolution. The first was the deepest economic recession of the past century. The second was armed conflict, including attacks on the country's power and energy infrastructure.

From the 1940s to the 1970s, and again in the early 1990s when reform was adopted, Colombia's economy grew at a pace of 5 percent, slowing to 2.5 percent during the 1980s. In 1998, the annual growth rate was flat, falling to -4.2 percent in 1999. Since that year, the country's economy has failed to return to 2.5 percent annual growth.

External factors have contributed to the collapse of growth, especially in recent years; however, errors in economic policy and implementation of the general modernization project have also contributed, affecting power sector policies. Expansion of the early 1990s was caused, in part, by unsustainable capital inflows and creation of a "bubble;" these were not contained by sufficiently compensatory measures, as larger fiscal adjustments and public savings would have been. Imprudent expansionist measures and defense of the currency precipitated vulnerability and collapse of the economy in 1998, amid the crisis of emerging markets. A good part of oil and concession funds went toward consumption.

Response to the 1998 crisis, while correct in general terms, has been, at best, slow and disinterested in the country's unemployment, which rose from 8 percent in 1995 to the current rate of 20 percent. Public debt, which had already reached 25 percent of gross domestic product (GDP), shot up to 40 percent of GDP in 1997. It is estimated that recent tributary and transfer reforms will not restore sustainability of central government finances, which will require, at a minimum, another strong pension adjustment and a large tributary-base increase. Reactivating growth will require consolidating and deepening of economic reforms, including the labor front.

Endemic armed conflict has become more prominent in recent years, and guerrilla terrorism has significantly affected the country's infrastructure, including roads, energy, and power transmission. The results have been not only higher repair costs, but also increased costs of power constraints.

Restructuring, Privatization and SOE Performance

In many ways, the reform has lived up to the expectations surrounding its adoption. Foreign investment in the sector now totals more than US\$6 billion; fiscal burden on the central government has shrunk, as has the public debt for which the sector is responsible. Private sector capitalization of the Bogotá Energy Company (*Empresa de Energía de Bogotá - EEB*) and 65 percent divestiture of EPSA have brought the community numerous benefits. Generation costs and end-user tariffs have decreased in real terms (Figure 2.2). Finally, threat of rationing, brought about by ENSO in 1997-98, has been successfully addressed.

Despite these achievements, technical and institutional limitations, as well as political and economic difficulties, have prevented the realization of many other expectations, making the process vulnerable to external shocks. The government failed in its attempts to use entrepreneurial criteria to manage DICOSG and the municipal utilities (with the exception of EPM). Intervention in insolvent utilities proved inefficient and prolonged their agony. After a promising start with several greenfield independent power producers (IPPs) and sell-off of the central government's generation assets, some DISCOSG continued executing PPAs under onerous terms, and privatization of ISAGen and CORELCA stagnated. Finally, while dependence on the national budget diminished initially, the tendency has reversed itself over the past few years.

While such performance can be attributed largely to external factors, including developments in the economy and security problems, fundamental aspects of the reform model itself must be understood in order to formulate a solution. Specifically, the validity of implicit assumptions that supported reform adoption must be analyzed and related to the constraints resulting from the poor fit with institutional capacity. Explanations are needed for failure of State utilities during the transition period and the uneven performance of major municipal utilities. Also needed are a description of national-budget liabilities resulting from the entrepreneurial situation and analysis of the privatization process and involvement of greenfield private investment.

Political Governance of State Utilities and Failed Intervention Mechanisms

Because of the political transactions involved in reform approval, local politicians retained effective control of the utilities, and the efforts of performance agreements (PAs) seeking an efficient operation were rendered useless for the reasons explained below. Even worse, the SSPD's inability to manage utilities in which it had intervened accelerated the deterioration of those companies. Generally, the political governance problem hit hardest in those companies where the government was a controlling shareholder; however, for reasons of political balance, it was either unwilling or unable to exert necessary controls to reach objectives. This was also true for the municipal utilities (with the possible exception of EPM). The national utilities ISA and ISAGEN have remained relatively free of direct political intervention; however, the government has used ISAGEN to cover the financial disarray of the La Miel project. Private sector participation proved to be a sound answer to EEB's administrative and financial disaster, but the jury is still out on the divestiture of ECO and ECA.

The DISCOSEG, including those of the country's inland and north coast, could not adapt to the new model. Although the national government was supposed to control and preside over the boards of directors, it failed to execute these functions, and local politicians continued appointing managers and using the companies as political bulwarks for re-election. Exacerbating the chaos was an array of factors: excessive hiring; an enormous, poorly funded pension burden; high labor costs; scandalous power loss levels; corruption; ill-contracted PPAs and BOTs; invoicing and collection problems; breaches in the dismantling of extralegal subsidies; lack of attractive markets; low coverage of spot-market risk; and collapse of demand.

These results demonstrate failure of the PA system to guarantee use of modern entrepreneurial criteria to manage State utilities—an implicit assumption of the reform. At the core of the failure was the staunch belief that the problem was one of corporate, rather than political, governance. As suggested by the neo-institutional analysis of Wiesner (1997), efforts to discover reasons for that failure necessarily pointed to the public sector's institutional structure and political economy constraints.

The first PAs were established as part of measures adopted to control State companies in the years just prior to adoption of Laws 142 and 143;¹⁴ these were carried out by the National Electricity Finance Company (*Financiera Eléctrica Nacional - FEN*), commissioned by the MME in 1993. One DNP study (Acosta, 1996) revealed that the PAs held until 1995 failed to meet expectations. According to Wiesner, this failure was caused by both property rights problems and the institutional structure. FEN lacked effective means to enforce agreement compliance by the companies, who were always favored by system changes and inter-institutional conditions. FEN faced a typical moral hazard problem: Suing the companies would jeopardize its own position as principal party in the agreements or as guarantor of many companies' liabilities. Incipient development of CREG and UPME prevented these institutions from supporting FEN in enforcing the PAs. In 1997, the government regulated the performance and management aspects of SOEs, as envisioned by Law 142, formalizing the PAs through a complex procedure whereby CREG defines PA criteria, UPME sets their goal parameters, and SSDP supervises their compliance. While this process ensured assignment of technical responsibilities, it failed to ensure accountability or property rights because, in the long run, no one can resolve differences between institutions; this, in turn, creates gray areas that rent seekers can benefit from. In practice, this led to continuing inter-institutional conflict, as well as political interventions that resulted in the SSPD crisis.

PA problems do not lie simply in the weakness of legal instruments, but in the global policy limitations that prevent the principal party from complying. As Wiesner points out, Colombia's main problems are the political and economic constraints that go hand in hand with tenure of certain rent seekers; they influence both the principal and the agent before the agreement is signed and when its performance is assessed.¹⁵ These are important lessons for designing management procedures for State companies, within the context of using private capital.

¹⁴ Performance plans had also been demanded by the World Bank and the IDB as a condition for loan disbursements to FEN in the previous five-year period.

¹⁵ For example, FEN reports show that ELECTRANTA could not comply with suspending service to overdue debtors because of pressure from the workers union.

The financial crisis of national utilities became apparent by mid-1997, and financial support was provided until 1998. Total bailout (including moral hazard) totaled nearly COL\$800 billion, and SSPD was to take over some of the utilities. Atlantic coast utilities suffered the same predicament, with CORELCA a particularly sore point. By mid-1998, at the end of the Samper administration, another utility restructuring and capitalization process was launched in the Caribbean zone, whereby CORELCA's generating activities were assumed by the State and transmission activities went to ISA (via its TRANSELCA subsidiary). Most assets from distribution utilities were consolidated into two new utilities:¹⁶ ECO and ECA, 65 percent of which was sold to the same private operator. After three years of SSPD management, it has been impossible to liquidate the utilities that remained, despite their having assets large enough to pay back MEM; many attribute the reasons to poor incentives of SSPD-appointed agents.¹⁷

Moreover, in 2001, the TermoRío scandal came to light. This involved a PPA executed by ELECTRANTA (one of the eight utilities). When an arbitration tribunal ordered ELECTRANTA to pay TermoRío damages worth US\$60 million, the government overturned the decision, which involved corruption.¹⁸ Subsequent investigation determined negligence by the lawyer SSPD appointed to represent the State in this case; in addition, the lawyer's connections with the Superintendent led to his resignation and imprisonment. The scandal triggered ongoing controversy over corruption in the sector, especially regarding PPAs, allowing many reform detractors to blame corruption on the privatization process.

EMCALI, a municipal utility servicing 7 percent of the market, in which intervention has occurred, is in shambles. EEP is on the brink of intervention. EEB—despite serving the largest market in the country and

¹⁶ The legal structure of the utilities remained, with US\$100 million in liabilities, but with assets to pay them.

¹⁷ The following appeared in the September 9, 2001 edition of *El Tiempo*: "That's the nightmare of the electricity sector" ("*Así es la pesadilla del sector eléctrico*").

¹⁸ ELECTRANTA awarded a 20-year PPA to TermoRío; subsequently, an amendment to the contract established that the utility could not compromise its assets without consent from TermoRío and proper authorization from the Board of Directors and the MME. This, along with the agreement's breaking of CREG rules, led the government to take actions in July 1998 to declare the agreement void.

receiving generous national government funding and multilateral refinancing of its scandalous 1,000-MW Guavio hydraulic project—failed to improve its management or dismantle excessive consumption subsidies. However, this did not lead the national government to bail out; on the contrary, this was made into an exemplary case of private sector capitalization by a management not compromised by conventional politicians. Why replicating such success has not been possible in cases like EMCALI is caused, in part, by fundamental differences in the administrative styles of the utilities' respective cities; however, more detailed analysis is needed.

A Tale of Three Cities: Bogotá, Cali and Medellín

Law 142 set a deadline for municipal utilities to choose between two organizational models that defined the extent of private sector participation: 1) a joint-stock company, which opened the door to privatization or private capital involvement, and 2) a State Industrial and Commercial Enterprise, which maintained municipal control and ownership. In early 1997, both EEB and EMCALI opted for the joint-stock model; EMCALI restructured its activities into a parent company and utilities specializing in each service, while EEB chose a parent company, plus generation and distribution utilities. Conversely, Medellín's town council opted for the State Industrial and Commercial Enterprise model, thereby closing the door to private participation; however, it kept open the potential for entrepreneurial participation, on its own or in association with other companies, in other jurisdictions.

By the end of 2001, the private sector controlled the unbundled EEB distribution, CODENSA, and EMGESA generation. This facilitated significant improvement in service quality and attention to customers; it also reversed the flow of fiscal resources back into Bogotá's coffers, thereby contributing greatly to success of the city's transport infrastructure and social development administrations. In stark contrast, EMCALI faced its gravest financial crisis ever, with SSPD intervening to end service interruptions. EPM continued to provide services and contribute to city transfers, with a strategic focus on growth. In response to the reform's challenges, the company reorganized to improve efficiency in service delivery and national competitiveness in power and telecommunications

markets, achieving a key positioning. What led Bogotá and Cali to such different outcomes? What explains Medellín's relative success, and how transferable or sustainable is that model?

Clues to Two Outcomes: Bogotá and Cali

Municipal leadership, as well as local administrative pressures and incentives at any given time, helps explain why the outcomes in Bogotá and Cali differed so greatly. When EEB was on the brink of financial collapse and running out of options, Mayor Mockus rose to the challenge, using the situation to defeat city-council opposition to changing the status quo. Fed up with past failures and frightened by the magnitude of the crisis, citizens who had voted the mayor into office did not hesitate to back the novel solutions proposed by his team. The mayor surrounded himself with a team of honest technicians and sectoral outsiders and obtained backing from investment bankers with which to devise ingenious solutions to complex political, financial, and legal problems. Such diligent work was aided by a favorable economic climate and the interest of multiple investors. The later decision to de-capitalize utilities, rather than invest in other zones, increased Bogotá's available resources, which, along with contributions from taxes and company dividends, permitted it to finance programs without sacrificing future flows. Finally, it should be stressed that successor administrations' continuation of government policies was fundamental to preserving community benefits; this explains the need to overcome city council opposition and develop a broad campaign to communicate the importance of capitalization's role.

When it was first restructured, EMCALI faced no financial downturn or lack of resources. However, municipal infrastructure development plans required large investments that were financed through EMCALI debt and transfers to the municipality, taking advantage of a large discretion for payment of dividends. Regardless of the need to invest in infrastructure, the operation set off a debt process that lies at the root of the company's woes. Later on, the company directly implemented numerous works for the city, and all municipal dependencies stopped paying their utility bills on the grounds that accounts would be settled sometime in the future. The problem worsened when City Hall caved in to the demands of a combative

workers union and abandoned the previously adopted organizational restructuring, which had enabled transparent participation of private capital; this change opened the door to unscrupulous interests that stood to benefit from future operations in partnership with the private sector.

Although sectoral reform presumed separation of distribution and generation segments—where EMCALI was a distribution company—city politicians and entrepreneurs insisted on investing in generation, supposedly to survive within the new sectoral model, pointing out EPM's vertical integration as an example to follow. By this means, they lured the company into ill-planned generation projects, which worsened its financial problems. Termopacífico, for example, saw no prosperity after investing US\$10 million. Poor handling of a waste-water treatment plant exacerbated the disaster; the initially planned contract cost of US\$80 million nearly doubled because of technical reasons, and a credit contracted in Japanese yen failed to adequately cover exchange-rate risks.

Today, EMCALI's financial situation is desperate, and the current municipal administration, supported by a belligerent workers union, has rejected restructuring that would allow private-sector participation. Given today's deteriorated conditions, EEB's future success may not be guaranteed, but a larger disaster may be preventable. The administration centers its strategy on avoiding liquidation when the two-year period prior to SPPD intervention expires and forcing capitalization by the national government so that groups that have been extracting rents will be permitted to continue doing so.

That EMCALI had previously enjoyed stability, matched only by that of EPM, makes this dramatic change in conditions all the more surprising. The effect of lack of continuity is evidenced by the short tenures of the last four city managers, which have averaged barely more than a year. Rotation of mayoral political affiliations, combined with short tenure, maximizes incentives for opportunistic use of the company and prevents management consistent with a long-term development program. This interpretation of EMCALI's deterioration offers important lessons for the EPM case. While it may be true that many of the conditions that permitted EPM to retain its pattern of excellence still stand, certain ones, including lack of administrative continuity, are common to both companies, although at different levels.

Analyzing EPM's Excellence: Lessons from Medellín

Various authors share a widely held view that EPM's excellence originated in the entrepreneurial spirit of Antioquia State, which was shaped by the need to survive in a hostile environment and the work culture that developed around the Medellín School of Mining (Maya Mora, 1984). Although these factors helped to establish conditions that permitted later development, for the purposes of this analysis, three features are key to interpreting success of the EPM model. First, the utility enjoyed inexpensive hydraulic resources from which it profited. Second, it had an abundant supply of qualified personnel to develop and manage those resources. Third, and most important, the owner demanded results.

Unlike other regions that competed for national government resources to finance their investments, Medellín developed its services without such funds, thanks to a fortunate convergence of public and private efforts to benefit the community. At the outset, Antioquian industrialists understood that their fate hinged on developing cheap and efficient public services, and they became zealous guardians of the company's administrative integrity. Businesses, academia, and the general public shared this sense of belonging; they all recognized the care demanded by the EPM legacy and its entrepreneurial criteria (National University, 1999). This explains why the city's key entrepreneurial leaders sat on the EPM Board of Directors; EPM executives were recruited from a pool of the most capable candidates, and politicians had a tacit agreement to omit EPM from the electoral booty handout. Within this governance scheme, EPM incorporated the region's best human resources to create a technical corps to develop low-cost hydraulic potential, taking advantage of natural-resource income and consolidating its financial solvency. Unlike other Colombian utilities, EPM used its relation with multilateral credit institutions to innovate its practices and develop a work method, thereby establishing its reputation as one of Latin America's best utilities.

Initially, EPM had reservations about a model that pursued privatization and unbundling; however, once the unbundling requirement was dropped, it strongly supported reforms that sought to take advantage of strengths to compete in the new medium. The company developed an aggressive policy of investing nationwide in the telecommunications

sector, maintained its participation in ISA, sought to increase ISA participation through ISAGEN bidding, took control of *Electrificadora de Antioquia*, and continued investing in new hydroelectric plants. By choosing a strategy that emphasized growth over stockholder remuneration, short-term, potential transfers to the municipality were made more expensive at a time when social-investment needs were urgent. Continuity of company management has been affected by the electoral cycle; each new administration puts a new manager at the helm with a different agenda. Many observers agree that the tacit, political-class pact of no intervention in company matters no longer holds.

Assuming that the earlier analysis is correct, the question now is whether the EPM model is replicable in the rest of the country. This would be possible only in regions that demonstrated the conditions behind EPM's success: natural resource rents, history of sound management, and—most importantly—the ownership exercised by Medellín's citizens. The total financial disarray of EMCALI and *Empresas Públicas de Pereira* strongly confirms the uniqueness of Medellín. Nonetheless, the rarefied institutional atmosphere predominant in DISCOSG, economic deterioration, and the downturn in regional finances make it more difficult to replicate this model throughout the country.

To sum up, if the coincidence of crisis and leadership contributed to Bogotá's success and absence of crisis and leadership frustrated opportunities in Cali, then any leadership deterioration in Medellín could lead to a new crisis of unpredictable proportions and results. By resigning or selling off private sector capitalization and contracting debt to finance its infrastructure, Cali, in effect, "killed the goose that laid the golden egg." This, in turn, limited its chances for future capital flows or use of surplus funds to subsidize low-end users; the opposite option enabled Bogotá to invest without harming its equity, while maintaining an income flow that allowed it a degree of flexibility. To date, EPM has managed to deliver important financial transfer to the municipality, while, at the same time, increasing its net worth. EPM's sustainability depends on the extent to which opportunistic dealings to satisfy electoral interests can be avoided, the size and timing of the municipality's financial needs, and implications of the company's growth strategy for meeting them. Finally, while private capital participation might help fend off opportunistic use and free up

resources to meet critical social investment and production needs, the current climate may not favor it.

State Financial Burden

The State has a 69-percent share in DISCOSG. Losses sustained by these companies, which started in 1996, had reached nearly COL\$159 billion by the year 2000. Recession has affected the payment capacity of customers. Although 85 percent are in the upper three socioeconomic strata, accounting for 61 percent of sales (General Controller, 2001), other reasons explain their plight. Most of the utilities are trapped in a vicious cycle: lack of investment resources; energy losses of nearly 30 percent; operating deficiencies; special contracts (PPA and BOT); and financial insolvency, resulting from regulatory problems, which has made them unable to service their debts or collect accounts receivable. They operate in loss-making markets because of the low, average payment capacity of consumers and high costs associated with their dispersion.

If these utilities cannot be capitalized or sold off, the government's potential operating losses could be as high as COL\$100 billion annually, not counting guarantees of some PPAs. To avoid such losses, the government could invest and take charge of contract sections that cannot be renegotiated and retirement liabilities. An alternative contingency plan, the design of which is pending, will establish the minimum investment required to run the utilities without any operational losses until they are privatized.

EMCALI has debts totaling 140 percent of current assets, most of which are overdue (73 percent were overdue in 2000), and liabilities equal its equity. In the year 2000, EMCALI lost COL\$120 billion. It pays COL\$100 billion yearly for the PPA with TermoEmcali. It owes ISAGEN and CORELCA COL\$50 billion and COL\$28 billion, respectively.¹⁹ The State is guarantor of the company's US\$35 million debt, which it cannot afford to pay. Under such conditions, its arrears with MEM can lead to service cuts. However, Cali's mayor rejects injecting private capital as a solution, hoping that the State will assume the debt so that operation as a

¹⁹ As stated by Cali's mayor in a letter to the president in *El Tiempo*, Sept. 6, 2001, 1-6.

municipal utility can continue. A combative workers union and SSPD's irrelevant management reduce the number of options available, raising questions about the potential for or implications of liquidation when the intervention deadline arrives.

Not even such utilities as CORELCA, which the State has restructured to facilitate sale, has escaped this predicament. CORELCA has maintained generation assets, in addition to assuming TEBSA PPAs, for which the State is guarantor (an annual disbursement of COL\$240 billion in 2001) and others without a guarantor (such as Flores I and San Andrés), for which it loses up to COL\$35 billion annually. Fuel debts with ECOPETROL total COL\$60 billion. ISAGEN uses operational income to pay State-incurred debt with multilateral institutions and private banking to finance the La Miel Project. Finally, the dismantling of FEN, with a current negative value of US\$1.5 billion, and its potential for having to assume PPA guarantee for Paipa IV, means disbursement of COL\$220 billion over the last three years of the contract.

These figures reveal not only that generation and distribution will continue largely in the hands of nonviable public utilities; they also show that the government has maintained its role as a last-resort financier, and will again be significantly hit by the distribution crisis. Added to all of this is the contingency for the government re-taking private companies, including coastal ones. This, along with deteriorating utilities, which makes sell-off harder, could affect other companies, such as ISAGEN. Also critical is the CORELCA case, the potential magnitude of which is larger than that of the 13 national utilities combined.

Privatization Process

Privatization of Colombia's power sector has aimed mainly at solving the prior model's generation, investment, efficiency, governance, and fiscal dependence problems. Privatizing began with generation, followed by distribution, and is now stymied in both segments of the sector. The reasons are not limited to recession and security risk; they also include powerful, emerging counter-trends that threaten reform sustainability. Some stakeholders do not accept incorporating the private sector into a competitive, regulated model. Delay in privatizing distribution and its

affect on separating competitive from natural-monopoly segments—that is, whether vertical integration will prevail, and if so, will the playing field be level for public and private utilities—are questions at the heart of disagreements that have made the sector vulnerable and unstable.

Although the 1991 Constitution provided for incorporating private agents into the utilities sector and structuring of a regulated market, movement accelerated operationally in the aftermath of the power rationing that started in March 1992. Public utilities were authorized to enter into generation contracts with private generators under less demanding conditions with the State as guarantor. By trading stocks and assets for debt, the State took over ISA, CORELCA, EPSA, and numerous generation assets during 1992-93 and became the main partner in many of the country's inland utilities. Its ownership of these entities—a necessary, but insufficient, condition for privatization—was assumed to reduce the fiscal cost in their public management. Apart from the inland utilities, over which sufficient control was lacking at that time, most of the State's acquisitions were in generation and transmission. Aside from supply urgencies and the need to stop fiscal bleeding, legal and political difficulties in absorbing integrated municipal utilities and those along the coast imprinted this bias onto privatization.

Not until late 1995 was the legal and regulatory framework complemented by the conditions for privatization: passage of the Privatization Law, development of a Constitutional principle, creation of the Energy Pool, and start-up of SSPD. New investors began operating in a market context superior to merely supplying power to public companies. Perfecting the regulatory framework—with such indispensable elements as CPCs, dispatch and distribution regulation, charges for regional transmission systems, regulated tariffs, user and rationing regulations—was ongoing at that time. That the Distribution Code was not issued until early 1998 indicates the priority assigned to this segment of the sector.

EPSA started exclusive operation as a national power company as early as 1995, and ISA was spun off into separate transmission (energy dispatch and pool) and generation (ISAGEN) companies—indispensable steps for configuring and operating the new market model. Table 2.2 shows that the privatization process was concentrated in 1996-97, when the State sold its generation assets or generation-focused companies

Table 2.2. Privatization Timetable

Year	Process	Asset	Capacity		Value	
			MW	Customers (thousands)	US\$ millions	%
1996	Sale of shares in four generation plants	Chivor (H)	1,000	na	647	100
		Betania (H)	500	na	506	100
		Tasajero (T)	153	na	19	100
		Cartagena (T)	179	na	18	100
1997	Sale of shares in Integrated Company Capitalization: generation distribution transmission	EPSA (96% H)	869	270	537	65
		EMGESA	2,453	na	952	48.5
		CODENSA	na	1,500	1,226	48.5
		EEB	na	na	na	11
1998	Capitalization of distribution, transmission	ECO	na	490	530*	65
		ECA	na	627		65
		TRANSELCA	na	na	—	65
2000	Sale of IPO shares, transmission company	ISA	na	na	—	25

* Includes ECO and ECA.

na = not applicable.

(Chivor, Betania, Tasajero, Cartagena, and EPSA) and EEB capitalized ENGESA and CODENSA. The effort continued in 1998, when the State sold a large portion of its participation in ECO and ECA, but the process stagnated that same year. The national government focused its efforts on the sell-off of ISAGEN and ISA, neglecting sell-off of DISCOSEG, which it would later regret. Since then, only the so-called democratization of ISA has been possible, with close to 25 percent of its stocks publicly owned.

Analysis of the privatization chronology shows the low priority assigned to distribution; with the exception of EPSA, which was programmed in the initial stage of the restructuring process, the national government failed to face the problem of the DISCOSEG until it became unmanageable, as evidenced by the coastal companies. Regional politicians were no strangers to this decision. Delay in privatizing central Colombia's utilities deserves special attention because of its effect on the

current situation. Caballero (1999) shows that, even though efforts to bring private capital to certain utilities date back to 1994 (Quindío) and 1996 (Tolima), they failed, in part, because of opposition from regional politicians. In 1997, CONPES (Document 2950 of September 24) defined the strategy to incorporate the private sector and established four groups: CORELCA utilities, Quindío and Tolima, Chocó and Cauca, and Nariño. Only the first group succeeded because the design of its package was attractive to investment banks and because it was a national government company. The other three groups failed to attract investment banks because of their small, fragmented nature. Not until 1998 was the need to design more attractive market packages recognized. However, a consultant was not hired until early 1999, and little progress has been made to date. (Sale of the first package had to be postponed until after congressional elections because of lack of interest and regulatory difficulties.)

To help consolidate the privatization process of DISCOSG, the government works to restore their liquidity through such actions as paying them overdue subsidies and trading power bills with generators who are also indebted to the State, organizational restructuring, loss-reduction programs, and, above all, coordinated governmental participation on the boards of directors.

The Investment Bank started the process in July 2001 by putting four utilities up for sale (these are not the most attractive utilities, which have been reserved for a better round). The aim is to capitalize each utility individually, handing control and stock majority over to strategic investors in order to attract Colombian investors, consultants, and operators. The two most troublesome PPA processes are being resolved, and a decision has been made to subsidize, restructure, and contract an operator in the case of the company with the weakest market.

Furthermore, discrepancies in tariff formulas for regulated users have been identified. Some of these problems affect all distribution and commercialization companies, and call for a revision of tariff formulas. Also at stake is recognition of structural differences between markets, but they do not always explain financial performance. The regulator faces the hard work of adjustments at a time when the general distribution and commercialization market must change with privatization of public

agents, pressure to bias abounds, and privatized utilities are experiencing market—and even regulatory—difficulties.

Of particular concern are the performances of ECO and ECA; *Electricidad de Caracas* and Houston Industries (now Reliant) originally took control of them in 1998, and then transferred control to the Fenosa Group in 1999. In 2001, overdue collections totaled COL\$350 billion, of which COL\$58 billion belonged to the government, and their billing does not cover generation cost. Lack of payment to MEM drove them to the brink of rationing in 2001. More recently, they have managed to renegotiate debts, improve collections, and reach certain agreements on supply to poor neighborhoods.

Since 1998, divestiture of ISA and ISAGEN has become the government's top priority, at least for fiscal reasons (it had a commitment with the IMF); however, controversy surrounds their privatization. In the case of ISA, which is sensitive politically for its role in long-distance transmission, selling shares directly to the public has been the way to incorporate private investors, resulting in property democratization and capital-market strengthening. For ISAGEN, privatization is necessary and agrees with the reform model proposed thus far. But it has met opposition from EPM, which would like to buy ISAGEN hydroelectric plants located in the Nare-Guatapé river basins; this would give it control of the hydroelectric generation system in Colombia's western region and potential market power, for which reason CREG has restricted it. The company has taken legal action to stop the sale process, demanding compensation from ISAGEN for externalities resulting from operating the El Peñol Reservoir, located upstream from an ISA plant.

As discussed earlier, nearly all SOEs—including DISCOSEG, Pereira, and EMCALI—are nonviable. They threaten reform not only because of their financial and fiscal effects, but because they are a niche for political cronyism and populism, which spearhead counter-reform in local government entities and Congress. Reversion can also be facilitated by failure of privatization, as might be the case for Atlantic coast utilities. All of this reveals little investor appetite and excessive institutional risk (national, regulatory, and public investment). Distribution should be an attractive area with few risks and high operational potential, but it has suffered a more lengthy regulatory delay and greater political interference.

Private Investment in New Generation

Figure 2.5 shows participation modalities in generation over the last decade. They include PPAs, private sector plants, State companies, and State-guarantor investments. After the first round of private investment through PPA contracts, investors were expected to make decisions based on guarantees offered by the new regulatory framework and wholesale market.²⁰ While many accepted this challenge, especially in view of expected high prices brought about by the 1997-98 ENSO event, a series of controversial PPAs were signed that DISCOG mishandled through lack of managerial capabilities or other, less transparent reasons. Similarly, SOEs like ISAGEN and EPM invested in competition in the private investor market.

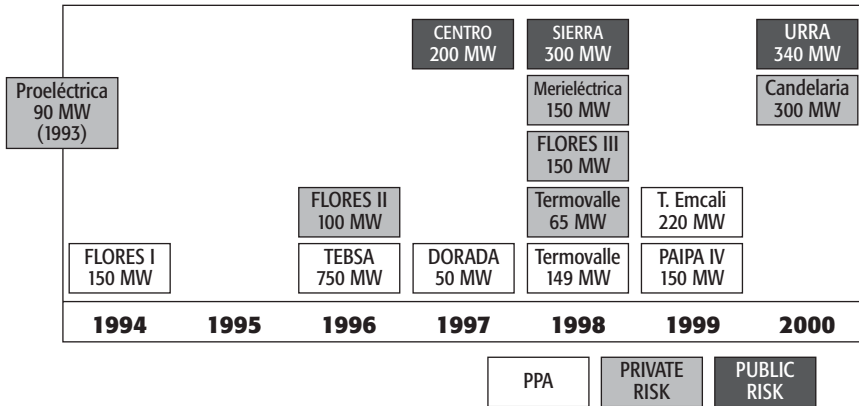
PPAs with private suppliers are used when competitive power markets are lacking and when political institutions (e.g., government and Congress) do not guarantee the companies rules compliance while enforcing contract compliance. Under such conditions, new investments in generation, aimed at strengthening the system after the blackout and before constituting the wholesale market, were made through the first PPA contracts, mainly for the TEBSA (750 MW) and Las Flores I (150 MW) plants, but they were commissioned after the rationing, when the integrated market was operational, and they set the precedent of indirect State guarantee through FEN.

TEBSA and Las Flores I PPAs, signed before passage of Laws 142 and 143, concentrated capacity payments in the first 10 years; this imposed a large financial burden on CORELCA, the State company signer of the contracts, especially when market prices dropped sharply in response to lower demand. While these guarantees contributed to poor selection of suppliers, criticism comparing such contracts with current costs of a depressed market is unfair. Furthermore, payments for capacity according to the PPA will drop substantially in 2003.

The second round of distribution company PPAs (EBSA, CHEC, EMCALI, and ELECTRANTA [Paipa IV (150 MW), Termodorada (50

²⁰ CONPES Document 2763 (1995) states: "From now on, the private sector will have to assume ever larger market risks in investment projects...."

Figure 2.5. Commissioning Generation Projects: Timeline, 1994–2000



Source: ACOLGEN.

MW), TermoEmcali (220 MW), and TermoRío (130 MW)) were signed after approval of the legal framework under alleged disadvantageous conditions, given existing market prices, or following irregular procedures (TermoRío). In general, these contracts reveal poor management by the distribution companies; other considerations—local coal resources or even corruption—were the main drivers. As a result, PPA prices were high and onerous for users. Also adverse was keeping the State’s guarantee scheme while local politicians controlled power companies. While overall solvency of the system is not threatened, some PPA contracts, as well as BOTs, weigh heavily on the financial crisis of utilities that still lack sufficient State control.

Clearly, Colombia’s privatization process is not over, with its 13 DISCOSG in an ongoing process of private capitalization or eventual divestiture. In addition, the Pereira municipality is preparing for private capitalization in the face of imminent intervention. Moreover, ISA has launched a second stage of its ownership democratization process, ISAGEN divestiture is frozen, and studies to privatize CORELCA are ongoing.

Reform in Practice: Institutions and Politics

Technical and institutional limitations, as well as compensations and concessions granted during the approval process, have complicated implementation of reform; this has led to the endogenous development of

new interests among groups who have benefited from the transition period and have strong incentives to perpetuate it. Achieving the reform's original objective of service supply within this context requires that its elements— institutions and actions— be compatible with the country's institutions. In addition, more advocates of reform with greater influence are needed to reduce vulnerability to external shocks.

External shocks, the economic and fiscal events of the 1990s, increased guerrilla attacks, and stakeholder strategies—all have contributed to the surge of threats and weakening of political will to consolidate reform. Understanding the reorganization of actors and interests that has resulted from such changes can help in identifying the political manifestations of threats and, in turn, the best strategies to support reform consolidation.

State as Regulator and Entrepreneur

Having the State compete with the private sector in owning and managing significant portions of sectoral activities conflicts with the State's role as policymaker and regulator—a problem not easily resolved within the current constitutional and legal framework. Furthermore, as the EMCALI case illustrates, the problem is exacerbated by local utilities. Although supposedly autonomous, they count on implicit guarantees when the State fails to balance finances and control local debt; in such cases, it tends to bail out local companies, which, in turn, provokes lax behavior at the expense of the public treasury—a moral hazard problem.

Sectoral policy and regulation might favor SOEs or arbitrate their value when they are privatized. This risk is immediate and inescapable when either the minister or his or her representative presides over or serves on a company board (e.g., ISA, ISAGEN, DISCOG, and especially CREG). Sectoral planning, which is the ministry's responsibility, seeks to support the State mandate (Law 143) for making investments that the private sector will not (especially, but not limited to, transmission). This weakens private incentive to invest in generation, and establishes wrong incentives for public investment in transmission. No mechanisms or controls are in place to ensure neutral policies (even in regulation) if the State manages investment.

Municipal utilities can have implicit government guarantees, for either financing of contracts or obligations, such as pension funds, which private companies do not enjoy. However, in terms of supervision, they are not only subject to SSPD intervention, but also that of other agencies, including the General Auditing Office and the General Attorney's Office, whose regulations may not harmonize with the private sector. Moreover, controls on local politicians' influence over national authorities are lacking.

The risk of competition imbalance between public and private utilities is caused not only by biased market participation but also by subordinating regulation to State management, thereby making it possible to impose expropriation policies. This risk, traditionally recognized in the literature (it can also work against consumers), increases as the degree of regulatory autonomy diminishes.

In response to a recent unconstitutionality suit against the laws regulating the regulatory commissions (based on allegations of incursion by Congress in the regulatory powers vested in the president by the Constitution), the Constitutional Court denied the petition, stating that such commissions are subject to the administrative branch and that their function is to pinpoint the details of policies set forth by the government, despite the impression of independence that certain measures on managerial and financial autonomy and appointment of nongovernmental members could convey.²¹

Regulation comprises ruling and supervision, which, in turn, cover inspection, scrutiny, and control of tasks. Regulatory tasks, which consist mainly of activities and functions, are said to be objective, while supervisory tasks, which deal with companies and individuals, are classified as subjective. The entities in charge usually carry out both objective and subjective activities; however, regulatory commissions are generally not called upon in specific cases, and superintendencies usually specialize in inspection, scrutiny, and control of subjects, for which they also issue

²¹ In an opinion for the MME, a former Constitutional Court justice proposed issuing an ordinary decree to alter voting procedures, give the ministry veto rights, and have the government issue decrees to direct CREG in its rulings (communication of Vladimiro Naranjo, consultant lawyer, with the MME on March 9 and May 7, 2001).

procedural rulings. Regulatory commissions also deal with individual cases, such as setting company parameters for applying regulatory formulas issued to all companies. Rulings of the regulatory commissions are usually restricted to those needed to build and control markets and companies, while those of supervisory entities must also ensure observance of other rules: statutory order of companies; corporate, consumer and environmental protection; and general legislation (e.g., labor or tax).

State regulation in fields of public interest (those requiring permanent intervention), such as the financial field, had been based on supervisory entities, like the Superintendence of Banks, which strongly influenced rulings and issuance of decrees, even though they were under executive authority. The formal superintendence model has highly influenced recent designs, including that of Public Utilities and Health.²² The Superintendence of Banks also carried out functions delegated by the president; however, it was under direction of and in collaboration with the Ministry of Finance and Central Bank, which ensured quality officers, ample technical rationality, and distancing from political cronyism.

For this reason, Colombia did not see the need to strictly separate supervision from ruling until the 1990s reforms. This separation avoids regulatory capture and conflict of interest by ensuring that the enforcer of rules does not issue them. This is advisable in that regulation is interventionist and market unfriendly.²³ New legislation generally conforms to the criterion of separate functions; however, it keeps subordination of ruling in the executive branch (president and ministers), and supervision conforms directly to the president's delegation of powers to the superintendencies, which conduct multisector and subject-related functions.

In practice, the total and effective separation that the model calls for has not been possible. The main obstacle has been lack of supervisory quality; this has been the case in public utilities and social services, unlike financial services, which remains under ministry supervision. Regulation has opted for excessive interventionism and micro-management, which require a much larger supervisory capacity. Superintendencies of public and social

²² The Superintendence of Banks advised on initial organization.

²³ Separation between regulation and supervision has not been as strong in British cases, from which certain fundamental ideas were adopted.

services have been most influenced by political cronyism and have failed to hire the best personnel. They lack the necessary information, making the regulatory task even harder. Separating regulatory and supervisory functions is thus limited by asymmetry among corresponding entities, dispersion of supervisory functions, and cronyism in supervisory bodies.

Energy and Gas Regulatory Commission

Established in 1995, CREG is the key institution in implementing reform (Box 2.2). It faces difficulties in keeping qualified experts because of lack of competitiveness with private sector salaries and its own hiring restrictions. Because of limited remuneration values, optimal service time is only two years; thus, appointees not intending on public-service careers do not serve out their terms, resulting in high staff turnover. This causes regulatory inconsistencies and volatility, stemming from staff inexperience and a desire to implement their own approaches. Regulators are appointed with the minister's approval and may therefore be his or her subordinates.

Deficiencies in separation of powers within Colombia's regulatory framework have caused disputes that have exhausted CREG. In the absence of SSPD technical capacity, CREG could have filled gaps, but at the expense of new conflicts. Discussion with MME about liberating gas prices further harmed CREG because it caused most experts to resign. While the rationale for CREG positions may be sustained, confrontations springing from lack of definition and regulatory-framework contradictions have weakened the institution.

Some scholars and reform experts have pointed out conditions they consider indispensable to guarantee independence (Smith, 1997). At no time is the regulator to take instructions from the policymaking body, and every message to the regulator and piece of evidence must be made public. It must be demonstrated that decision-making is based exclusively on public information. However, appointing regulators for a fixed term and financing the agency through service charges to eliminate dependence on governmental budgetary decisions strengthen independence. The Commission's composition, majority vote, and information asymmetry between experts and ministers may have propitiated a certain degree of CREG autonomy, which some experts claim. However, in general, the

Box 2.2. Functions of Energy and Gas Regulatory Commission

According to Laws 142 and 143 of 1994, CREG develops regulatory functions to:

- ◆ Create conditions that guarantee power supply,
- ◆ Liberalize the market,
- ◆ Define methods to calculate regulated user tariffs,
- ◆ Issue regulation for power self-generation and co-generation,
- ◆ Develop criteria for guaranteed energy-sales commitments,
- ◆ Establish regulations for implementing planning and coordination of SIN operation, and
- ◆ Regulate functioning of the wholesale energy and gas markets.

This work is conducted with assistance from sectoral companies, the ministry, SSPD, Mining and Energy Planning Unit (UPME), National Planning Department (DNP), Energy Control Center, and National Council of Operations (CNO). Legally, CREG is a special administrative unit, with administrative and technical independence. It is financed by contributions from the regulated companies (up to 1 percent of their overhead). Its members are MME (presiding member), Minister of Finance and Public Credit, DNP Director, and five exclusively dedicated energy experts designated by the president for four-year terms (official employees who can be re-elected and are not subject to the administrative career regime). Recommendation from the minister is required. The government can fill vacancies only because of resignation or term expiration.

CREG appoints an executive director. Either the executive director or the president calls the Commission. It can meet with six members in attendance; decisions are made by the majority of attendants but require the favorable vote from at least one government representative. Decisions are adopted through resolutions.

Anyone can object to the resolutions' compliance with the law and the Constitution by petitioning the Commission, and then the State Council. The General Auditing Office exerts fiscal control, while the General Attorney's Office is in charge of disciplinary control.

government can block the experts if consensus is lacking or use the governmental vote required for approval of any measure. Moreover, according to a former Constitutional Court magistrate, voting rules could be changed by decree to give priority vote to the minister because CREG must adjust to government policies. To date, latent conflict regarding these matters has not been resolved by either veto or priority vote, even though the basis for it exists, especially through appointment of experts.

At any rate, regulatory independence is not an end in itself; it is pursued to guarantee investors that the government will not act opportunistically and that consumers' long-term rights will be respected. What is key is to generate confidence in the regulator's ability to solve problems and make decisions based exclusively on facts. This implies a certain degree of immunity from government pressure, freedom to hire the best regulators and most capable staff, establishment of clear procedures for decision-making, ability to adapt to changes and adjustments that a formative market requires, acquiring credible commitments, and making other changes related to regulatory style. To the extent that these conditions can be met within existing constitutional restrictions, it would be possible to minimize the risk of opportunistic use of regulation by the government to expropriate the private investor.

Conflicts also arise over regulatory styles and are magnified by their political consequences. The capacity charge (CPC) debate has been particularly heated because of its implications on remuneration of hydraulic and thermal generators; resulting alignments between supporters and congressmen threaten intervention in matters of exclusive competence of regulators. These types of instruments can never satisfy all and do not use market information to allow for a commercial solution. The gas conflict, while similar, centers on coordination between policies and regulation and appropriate timing for liberation measures. The power sector's regulatory style has retained many older structures and habits. Regulation is usually detailed, but institutional capacity to enforce inspection may be lacking. Command-type rules (e.g., minimum operatives) have been preferred because they improve experts' negotiation field with respect to the minister and CREG members without energy expertise. At the same time, such rules directly affect the asset value of companies, and their execution does not yield any valuable information on demand and willingness to pay. Resolutions of this type are frequent and differentially

affect the various coalitions of agents, as usually happens with regulatory arbitration between thermal and hydraulic generators. ACOGEN has listed some 15 resolutions relative to CPCs having such effects, and they are often corrections or fine handling required by unforeseen consequences of an initial resolution. Market agents also complain about scarcity of consultation and lack of transparency.²⁴

Although a cumulative regulatory process has established bases that did not exist previously, response to model inadequacies and country conditions and events has been severely limited. A case in point is response to market segmentation and price volatility resulting from guerrilla attacks to transmission and generation infrastructure. The Caribbean coast can be isolated from the SIN for periods of up to one year; under such conditions, it operates as an independent market with sufficient installed capacity but few generators. Because the pool rules did not provide for the eventuality of prolonged market segmentation, a single power price was considered and obtained from an ideal dispatch with no constraints. Nevertheless, at the moment of power dispatch, system constraints are taken into account, remunerating those plants with out-of-merit generation (the difference between their offer and the ideal dispatch price), and compensating plants with trapped power (the difference between ideal dispatch price and their offer price). These charges are known in Colombia as costs of constraints. Until October 2000, they were shared equally by generators and traders, at which time they became fully charged to the trader and, ultimately, to the end user.

During the first quarter of 2001, bids from out-of-merit generators increased substantially, while those from generators with trapped power neared the zero level. To counter this situation, CREG issued Resolution 026 of 2001, declaring secret all information about reservoir capacity and state of the grid; it changed the generators' bidding system from hourly to daily, sparking strong protest from generators. This was followed in the same year by Resolution 034, which set a bidding floor for plants with trapped power and a ceiling for out-of-merit generating plants. Genera-

²⁴ A partial explanation of preference for commands may lie with regulators' fear of volatility, as well as extreme aversion to rationing, which would expose them to suits, actions for restoring fundamental rights, and executive pressure.

tors claimed these limits did not cover their variable costs. Moreover, generators considered that Resolution 034 changed the rules of the game, since, according to their interpretation, complaints over market power can only be filed with SSPD, not with CREG. In addition, a plant that must always be dispatched must receive some return on investment, apart from remuneration for variable costs.²⁵

ACOLGEN claims that the generators have not exerted market power at any time, but were merely trying to take advantage of a tied market to compensate for losses incurred because of Resolution 063 of 2000, which made them maintain valid bids for one week in case lines were out of service. While proving that exercise of market power is a difficult task, generators have ample incentives to take advantage of opportunities to compensate for the effect on cash flow, introduced by changes in capacity-charge methods, low market prices, and drop in power demand.

Agents agree that CREG procedures have not been transparent and that generators have often lacked clues about the direction of changes. Some generators claim that CREG has not consulted sufficiently with the CNO and that resolution objectives have not been made explicit. Resolutions 034 and 092 were defined as temporary measures, but circumstances under which validity would cease are not yet explicit. The generators have gone to court on several occasions, using diplomatic pressure to advance their cause, even when their legal appeals have not been exhausted.

Concentrating regulatory measures on power generation and transmission reflects the privatization sequence; that distribution fell behind may have been exacerbated by the novel intellectual challenges posed by design of a new wholesale market. Policies governing the natural gas sector have also experienced delay and lack of coordination, with regulation having had to face Ecopetrol's political power and independence.

²⁵ In fact, Resolution 034 has not recognized all variable costs, starting from a cost curve for a plant at maximum capacity, not including fixed fuel-transport costs or taxes, and considering only a fraction of start-up and shutdown costs. Similarly, the resolution has set a floor for generators with trapped energy, based on the added level of the reservoirs, following a procedure consistent with that of minimum operatives. Two months later, CREG issued Resolution 092, which recognized fuel costs, taxes, and exchange-rate variations, but omitted gas-transport costs. On the date of issuance, CREG sent a circular to the generators, requesting their suggestions on quantifying start-up and shutdown costs.

Superintendence of Public Utilities

SSPD has been the most controversial of regulatory institutions. It stands out because of its inability to implement functions assigned by law. Mishaps and repeated failures in its supervisory capacity jeopardize sector performance. Its weaknesses affect continuity of supply, capitalization or privatization of distribution utilities, ongoing processes in overcoming lack of liquidity or identifying insolvency in other utilities, supervision of distribution of tariff formulas and pool prices under emergency resolutions, attention to service suppliers and users, potential for regional politicians to capture regulators, and rules of the game and investor incentives.

SSPD is structured to include state branches and sectoral divisions: water and sewage; power, gas, and fuels; and telecommunications. Its many responsibilities are summarized in Box 2.3.

Law 142 entitles SSPD to complement its in-house capacity with external resources while carrying out its inspection, supervision, and utility-control tasks. Thus, capacity may rest on the internal control that companies must exert and on specialized external auditing. Through

Box 2.3. What Is SSPD's Role?

According to Law 142, SSPD oversees market competition, utility management, and compliance with safety and service standards. It informs and issues opinions to CREG and the ministry on managerial performance of service providers. It also certifies stratification of residential users in the allocation of subsidies. Further, it establishes system standards for utilities and publicly disseminated information. It decides subscriber and user appeals once the utilities have resolved first instances. Finally, it guides and supports community participation, especially through Social Development and Control Committees.

In terms of monitoring and control, SSPD's main tasks are to ensure that companies abide by Law 142 and Regulatory Commission resolutions, user contracts are complied with, subsidies are directed to the poor, and utilities comply with management indicators set by the commissions. It investigates and requests information on irregularities that may arise within companies. It conducts inspections and tests and penalizes companies that fail to comply with the rules.

external auditing, SSPD would avoid expansion and be able to hire independent, qualified staff for all specialized areas (not only financial ones) that statutory auditors have dealt with traditionally. Statutory auditors may also provide these services, particularly in private companies, but as stockholder representatives, while external auditors represent the users.

However, for SOEs or any company in which the government is stockholder, the General Auditing Office has jurisdiction in areas of resources, rules compliance and relevant authorizations, and management responsibilities of officers in the Attorney General's Office. In principle, this difficulty would be overcome by exempting such companies from external auditing and adapting their internal control to general official rules. However, this approach does not work in all cases. Moreover, competence areas differ among the General Auditing Office, Attorney General's Office, and external auditors.²⁶ Regimes of public and private companies also differ, adding difficulties by subjecting companies to multiple supervisors and controllers and poorly coordinated rules.²⁷ Law 142 assigned CREG the job of establishing rules for adequately balancing components of company control systems. The task remains to be completed, and there are competence problems with the General Auditing Office, with respect to jurisdiction of companies and public interest.

In most cases of this type, external auditing has worked poorly; in others, practices of the General Auditing Office have been followed without sufficient adaptation to specific public-services requirements (Económica Consultores, 2000).²⁸ Causes for these deficiencies are related to guidelines and criteria assigned to external auditors, expertise required to establish them, SSPD's lack of tools to enable these agents to achieve satisfactory results, and the entity's lack of interest in them. Results have

²⁶ Fiscal control must be the General Auditing Office's responsibility, which should adapt it to public services. Other areas not covered by the General Auditing Office or internal control are exempt from external auditing. External auditing should not only look after the public interest, but also the interests of entrepreneurs and users, which are alien to the General Auditing Office.

²⁷ Companies are also subject to rules of association, taxation, and labor, as well as jurisdiction, apart from public-services requisites and activities.

²⁸ External auditing deficiencies include superficiality of evaluations, cases of auditor capture by companies, being a subproduct of statutory auditing (an ingrained problem in large companies), and lack of stakeholder concern about deficient auditing (an area outside the realm of SSPD).

included ineffective supervision and control and asymmetry among private and public operators in this field.

Allegations of market power in the electricity sector have been common since 2000, but SSPD does not have the information or capacity to establish it, according to CREG's rules and criteria. Ex-post control is difficult, and trying to argue it ex ante would lead to competence conflicts with CREG. Investigations of unfair competition and competitors' restrictive practices had been a source of conflict with the Superintendence of Industry and Commerce; they were defined in Law 689 of 2001, a new adjustment to Law 142 that eliminates every jurisdiction of the latter in these matters and concentrates them in SSPD, which lacks specialized infrastructure, staff, and experience in the field. This expertise is available at the Superintendence of Industry and Commerce.

In general, SSPD's supervision and control efforts, both human and financial, have been insufficient, not only with respect to the importance and complexity of such undertakings, but in other work areas. Supervision and control are the most efficient, short-term ways to benefit users who have wrongly been considered well-served by social-control efforts and resources, to the extent that SSPD seems to have exceeded what is established by law. In principle, SSPD is not in charge of promoting social control, but supports those who organize and execute it, such as territorial entities and participatory Social Development and Control Committees or their representatives. Public utilities must even invite them to serve on their boards. Regarding customer service and claims, SSPD's work must be one of guidance and involve other instances of social control; regarding appeals, SSPD only takes care of them in a subsidiary manner. SSPD has dedicated considerable funding to filling this type of jurisdiction gap, which the law assigns to territorial entities. It has overemphasized attention to petitions, claims, and appeals. Consequently, results from remaining control agents have been poor. Dedication of State branches to these areas, versus improving delegated sector divisions in charge of supervision and control, is an example of SSPD's wrong focus. The question is whether this has contributed to, at least in part, entity politicization and emphasis on regional over national interests.

According to the law, supervision and control of suppliers must be based on objective measures of results. CREG is in charge of defining

criteria, indicators, and even models that permit assessment of management and results. Management indicators and results plans are the basic tools. The utilities have submitted their annual plans to UPME; these plans should, in turn, be the basis upon which external auditing can do its work, with SSPD in charge of supervising compliance with CREG norms and imposing sanctions whenever necessary.²⁹ In addition to multiple agents establishing indicators that have not been coherently arranged and that have design and development deficiencies, a more serious issue is that the utilities are not supervised or penalized based on such indicators, and SSPD does not verify the quality of the information involved.

Law 689 of 2001 has led to another philosophy: establishing minimal conditions of mandatory compliance and indicators to signal the timing for SSPD inspection and special supervision. This involves classifying the risk of each company that might need special treatment. Such public classification runs the risk of influencing third parties (e.g., financiers or insurers) in a way that will interfere with company management and the process prior to tenure inauguration. Instead, this process should be improved and fine-tuned, with prudent regulation that also produces *ex ante* company quality.

Although SSPD has ample authority to penalize, the process is vague and penalties do not match the benefits of breaking the rules. It is necessary to further typify certain ones and define most *a posteriori*. Greater benevolence, with respect to public companies, is observable, and there may be no definition as to what happens when SSPD manages them itself.

SSPD takes possession of utilities to run them temporarily, and ultimately to liquidate and replace them either because of regulatory framework violations or defaulted payment of a service that must be supplied. Takeovers are done on SSPD initiative, upon opinion from the ministry or CREG, and they are optional, not mandatory, especially in cases of liquidation. In principle, they must lead to a contract of fiduciary administration, and in case of circumstances chargeable to management, a deadline must be set (two years maximum) to reach liquidation, in the absence of guarantee to resume normal operating conditions.

²⁹ The law is ambiguous about whether SSPD can also define indicators; treatment of public and private utilities also differ; for the former, there are measures in addition to penalties.

The main takeover problems identified are as follows (Económica Consultores, 2000):

- ◆ Although there is a two-year deadline for defining liquidation, SSPD is responsible for guaranteeing service continuity without resources for this purpose (currently, at generators' expense); it allows owners lax compliance with responsibilities, which does not foster sound management but exposes SSPD to liability claims.
- ◆ Management takeovers do not guarantee any improvements in practice, and would involve subsidies if they have to revert back. If there is insolvency, temporary management would reap no benefit, and there would be exposure to claims.
- ◆ SSPD ends up being a judge and a party, particularly in management cases.
- ◆ The fiduciary figure has not been operative at SSPD, which has appointed its officers to manage and liquidate based on alleged lack of experience and legal contracting difficulties. This has resulted in misallocation of scarce resources.

Takeover difficulties are particularly serious for sustainability of power sector reform. They block privatization; protract political control of utilities; and either divert urgently needed public funds or pass costs on to generators, thereby increasing chances for corruption. Regrettably, SSPD has become known for its corruption scandals, which have led to ongoing processing of the former Superintendent, as well as certain assistants and legal consultants, on alleged grounds of their acting on behalf of all parties involved in the claims. This type of action is symptomatic of SSPD's cronyism and perverse incentive structure.

SSPD's attempts at reform are instructive. Nearly every point made in this section originated in a governmental study that was carefully conducted to correct mistakes based on earlier experience and current challenges, which translated into a decree with the force of law issued by the executive branch and protected by congressional authority. The Constitutional Court pronounced it unconstitutional because of procedural defects; it was presented again as a bill, which Congress and the superintendent had modified to disguise the adjustment attempt. This

was an opportunity to concentrate all supervision of competitive practices in SSPD (excluding the Superintendence of Industry and Commerce), maintain the superintendent's discretionary and jurisdictional authority for fiduciary inclusion in takeovers, and designate other types of agents without restriction. By designating the superintendent as the area's "first technical and administrative authority" and transferring nominating jurisdiction of delegate superintendents, a point is reached where supervision by constitutional delegation of the president is ignored.

Ministry of Mines and Energy

The MME establishes sectoral policies; its work is restricted by the budget and the Quadrennial Development Plan, which sets national public investment for the period.³⁰ Under the Constitution, the government, through MME, is responsible for ensuring adequate and reliable supply security. To achieve this end, expansion plans for generation and transmission are under way, and utilities are preparing management plans through UPME. This requires future demand estimates and expansion plans indicative of generation and binding for ISA when there are no other bidders for transmission projects, as has happened previously. UPME also collects and organizes operative and financial data for the sector.

Recent recorded projections have been incorrect, and generation planning is in disarray because of the economic situation and terrorist attacks. Planning of transmission expansion lacks economic incentives to alleviate restrictions resulting from the current tariff system. This causes projects to depend on guarantees that project coordination lacks the capacity to offer and financing schemes outside the planning unit domain. Aside from current planning difficulties and regulatory defects, planning should be a matter for discussion, since the government must ensure security of supply. Public projects and guarantees reduce private-investor incentives because these projects concentrate investment in areas that are the least capital intensive with the most easily replaceable technology. The role of

³⁰ This could be a potential source of rigidity, with politicized cronyism involving scant national investment resources. The standard of giving the plan priority over the budget has not been complied with; the current plan is in legal limbo, resulting from procedural defects in Congress.

the ministry in utility planning has been unclear because it is not using utilities to define long-term policies and plans and is incapable of appreciating them; since they are a prerequisite, they are partially responsible for management of companies. The idea of approved plans complies with the companies' public regime, but with private ones, the work is restricted, and other incentives are substituted that would be more appropriate.

The ministry and UPME also have difficulty hiring and maintaining staff in a sector where many career opportunities are in the private segment. This results in high turnover and conflicts of interest. A stable and qualified advisory body is needed to serve as the counterpart to CREG and SSPD, but that has not been supported in the ministry or even in a technical unit, such as UPME.

Regulation of Noncompetitive Segments

Consumers with a capacity of more than 0.1 MW or monthly consumption above 55 MWh, who account for about 25 percent of the market, have the option to buy directly from wholesaler traders at freely negotiated prices and pay transporters or distributors a toll for grid usage. For most regulated users, the DISCO also functions as a trader. As Figure 2.6 illustrates, net payments from regulated consumers have decreased in real terms since 1998.

Figure 2.7 illustrates the tariff structure of the regulated consumer, particularly the ways in which segments and restrictions affect the final tariff. Despite important regional variations, the average value is relatively low when measured against international standards, even though it is overloaded with constraint costs caused by market fragmentation. This is due, in part, to low generation charges resulting from current oversupply and partly because of low remuneration for distribution (Box 2.4).

Transmission companies are not responsible for system expansion. UPME's expansion plan, with consultant-committee participation (consisting of generation, transmission, and trading-company representatives) has a normative nature and construction of the plan's projects is assigned by bidding.³¹

³¹ Through its affiliate Transelca, ISA directly and indirectly controls 83 percent of the national transmission network; the remaining 17 percent is the property of integrated companies.

Figure 2.6. Regulated Consumer Prices

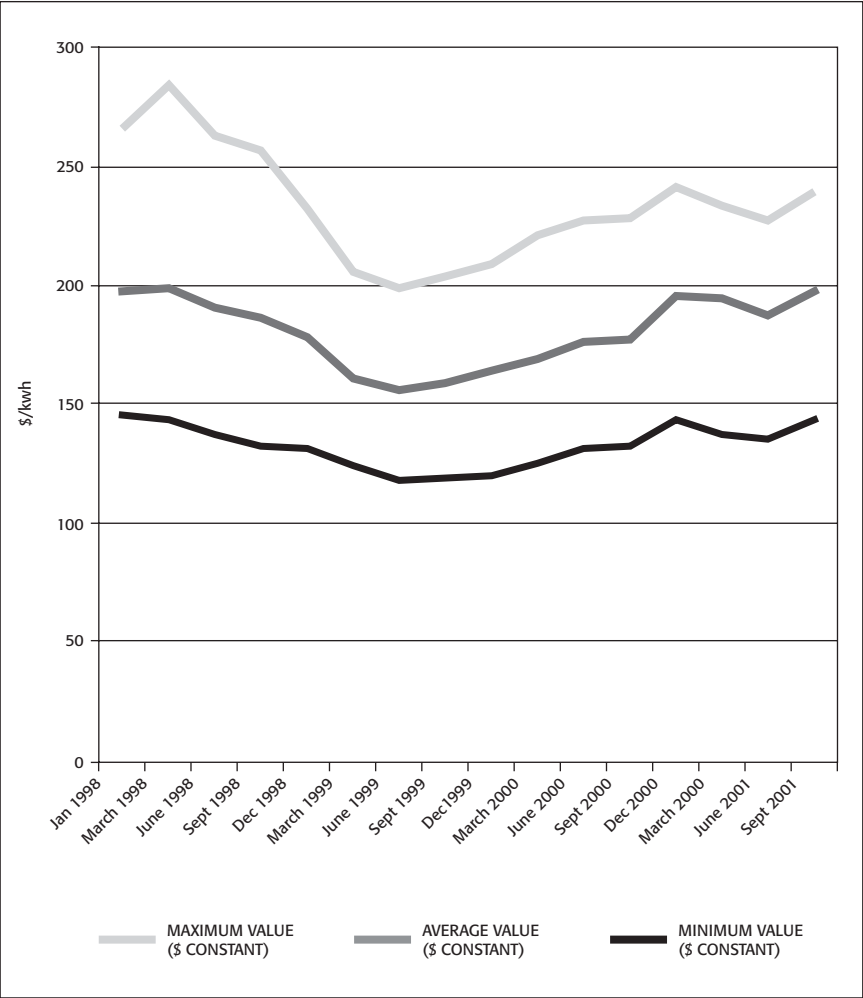
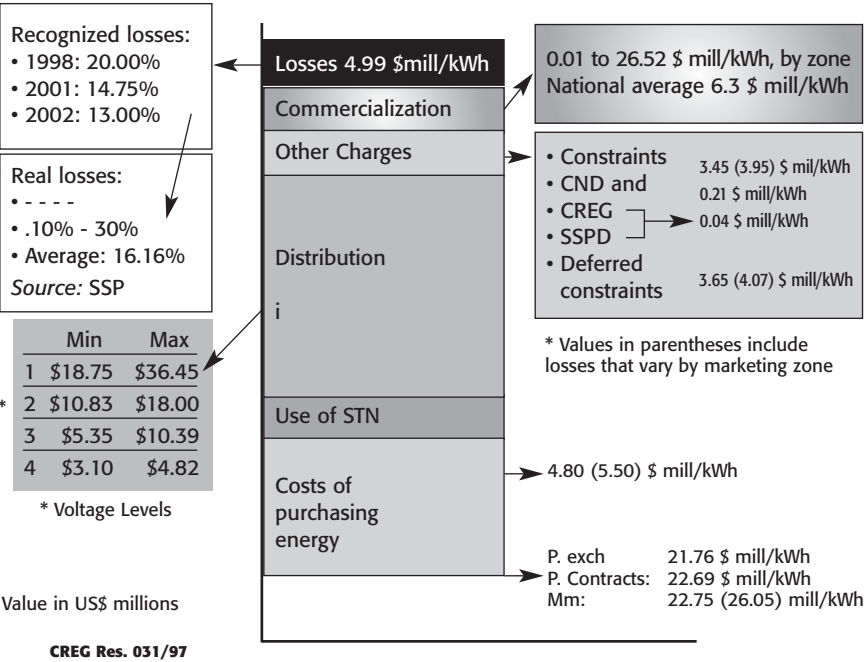


Figure 2.7. Tariff Structure Values of the Regulated Market as of May 2001



$$CU_{n,m,t} = \frac{G_{m,t} + T_{m,t,z}}{(1-PR_{n,t})} + D_{n,m} + O_{m,t} + C_{m,t}$$

Average Tariff
77.16 \$ mills/kWh

Source: ISA (2001).

Box 2.4. Tariff Formula

The tariff formula in Figure 2.7 estimates the Unit Cost, **UC**, as a function of the following variables:

Pass-through generation cost, G (12-mo. moving average of purchases, contracts, or spot market).

Transmission costs, T (220 kV and higher levels). Capital cost is recovered using a tariff base equal to the replacement value of STN components, while Operation and Maintenance (O&M) costs are recovered as a percentage of the previous value. Total income from transmission is distributed among utilities that own the grid, according to their participation in ownership.

Generation and transmission costs are passed along to the regulated consumer, with an acceptability threshold of admissible losses set initially at 16 percent, gradually decreasing to a minimum of 12 percent. This method gives DISCOS an incentive to reduce losses, using investment profits.

Distribution charges, D (in \$kWh, by voltage levels, which differ by company). CREG regulates these charges by reviewing price caps every five years. Valid charges for 1997-2002 were determined as the quotient of average asset values at the beginning of the period (using regulated unit costs, typical useful life of assets, and a 9 percent discount rate), plus O&M costs equivalent to 4 percent, historic averages of net power flows for the last year estimated for each voltage level and the loss threshold recognized or admitted. The tariff base is capped at 120 percent of the national average.

Operational charges, O, include operational costs, set at 4 percent of the tariff base, and transmission-constraint costs in the pool operation. Finally, **C** covers costs of commercialization.

During 2000-01, 25 percent of transmission charges was covered in the form of a national postage stamp.³² Beginning in 2002, the bulk of transmission cost was covered by DISCOS-Traders. New generators will pay deep connection charges. This modality fails to provide economic signals for locating new projects, thereby eliminating economic incentives for defining optimum expansion of the gas transmission and transport network; in turn, the deep connection charges for new generation companies could create a barrier to entry, as well as unjustified income for existing generation companies. However, users do not pay the established tariff because of a cross-subsidy system that favors low-income users (Box 2.5).

Distribution companies associated with ASCODIS have always complained of inequities in regulatory definitions, especially in terms of

Box 2.5. Subsidies to Subsistence Consumers

Law 142 of 1994 established explicit subsidies for low-income users (50 percent, 40 percent, and 15 percent for income strata I, II, and III, respectively). These subsidies are funded by a 20-percent contribution from the invoices of high-end users (strata V and VI), as well as commercial, industrial, and non-regulated users. There are legal provisions for additional contributions from territorial entities and the State. They are not mandatory and, to date, the State is the only contributor. The Subsidy Solidarity Fund for Distribution of Income pays the difference between contributions and subsidies. Consumption levels above subsistence use (200 kWh per month), and with contributions above 20 percent, were subsidized until 1994. Once Laws 142 and 143 entered into force, dismantling of these extra-legal subsidies and leveling off of contribution rates (the transition deadline was December 31, 2001) were agreed upon. However, for various reasons, Congress has delayed dismantling. The law is ambiguous regarding 20 percent surcharges for co-generation and self-generation above 25 MW.

³² Generators paid 50 percent in 2000 and 25 percent in 2000-01, based on location.

adopting quality norms established after issuance of Resolution 031 of 1997 to set tariffs and the effect of lower-than-expected sales due to recession. However, sell-off or private capitalization of distribution companies, which required tariff definition, has forced a tariff review for the five-year period starting in 2003. In December 2001, CREG presented its proposed draft of Resolution 080 of 2000, following a year-long discussion on methodology. CREG's proposal leaves advance adoption of the new method up to the distribution companies. In late 2001, CREG issued Resolution 159, thereby establishing a tariff option for DISCOS in which it freezes the losses allowance and options for applying quality thresholds for the year 2002. In early 2002, CREG debated definitions of other tariff parameters (Box 2.6).

Box 2.6. ASOCODIS' Position

On July 14, 2001, ASOCODIS presented MME and CREG the following proposals:

- ◆ Raise the ceiling for distribution charges from 120 percent to 140 percent and call for its long-term elimination.
- ◆ Gradually increase the real rate of return from 9 percent to a 19 percent nominal Weighted Average Cost of Capital (WACC).
- ◆ Increase the Operations and Maintenance (O&M) cost ceiling from 4 percent to 8 percent.
- ◆ Freeze goals of service-quality indicators (frequency and duration of service interruptions) at 2001 levels, and conduct studies prior to future modifications.
- ◆ Regulate energy costs so that they depend only on a company's purchases.
- ◆ Return to initial power-loss levels (16.5 percent and 18.0 percent), according to market characteristics; conduct a study prior to decision on whether to modify these parameters.
- ◆ Update tariffs, based on 3 percent variation of unitary cost components instead of total variation, and eliminate the 3 percent variation over the long term.
- ◆ Regulate trading costs, separating average consumption of nonregulated and regulated users and market segmentation to regulate long-term trading costs.
- ◆ Eliminate moving average to transfer constraint costs to users and modify remuneration of out-of-merit generation over the long term.

The new tariff formula is not only vital for capitalization of the 13 State-owned utilities and municipal utilities in Pereira and Cali, but also for viability of Caribbean coast utilities owned by Union Fenosa. For this reason and because of its timing (in the middle of an election campaign), the repercussions will affect the future of reforms. Fenosa has limited capital infusion in its recently acquired Atlantic coast utilities because of a breach of promises made by the national government regarding its participation. In addition, financially solvent distribution companies (CODENSA, EPM, and EPSA) seek to improve their financial conditions through renegotiating the tariff formula.

CREG's response is constrained by a rigid framework that prevents it from tending to companies' individual problems, while demanding estimated return on assets and value at replacement cost for all DISCOS. These concepts are clearly incompatible. Discussion on this topic is reminiscent of the U.S. debates of the 1970s, as recounted by Alfred Kahn's classic treatise on regulation (Kahn, 1988). At that time, utilities and regulators considered complicated formulas to estimate the tariff base and rate of return independently, ignoring that what counts is an income volume large enough to keep investors in the business, usually fixed according to correlation of forces between consumers and suppliers at the time of revision.

CREG's problem is exacerbated by not having prepared to undertake price reviews. While setting price ceilings every five years appears to have an advantage over conducting annual rate-of-return regulation, it demands resource concentration during review periods and careful preparation, as confirmed by the large amount of resources that Argentina has dedicated to these tasks. Unfortunately, this has not been Colombia's case, which has trivialized the debate.

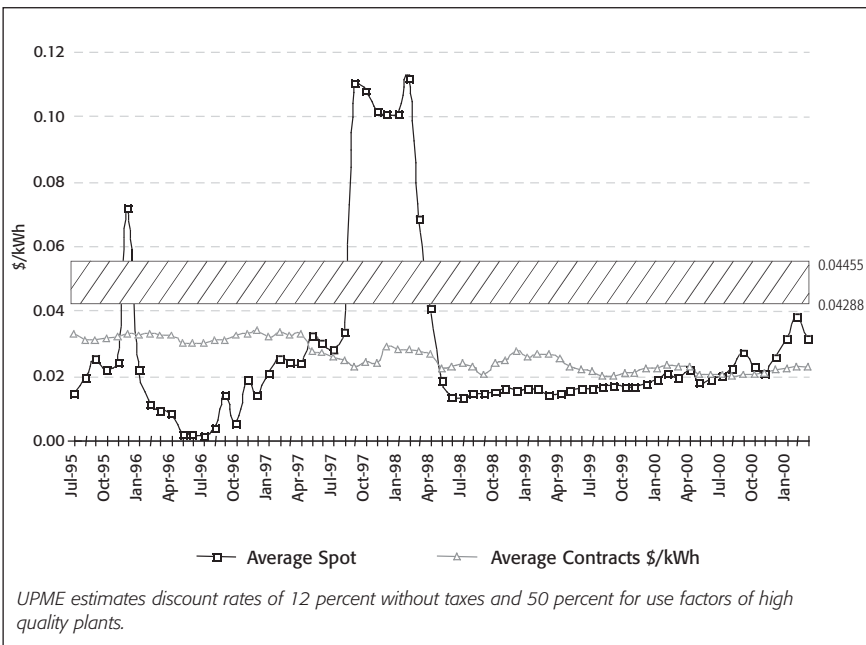
In addition, legal uncertainty caused by the Constitutional Court and a recent ruling by the Superintendence of Corporations, which denied de-capitalization of CODENSA, have created significant uncertainty.

Wholesale Energy Market

Wholesale market design, start-up, and six years of uninterrupted operation have been one of the reform's largest accomplishments. On average, wholesale prices have stayed below the long-term, average incremental

costs estimated by UPME. Volumes of nearly 150 percent of total demand are being traded in the bilateral contract and spot markets. The market offers more than 15 types of contracts. However, participant insolvency, high volatility, lack of coordination between short- and long-term signals, and a design that failed to consider persistent transmission constraints (stemming from market fragmentation caused by terrorist attacks to the national grid) seriously threaten stability (Figure 2.8).

Figure 2.8. Changes in Wholesale Electricity Prices (July 1995–January 2000)



Source: ISA (2001).

Volatility, Supply Continuity and Long-term Price Signals

Volatility is high in the Colombian power market, even by power-market standards. Over the past five years, guerrilla attacks, lack of demand-side response, overcapacity, and recurrent environmental events (including ENSO and wet periods)—all have contributed to transmission constraints. Because of heavy dependence on hydroelectric plants, energy constraints (rather than power as is the case for thermal systems) dominate Colombia's continuity of supply. Use of thermal capacity can vary substantially, depending on weather conditions. Thus, in dry years, thermal capacity is generally dispatched at high prices in the wholesale market. During rainy seasons and La Niña climate events, hydroelectric plants satisfy the bulk of demand; thermal plants can remain idle for long periods, during which time wholesale market prices are too low. Low levels of capacity use over several consecutive years mean excessive periods of low payment for thermal reserve plants, resulting in serious cash-flow problems, which, combined with a ceiling on rationing prices, obstruct new investments.

Volatility in dispatching gas-fueled thermal plants—arising from weather-related concerns—creates added problems and distortions in gas exploitation and transport. Gas reserves should make it possible to satisfy thermal-plant demand to guarantee supply continuity under critical hydrologic conditions. Gas transport infrastructure should be designed the same way. However, because of thermal plants' wide participation, seasonal demand, and lack of a secondary gas market, ECOPETROL, the gas supplier, signed take-or-pay contracts for supply and transport in order to stabilize use of pipelines. These types of contracts have been criticized because they allocate hydrologic risk to the party less capable of bearing them: the generator.

This problem is made worse by the fact that many plants located in the country's inland were built to use gas produced in the Opón fields, which were dry upon development. As a result, these plants are supplied gas from the Atlantic coast, transported through pipelines with serious capacity constraints, which can, in turn, limit supply to plants located in remote areas with critical hydrologic conditions.³³ Although more remote

³³ In certain cases, substitute fuel has been used in refinery plants and industries to liberate gas for plant use during critical seasons.

plants could be adapted to operate on oil byproducts, a definitive solution to the problem would come only from exploitation of new fields (Cusiana reserves) once CREG resolves the pricing issue.

Introducing price flexibility has been extremely difficult in Colombia. Regulation aims at price stability and sets ceilings during times of shortage. Under such circumstances, consumers are not exposed to price fluctuations and are unable to respond to prices with alternative measures, such as self-generation or efficiency-improvement investments. Nonregulated user demand, representing 25 percent of total demand, is more elastic in theory since the users have real-time meters; however, they usually participate in the market through long-term contracts that give them a relatively smaller margin for maneuvering. However, average contract terms are short and seasonal, which can provide a sound signal to both consumers and investors. The tariff formula for regulated users includes a 12-month, moving average of energy that generators purchase from trading companies, which prevents the price signal from being transmitted; the price signal is continuously distorted because delay leads to lower or higher prices when the opposite is required.

Critical to all power supply system goals is ensuring continuity of service delivery. Recent rationing in California and Brazil strongly confirm the rationing lessons that Colombia learned during 1992-93: Whatever the reasons for interruption, the government is responsible for re-establishing power, and how diligently it does so will determine its survival. Thus, finding a solution to supply-security problems is crucial, not only for acceptance of regulatory reform, but also for its sustainability.³⁴

However, regulatory interventions in the Colombian market, though clearly well intentioned, are not necessarily well designed, and they can weaken the system's capacity to supply reasonably secure flow. The solution provided by the country's regulatory framework has three complementary components: CPCs, operational minimums, and rationing code. CPCs aim at recognizing (through income) the reliability that certain plants confer upon the system during the dry season. This charge is collected by generation companies through power sales, and is distributed

³⁴ For more detailed treatment of the supply-security issue, see Chapter Five.

among them according to the Theoretical Remunerated Capacity (CRT); CREG computes the CRT, using a model that takes into account the ability plants have to generate power under critical hydrologic conditions. The collection method of the charge creates a market floor for generation companies (Equivalent Power Cost), which must, in theory, provide sufficient resources to remunerate plants and foster investment in reserves. To guarantee short-term continuity of supply, the Minimum Operatives (MO) system imposes restrictions on operating reservoirs that limit use of stored water to preserve critical reserves until the dry period ends. This means that hydroelectric generation companies forfeit discretion to act according to market signals. MOs change annually, according to supply-demand balance and level of reserves. When a reservoir falls below these levels, the hydraulic plant is dispatched only after the last thermal plant. In addition to this intervention, another, more critical level was fixed under which the plant may not be dispatched. In this case, programmed rations are put into effect.

Although the three instruments were designed to ultimately ensure supply security, their adequacy and efficiency in obtaining it remain unclear. Even though CPCs are a clear incentive to construct new plants, the importance of this incentive depends critically on the monetary value assigned to them. Thus, depending on whether this value is assigned above or below long-term marginal costs, the result can be remuneration excess, giving way to over-installation or a capacity deficit. The calculation method has been continuously questioned since parameters for 2001 were adopted. Criticism has focused on three fundamental problems. First, the capacity to be compensated is difficult to justify based on an administrative criterion, no matter what sophisticated models are used to estimate it. Second, income distribution among generation companies depends greatly on the model's implicit assumptions, particularly the hydrology adopted. Third, incentives are not clearly associated with security; this was demonstrated during the ENSO events of 1997-98, when the method did not guarantee plants remuneration that effectively contributed to security. On the other hand, regulatory changes have significantly affected the incomes of diverse generation companies, resulting in wrangling over assignment of such income and continued modifications of the rules (15 changes have been made since 1996). The CRT calculation for 2001 propi-

tiated redistribution of remuneration from hydroelectric plants to thermal ones; as a result, hydraulic generators felt expropriated and sued CREG. In short, the consensus is that an administratively fixed system of charges does not produce appropriate incentives to guarantee an adequate level of supply security or an efficient combination of thermal and hydroelectric technologies.

Establishment of minimum operation levels for water stored in reservoirs further complicates the problem. First, it is not obvious that these regulations are required or if hydraulic generators have incentives to empty their reserves to sub-optimum levels. Expected shortages can create strong incentives to keep water impounded to take advantage of higher prices. Consequently, efficient operation of reservoirs is profitable both socially and privately. Second (and perhaps more importantly), expected intervention in reservoirs may create perverse incentives. Anticipating limited generation caused by the minimum operation levels, hydraulic-generation companies may be tempted to increase production and avoid leaving water impounded in reservoirs; this, in turn, could anticipate reaching the intervention threshold. In fact, discretionary application of minimum levels during the 1997-98 ENSO event prevented dispatch of numerous hydroelectric plants, which were forced to comply with commitments by purchasing in a spot market at high prices, due to thermal generation companies' exercise of market power to end the dry period with half-full reservoirs. The effect of this measure was that only hydraulic generators paid the cost of keeping the reserve, making them feel expropriated.

Because of these deficiencies, CREG hired a consultant firm to propose a substitute method that would simultaneously eliminate the need for CPCs, minimum operation levels, and the rationing code (TERA, 2000). The consultants' proposal, based on the purchase and sale of contracts of firm energy options, was complemented by a futures market. ACOLGEN and other sector agents have strongly criticized this proposal, and CREG itself has delayed implementation. The alleged reasons for opposing the proposal are based on its complexity, which would make implantation difficult in light of the country's institutional restrictions and weaknesses. However, at the core of the matter is a natural resistance from generators, who see the potential for reducing the CPCs they currently receive.

The consultants hired by ACOLGEN have made simpler contract proposals limited to energy-security options (Vasquez, Rivier, and Pérez-Arriaga, 2001; TERA, 2000).³⁵ The idea is to contractually commit generation companies to be available whenever needed because of power shortages. The contracts consist of a combination of financial purchase options with a given strike price and penalties for compliance failure. When the spot price exceeds the contract strike price, the contract generator must compensate its counterpart in the contract (consumers) for the difference between prices; therefore, this option, sets a de-facto cap for the electricity price. If the generator cannot deliver on its contractual obligations in physical terms, it must pay an additional penalty. To compensate it for the cost of consumer payment and to ensure adequate level of supply security, the generator receives a premium.

As von der Fehr discusses in Chapter Five, contracts are to be traded in an auction process, whose goal is to create a reliability market that determines the price of the reliability product by means of market-based mechanisms. The regulator sets the basic parameters of the contract (strike price, total amount of contracts to be issued, penalty for non-delivery, and contract duration), and, at auction, generators submit price-quantity bids for the total amount of capacity they wish to commit and the minimum acceptable contract premium. Winning bids are selected to minimize total premium costs (the highest accepted premium determines the price of contracts). This proposed approach reduces the need for administratively determining certain reliability criteria (e.g., individual market participants determine the amount of capacity generators have to offer and the cost of ensuring the required level of reliability); however, certain critical parameters (e.g., strike price, overall system-reliability criteria, non-delivery penalty, and contract duration) would still be set administratively.

As the author points out, the single contract type proposed implies a degree of arbitrariness with respect to choice of key contract characteris-

³⁵ These two proposals are similar, with certain differences. TERA suggests firm energy options, a futures market (to cover options sellers [generator] risks and support short-term assuredness), modification of procedures to introduce rationing, and taking other out-of-market actions. A rationing event can be adopted only if reliability is threatened, based on public information and reasonably identifiable criteria. The assumption is that suggested rules will affect the market less often or severely than existing rationing procedures and minimum operation levels.

tics and leaves market participants little flexibility. Moreover, it is unclear why price and quantity protection should be combined into a single contract. They could, at least in principle, be disentangled by introducing two types of contracts: one containing the firm-energy element and a penalty for non-delivery and the other, a purely financial contract, containing a strike price and option premium. Having two types of contracts would enable the market to determine the insurance premiums for supply security and price protection separately, allowing both generators and consumers a more flexible choice.

Firm energy contracts, unlike CPCs, require creating an entirely new market, with the necessary institutions and regulations, including mechanisms to ensure that participants adhere to market rules. As the author mentions, if the penalty for non-delivery is set too low, generators may be tempted to over-contract in order to benefit from the payment of contract premiums. Moreover, in cases of demand and supply imbalances (with correspondingly high spot prices and difficulties in ensuring the required energy), agents may be tempted to default on their contractual obligations (in extreme cases, by declaring themselves bankrupt). Thus, it is necessary to select the rules carefully, continually oversee market performance, and impose sanctions on agents who do not abide by the rules.

Under this proposal, the regulator would still be responsible for supply security.³⁶ A potential alternative would be to introduce demand-side bidding in the contract market, thereby allowing consumers (or suppliers on their behalf) to determine contract coverage. This would eliminate the need for fixing a reliability criterion, and leave decisions about the required level of supply security to the market. Another option, as suggested by von der Fehr in Chapter Five, is to follow the example of Guatemala, whereby consumers determine their level of supply security, while other (regulated) consumers are provided full security and their suppliers' obligation to ensure it.

³⁶ TERA (2001) assumes that consumers (or traders on behalf of consumers) would buy the energy-security contracts. However, contractual coverage would be subject to supervision by market operators so that, in fact, the market would maintain responsibility for determining the minimum level of supply security. Following a reasonable transition period, qualified users would choose their coverage level. Moreover, a secondary market with contractual positions that could be revised would be considered.

Market Design, Market Power and Vulnerability

The pool of mandatory agent participation operates based on capacity and price offers made by agents who use a marginal-cost system method. The pool price for each hour corresponds to the daily offer of the last generating plant—capacity and price—necessary to satisfy demand during the respective hour. Hourly pool price and long-term contract prices are the basis for valuing commercial exchanges among agents. Similarly, CPC payments, cost of ancillary services, and cost of constraints are liquidated in the pool. Generation companies receive value of contracts as payment. The difference between a generator's total dispatch and its long-term contract sales must be sold or purchased in the pool at spot price.

Theoretically, offers must reflect costs and are subject to SSPD control; however, in practice, the offerers enjoy discretion, and prices may exceed costs. Although dispatch of generating units is centralized, based on the price offers submitted, in practice, generation companies have many opportunities to affect the potential for dispatch. This is particularly valid for hydraulic generation companies, where offers are based on the cost of water.

Power-pool prices are determined in terms of ideal economic dispatch, which does not consider the current state of the grid. Once the ideal economic dispatch is determined, actual dispatch is scheduled, taking grid constraints into account. Differences between ideal and actual dispatches are the costs of constraints. These costs are assigned so that plants with out-of-merit generation are paid the difference between their offer price and that of the ideal dispatch, while plants with trapped power (i.e., power that cannot be dispatched because of grid constraints) are paid the difference between the pool price and their offer price.³⁷ Traders pay the cost of constraints proportionate to their commercial demand. The share of costs increased significantly over the last several years. The timing coincided with intensified terrorist attacks beginning in mid-2000, which practically segmented the system into several subsystems. Clearly, the premise that costs of constraints would be so slight that they would not affect adoption of the model no longer held. However, the system continued operating under the guise of a single integrated system, and

³⁷ Abuses caused these constraints to rise substantially, which led CREG to establish controls.

constraint costs increased significantly during 2000-01, with adverse effects on end-user tariffs.

Prolonged fragmentation periods (the interconnection link between the Atlantic coast and central Colombia was operational for only one month during 2000) were never foreseen when market designers adopted a single ideal dispatch and equal distribution of constraint costs among all agents. Added to the technical problems of keeping service continuity under current public-order conditions (actual dispatch is increasingly distant from ideal dispatch), market fragmentation increases chances for agents to exert market power.

Colombia's concentrated market structure, exacerbated by significant transmission constraints, provides ample opportunity to exert market power.³⁸ Furthermore, a high degree of vertical integration exists, caused by restrictions imposed during reform negotiations, as well as mergers and acquisitions; various studies corroborate these allegations (Garcia and Arbeláez, 2002; Sttachetti, 1999). However, transmission grid constraints (especially along the Atlantic coast) and terrorist attacks have given ample opportunity to exert market-power practices. Generation in fragmented markets becomes security generation, and chances for competition are substantially diminished. Other generators are located in areas where terrorist attacks prevent dispatch at maximum capacity, which also gives them room to submit their offers in a way that maximizes the payments they receive for constraints.

As discussed earlier, CREG's measures to control market power under transmission constraints have been criticized as inappropriate intervention in the competitive market. However, when conditions that made competition possible no longer exist or prove inadequate, market interventions are clearly legitimate within the spirit of the new regulatory framework; this has been the rule, rather than the exception, in all competitive markets worldwide. Any agent that claims otherwise risks being accused of being out of touch with debates sparked by the problems

³⁸ CREG's preventive measures notwithstanding, the four largest utilities control 65 percent of installed capacity (with the three largest controlling 50 percent). The maximum participation allowed (direct or indirect) is limited to 25 percent of total installed capacity or the difference between average available annual capacity and demand peak. Maximum participation by traders is limited to 25 percent of total demand.

of the last few years (Littlechild, 2001). According to Joskow (2001a), most economists who have requested that the Federal Regulatory Commission play a more active role in controlling market power by some agents in California and other U.S. regions have, at no time, suggested use of rigid price caps (they have referred to the potential dangers of using them). Proposals to be developed in the short term refer to reduction of generator incentives and ability to benefit from market imperfections by setting prices above equilibrium level. Joskow suggests using a conditional rule that specifies explicitly the circumstances under which these measures would be lifted to counter criticism that temporary measures tend to become permanent. From this perspective, the problem may be viewed best in these terms: Given the inevitability of changes and adjustments, it is important to ensure that they be made in a predictable manner, adjusting to principles, following transparent procedures for their execution, and establishing clear criteria for their advisability.

Summary: Stagnation, Vulnerability and Counter-reform Threats

Building on earlier discussions that illustrate the lack of fitness between reform elements and the country's institutional and resource capacity, this section introduces the external shocks that precipitated the current crisis and makes a preliminary assessment of the conflicts and special interests that may effectively threaten sustainability of the reform. First, however, it is important to recognize that, at the time of reform:

- ◆ The basic elements of an institutional framework (agents and rules of the game) had been completed.
- ◆ Private investors were no longer attracted as minor actors filling gaps left by state-owned utilities, but as integral players in the new market scheme.
- ◆ Nearly complete fiscal dependence and its condition as source of major macroeconomic imbalance were overcome (an accomplishment that was the main reform booster).

Continued development of the new model could have been expected, perhaps somewhat ingenuously and superficially, by consolidating its

decisive elements, filling gaps, and correcting defects, such as those derived from forced, inefficient administrative solutions to problems that could be solved with further development of the regulated market (e.g., procuring better long-term signals for expansion). However, by 1998, the interests generated in the interim and by those benefiting from the old order had protracted reform implementation and restricted response capacity to shocks. Therefore, it is important to discuss not only how external shocks limited the system's capacity to consolidate reform, but to inquire further into the incentives fostered by reduction in the size of the pie—to seek rents and new, stable configurations that favor them further at the expense of the basic purposes of reform (Box 2.7).

Drop in demand and payment capacity of users, along with fiscal constraints to invest in the upgrading of DISCOSG (which was needed to privatize them and manage their subsidies) are the strongest exogenous factors affecting their crisis. Along with stagnation of privatization, this crisis added to the financial situation of territorial entities and the culture of non-payment among official entities, which, in turn, resulted in default or delay in payment to generation companies, opportunities to maintain political control of utilities, and extraction of rents or subsidies from the national government. Added to this complexity was the public's disappointment in privatization, and, paradoxically, scandals and corruption (e.g., BOT contracts), which were used opportunistically to attack reform and privatization. The government's weak circumstances, combined with a fragmented, lax parliamentary discipline, facilitated attacks on the potential of reform through individualized and harmful initiatives that favored special interests, including the coal sector.

Stagnation of privatization, in turn, creates fiscal needs that can no longer be met in the face of a weakened economy and the urgency to attend to other fronts, including social investment and security. Because of fiscal and regulatory incapacity, exogenous shocks precipitate cumulative and interdependent processes that affect the functioning (mainly via nonpayment), trust, and security of investors and users, and an open opportunity for rents and counter reform.

The thrust of reform and success of the new model are based on support from a decisive, winning coalition that must compensate losers without making them into winners or permanent parasites blocking the

Box 2.7. External Shocks: Threats to Sustainability

- ◆ Drop in demand, resulting from Colombia's worst ever economic recession (1999) and weak recovery.
- ◆ Guerrilla attacks on transmission and generation infrastructure. (Colombia's armed conflict has worsened, demands the government's current and future resources, further postponing a solution.)
- ◆ Legitimacy of the reform models in question. (Power conditions in California and Brazil and overhaul of the English model have opened up better opportunities for investment in other countries and reduced the legitimacy of the models on which the Colombian reform was based.)
- ◆ General public disappointment at privatization's failure to show results; slow or nonexistent institutional second-generation reforms; and economic weakness to maximize and better distribute reform results.
- ◆ Government's lack of parliamentary support, which has limited its ability to control and boost reforms. (This has been made more acute by the failure of political reforms necessary to overcome a short-term outlook, opportunism, and lack of political leadership and organization; the government has inherited a fiscal imbalance impossible to solve in the short term, which diminishes maneuverability and imposes adjustment restrictions.)
- ◆ Increased legal insecurity. (This is perhaps part of the natural development of the new constitutional framework; however, it is also caused by an inability to tackle new problems; gaps created by executive and legislative branches; a scheme with insufficient supervision or checks and balances; and lack of transparency, consistency, and accountability.)
- ◆ Reform development leading to a rethinking by the main actors and closer adherence to global strategies (rather than only local necessities and circumstances).
- ◆ Territorial entities slipping into general financial crisis, dragging DISCOS along with them (to the extent that the government has been unable to control transfers or debts and moral hazard conduct affects the partial bailout procedures implemented thus far).
- ◆ Gas sector's lack of strategic guidelines (its regulation is not congruent with or adjusted to the power sector).
- ◆ Poor use of the oil boom—that is, no savings but heavy squandering—and lack of a timely sustainability and expansion policy. (This factor is critical for public finance, largely defining general-sector economic policies.)

achievement of goals or the potential for forming other coalitions around challenges and goals fundamentally contrary to them. The State's continued entrepreneurial involvement, its allocation of subsidies for political reasons, and the indefinitely prolonged transition are at the core of the counter-reform proposals. They provide electoral dividends at the cost of a sustainable sector and blockage of benefit extension to other groups that could support the reform, such as those without service coverage.

Analysis of the political potential for reform's success, failure, or deviation foremost requires identifying the actors and their interests. The main source of opposition to reform consolidation lies in the cronyism of politicians and congressional members with direct regulatory power who are scattered without mobilizing users. Some have regional and individual interests in public-investment projects. However, with elections imminent, reversion of privatization processes and tariff limitations may be opportunistic causes, as they were in some cities during the past election. Major risks are derived from partial measures favoring local or individual interests or from blocking privatization to preserve rent extraction from fiscal coffers. There is a dangerous potential for opposition catalyst, or beneficiaries from stagnation of privatization, and extraction of rents and perks, which has sometimes concentrated on SSPD.

Private agents and sectoral companies that support the reform have recently been displeased with the instability of rules of the game, as well as regulatory uncertainty and delay, particularly regarding potential tariff changes and corrupt supervision-and-control practices. Recent strategies tend toward global interests and prospects; these may work against the reform principle that promotes competition in segments that allow it, and instead favor structures that permit vertical integration. All of this makes private agents and sectoral companies conditional supporters for now; in exchange, they request more independence, better regulatory quality, and a level playing field to face potential public competitors who would favor the reform, though with little regard to ex-ante control of concentration and anti-competition practices.

The greatest potential for consolidation of power sector reform could arise from the fiscal discipline that would induce privatization processes, dedication of meager resources to subsidize the poor, and extension of coverage to overlooked areas. Along with a credible compromise to avoid

State involvement in costly public projects, which so discourages private participation, such discipline would broaden a favorable coalition.

Conclusions and Recommendations

While much of the reform agenda has been implemented, yielding some expected results and overcoming barriers implicit in the former regime, mismatch between the model's assumptions and institutional and resource capacity has weakened the outcome; thus, reform is vulnerable to external shocks, which threaten sustainability. Only by understanding these circumstances can a rethinking of strategic formulas and solutions occur.

Weakened Climate for Reform

Technical and institutional limitations, initial conditions, compensations and concessions granted during the reform process—all have complicated implementation, generating new interests that benefit from reform stagnation, preventing the extension of benefits to other critical groups that could become supporters. Strong regional interests and weak regulatory institutions have prevented the national government from relinquishing its entrepreneurial role and prolonged the transition period. While model weaknesses did not stand out during periods of growing demand and new investment opportunities, absence of a paradigm shared by all actors made the reform vulnerable to sharp changes in investment drivers.

The economic recession of 1999 and escalating guerrilla attacks deteriorated conditions that would have permitted all parties to benefit from the reform process, turning it into a zero-sum game. Everybody struggles to survive in a depressed market, where regulation measures are fought over bitterly. This climate has weakened the reform coalition, which now faces a difficult period plagued by opportunistic initiatives aimed at reversing reform achievements. As a result, the set of available options for entrepreneurs, consumers, and the government is further restricted.

Erosion of Support

Public disorder, insecure national and international economic conditions, regulatory institutions' lack of credibility, and uncertain distribution regu-

lation hardly make Colombia a haven for foreign investment. Harsh economic conditions and larger flows of refugees add to utilities' bad debts and multiply illegal connections. Taken together, these problems pose two serious consequences. First, foreign investors will demand returns on investment to make up for the risk. Second, they will tend to protect themselves through negotiation of special privileges (e.g., favorable fiscal treatment, bailout operations, or vertical integration). This lack of private sector appetite may limit the options available for solving distributors' problems.

Even so, current economic deterioration makes it harder for consumers to accept rate increases necessary to complete the sale process of distribution companies. The legitimacy crisis of the model, simultaneously stressed by tariff increases triggered by transmission constraints, the PPA debate springing from scandals and corruption claims in the TermoRío case, and the SSPD mandate have all eroded public support for reforms, thereby facilitating opposition from opportunistic politicians. As a result, numerous reform proposals have been put on the table and call for immediate action.

Although the limitation of State funds to invest in the sector can be taken as an assurance against reversal of privatization and costly public investment, this is no guarantee that public funds will be directed exclusively to high-priority works

The slight tolerance allowed by price volatility limits involvement of demand options as part of a strategy to ensure security of supply. Paradoxically, aversion to blackouts leads to more expensive service in the long run if valuable instruments to control them—namely price signals—are overlooked.

Concentration of urgent decisions in the hands of a relatively weak regulator limited by scant resources and restrictions of the judicial regime, deprive the regulator of a long-term vision, inducing it to preserve the status quo.

Road to Sustainability

Within this complex scenario, an array of proposals must come forward to counter current threats without compromising long-term reform objectives. Building upon sectoral diagnostics and keeping in mind constraints that limit potential options, the authors suggest that sustain-

able power service over the long term can only be achieved by re-establishing institutional legitimacy and credibility, and by setting clear priorities for public expenditure and private entrepreneurial participation that does not conflict with the reform's long-term goals.

Some of the proposed measures require changes in the regulatory framework, where the political opportunity to introduce reform can be as important as the reform itself; others call for no legal reform, and their immediate implementation would help improve sector performance.

Attracting private investors requires minimizing regulatory risks, while controlling market power and guaranteeing service quality require effective regulatory institutions. To this end, it is necessary to strengthen institutional legitimacy and credibility by eliminating constraints to performance, reassigning functions, minimizing conditions that permit opportunistic government actions, and adopting a more transparent and predictable regulatory style. The new regulatory framework must achieve a stable political balance, where partners are not interested in altering the status quo, even in the face of moderate shocks.

Reaching an adequate investment level also requires price signals and a better-functioning wholesale market. It implies participants' consensus for more realistic operational procedures in a segmented market, as well as more appropriate instruments to guarantee supply security.

Availability of State financial resources and capacity to acquire new ones are constrained by the commitments and requirements of the peace process; this leaves scant margin for public investment in the power sector, and forces the State to define its sectoral priorities and strategies. However, this budgetary constraint may not suffice in keeping the State from embarking on large hydroelectric projects publicized in recent electoral campaigns. Furthermore, difficulties in selling public distribution companies and avoiding regional politicians' opportunistic use of SOEs may increase an already heavy financial burden. Thus, it is imperative to build consensus around the limitation of State financial contributions and guarantees to provide service access to the poor and to guarantee continuity of supply, while avoiding entrepreneurial involvement.

Under these conditions, completing the privatization process and ensuring incentives for future private investment allow for no delay. However, maintaining investor interest, at the expense of a slightly

competitive market plagued by concessions to particular interests, could compromise the future of reform.

Analysis, adoption, and implementation of these suggestions belong to stakeholders in the Colombian power sector: the executive, legislative, and judiciary branches of government; regulatory institutions; and producers and consumers. To cope with the crisis, the authors outline an action plan that includes the following recommendations.

Recommendation 1: Build stakeholder coalition to support sectoral sustainability.

As an alternative to ongoing congressional proposals to reverse reform, the government should mobilize power sector stakeholders into a wide coalition to boost adoption of measures that seek to strengthen 1) institutional legitimacy and credibility, 2) prioritization of public expenditures, and 3) participation of private entrepreneurs that does not conflict with the reform's long-term goals.

Despite the moderating effect of the Inter-sector Commission of Public Utilities on discussing the many anti-reform proposals or elimination of Law 142, at the time of this writing, parliamentary groups and presidential candidates were still promoting them. While quality of political debate, particularly media coverage, has improved since the first signs of a sectoral crisis became evident (in early 2001), key public figures and opinion makers still misunderstand the true cause of current problems.

Forming a strong coalition of stakeholders around these principles is not easy; it mainly requires:

- ◆ ***A good understanding of the participation constraints of the stakeholders involved.*** Each stakeholder has minimum requirements without which it will not participate in a coalition to advocate the reform process. The behaviors of Medellín and Cali, private distribution companies, and other potential investors are dictated largely by these requirements. Therefore, these constraints, as well as those of influential politicians genuinely concerned about the system's capacity to supply power to the poorest groups, deserve special attention.

- ◆ ***Rallying public opinion and users without coverage and environmental groups.*** These stakeholders should be mobilized through a well-planned, public-education campaign to disseminate reform benefits and options to facilitate access by the poor without jeopardizing the sector's financial sustainability. To succeed, such campaigns must be accompanied by concrete measures to protect the reform from opportunistic, corrupt management that characterized the old regime.
- ◆ ***Negotiation.*** Better education and seeking stakeholder consensus and participation are as essential as negotiation. What are the parameters and resources for achieving this? What type of forum would be appropriate for legislation? Who should lead this effort? These are the key questions the stakeholder must answer.

Recommendation 2: Re-establish legitimacy and credibility of regulatory institutions.

The national government, within limitations imposed by the National Constitution, should carry out legal and regulatory changes to lift constraints that have affected CREG's performance and restructure the SSPD. CREG is responsible for adopting a regulatory style that will reinforce transparency and make its interventions more predictable.

Promoting SSPD Reforms

SSPD's legitimacy crisis stems from a design that assigns it functions that it cannot fulfill. Consensus among sector agents is reflected in the following recommendations:

- ◆ ***Recognize the heterogeneity of public services and special characteristics of electricity and telecommunications*** that reach beyond the local sphere, and are, in fact, a national and international market.
- ◆ ***Define intervention and liquidation criteria and appropriate instruments for implementation.*** Prior experience is an example of the failed intervention and liquidation mechanisms of utilities.

A legal solution is needed to enable immediate liquidation of utilities that have undergone intervention or to formulate financial and managerial requirements to bail them out.

- ◆ ***Delegate social control.*** SSPD capacity has been strained in responding to complaints filed by utility users. The organization has gone too far in promoting social control; it has assumed tasks that belong to municipal governments and participation committees to the detriment of its duties in utility supervision and control, which eventually influences politicization. Although the law compels utilities to hire external auditors, their application has not been successful and could be helped by better use of statutory auditing instruments—a good example of how to relieve the SSPD of its burden without deteriorating user rights. Freeing up the SSPD from tending to individual user complaints will enable it to channel resources toward measures capable of changing utility behavior and adequately defending its decisions in court.
- ◆ ***Reassign market-power control functions.*** Experience with power markets worldwide has confirmed how difficult it is to handle generators' market power with only ex-post control procedures. The best practices combine regulatory and control measures, assisted by market follow-up by a highly specialized body that can address recommendations of both the regulator and competent agency. This is the case in the markets of Alberta (Canada), California (U.S.), the Netherlands, and Panama.

The market operator would conduct detailed follow-up, process the information, and submit it to a group of international experts that would meet periodically to analyze it and make recommendations, either to CREG or the Superintendence of Industry and Commerce (SIC). The group's recommendations would permit CREG to issue resolutions required to make necessary market adjustments and allow SIC to process behavioral penalties and authorize acquisitions and mergers. This expert group would not involve increased bureaucracy because its members would not be public officers; rather, they would be part-time consultants, preferably foreigners, who could be assigned to the market operator, as in other countries, or hold a position in SSPD, similar to the Securities Superintendence's arrangement within SIC.

- ◆ **Reorganize SSPD's administration**, within the limits imposed by law and the Constitution, to make its operation more efficient and minimize incentives for opportunistic use, which favors cronyism.

Lifting Constraints to CREG Performance

Instead of reiterating the need for CREG to have formal independence as an end in itself, the authors believe it is more instructive to repeat the recommendations resulting from the experiences of other instruments with such independence: Eliminate the government's potential for opportunist action to expropriate private investment via price control or other mechanisms or use its regulatory role to favor State companies. The authors' specific recommendations are to:

- ◆ **Define CREG functions.** Although there are powerful reasons for a continuing presence of ministers in CREG, conflicts of interest could be reduced if responsibility for policies outside the regulator's control could be separately established beforehand.
- ◆ **Control potential opportunism.** Although excluding ministers from CREG could weaken the commission in the view of agents, opportunistic actions by the State could be controlled by modifying its internal rules to qualify decisions that the government can veto or through the credible commitment implicit in submitting certain decisions, such as market power, to an independent group of experts for recommendation. The regulatory style changes suggested below also tend to compensate for formal independence.
- ◆ **Select and remunerate experts and use resources.** The regulator's efficiency depends ultimately on the prestige of the commissioned experts and the timely access they may have to the most respected consultants worldwide. It would require a government study and implementation of procedures that would permit competitive remuneration to the future commissioned experts and CREG technical staff. Although certain inabilities and limitations appear to originate in a biased interpretation of the law, others may call for modification.

Changing Regulatory Styles

- ◆ **Transparency.** Despite recent progress in regulatory process transparency, a steady course in this direction is fundamental. Although many of the authors' suggestions point toward transparency, they must be complemented by formal accountability proceedings, such as annual reporting to Congress on performance of adopted regulations, which includes all of the country's existing control proceedings. CREG should make all of its rulings based only on public information.
- ◆ **Predictability.** Contrary to a popular claim, market intervention is legitimate within the general regulatory framework and is the rule, not the exception, worldwide when conditions that made competition possible are no longer valid or prove inadequate. From this perspective, given the inevitability of changes and adjustments, the conditions must be predictable, adjusted to principles, and executed transparently, with clear criteria for their advisability.
- ◆ **Self-analysis of CREG's regulatory style.** With the help of consultants, CREG should carefully analyze its regulatory procedures in order to assess institutional transparency, predictability, tendency to micromanage, and overall regulatory style.

Recommendation 3: Strengthen the wholesale energy market.

To re-establish its credibility and that of the wholesale market, CREG must adopt modifications in design of the wholesale market to facilitate control of market power and ensure continuity of supply.

Preventing and Controlling Market Power

In addition to the suggested market follow-up committee, which would advise CREG on adjusting rules when called for, explicitly recognizing the fragmented condition of the market would make CREG's activity more predictable. For this purpose, a conditional rule would be established:

Observing an internal indicator, such as network conditions, triggers special norms that consider the scope for competition in each segment. Thus, for example, the factors defining must-run generation and the remuneration that would apply under these circumstances would be identified beforehand, as would the indicating level that triggers the system back to normal.

Besides the technical problems implicit in maintaining continuity of supply under current public-order conditions (the gap between actual and ideal dispatch is ever increasing), market fragmentation increases the potential for agents to exert market-power practices. However, when CREG intervened in the market in early 2001, generating companies protested in unison, claiming that the government changed the rules of the game to expropriate income to which they were entitled.

Several generators interpreted the regulation as an inflexible rule under which SSPD could determine only *ex post* if there was market power, regardless of the operational conditions of the grid. The generators oppose the government's discretion to define market-power conditions *ex ante*. However, as Dixit (1996) mentions, all parties in these cases win if the regulator gains credibility by giving up discretion to change the rules. This does not imply unconditional signaling of future regulation; rather, it can be interpreted as a rule of conditional response adopted as a function of other variables. Rules of this type are better than discretion, while unconditional rules are not.

Conditional rules must be applied simply to avoid future opportunistic use. The regulator must be positioned to balance trade-offs between flexibility and credibility. Dixit suggests that ideal regulation combines simplicity with the advantages of having inflexible rules for certain circumstances and flexible rules for others, as well as contingencies for changing regimes.

In the case of Colombia's fragmented market, submarket size or the cost of constraints could be used as criteria. When parameters are within the range, the existing rule would apply, because assumptions about an integrated market are reasonably true. Conversely, when the variable is out of range, flexibility is required; in such a case, it would be better to operate submarkets independently or move to cost-based regulation. Identification and quantification of such parameters are technical prob-

lems not inherent in the rules of the game. If agents are unable to manipulate the parameters that trigger change, then this method surpasses imposing ceilings that could become focal points.

Ideally, CREG would present clear rules of the game for segmented markets, indicating how they should operate in this circumstance. It would make explicit the conditions under which these special rules would become operational, defining the types of market segmentation, associated rules, and criteria for returning to regulation under normal conditions. To change from one regulation to another necessarily implies certain costs that may result from litigation and other delays caused by the frustrated expectations of generation companies that benefited from high prices. However, as Dixit (1996) states, these payments can be lower than the present value of benefits associated with the measure. The criterion suggested to define the alert threshold must be the one that equals benefits and costs.

Even if the Colombian market operated free of transmission grid constraints, generation companies would be in a position to exert market power. The fact that three generation companies own nearly 50 percent of installed capacity makes problems associated with the functioning of the wholesale market (method to make energy offers) and institutional weaknesses in supervising competition permanent threats. As Joskow (2001a) mentions, it is not possible to offer a solution without taking into account those who will be in charge of implementing it. In this case, measures to control market power must consider and overcome SSPD limitations. California's recent experience is a reminder that controlling market power ex post is difficult. At no time did the U.S. Federal Energy Regulatory Commission issue any resolution confirming market power activities due to the paperwork and serious legal consequences involved, although expert studies determined the existence of such practices (Joskow, 2001b). Leaving the task up to SSPD exceeds its potential, even endowing it with the resources of an OECD country's supervision-and-control institution.

Guaranteeing Continuity of Supply

In theory, the price signal would suffice to ensure a balance of supply and demand, and brisk increases in pricing necessary to compensate all secu-

rity generation would be politically non-viable. Recent events in California and Brazil are costly reminders of the State's accountability for supply continuity, regardless of circumstances, as the only way to avert a governance crisis. This creates a temptation to assign the State the role of last-resource generator. The way in which this responsibility is developed is vital for system sustainability.

The importance of clarifying responsibility for supply security cannot be overemphasized. Given reluctance or inability to rely on short-term price signals—a direct result of handing over supply-security responsibility to consumers—this responsibility must be placed elsewhere. The most natural (or perhaps only) place would be with retailers (i.e., distribution companies), who would cover customer demand with capacity contracts or enter into contracts for interruptible demand. This measure should be complemented by giving the system operator responsibility for ensuring short-term balance of supply and demand (this would require entering into contracts for reserve capacity and interruptible demand). Clarifying responsibilities is fundamental to establishing market-based solutions to the supply-security problem; indeed, clarifying responsibilities relieves the regulatory authorities from participating in long and difficult debates on alternative instruments.

Putting these principles into practice involves:

- ◆ Assigning retailers (distribution companies) responsibility for covering demand of customers with capacity contracts (and/or entering into contracts for interruptible demand).
- ◆ Appropriate pricing during times of shortage, gradually increasing exposure of demand to spot prices, but reducing volatility.
- ◆ Redesigning transfer of generation costs to regulated users without distorting price signals to reflect seasonal differences in generation costs, while offering alternative handling of demand.
- ◆ Assigning the market operator responsibility for auctions to purchase power and/or demand from co-generators well in advance to cover shortages during dry seasons. For this measure to have larger repercussions, clarification of the ambiguities in Law 143, which punishes co-generators above 25 MW with a 20 percent surcharge, would be required.

- ◆ Designing, in advance, an incentives program to encourage power saving during shortages by regulated users, with specific goals, bonuses, and penalties modeled on the successful program conducted during Brazil's recent crisis.

Recommendation 4: Remunerate investment adequately.

CREG is responsible for issuing regulations that permit private involvement in State companies in a way that will not compromise long-term reform interests. In regulating distribution and transmission, the first review of distribution charges should consider the following items:

- ◆ Recognize that investors face risks involving payment capacity of users and initial conditions of the company and its market; these risks will vary, depending on whether the enterprise is privatized, in the process of privatization, or public. Alternatives for handling this include different remuneration for new and old investments and incorporating explicit and implicit investment commitments at the time of privatization to avoid diverting funds created by the tariff scheme. To the extent possible, the State should not impose added risks on investors resulting from its own failure to comply with commitments or from regulatory deficiencies in recognizing non-manageable costs. The degree to which the government can keep these risks at bay should be reflected in entrepreneurs' remuneration.³⁹ Utilities must have clarity regarding their commitments as last-resource distributors in the case of substandard neighborhoods, worsened by the refugee problem.
- ◆ Maintain efficiency incentives implicit in the permissible loss threshold, particularly for those who already have them. Review certain levels, if needed, as long as they are compensated by lower capital remuneration.

³⁹ The Constitutional Court, like the recent ruling by the Superintendence of Societies, rejects the new capital structure proposed by CODENSA.

- ◆ Discuss the proposed review of distribution charges at a high-level seminar, with the participation of international experts and regulators from other countries who are involved in the same process.

Clearly, a crucial element in this problem is finding an appropriate procedure to adjust commercialization and distribution charges. Adjustments suggested by distribution trading companies aim to increase the rate of return and to raise O&M cost allowances; however, it implies a step backward in efficiency incentives for losses recognized in the tariff formula. Distribution companies serving high-density markets, such as Bogotá and Medellín, have succeeded in reaching the loss-threshold recognized by the regulator (14.75 percent), while other companies, particularly those serving low-density markets, continue with levels above 25 percent. The distribution sector has proposed increasing the level of recognized losses up to 16-20 percent, according to the company, and a general increase in the rate of return on fixed assets at replacement cost. Efficient companies argue it is not possible for them to maintain current loss levels, a claim difficult to verify, given the information asymmetry. The question is how to get them to invest in loss control, while permitting them to keep part of the rent. In principle, the incentive to reduce non-technical losses is high power, because it permits them to increase revenues by investing only in programs that aim to combat illegal or irregular connections, as has been the case with most successful utilities in Latin America. Nonetheless, the incentive is less when losses are already low, and marginal cost of reduction increases (e.g., EPM and CODENSA) or when the agent is not neutral to risk, such as a company with serious initial financial problems (e.g., Coast and Caribbean). The trick is to achieve recovery from financial problems, but also commit to injecting new resources into its operation.

If distribution companies could choose between a low return and a high level of recognized losses, they would have more incentive not to delay the loss problems.⁴⁰ If the investment plan of capitalized companies

⁴⁰ This proposal has its inspiration in contracts offered by the Federal Communications Commission to Bell's U.S. regional operators; the choices were low price caps and sharing of a high-profit percentage or vice versa (see Dixit, 1996).

has a component for these purposes, CREG could temporarily include a higher threshold, subject to plan compliance. While this strategy may be impractical at this stage in the tariff review, it focuses the authorities' attention on seeking a general solution to the tariff formula instead of embarking on individual negotiation of each parameter. Whether recognition of higher losses or acceptance of a higher return on assets, these adjustments result in higher consumer prices, which call for readiness. Renowned regulation experts have expressed doubts about the soundness of using the value of new investment as a tariff base (Newberry, 1997; Kahn, 1988); this explains why the definition process would benefit from a highly qualified group's review of the methodology. It might be more prudent to subject permanent adjustment of the tariff formula to the results of more careful analysis, but with clearly defined principles and temporary adjustments that work in the right direction if adjusted to the situation. The regulator cannot afford to revert to hasty decision-making.

Recommendation 5: Prioritize use of State funds.

Use of State resources would target efficient service coverage of the poor, capitalize DISCOS if private investors fail to do so, and, in rare cases, support the market in measures aimed at guaranteeing continuity of supply, without involving the State as entrepreneur. It is within the national government's authority to ensure that the State's entrepreneurial role is minimized and that measures are taken to independently handle assets that, for some reason, are still under its control.

Priorities

Four major uses of State funds would be to:

- ◆ **Prioritize total service coverage of the poor.** This will legitimize the reform. Royalty funds, for example, could go toward normalizing the grid in substandard neighborhoods and provide the poor energy-efficient lamps to maximize consumption efficiency and keep bills low. When added to legal penalties, this could help to create a discipline of payment. On the other hand, opening up

the privatization process will permit use of public funds for urgent needs, such as increasing service coverage.

- ◆ ***Capitalize distribution companies during the transition.*** If private capitalization of distribution companies fails to materialize, the State should capitalize them to permit the trust to maintain service and reduce losses.
- ◆ ***Comply with State responsibilities as ultimate supplier,*** using the private sector or communities organized in the areas not interconnected (ZNI), rather than State utilities.
- ◆ ***Abolish guarantees or preferential treatment for State enterprises,*** especially large hydraulic projects that would severely affect the competitive market.

Some interests argue that, as guarantor of supply security, the State must be prepared to physically deliver the service; for this reason, it must maintain public utilities capable of developing generation-expansion projects and provide service directly in zones not covered privately. Reckless use of ISAGEN to bail out unwise regional hydroelectric projects and failure of the Institute for Energy Solution Planning and Promotion (*Instituto de Planificación y Promoción de Soluciones Energéticas - IPSE*) to expand service to off-grid customers demonstrate the dangers implicit in this paradigm. The State can carry out this function without having to maintain ownership of companies that rent-seeking regional politicians continue to exploit.

The recent example of Brazil illustrates how it is possible for the State to comply with its commitment of guaranteeing supply continuity without having to revert to its entrepreneurial role. In the initial stages of this case, SOEs proposed constructing new generating plants, claiming that the private sector would be unable to alleviate the existing supply deficit. Yielding to their demands would have strengthened them, protracted their privatization process, and created an incentive to justify their perpetuation. The Brazilian government decided to use resources only for supplying “emergency generation” during the time necessary for reservoirs to recover reserves and construct power-transmission lines. While Eletrobras will have a role to play in constructing transmission lines, it will have limited participation in joint ventures with the private sector; the task of providing emergency power has been given to a specialized agency.

State resources can also be used efficiently to guarantee universal coverage of electricity service. Two key national government proposals that aim in this direction are expanded coverage of the ZNIs (approved by CONPES), and a resolution issued by CREG to establish criteria to legalize illegal connections in substandard neighborhoods. The government has commitments to earmark part of the funds from privatization to improve ZNI coverage. States and municipalities are also expected to dedicate a portion of the resources they obtain from the National Royalties Fund to construct new distribution networks and other works necessary to legalize illegal connections. At any rate, assuming that communities would be willing to pay for the service may be optimistic. While steps are being taken in the right direction, there are obstacles to implementation that the national government could help overcome. For example, part of the subsidies for irregular connections could be dedicated to free installation of efficient lighting to reduce power consumption in low-end neighborhoods, as was done in Brazil. This would not only legalize illegal connections (thereby reducing non-technical losses); bills would be lower, and users would be able to pay their bills on time. The importance of a quick, firm solution cannot be overemphasized; it is crucial to satisfy participation requisites of actors with significant veto rights.

State as Entrepreneur

To avoid conflicts of interest because of its multiple roles as regulator, entrepreneur, and guarantor of efficient control of utilities where it is a controlling stockholder, the national government must have its stocks professionally represented through trusts, with a clear mandate to privatize or temporarily administer them, including negotiations of PPAs whenever advisable. The MME would not be answerable for them, and would no longer sit on their boards of directors. The Minister of Finance would be accountable for required funding.

Scant State resources and dangers of opportunistic use make completing the privatization of distribution companies indispensable and call for sale of its stakes in CORELCA and possibly ISAGEN, while keeping those in ISA. The State must fight the temptation to become directly involved as an entrepreneur in order to comply with the constitutional mandate of securing power supply and the goal of universal service.

Privatization of Distribution Companies

Privatization of DISCOS depends first on adopting fair regulation and finding solutions to the financial problems that still affect distribution companies along the Caribbean coast. Second, the government must be committed to exerting control over State DISCOS and avoid corruption cases during the capitalization process. It is likely that new delays will arise in the privatization program and that some distribution companies will fail to be capitalized; this explains why the government must have a contingency plan in place. Third, the State must find an efficient solution to guarantee payment of its agencies' electricity bills. Fourth, it must explore the advisability of negotiating some PPAs and BOTs to facilitate capitalization of DISCOS. Fifth, it is urgent for the State to face the problems of utilities where intervention has occurred. Finally, given current constraints, the short-term challenge is to complete privatization of national government-controlled distribution companies, known as the EDCGN (*Empresas Distribuidoras Controladas por el Gobierno Nacional*), even though only a few agents may be interested.

The importance of transparency in the capitalization process, need for a contingency plan to manage the SOEs if capitalization is delayed or nonviable, State compliance with consumer obligations, and development of an efficient mechanism for intervention of troubled companies are factors that cannot be overlooked. However, deciding whether to renegotiate PPAs and BOTs will depend on their individual characteristics and the difficulties imposed for capitalization or divestiture of DISCOS. In cases such as Paipa IV's PPA, the necessity for renegotiation is more evident; in other cases, like TermoEmcali, a satisfactory solution might be found; in still others, it would not be needed.

Given current market conditions, few prospective investors are interested in capitalization of these distribution companies. It is important to resolve the conflicts arising from concentrating distribution among Union Fenosa, Endesa, and EPM, which can exacerbate asymmetry in regulation and vertical integration problems. Ensuring competition in generation is even more difficult if structural constraints in the sector are eliminated, which increase vertical integration as a bait to attract investors to distribution. While market concentration can prevent competition, it

may be reasonable, given Colombia's security conditions, to allow EPM to bid on some utilities subject to capitalization or to execute a mandate, especially in association with private Colombian investors, if the structure of the generation market is not affected.

MME presides over CREG, ISA, the ISAGEN boards of directors, and the boards of the 13 EDCGNs, and has publicly expressed the awkwardness of the situation and of wearing so many hats simultaneously. This conflict of interest could be resolved if management of State assets were commissioned to a private fund (with clear management goals) until privatization is completed; this is what SSPD should have done with the utilities in which it has intervened, instead of running them with its own staff and reaping poor results. Of course, this proposal does not exempt the government from making necessary capital investments to guarantee operation of these companies.

Privatization of Generation Plants

Privatization of generation plants depends on the solution given to the distribution trading companies. It also demands resolving the conflict with EPM, resulting from its interest in consolidating the group of power plants in the Nare and Guatape river chain (San Carlos [1,240 MW] and Jaguas [170 MW] plants). This conflict arises because control of the chain may give EPM the ability to exercise market power, but it is also fed by the dispute between EPM and ISAGEN over use of storage water in the El Peñol Reservoir.

Discussion continues about the advisability of adopting a corporate structure in Medellín that could allow private sector participation and maximize benefits for the population, as was the case in Bogotá. Early in his administration, the current mayor of Medellín proposed (but later recanted) limiting EPM investments to those required to serve its own market. Determining the wisdom of these proposals is the privilege of the citizens of Medellín. In any case, the regulator should be vigilant about opportunities to exercise market power that an aggressive growth strategy may present. However, in the case of continued public ownership, the regulator must ensure that this feature does not undermine the level playing field among competitors.

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CHAPTER THREE

Honduras: The Road to Sustainable Reform

Ian Walker and Juan Benavides

Honduras has advanced more slowly than many other countries in the region in power sector reform, having only partially implemented its first reform, which was legislated in 1994. The second attempt in 1998 dragged on for three years before stalling in mid-2001. Using the analytical framework presented in Chapter One, this chapter analyzes the recent history of the electricity sector in Honduras and describes the achievements, constraints, and options for correction. In particular, the chapter considers questions in the following four areas:

1. **Governance:** To what extent has the electricity sector moved from the “State as entrepreneur” to the “State as regulator” model, with private participation in the productive activities of the sector (generation, transmission, and distribution)?
2. **Market structure and architecture:** How much progress has been made replacing monopoly providers and “cost-plus” regulation, which tend to condone inefficiency and promote over-investment, with competitive markets that can produce efficiency gains and improved value-for-money for consumers?
3. **Sustainability:** What are the political, institutional, and physical constraints to reform implementation and future sustainability?
4. **Reform strategy:** How do answers to the above questions inform the design of an appropriate and sustainable reform process?

The key constraints to success of the reform strategy include non-viability of State-financed expansion because of high debt and limited borrowing capacity, unfavorable investment climate, limited electricity demand and restricted market, weak regulatory capacity, weak sectoral governance, and widespread public skepticism about the consumer benefits of privatization. Based on these constraints, we make recommendations that aim to promote increased private investment and improve sector governance.

We begin by analyzing the recent history and performance of the Honduran electricity sector, showing how the partial reform of 1994 eased the sector's financing constraint through recourse to power purchase agreements (PPAs), but did little to modernize its governance or architectural structure. We also consider the outcome of the failed effort, begun in 1998, to implement second-generation reforms. In light of this diagnosis, we then analyze the goals of the reform process; how the new model addresses them; and political, institutional, and physical constraints. Finally, we propose a "rolling" reform strategy based on prioritizing problems and solutions.

History of the Electricity Sector

Over-expansion and Crisis: 1984-93

The traditional *état* model of the Honduran electricity sector dates back to 1957, when the vertically integrated National Electricity Company (*Empresa Nacional de Energía Eléctrica* - *ENEE*) was formed. The State model had its heyday in the early 1980s, when the company undertook ambitious hydroelectric expansion by constructing the 300-MW El Cajón dam; at a capital cost of \$680 million, the dam increased installed capacity by 144 percent (Table 3.1).¹

However, the borrowing that financed this investment proved unsustainable. Expanded capacity far exceeded demand; the spare capacity intended to generate export revenues failed because of regional limitations in interconnecting Honduras to Nicaragua, Costa Rica, and Panama. Moreover, the domestic tariff was not adjusted to cover the cost of debt

¹ Some sources estimate the final cost of El Cajón as high as \$1.2 billion, including interest payments on the loan.

Table 3.1. Capacity and Demand in the Honduran Electricity System, 1980-99

Year	Installed capacity (MW)	Maximum demand (MW)	Net generation (GWh)			% private	% load factor
			Public	Private	Total		
1980	207.8	207.8	854.2	0.6	854.8	0.1	63.3
1985	560.3	560.3	1,346.2	5.7	1,351.9	0.4	63.5
1990	532.6	532.6	2,273.6	0.0	2,273.6	0.0	63.1
1995	755.9	755.9	1,914.9	882.7	2,797.6	31.6	63.0
1996	753.0	753.0	2,042.2	1,020.3	3,062.5	33.3	64.1
1997	729.0	729.0	2,127.0	1,074.0	3,201.0	33.6	63.3
1998	775.0	775.0	2,196.8	1,313.7	3,510.5	37.4	62.5
1999	906.3	906.3	2,175.2	1,252.9	3,428.1	36.5	61.5

service. Instead, an aggressive rural electrification program resulted, which incorporated additional loss-making clients into the system. Eventually, ENEE stopped paying debt service to the Finance Ministry. This contributed significantly to Honduras' 1989 debt default with the multi-lateral financial institutions. Following that, currency depreciation (as part of the resulting adjustment package) eroded the dollar value of tariff revenues, further crippling ENEE's debt-service capacity.

In the early 1990s, capacity expansion was halted, in part, because it was perceived that the El Cajón dam more than sufficed to cover potential demand and because of ENEE's continuing financial insolvency. The international financial institutions (IFIs) changed their policy on financing infrastructure investment in electricity through loans to governments, preferring to promote the incorporation of private finance. In this setting, access to IFI financing was suspended, making it impossible to commission new in-house capacity during this period.

However, the multi-year drought of 1990-94 quickly led to a severe energy crisis, with major nationwide outages for nine months during 1994.²

² The El Cajón (Francisco Morazán) hydroelectric system is a "foot of reservoir" plant, which loses up to 50 percent of capacity when water levels are low.

This crisis was unnecessarily worsened by the failure to maintain ENEE's reserve thermal capacity in operating condition for emergency use.

First-generation Reforms: 1994

The 1994 energy crisis opened the way for first-generation sectoral reforms in the context of a sectoral reform loan supported by the World Bank and the Inter-American Development Bank (IDB). The 1994 Framework Law, which is still in force, was the first electricity-sector modernization law to be passed in Central America. It was based on the Chilean model and provided for a separation of functions (policy, regulation, and service production). The principal motivations for the reform were the inefficiencies and capacity constraints of the State-owned system. The law was promoted by the IFIs (International Monetary Fund, World Bank, and IDB) as part of the structural adjustment process that had begun in 1990. Once the macroeconomic situation had been corrected, electricity was one of the first focuses of sectoral adjustment loans. The Honduran government was strongly committed to using private sources for the future growth of generation, and was also motivated by the offer of balance-of-payments support under the reform operation. The law sought to:

- ◆ Strengthen ENEE's financial situation by institutionalizing cost-based tariffs overseen by a sector-specific regulator.
- ◆ Promote private investment through privatizing distribution and PPAs in generation.
- ◆ Increase efficiency (ENEE was heavily overstaffed and inefficient on standard international comparisons, such as system losses).

Sector Governance

Under the 1994 Framework Law, an Energy Cabinet charged with defining sectoral policy meets on an ad-hoc basis to deal with crisis situations. On a day-to-day basis, sectoral policy is the responsibility of the Environment and Natural Resources Secretariat (*Secretaría de Recursos Naturales - SERNA*), whose Energy Directorate is charged with ensuring sufficient capacity and power supply. However, SERNA's sectoral leadership is weak, and its principal electricity concern is promoting renewable energy sources. In practice,

sectoral planning is still done largely within ENEE, and it is striking that SERNA did not play a lead role in promoting the new reform in 1998-2001.

Because SERNA has environmental control of new electricity projects, a conflict of interest could arise regarding policies for proposed expansions. However, this arrangement also has a positive side, in that it is easier to negotiate settlements on the trade-offs between environmental and energy-sector concerns, thereby avoiding the type of standoff that recently led to California's problems in expanding generating capacity.

The National Electricity Commission (*Comisión Nacional de Energía Eléctrica - CNEE*) was created under the 1994 law as a single-sector regulator. Prior to passage of this law, the regulator was the cross-sectoral National Supervisory Public Services Commission (*Comisión Nacional Supervisora de Servicios Públicos - CNSSP*). CNSSP had negotiated a contract plan with ENEE as an interim measure, pending the (supposedly imminent) privatization of distribution. In 1997, the government changed the law to reduce CNSSP's independence and changed its name to the National Energy Commission (*Comisión Nacional de Energía - CNE*).

Although CNE is formally "deconcentrated," (i.e., it forms part of SERNA, yet maintains a high degree of operational independence), it is generally considered weak. The executive branch controls CNE through the president's direct nomination of all commissioners for the four-year administrative term. The commission also lacks fiscal independence (SERNA controls its budget) and is technically weak, heavily depending on ENEE for information and analysis. Users have no effective rights regarding the right to access or quality of services.

Honduras' legal and administrative regulatory setting is also deficient. The country lacks general antitrust legislation, and the judiciary has historically been highly politicized and incompetent. However, efforts are under way to modernize the judiciary and strengthen its independence. Moreover, the National Congress has an Energy Commission that oversees electricity legislation.

Market Structure and Architecture

The 1994 Framework Law proposed vertical unbundling of the sector through the privatization of distribution, but this was never implemented.

The sector therefore remains centered on the vertically integrated state monopoly, ENEE. The company remains in direct charge of all hydraulic generation, transmission, distribution, planning, and operation of the dispatch center. Billing, collection, and generation are also outsourced to private suppliers. Most thermal generation is undertaken by private companies on contract to ENEE through PPAs, leasing contracts, and co-generation agreements. ENEE also has a statutory monopoly on external trade in electricity.

ENEE operates economic dispatch based on short-term marginal prices negotiated in PPAs and their respective indexes. A Stochastic Dual Dynamic Programming Model (MPODE) is used to minimize the expected discounted cost of the future operation of the interconnected system's hydro and thermal plants based on projected demand, fuel prices, and water-inflow probabilities. An arbitrarily determined value for the cost of unmet demand is also used as part of the calculation. Programming is done on a monthly basis. Once hydro dispatch has been determined, the residual demand is assigned to the thermal plants in economic order, based on the short-term marginal costs to ENEE of dispatching each of the available plants. PPA owners are allowed to lower their offering price below the negotiated ceiling to improve their chances of being dispatched.³

Private-sector, renewable energy projects up to 50 MW are given special treatment in the dispatch rules. To promote renewable energy, ENEE is required to purchase power from any private hydro, solar, or similar source at the system's marginal cost, plus 10 percent.⁴ Once a long-term contract is signed, ENEE is obligated to take all of the power available from the plant at the contracted price, which reduces the investor's market risk.

This arrangement has been criticized for placing these plants outside the rationality of the centralized dispatch mechanism. However, this objection reflects confusion between the concepts of the financial contract and the economic value of the resource. Since there are no capacity payments for these plants, the financial remuneration for each kilowatt

³ This adjustment of prices is made after the MPODE is run, so the outcome is sub-optimal.

⁴ As specified in Decree 267-98 and Article 12 of the 1994 Framework Law.

hour dispatched includes that for the capital investment, which, in turn, makes it necessary to guarantee the purchase of power from the plant.⁵ However, in principle, there is no reason why these plants should not be dispatched on the basis of the economic value of the water, as calculated in the MPODE.

At present, three private hydro plants are in varying stages of development: Cangrejal (50 MW), Babilonia (4 MW), and Yojoa (0.7 MW); in addition, a 60-MW wind generation project is in preparation at Cerro de Hule, south of Tegucigalpa. The contract for the Cangrejal project specifies prices according to the period of dispatch: 8.7 cents for peak hours, 6 cents for intermediate hours, and 4.5 cents for off-peak hours. This price structure was agreed on to give the developer an ex-ante incentive to build storage capacity into what would otherwise have been a run of river plant.

With regard to transmission, ENEE has historically set rates for private use of the transmission grid and has used them to defend its profitable contracts with large consumers against the incursion of private generators. Recently, however, regional agreements have been reached in Central America, which should lead to the rationalization of transmission tariffs.

Fiscal Regime

ENEE enjoys preferential treatment in fuel, municipal, and sales taxes. Private and public generators compete for sale to third parties (large consumers) on an uneven playing field, as tax exceptions on fuel imports are allowable only when they sell the energy they generate to ENEE. Efficient technologies, such as co-generation, face entry barriers for the same reason.

⁵ The reason no capacity payments are offered is that ENEE has no legal mechanism for determining their value outside the setting of a public contract auction of the sort used in PPAs. Renewable energy projects are developed by individual entrepreneurs without any element of competition for a given site. The law only allows for contracting the purchase of energy per kilowatt hour; for renewable sources, ENEE may not pay more than 10 percent above the official short-term marginal cost, as estimated by MPODE. Arguably, lack of a mechanism to make capacity payments for renewable sources is a significant bias against development of this type of energy and is scarcely offset by authorization to pay 10 percent above the short-run marginal cost of the system, as calculated by MPODE.

User Tariffs

The 1994 law sought to ensure tariff sustainability by tying rates to long-run marginal costs (LRMC). However, it mandated cross subsidy from high-volume to low-volume consumers.

The tariff charged to users has four components: generation, transmission, distribution, and substation. The generation component, calculated by MPODE, is then fed into a financial model that takes into account the costs of contractual capacity commitments to ENEE (e.g., under the PPAs) to determine the generation tariff of \$0.057 per kWh (Table 3.2).⁶

Table 3.2. ENEE User Tariff, March 2000

Component	User Tariff US\$/kWh
Generation	0.057
Transmission	0.010
Substation	0.029
V/A Distribution	0.012
Total	0.108

Formally, the system is supposed to set generation tariffs based on system marginal costs as described above. It seems more than coincidental that the resulting calculation results in revenues sufficient only to cover ENEE's financial costs. If the tariff really represented the system LRMCs, given the high proportion of hydro capacity at sub-marginal costs, ENEE ought to log a comfortable profit. But the definition of marginal cost is such that it falls well below the total financial cost of most PPAs and rental agreements. The economic rent on the old hydro capacity is therefore being used to pay for the high costs of the PPAs. The average financial cost of privately generated power to ENEE, including capacity costs, is \$0.092 per kWh; but this is offset by the relatively low financial cost of the hydropower to ENEE.

⁶ This figure does not take into account transmission losses. According to CNE data, the cost per kilowatt hour of net generation losses is 7.1 cents.

The components for transmission and distribution are added to this to obtain the total tariff (Table 3.2). However, the tariff does not cover the full economic cost of distribution and transmission, but rather the real financial costs incurred by ENEE, leading to a low component for distribution.

Based on international experience, privatization of distribution and a shift to a full-cost tariff would likely lead to tariffs for that component of the service of about 3 cents per kWh, well above the 1.2 cents presently collected. There has been little investment in transmission in recent years (leading to weaknesses in the transmission network that will limit the scope for trade in power across the network under a wholesale-market scenario).

Effective tariffs (i.e., the amount finally collected from users) are generally lower than in neighboring countries, according to data from the Economic Commission for Latin America and the Caribbean (ECLAC). Total income per kWh generated is \$0.064 in Honduras, compared with \$0.074 in Nicaragua and \$0.081 in Panama; only Costa Rica is lower (\$0.057). Income per kWh sold is \$0.081 in Honduras, compared with \$0.105 in Nicaragua, \$0.101 in Panama, and \$0.064 in Costa Rica (no ECLAC data are given for Guatemala and El Salvador).

The tariff structure to final users is complex (Table 3.3). The basic tariff has a stepped rate, which generates cross subsidies in favor of small consumers. There is an added surcharge on the total consumption of any consumer above 500 kWh per month. This results in considerable differences in billings per kWh, depending on the client's consumption range (Table 3.4). There is no real-time pricing for any system user or time-differentiated tariffs, although the law allows ENEE to implement their

Table 3.3. Domestic Tariff Structure

KWh/mo.	Lempiras/kWh
0-20	8.03 (min. rate)
21-80	0.8117
81-300	1.1832
301-500	1.3758

use. Responsive pricing would reshape the load duration curve, transferring some peak load to the knee and the base of the curve, with corresponding reduction in capacity expansion requirements.

Table 3.4. Residential Consumption Structure, June 2000

Consumption KWh/mo.	Users (%)	Averages		
		Lempiras/ client	KWh/ client	Lempiras/ kWh
0-20*	17.6	8.0	4.5	1.8
21-100	18.2	32.5	49.7	0.7
101-300	45.1	184.5	195.4	0.9
> 300	19.1	698.2	558.8	1.2
Total	100.00	223.8	204.6	1.1

* The lowest consumption range has the right to up to 20 kWh for the minimum charge of 8.0 Lempiras. This gives a per-kWh cost of 0.4 Lempiras; however, because many users consume such small amounts, a high average unit cost (1.8 Lempiras) results.

Source: National Electric Company (ENEE).

Subsidies

The Honduran Government has two direct subsidy programs: 1) domestic consumers who use less than 300 kWh per month and 2) new connections via the rural electrification program. The first program, initiated in 1997 at a cost of \$18 million per year (as of 2001), represents about 7 percent of ENEE income and benefits mainly non-poor households.⁷ Rapid expansion of coverage in low-income areas has stressed the budget significantly. During 2001, the government had to adjust the formula for calculating the subsidy to keep within the budgeted amount, even though it had increased the budget by 6.6 percent in real terms.

The subsidy to expand coverage totaled \$23.5 million in 1997-2000. This money is granted to ENEE and covers per-connection costs of \$300-500. ENEE expects to lose money on most of these connections, as they

⁷ According to the World Bank (2000), 86 percent of the total goes to those who consume more than 100 kWh, 80 percent of whom are non-poor users.

represent low-volume consumers whose consumption tariff does not even cover the variable cost of supplying them because of the cross-subsidy system, and whose inclusion in the system tends to lower the overall load factor, as their consumption is concentrated during peak hours.

Effects of 1994 Law on PPAs

Expansion of Private Generation

Although the first PPA (with ELCOHSA) predated the 1994 law, passage of the law provided a secure basis for the purchase of power from private generators, and, through the second half of the 1990s, ENEE commissioned several batches of thermal capacity through PPAs, which led, by the end of the decade, to a market share for private generators of nearly 45 percent of installed capacity and close to 37 percent of power generated (Table 3.5).

Table 3.5. Capacity, Generation and Plant Factors by Source, 1995

Source	Installed capacity		Net generation		Plant factor
	MW	%	MW	%	%
Public	501	55.2	2,175,229	63.1	50.7
Hydraulic	433	47.7	2,130,333	61.8	57.5
Thermal	68	7.5	44,896	1.3	7.7
Private	406	44.8	1,269,506	36.9	36.5
Hydraulic	1	0.1	1,565	0.0	24.4
Thermal	405	44.7	1,267,941	36.8	36.6
Total	906	100.0	3,444,735	100.0	44.4
Hydraulic	433	47.8	2,131,898	61.9	57.4
Thermal	473	52.2	1,312,837	38.1	32.4

Table 3.6 shows the cost of energy acquired under PPAs and rental contracts between January and October 2001. These contracts include payments for capacity and separate payments for dispatch cost. Some PPAs and rental contracts are expensive (15.1 cents per kWh for LUFUSSA 1 and 18.5 and 18.3 cents per kWh, respectively, for the rental contracts of *Nacional de Ingenieros* and *Laeisz*); however, these are not

Table 3.6. PPA and Rental Contract Generation and Costs
(*Monthly averages, Jan.-Oct. 2001*)

Supplier	Capacity		Generation		Plant factor		Unit cost (\$/kWh)		
	Mw	%	Mwh	%	%		Total	Fixed	Variable
ELCOHSA	80.0	20.0	275,188	17.0	47.8		0.107	0.044	0.063
EMCE 1	82.0	20.4	278,259	17.2	47.1		0.076	0.016	0.060
EMCE 2	55.0	13.7	324,917	20.1	82.0		0.071	0.026	0.045
LUFUSSA 1	39.5	9.9	204,481	6.5	36.7		0.151	0.076	0.074
LUFUSSA 2	77.0	19.2	498,186	30.8	89.9		0.069	0.024	0.045
Subtotal	333.5	83.2	1,481,032	91.7	61.7		0.084	0.030	0.053
Rental contracts									
Nacional Ing.	45.0	11.2	93,039	5.8	28.7		0.185	0.050	0.135
Laeisz	22.5	5.6	41,047	2.5	25.3		0.183	0.050	0.133
Subtotal	67.5	16.8	134,086	8.3	27.6		0.184	0.050	0.134
Total	401.0	100	1,615,118	100	55.9		0.092	0.032	0.060

Note: The overall average plant factor for this period, 55.9 percent, was relatively high due to the late rains in 2001, which restricted hydro generation. The historical annual average is lower (36.5 percent in 1999).

Source: ENEE and authors' calculations.

dispatched heavily. The average total cost of the PPAs (including capacity and dispatch payments) is 8.4 cents per kWh and 18.4 cents per kWh for rental contracts (Table 3.6). The cheapest PPA contracts are those signed in 1998-99 by EMCE 2 and LUFUSSA 2 (7.1 and 6.9 cents per kWh, respectively). Plants with the lowest variable costs are dispatched virtually as base facilities (with plant factors of above 80 percent), while the most expensive plants are those on rental contracts, used mainly for peaking load (with plant factors of 25-30 percent).

In October 2001, ENEE had in motion an international public bid for a 210-MW PPA to avoid outages within the next 24 months, which was expected to yield a total cost per kWh of \$0.05-0.06. However, at the same time, ENEE requested a new 24-month rental contract for 85 MW, expected to cost about \$0.105 per kWh, to deal with short-term demand growth.

Contracting Challenges

The process of contracting PPAs has been slow and cumbersome, leading in many cases to high costs and undermining of public credibility. Corralled by the difficult procurement rules of the State Contracting Law (*Ley de Contratación del Estado*),⁸ ENEE has had problems with the timely acquisition of sufficient additional capacity to meet the 5 percent growth rate of demand.

State procurement rules, as interpreted by ENEE, often have not guaranteed effective competition because they discourage possible bidders from entering the process. Obstacles to entry in bidding for these contracts have included the following:

- ◆ In the early contract-letting processes, bidders were required to provide guarantees of their offers and contract compliance, based on the full value of the capacity payments for the life of the contract. For a 12-year contract, this meant providing a bid bond equal to 60 percent of the expected revenue in the first year and, upon winning, putting up a performance bond worth 120 percent of one year's revenue. Later, ENEE reduced this, basing the guarantees on one year's payments.

⁸ Refers to the law prior to its 2001 legislated revision.

- ◆ ENEE required bank guarantees, which cost 3 percent per year of the guaranteed amount, even though the State contracting law allowed use of insurers' guarantees, which were less than half as expensive.
- ◆ Guarantees had to be issued by Honduran banks so that foreign companies interested in bidding would have to negotiate with a Honduran financial institution. Honduran banking practice treated contract guarantees as a full, rather than a contingent, liability; therefore, banks usually required counter-guarantees based on liens on real assets equal to the total guaranteed amount. This meant that the bidders had to deposit bonds for a large proportion of the value of their offer.
- ◆ Through addenda, ENEE sometimes built technical limitations into the auctions, which were not stated in the original terms of reference (in one case, provision of electricity using barge-mounted plants was ruled out in a subsequent note).
- ◆ Rules for deciding the winner were not always clear. For PPAs and rental contracts with both capacity and variable payments for dispatch, it was critical to declare the plant factor to be used to evaluate the cost of the offer. In the contracting of extra rental capacity undertaken during 2001, this was not declared. This led to an impasse in deciding the result of the competition, since the result would favor one offer if a plant factor of 32 percent were used, and another if 35 percent were used.
- ◆ Taking advantage of such ambiguities, ENEE directors sometimes got involved in the assignment of contracts, pressuring technical committees to prefer offers that had not initially been placed first. Several key companies involved in these processes had links to politicians with seats on the ENEE board.

Such obstacles discouraged participation, especially by foreign companies. Even though these were international public contract lettings, in most cases, ENEE received only two or three offers. Most PPAs and rental contracts are with Honduran investors, and ambiguities in the rules frequently have led to legal disputes over the outcome of competition. As a result, on various occasions, ENEE has made emergency procurements under the shadow of impending power outages, which allowed waiver of the formal rules.

Emergency acquisition has also led to sub-optimal technology choices, resulting from commissioning small, high-speed diesel units to meet urgent needs, with unit costs well above those of larger units, which could have been ordered had forward planning been better. As a result, the balance of current thermal capacity is skewed toward small plants with low capital costs and high dispatch costs.

Indications are that ENEE has learned how to handle the contracting process more efficiently, and recent PPAs have been offered better value for money than earlier contracts. However, delay persists in deciding whether to contract additional capacity, making it impossible to contract the most efficient technology. In addition, the dead weight of high stranded costs of early PPAs and recent rental contracts remains a major financial problem for sectoral management.

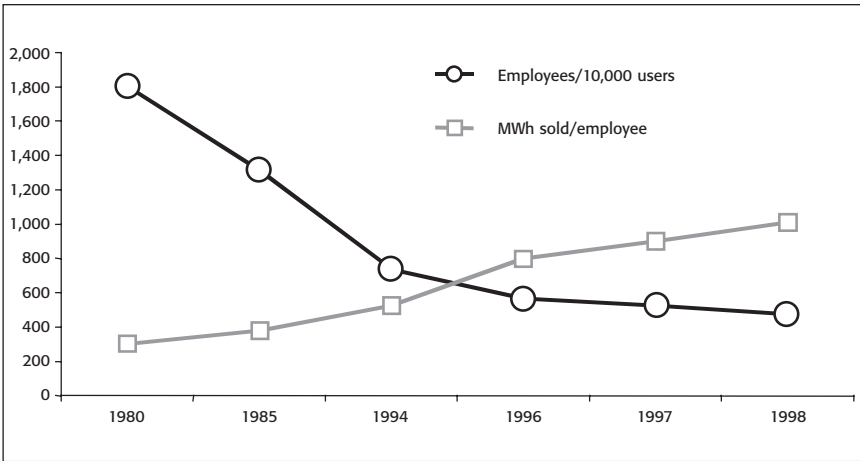
ENEE Headway in the 1990s

Efficiency Gains

Notwithstanding the delay in privatization of distribution, during the 1990s, ENEE made continuing headway with internal efficiency gains. Labor productivity improved from 739 employees per 10,000 users in 1994 to 478 in 1998; and energy sales per employee rose from 527 MWh to 1,014 MWh over the same period (Figure 3.1). Job cuts linked to the outsourcing of billing and collection and use of PPAs for expanding generating capacity have been the main factors behind this improvement.

Distribution losses were reduced from 27 percent in 1996 to 18.5 percent in 2000—well above the 10–12 percent levels registered in comparable Central American utilities, indicating an opportunity for further advances in this area. ENEE has outsourced billing and collection to SEMEH (*Servicios de Medición Eléctrica de Honduras*), a company that undertakes this task in return for the right to handle the resulting revenues for two months, before passing them on to ENEE.⁹ It is hoped that this will lead to further reductions in economic losses from distribu-

⁹ With ENEE's monthly billing of L.320 million, SEMEH can expect to hold L.640 million (\$40 million) at any given time (2001 figures). A monthly interest rate of 1 percent would generate a monthly interest income of L.6.4 million (\$420,000); however, since ENEE previously averaged a 120-day delay in bill collection, this arrangement is apparently free to the company.

Figure 3.1. Indicators of ENEE Labor Productivity

tion, although it is unclear to what extent the SEMEH contract provides clear incentives to detect and eliminate fraud. ENEE's target level for distribution losses is 15 percent.

Coverage

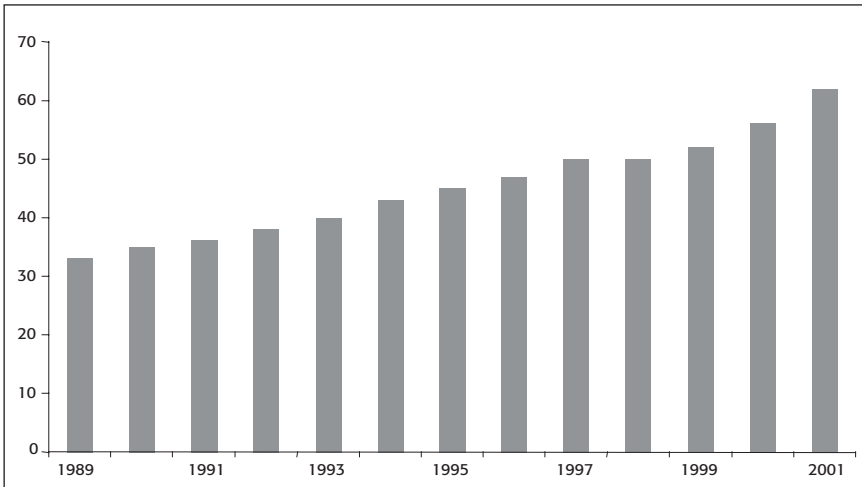
Household coverage has grown significantly over the past decade, from 33 percent in 1989 to 62 percent in 2001, according to ENEE estimates (Figure 3.2). This has been achieved against a backdrop of 2.8 percent population growth.

From 1998 to 2001, annual connections grew at a rate of 9.5 percent, thanks to a donor-financed, capital subsidies program to increase rural coverage. Based on the government's household survey data, including illegal users (excluded from the 62 percent ENEE coverage estimate), total coverage is now estimated at 75-80 percent.

Service Reliability

Overall reliability of supply has improved greatly since the sweeping outages of 1994, which were caused by hydropower systems problems linked to El Niño, as well as ENEE's failure to maintain reserve thermal capacity in usable condition or commission new capacity. Capacity has

Figure 3.2. Household Electricity Coverage, 1989-2001
(Percent of households with formal supply)



since been greatly improved by contracting PPAs. The hydro systems problem was improved by Hurricane Mitch, which quickly restored the severely depleted reservoir levels at El Cajón. This largely explains why only limited outages occurred following the 1998 El Cajón fire, even though 150 MW of generating capacity were disabled for several months. Another cause was reduced demand following Hurricane Mitch, linked to temporary closure of factories and energy-intensive agricultural industries (e.g., north-coast banana plantations); average demand fell 100 MW, and only recovered to pre-hurricane levels a year later.

The power balance remains highly vulnerable to climate factors; with annual economic growth now back up to about 3.5 percent in real terms, demand growth places ongoing pressure on capacity adequacy and reserve levels. At the same time, reliability problems in transmission and distribution persist.

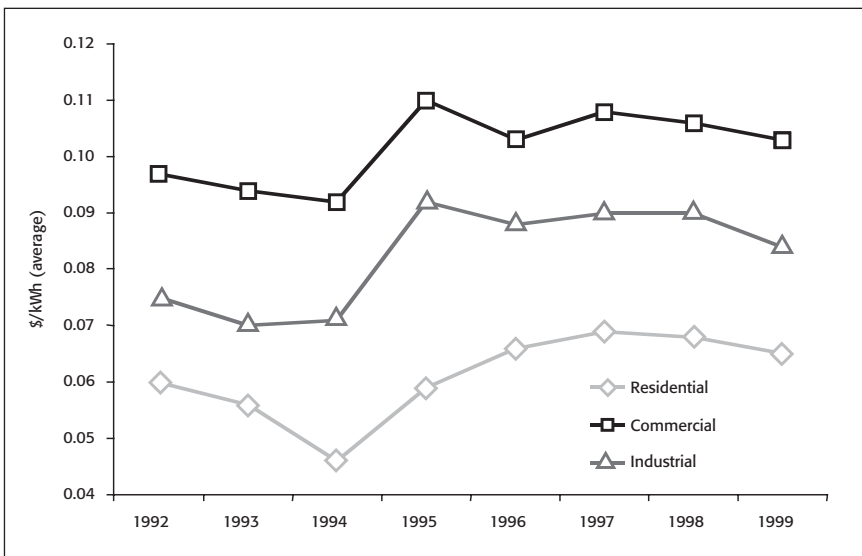
Financial Performance

During the 1990s, ENEE's financial balance improved, reflecting the positive effect of increased commitment to cost-based tariffs, in addition to a

steady advance in cost rationalization. Overall, the company can cover its current obligations and generate a surplus to finance part of its investment needs. Over the decade, income grew 4.2 percent per year in real terms, and annual expenditures fell 4.6 percent, thereby transforming an account deficit of 2.2 percent of GDP in 1990 into a surplus of 0.7 percent of GDP in 1999.

This solvency has been made possible, in part, by a fairly robust tariff performance (Figure 3.3). Although the 1994 law has not been implemented in the strictest terms, inflationary erosion of the tariff has been limited, and the present tariff appears to cover ENEE financial costs.¹⁰ However, the sector's financial balance is not as sound as it might at first appear, since roughly 7.5 percent of current annual income (\$18 million or 0.25 percent of GDP in 2001) is paid by the central government in the form of a consumption subsidy.

Figure 3.3. Evolution of Electricity Tariffs, 1992-99



¹⁰ Based on cost analysis in October 2000, ENEE remitted to CNE a proposed tariff adjustment that would have reduced the average final-user tariff by 8.4 percent, compared with the rate that has been operational since March 2000; however, this was not approved.

In 1994, ENEE and the Finance Ministry agreed on the company's outstanding debt-service obligations of \$38 million. Since then, the two entities have carried out a complex annual liquidation. ENEE's debt-service obligation, plus savings to ENEE from import tax breaks on fuel imports, introduced in 1997, are offset by government consumption of electricity and cost to ENEE of the electricity subsidy for domestic consumption. Details of this liquidation are unpublished, leading to a low level of transparency regarding the company's financial solvency. Overall, however, the company has remained solvent, and, by mid-2001, ENEE's outstanding debt to the central government had been reduced to \$25 million.

Proposed Reforms: 1998-2001

Within three years of initiating the 1994 reform, the agencies that had promoted it decided it was badly designed. The 1994 Framework Law gave priority to Honduran pension funds on the purchase of distribution assets. The International Finance Corporation (IFC), brought in as an advisor to carry out privatization, recommended that the law be changed to establish a level playing field for all offerers. The IFC also argued that it would be difficult to privatize distribution until future operation of the generation market was clearly defined. For this reason, the IFC proposed replacing the 1994 law with a model based on a competitive wholesale electricity market before privatizing distribution.

Within this context, Honduras would privatize distribution and introduce horizontal unbundling into remaining State agencies. ENEE would be unbundled both vertically and horizontally, and its generating units would be broken up into operating companies, while the transmission network would be assigned to a separate company.

Development of thermal generation would be undertaken privately, licensed by SERNA. Tax breaks on imported fuel would be extended to all generation (at the time of the proposed reform, only power sold to ENEE had them). Development of renewable energy sources would be awarded through concessions. To guarantee a competitive structure, no generator with more than 25 percent of firm capacity would participate in new public offers to sell energy (Box 3.1).

Box 3.1. Key Elements of the Reform Proposal, 1998-2001

The draft law proposed introducing a competitive wholesale electricity market with agents: generators, distributors, transmission companies, traders, and large consumers.¹ In the process, sector governance would be radically reformed, sharply reducing the State's role as service provider and increasing its regulatory function.

Generation and transmission: New investment in generation would be private, and private projects to expand transmission would be allowed. The original proposal left open the future privatization of generation and transmission companies unbundled from ENEE, but Congress rejected this. The State could operate its hydroelectric plants and the transmission grid through private agents under contract, but could not sell or award them.

Distribution: Privatization of distribution would include sale of most stock in three regional concessions to private investors. An additional 5 percent could then be sold to workers and 6 percent to pension funds at auction price. These would be 30-year, non-exclusive concessions, with an obligation to provide services within the concession area. To ensure vertical disintegration, distributors would be limited to 5 MW of in-house generating capacity. Consumers with annual consumption above one GWh could opt to purchase directly from generators or traders.

Prices and tariffs: The Regulator would set distribution and transmission tariffs, based on audited efficient costs. Regulatory independence would be increased, with new rules for eligibility and selection of commissioners and a rotating membership not linked to the presidential term. The price of generation would be market determined. Distributors would pass on what they pay in whatever part of the market they acquire their capacity and energy. Bilateral hedging contracts would be let through public offering, subject to regulatory supervision, which should result in the best value available. It is unclear how the final price to consumers would be constructed; this would be subject to secondary legislation or regulatory discretion. However, distributors would be allowed specific tariffs by consumer type (to account for factors that cause the cost to vary). Adjustment of prices to the user would be gradual (a limit of 15 percent increase at any given time), but no intervals were specified.

¹ The draft law was submitted to Congress after incorporating adjustments proposed by the Congressional Electricity Committee into the original executive proposal.

Market architecture: The generation market would deal separately in capacity and power. However, it is unclear how the capacity market would work. Distributors would be required to hold long-term contracts for at least 70 percent of their projected demand for the next three years. Uncovered demand would be resolved in an opportunity or spot market operated in a central pool, administered by a nonprofit association comprised of system actors. All generators connected to the system would be required to offer their total available capacity, and all distributors demand their total programmed requirements. Bilateral contracts would serve only for economic hedging, with no right to physical dispatch. Economic dispatch would be based on the declared costs of being dispatched (short-run marginal costs). The dispatch process would establish a marginal price for each system node, which would be applied to all transactions cleared through the spot market during that period. (It is not stated whether declared costs would be auditable or whether generators could declare any cost they saw fit in order to get dispatched.) A market in transmission rights would deal with system congestion.

Stranded costs: The stranded costs of existing PPAs would be divided between distributors and passed on to consumers for the remaining life of those contracts.

Renewable energy: Generation from renewable energy sources would be let as concessions, based on the highest canon (per kWh) offered. A fund would be established to finance studies to develop renewable energy sources. Renewable sources could be dispatched at prices 10 percent above the nonrenewable alternative.

Coverage: An electrification fund would be established, financed partly by income from the privatization of distribution. (Congress reportedly reinforced this, but no details were given.)

An Uncertain Start

Designing, negotiating, and legislating the new reform was a tortuous process. Eighteen months after submitting it to Congress, only 50 percent of the proposed law had been discussed and approved. However, this process reportedly led to important changes in the original draft law, as follows:

- ◆ Prohibiting privatization of the transmission grid and State hydro-electric plants, thereby avoiding the conflict of interest that would result from the State acting as both regulator and generation-market participant.
- ◆ Assigning planning functions to the regulator (which confuses roles).
- ◆ Increasing advantages for renewable energy sources, compared with other types of generation.
- ◆ Strengthening support for a rural electrification fund.

In mid-2001, with presidential elections looming in November, the Government of Honduras and the IFIs agreed to abandon the effort to legislate, returning discussion to first principles. Meanwhile, the institutions created by the 1994 reform staggered on, rudderless.

Assessment of the Process

A central flaw of the faltered reform effort of 1998-2001 was its failure to state its goals clearly and relate them to the sector's problems. Interviews with lead actors and documentary analysis suggest a lack of unifying consensus on these issues. Public debate centered on the pros and cons of privatizing ENEE, with little discussion on market architecture or a strategy for future sector development.

Senior ENEE officials identified transfer of contracting capacity to the private sector as a key element of the reform. This resolved the bureaucratic difficulty associated with State contracting, but did not necessarily require adopting a competitive spot market in generation. However, reform designers envisioned a model in which future development of generation would be subject to market forces.

Clearly, reform design should reflect the sector's problems. In other countries, such problems have involved overexpansion and inflated consumer tariffs. At present, Honduras does not face these problems; rather, its major challenge is ensuring security of supply and sustainable tariffs. The diagnosis described above shows that electricity-sector performance in Honduras advanced in important ways during the 1990s. The cost-reflective tariffs that were established sharply improved ENEE's financial condition. In addition, balance of supply and demand was improved by increasing private generation capacity using PPAs. Moreover, coverage was greatly expanded.

Despite these gains, significant problems remained. The user tariff was low compared to real system costs, and distribution costs and key subsidy elements for domestic consumers were underestimated. The PPA process was cumbersome and often too costly because of poor planning and lack of competition. Balance of available capacity was heavily skewed to small plants with low capital costs and high variable costs, resulting in higher than necessary total generation costs. Finally, increased coverage required significant subsidy and greatly increased ENEE's loss-making customers, potentially undermining the sustainability of future expansion.

Goals of the Reform Process

In light of the foregoing diagnosis, the sector's two main challenges are to 1) confront continuing rapid growth in demand, which stresses available capacity, and 2) continue expanding household-level coverage, while maintaining financial sustainability.

These needs must be addressed within the context of the government's severely limited capacity to raise capital finance and its ongoing debt crisis. It is now slated for treatment by the Heavily Indebted Poor Countries (HIPC) initiative.

Thus, reform should seek to:

- ◆ Mobilize increased private investment throughout the electricity sector (generation, distribution, and transmission).
- ◆ Promote a coherent market architecture that optimizes use of available resources at the lowest possible cost, including selection of appropriate technology in generation capacity and economically rational dispatch.

- ◆ Guarantee cost-reflective tariffs through robust tariff and pricing rules that ensure the consumer pays full cost (but not more than that) of the efficient provision of services.

Constraints to the New Model

Many factors constrain the reform process. Some are concerned with political economy. For example, the interplay of vested interests may block the process or distort outcomes to favor certain actors over others. Moreover, institutional and physical constraints may arise as a result of the intrinsic characteristics of the Honduran government, the society in general, or the electricity sector in particular. The sections below consider such constraints, which must be weighed when deciding on proposed governance arrangements and market architecture for a sustainable sector model.

Political Constraints

As in the reform of any public service, the Honduran electricity sector has a complex set of actors and vested interests, which must be managed if reform is to succeed. Table 3.7 provides a political mapping of the main actors in the reform process, including reasons for their importance, interests they have at stake, and their position on the reform proposal.

The overall picture that emerges is that of an externally promoted reform process with relatively little government ownership and little support in the country at large. From the outset, the reform faced opposition from two groups with access to political power and influence in the legislative process: 1) popular organizations and trade unions and 2) SEMEH, holder of the meter-reading and billing contract, which will automatically end when distribution is privatized.

To make matters worse, as time passed, some initial reform supporters withdrew. Private companies holding PPAs initially supported the process, hoping it would lead to the institutionalization of a private market in which they would have increased opportunity. They were particularly interested in the possibility of buying ENEC's hydroelectric plants. However, they withdrew their support when the draft law proposed to limit to 25 percent the share of any one company in generating capacity, and the proposed rules for privatizing state hydroelectric

plants required bidders to have already operated three times greater capacity. These rules would effectively exclude national companies from offering on the privatization of State hydro assets.

Finally, the powerful new power-sector actors that appeared on the scene as the law was being debated had reason to oppose some elements of the proposal. Of particular importance was the 1999 arrival of AES Corporation, the U.S. power giant that promoted a 750-MW plant aimed at supplying the regional market. This was clearly inconsistent with the proposed 25-percent limit on a company's generating capacity. Conscious of this, AES promoted alternative legislation behind the scenes and supported dropping this element of the initial reform proposal.

In this setting, the legislative process became bogged down in detailed changes, which seriously damaged the internal coherence of the proposed law.¹¹ These political constraints can be expected to continue unless a proposal is developed with strong national ownership that either incorporates opposing interests or mobilizes sufficient impetus from supporting lobbies.

Government Ownership and Process Management

It is difficult to avoid the conclusion that the government lacked ownership of the project or process. Although the executive branch did not directly oppose electricity-sector reform,¹² no key minister took a leadership role. The IFIs originated the reform process and were responsible for proposing the specific reform model. The United States Agency for International Development (USAID) contracted the consultant who wrote the draft law, which was mainly based on the Argentine model.

The Electricity Sector Reform Commission, set up by the Energy Cabinet, managed the reform process and cooperated closely with the

¹¹ This process was conducted in secret, and the clauses approved by Congress have not been published. Changes reportedly introduced in Congress that are considered potentially damaging to the spirit of the law include the following: assigning planning functions to the regulator, prohibiting privatization of the transmission network and the State's hydro generation assets, and favoring renewable energy over other sources of generation.

¹² In the water sector, by contrast, the manager of SANAA, the State water company, successfully opposed reform during 1994-97, engaging in direct opposition to the State Modernization Commission's proposed legislation.

Table 3.7. Political Economy of Honduras' Electricity Sector Reform

Actor	Importance	Interests	Position on reform
Government institutions			
Energy Cabinet	Highest level sector policy body. Approves sector strategy plans and deals with crisis matters. Agreed with IFIs on the reform strategy and nominated the Electricity Sector Reform Commission.	Sustaining the sectoral reform operation started in 1994 with the World Bank and IDB and negotiating disbursements. Also concerned about maintaining Government popularity on sector outcomes (e.g., power supply, tariffs).	Formally led the reform process, but apparently not strongly committed to a particular reform proposal. Supported various strategic options at different times, following the leadership of the international agencies. There was little ministerial presence in the lobby for reform.
Electricity Sector Reform Commission	Charged with technical definition and promotion of reform legislation. Composed of representatives from ENEE, SERNA, CNE, and CCP. Technical Secretary seconded from the World Bank.	Agency established to promote and negotiate reform.	Led the process; however, when technical secretary's contract ended, it was not extended. This ended executive pressure in support of reform.
Environment Secretariat (SERNA)	Sector leader.	Responsible for ensuring power supplies.	Apparently not interested.
SERNA Energy Directorate	SERNA department responsible for electricity sector. Involved in Electricity Sector Reform Commission. Relatively weak technical capacity.	Strongly interested in sustainable energy.	Supportive.
Privatization Commission (CCP)	State agency specialized in privatization and attached to the Finance Ministry.	Lead agency to promote reform process. Hosted Electricity Sector Reform Commission.	Strongly supportive.
National Energy Commission (CNE)	Sector regulator.	Would be subject to reform under the new law. Likely to gain increased influence and independence. Existing members likely to be replaced.	Supportive.

Actor	Importance	Interests	Position on reform
Government institutions			
ENEE	State electricity company.	Would be broken up under the reform. Possible opportunities for higher-paying, private-sector jobs for senior engineers and administrators.	Formally supportive but not strongly involved in the process. Senior figures favor privatization of distribution but are skeptical about wholesale spot market for generation.
National Congress	Must legislate to approve reforms.	Uneasy about privatization in general and concerned about passage of unpopular legislation.	Energy Committee of Congress proposed constructive reforms and presented the bill; however, Congressional discussions proceeded slowly and further important changes were made before the process was halted, citing the California power crisis and problems in El Salvador's generation market.
Other actors			
International agencies: World Bank, IMF, IDB, and USAID	Source of finance for balance of payments support and technical assistance for State modernization.	Electricity sector reform is part of the country strategies of each organization.	Strongly supportive of the reform process and main point of origin for specific proposals. World Bank seconded technical secretary of reform commission, and USAID funded preparation of draft legislation.
Professional association of engineers	Source of qualified opinion regarding this technically complex sector.	Many employed in ENEE may stand to lose jobs, but can gain from improved terms and conditions in private firms.	No collective position.
ENEE employees	Reduced potential for opposition since the union was broken up in the early 1990s.	Many could lose jobs but expect good compensation packages.	Did not oppose the process.

Table 3.7. Political Economy of Honduras' Electricity Sector Reform (Continued)

Actor	Importance	Interests	Position on reform
Other actors			
Private generators	Hold existing PPA contracts. Mainly national companies. Several have influential political links.	Existing contracts are regarded as stranded costs. PPA owners fear reform might attempt to cancel sovereign guarantees in existing contracts. Even if guarantees are retained, they may lose revenue on existing PPAs from lower dispatch rates and would have to face increased competition in the future. On the other hand, they perceived an opportunity for expanding business through participation in the privatization of State generation assets.	Initially supportive, hoping for new business opportunities with the institutionalization of a private-market sector, while, at the same time, insisting on maintaining existing sovereign guarantees. However, withdrew active support when rules were adopted on market share limits and previous experience that would effectively exclude them from bidding on privatization of state hydroelectric assets. Have not been formally opposed but have expressed skepticism about details of reform design. In Sept. 2001, promoted legislation to increase capacity contracted under existing PPAs by 85 MW for nine years, as a cheaper alternative to new rental contracts; however, this was reversed following public outcry.
AES	U.S. power giant, which already owns 80 percent of the distribution concessions in El Salvador.	Since 1999, began promoting a \$650-million investment in a 750-MW, combined cycle plant, using liquid natural gas (LNG), to be built at Puerto Cortés, aimed at the regional Central American market. This plant would exceed the proposed 25 percent limit on any one company's share of generating capacity in the Honduran system.	Interested in dropping the 25 percent limit of market share in generation.

Actor	Importance	Interests	Position on reform
Other actors			
SEMEH	Holds existing service contract for billing, collection of ENEE charges. Consortium includes five key banks with powerful political ties.	SEMEH contract would be automatically terminated with privatization of distribution.	Clearly interested in prolonging the reform process to maximize returns from its service contract.
<i>Bloque Popular</i>	Influences politicians and media coverage.	Strongly opposed to privatization in principle. Leaders view reform as a platform to increase influence as a national union leader.	Opposed the law organizing street demonstrations used several times as justification for halting discussion of the law in Congress.
Users	Support for or opposition to reform can be decisive, as the whole purported purpose of the service is to meet their needs.	Interested in improved service quality and low tariffs. Most users likely to lose subsidy and pay more for electricity under reformed tariff system.	No notable direct presence in debates.
Communities without supplies	Can be powerful points of pressure in favor of changes that they believe will give them access.	Interested in continued financing of network expansion and/or off-grid solutions. Would gain from increased funding for system expansion through proposed Rural Electrification Fund financed partly by privatization revenue; but no clear program exists.	No notable presence in debates.
Political parties	Control legislative process.	Concerned about avoiding responsibility for unpopular acts, such as privatization and tariff increases.	No important party clearly supported the reform prior to 2001. In the 2001 electoral campaign, the National Party supported reform without specifying details, and the Liberal candidate opposed further privatization.
Press	Journalists influence opinions of politicians, Congress, and the general public.	Not interested in reform per se, but in a good story and, sometimes, in being paid to run a particular line.	Neither supportive nor opposed to the process; however, informed coverage is markedly lacking.

Privatization Commission. The Reform Commission included representatives from ENEE, SERNA, and CNE; and its technical secretary was a Honduran engineer seconded from the World Bank.

Although agency representatives on the Reform Commission understood many problems with the status quo and supported reform in general, they understood little about how the new model was to work in Honduras, either during the transitional period or in the long term. Most debates focused on the pros and cons of privatizing sections of ENEE, with little or no public discussion about the merits and risks of alternative market models. Vague draft legislation about how the wholesale market would operate added to the confusion, as did secretiveness about the legislative process. This made it difficult to win the argument for reform, not only with populist opponents of privatization in principle, but also with well-intentioned decision-makers genuinely concerned about making the best possible decisions for the country.

When the contract of the Reform Commission's technical secretary expired in 2000, it was not renewed. The secretary returned to Washington and was not replaced, effectively ending any Executive pressure for the new law to be passed. Thereafter, the main pressure for advancing legislation came from the IMF in the context of its review of conditionality compliance under the Poverty Reduction and Growth Facility. This led to periodic rushes to approve a few more clauses of the law, which quickly ended when negotiations with the IMF ceased.

Lack of government commitment was reflected throughout the process. For example, no senior politician assumed leadership in promoting the proposed reform, while leading figures of prior administrations were openly skeptical about such key tenets as increased regulatory independence.

Workers' Unions and Popular Organizations

The ENEE workers' union was not opposed to the reform process, due to the prospect of good severance compensation. Although historically a bastion of public-sector, trade-union militancy, the ENEE union was weakened following a major strike in 1991-92. Since then, staffing has been considerably reduced (e.g., by outsourcing meter-reading and billing).

By contrast, the national trade union and popular movement in general was vociferously opposed to the new law. The self-appointed *Bloque Popular* played an important role in public debate over privatization of ENEC during 2000-01. Reluctance of Honduran politicians to push through important changes in the face of declared opposition—even of a minority—gave this opposition considerable influence.

Users

Evidence suggests that politicians' nervousness about the unpopularity of privatization is not without foundation. Widespread skepticism about the motives for and consequences of privatizing public services is based, in part, on disappointing prior experiences. Findings of focus groups and opinion surveys suggest that many people believe that privatization is simply a racket to enrich private companies at users' expense, via tariff hikes (ESA Consultores, 2001).

In the power sector, stability of supplies has improved considerably since 1994, when the country was hit by severe blackouts; this improvement has led to public acceptance of incorporating private generators. However, a widely held belief among opinion shapers is that PPA contracts are too expensive, and they are hostile to the idea of selling existing state-owned generating capacity or the transmission grid to private firms.

Electricity service users interviewed in focus groups generally perceive privatization as a likely source of tariff increases, although others see the potential for improved services. Although the proposed reform envisioned a new fund for rural electrification, this was not clearly estimated, and non-connected communities did not lobby in favor of the law.

Private Companies in the Electricity Sector

Creating an important private generating industry, with the main contracts held by powerful economic groups, has increased the risk of state capture by these interest groups; this, in turn, has created a possible obstacle to any further reform that is unfavorable to holders of existing PPAs and rental contracts.

Currently, three key groups hold PPAs: ELCOHSA, which has American and Honduran capital linked locally to the "maquila" (garment

operations) sector in San Pedro Sula, and LUFUSSA and EMCE, both strongly linked to local political and business personalities. Two companies—Laeisz and Nacional de Ingenieros—hold short-term rental contracts for emergency generation.

Outsourcing of ENEE meter-reading and billing to SEMEH created another private-sector interest group wishing to delay or prevent privatization of distribution since its contract specifies that it will automatically terminate if distribution companies are privatized. (The SEMEH consortium has five banks, including Banco Atlantida).

Clearly, private-sector groups have used their influence to promote their own interests, wherever possible. For example, in September 2001, LUFUSSA and EMCE promoted a law to increase, by 85 MW, the capacity contracted under the EMCE 2 and LUFUSSA 2 PPAs for nine years, arguing that this was a cheaper alternative to issuing a new rental contract for 85 MW to cover ENEE's short-term capacity needs. Following public outcry, Congress blocked this proposal, voting not to ratify the minutes of this decision.¹³

PPA holders initially supported the reform process, favoring institutionalization of a private-market sector and hoping for increased business opportunities. However, they withdrew active support when rules were adopted on market-share limits of 25 percent of capacity in generation and requirements for previous experience operating large hydroelectric plants that would effectively exclude them from bidding on privatization of State hydroelectric assets. Since then, they have not formally opposed the new law but have expressed skepticism about details of reform design.

Emergence of AES Corporation (which owns 80 percent of the distribution concessions in El Salvador) has significantly affected the reform

¹³ Press reports on this matter were confusing; they described a proposal to extend the LUFUSSA 2 and EMCE 2 PPAs for nine years, rather than increase the capacity covered by 85 MW for nine years, within the time frame of the existing contracts at the prices already determined in the original public-contract auction. In the end, it was decided to let a new rental contract. At the time of this writing (due to the confused definition of the decision rule, as described above), it was unclear whether Nacional de Ingenieros or CEMCOL won. However, this contract will carry a considerably higher price than LUFUSSA 2 or EMCE 2.

process. As Table 3.7 describes, AES has, since 1999, promoted a \$650-million investment in a 750-MW combined cycle plant, using liquid natural gas (LNG), to be built at Puerto Cortés. This plant, which aims at the emerging regional Central American market, would greatly exceed the proposed 25 percent limit on any one company's share of generating capacity in the Honduran system.

Institutional and Physical Constraints

In addition to political constraints, reform of Honduras' electricity sector is also hindered by institutional and physical limitations. Care should be taken to tailor system design to market size, potential capabilities of the regulator, and the country's investment climate.

Market Size and Competitive Structure

In Honduras, introducing a generation market organized around a wholesale spot market implies increased uncertainty about the price users will pay for power and runs the risk that prices might stand well above efficient, system marginal costs for significant periods. It also raises the prospect of higher rates overall caused by increased cost of capital, linked partly to higher investor risk, as well as the possibility of limited competition leading to excess profits on a sustained basis.

The legislation stalled in 2001 proposed to limit any plant size to 25 percent of total demand, except for the 300-MW Francisco Morazán hydroelectric plant. However, no argument showed that the 25 percent limit would suffice to ensure competitive outcomes. Recent evidence from California suggests that, during peak hours, restricting a smaller proportion of supply capacity can sharply affect spot prices in a liberalized electricity market.

The Honduran electricity system has grown rapidly over the last decade and is expected to continue to do so in the future (annual growth rate of demand is currently more than 5 percent, with doubling of the total every 14 years). However, the system remains small in absolute terms (current maximum demand is less than 800 MW). In this setting, it is difficult to imagine designing a generation market in which individual units would not have considerable potential market power. In deciding on the scale of future

investments, Honduras may have to choose between achieving a more competitive market structure and accessing optimal size technology.¹⁴

Reform designers should recognize that, for the foreseeable future, individual actors will have a large market presence and considerable potential market power; this leads to delayed supply responses to benefit from sustained price disequilibria. This would make the regulatory task of ensuring competitive outcomes in a wholesale spot market difficult to implement, leading to the need for direct regulation of generation prices through price caps based on cost calculations.

The proposed AES plant at Puerto Cortés illustrates this point (Box 3.2). If it proceeds, AES will have 50 percent of the firm capacity of the Honduran system, sufficient to cover 90 percent of peak demand. As drafted, the law does not deal with this, unless AES sales to the Honduran grid are subject to a PPA before the law is passed.

Regulatory Capacity

In non-competitive markets, a regulator sets the price that producers are allowed to charge, based on analysis of efficient costs. However, in market-based models, the regulator must also intervene to prevent collusive behavior and ensure competitive outcomes. One striking lesson from experiences in competitive, wholesale spot markets—in places as diverse as El Salvador and California—is that regulatory discretion in ensuring competitive outcomes is a key determinant of success or failure. Even the best designed market architecture cannot automatically resolve all potential problems.

Such failures may occur in various ways; the most important, perhaps, is the risk that generators will act, individually or in collusion, to “game” the market, aiming to push up spot market prices at the expense

¹⁴ It is sometimes taken for granted that the optimal technology for base generation is combined cycle plants powered by LNG. This is now the case in any system that already has access to LNG. However, where LNG is not readily available, as in Honduras, the costs of building a port terminal to handle the fuel are high. This means that only large-scale plants are worth building; otherwise, cost of the port terminal would swamp the capital cost of the project. This, in turn, leads to additional compensatory investments in transmission to enable the network to cope with the volume of energy to be injected. Once these factors are built into the capital cost, even for a large plant, the required investment per kilowatt of capacity is relatively high.

Box 3.2. El Faro Project: Benefits and Issues

AES Corporation, the giant U.S. power company, proposes to build El Faro, a 750-MW, combined-cycle, liquid natural gas (LNG) plant at Puerto Cortés, Honduras. At a projected cost of \$650 million, El Faro is the first major private initiative aimed at Central America's nascent regional electricity market. AES proposes to supply El Salvador (where it holds 80 percent of distribution concessions), as well as Honduras and Guatemala. It would build a private transmission line from Puerto Cortés, Honduras to Nejapa, El Salvador.

Benefits of cheaper power. The projected cost of power is \$0.05 per kWh, well below recent prices of the Salvadoran spot market and comfortably below the \$0.071 reported by the cheapest PPAs in Honduras. The project would also result in balance of payments gains for Honduras from savings on fuel imports. However, the price is not guaranteed.

Regional issues. Given the uncertainty of reform in Honduras, the project raises serious regional issues. For El Salvador, it raises the specter of de-facto vertical re-integration, with the same company controlling a significant share of generation and distribution assets. Since the Salvadoran system allows for physical dispatch of bilateral contracts, AES could channel all base demand from its distribution concessions into the El Faro plant, which it plans to operate with a plant factor of over 90 percent. However, the result will be to displace demand from the hydro and thermal facilities of the National Electric Utility Company (CEL), forcing CEL to export surplus power.

Even if El Faro were the base plant for the entire Salvadoran system, the resulting base load of 400 MW would not suffice to fire the plant full time. It would therefore need to displace existing base facilities in Honduras and Guatemala, including hydro capacity.

How will trade function between El Salvador and Honduras, given that the countries' rules differ? The Salvadoran pool rules provide for physical dispatch of bilateral contracts, but the proposed Honduran rules would limit their role to economic hedging, and dispatch would be in economic order. El Faro would have to bid in the Honduran pool, which would fulfill the contract with Salvadoran companies. El Faro would be dispatched only if it were cheaper than alternatives. But technical design of a combined-cycle plant does not permit fine-tuning of output.

of distributors or users. Sustainability of a reform based on wholesale spot markets in generation would depend on the presence of a regulator with the mandate and capacity to identify market failures and act rapidly to correct them.

Therefore, when deciding on the design of Honduran reform, it is important to ask: What is a reasonable expectation for the regulator's capacity to manage the market to ensure competitive outcomes? The answer will depend, in part, on the technical capacity and credibility of the regulatory body, which, in turn, will be a function of the selection system, definition of terms of office that do not coincide with governmental periods, rules on rotation or overlapping of terms to ensure continuity, remuneration arrangements to ensure the ability to recruit qualified staff, and training or technical assistance programs. However, it will also depend on the legal setting, including the regulator's degree of autonomy and the judiciary's reliability and transparency.

Given the generalized weakness of regulatory institutions in Honduran public services to date, coupled with politicization of the judiciary, one must ask whether the country could quickly put in place a regulator with the skills needed to manage a wholesale spot market in generation (including effectiveness in discretionary powers to curtail the exercise of market power by large companies with powerful political contacts).¹⁵

Investment Climate and Mobilization of Private Capital

PPAs are often characterized as “cozy” contracts, where overly high rates of return are received without the corresponding risks assumed by the investor. However, another possible explanation for high rates of return on such contracts is the perception of Honduras' unfavorable investment climate including expensive local capital markets; a problematic labor code; and an

¹⁵ It might be argued that correcting this type of problem, at least in the short term, can be dealt with through cost-based regulation—either directly, through price caps, or indirectly, by rules that only allow generators to offer their power to the pool at the audited marginal cost of generation. In this case, the regulator would have the same function as in a non-market system (i.e., determining the allowable cost). However, automatic price caps (based on rules about audited costs) are difficult to design and impose, while discretionary price caps (as evidenced by the California case) inevitably lead to tremendous debate and disagreement as vested interests come into play.

unstable, corrupt judiciary and high level of political risk in sinking capital into a State-regulated industry. Such factors might mean significant investor risk, even when the contract bears a sovereign guarantee.

If the high rate of return on PPAs corresponded to such factors, then shifting to a wholesale spot market might not be expected to reduce the capital costs for the electricity sector. On the contrary, it could increase them, as the absence of guaranteed capacity payments would further add to the uncertainty associated with the investor's expected stream of returns in electricity generation projects, without correcting any other factors that currently lead to high capital cost. In a worst-case scenario, it could be nearly impossible to attract significant investment to the sector.

Environmental Regulation of Project Development

Rationalizing and de-politicizing environmental licensing are required to ensure the smooth operation of a Honduran generation market. Currently, environmental regulation is at a standstill for new investment projects in the country generally. Procedures for deciding what sort of study is needed, defining terms of reference for an impact evaluation, and assessing its outcomes are delayed and sometimes appear arbitrary. It is particularly noteworthy that the Environmental Control Directorate (DECA) of SERNA has been reluctant to approve private projects that face significant public opposition.

In the electricity sector, this problem has been side-stepped in the case of PPAs because SERNA is responsible for both the energy sector and environmental control; at the same time, the government, through ENEE, is the commissioning agent for these projects. However, in a reformed sector, where private investment proposals are made without government sponsorship, political and bureaucratic obstacles in environmental licensing will increase.

Three recent examples of private generation initiatives that arose outside the PPA framework illustrate this point. The proposed Patuca 2 project, a large hydroelectric project, was abandoned when it became clear that it would be difficult to obtain an environmental license. AES waited eight months for the terms of reference of an environmental impact study to be approved for the El Faro project (Box 3.2). In the case of the 50-MW, El Cangrejal hydroelectric project, environmentalists proposed major changes

(including relocating the machine room 3 km upstream) to protect the interests of an ecotourism rafting business owned by one of the lobbyists.

Stranded Costs

One widely recognized constraint for establishing a competitive wholesale spot market are the stranded costs of PPAs that guarantee long-term capacity payments to existing plants. If these contracts guaranteed the purchase of power (take-or-pay agreements), then only newly entering plants would operate on a spot market basis. However, in the case of Honduras, the PPAs do not carry take-or-pay clauses for the energy component. The State is committed to make good the negotiated capacity payments, but not to purchase power from the plants.

If not renegotiated, the PPAs may lead to an incentive problem (related to their allocation among purchasers) at the time of unbundling ENEE and a liquidity problem (limiting possibilities for enhanced trade and future competition) for a future regional market.

Honduras has several alternatives to deal with these contracts:

1. It could subsidize costly PPAs with the rents of hydroelectricity as is currently done. Distribution firms would receive a non-discriminatory, average price for wholesale energy, and would pay capacity payments pro-rata of their peak demand. There would be no renegotiation. This choice has inefficiency effects on pricing and, if capitalization of hydroelectricity were attractive, on coverage (whenever the injection of funds feeds a Universal Service Fund).
2. If privatization of distribution were politically infeasible, there would be no new domestic resources to afford the potential compensation required to remove the PPAs.
3. If privatization of distribution were feasible, Honduras would face a trade-off between using the proceeds of privatization for expanding service coverage or renegotiating the PPAs. The latter option would make price reductions and greater contract liquidity in the generation market possible. However, the benefit expected from renegotiating such contracts usually grows as they approach their end. A sound strategy might therefore include an option to renegotiate the PPAs in the future.

Supply and Demand Mechanisms for Market Regulation

In a pure spot-market model, price distributors pay to cover the demand unmet under hedging contracts, which fluctuates on a real-time basis as demand ebbs and flows. For most of the day, when the system had spare capacity, base generators would be expected to bid in the pool at their SRMC. However, during peak hours, distributors' obligation to meet all demand would lead to pushing the market-clearing price high enough to make it profitable to fire marginal plants. This would allow infra-marginal plants to charge more than their SRMC during peak hours, thereby recovering their capital costs.

This type of system can work well when sufficient capacity is available to meet total peak demand. However, if generation capacity cannot meet demand, then no price can balance supply and demand, unless some form of real-time demand management is introduced. Depending on how property rights are allocated, two alternative solutions might be consistent with economic efficiency. Consumers could be paid to accept temporary suspension of supply when the system reaches capacity constraints. Alternatively, interruptible contracts could be used to serve consumers according to their willingness to pay. Either option would lower system capacity needs.

Operation of a Wholesale Spot Market in a Hydro-thermal Setting

In Honduras, another constraint in designing reform is the hydro-thermal nature of the system. With centralized dispatch, a single computer model can be used to calculate the opportunity cost of water and optimize system operation. (This is what Honduras now does.)

With a horizontally unbundled generation sector, including various hydro plants, managers could decide how to value their respective plants' water. However, this would lead to the need for replicating modeling capacity. While this is not a major problem in a developed country, the costs may be significant in Honduras, given its human capital constraints. Private companies would likely hire the most qualified consultants, while State companies would struggle to implement the modeling effectively.

Thus, it would be better to retain a centralized model to determine the optimal dispatch of hydroelectric resources, as is presently done in

Panama and Chile. This is not inconsistent with horizontal unbundling of the existing hydroelectric capacity or future development of private plants. In this case, the factor for deciding their dispatch program would not be the value of the financial contracts they hold for the sale of power to distributors; rather, it would be the economic value of the water, as determined by the central program. An intermediate alternative would be for the central model to supply free information to all interested actors, allowing them to make their own decisions.

Path to Improved Performance

In light of the constraints outlined above, we recommend that Honduras adopt a rolling reform strategy, based on a clear understanding of the country's stage in electricity-sector development and prioritization of relevant problems and solutions. This strategy would give priority to strengthening sector governance and regulation, unbundling ENEE, and abolishing defective subsidies. It proposes a wholesale electricity market option that is feasible, given current constraints, but does not forego the future option of benefiting from regional market development.

It should be cautioned that these recommendations are not a blueprint. In many cases, short-term alternatives are feasible. In the medium term, the institutional constraints that conditioned this set of recommendations might shift. In too many cases, reform proposals in other countries have failed precisely because they were rigidly associated with single technical solutions that ostensibly could resolve all problems, but failed to take local realities into account.

Rather than insisting on the specific proposals presented here, we insist on the validity of their general approach to the reform process. This starts with an analysis of the problems and priorities of the country and its electricity sector, as well as constraints to the reform process. In this context, they seek to trace a feasible path toward improved system performance on a sustained basis. The successful reformer must anticipate the need to adjust tactics in the face of unexpected consequences, and shift to other instruments that will yield the desired results.

Summary of the Proposed Strategy

Three groups of recommendations are suggested, as follows:

- ◆ **Governance**—Aims at creating institutions better suited to formulating a country energy strategy, regulating the industry, and protecting customer rights.
- ◆ **Market structure**—Seeks to create an industry configuration that facilitates entry of private investors and reduces chances of market power abuse.
- ◆ **Market architecture**—Looks for market rules in procurement and price formation that reflect the limited scope of competition in generation expected in the medium term.

Governance

A separate Ministry of Energy would establish appropriate sector leadership and end conflicts of interest between the energy-sector development planning and environmental-control functions of the Ministry of Natural Resources.

A multi-sector regulatory entity would establish stronger regulation in Honduras. This suggestion needs to be discussed and coordinated with the needs and expectations of other public-utility regulators. A point in favor of the proposal is that a new entity would economize scarce human capital to staff individual regulatory offices.

Channels for effective public participation would give citizens a sense of ownership. Some channels worth exploring include media campaigns, incentives for consumption reduction, and periodic public hearings and consultation.

A Universal Service Fund to expand coverage would give priority to proposals that minimize the cost of supply and promote active community involvement.

More discussion is needed about how to integrate private renewable-energy projects into the reformed system. The best option would be to grant concessions for such projects on a competitive basis.

Market Structure

It is advisable to maintain the current draft law's proposed restrictions on industry structure, including prohibition of vertical integration and limits on horizontal integration.

ENEE would be unbundled into independent enterprises (e.g., one or two generation firms, one transmission/dispatch firm, and two or three distribution firms). Privatization would start in distribution. Other industry segments would, for now, remain publicly owned but would be incorporated, opening the way for future sale to private owners.

Before implementing a wholesale spot market in generation, the State's generation, distribution, and transmission enterprises would ideally be privatized to avoid conflicts of interest when the State exercises its regulatory function.

Market Architecture

To ensure sufficient expansion of generating capacity, Honduras should, for now, continue to issue PPAs with capacity and generation components, through competitive international public bids, under the regulator's supervision. This system would guarantee sufficient capacity to meet demand and avoid the price instability caused by supply imbalances that has undermined reform sustainability in other countries. An association of distributors would form the contractual counterpart of generators. The capacity costs of these contracts, along with those of existing PPAs, would be passed on to final users.

Implementation of a spot market for generation (without any central planning of capacity expansion) should be postponed until the Central American market becomes fully integrated. This larger market would have enough actors to offset the problems of market power that would certainly occur if the Honduran generation market were now fully liberalized.

Meanwhile, generation (regardless of technology) would be dispatched by economic merit through a central pool. For each period, distributors would inform their projected demand, and all generators would be required to make their functioning capacity available.

To reduce the extra capacity requirements that arise from flat tariffs, it is necessary to introduce real-time sensitivity between demand and

prices. A first measure would be to set price schedules, differentiated by time of day, for customers with adequate metering devices. A second measure would be to implement a market mechanism for the temporary suspension of excess supply.

Distribution firms should be able to use tariffs to collect the full financial costs of all system components. If the demand subsidy is limited to those who consume less than 100 kWh per month, then available resources could be applied to the coverage expansion program.

Key Design Issues

Generation Market

Given Honduras' political economy and institutional and technical constraints, it would be prudent, for now, to consider maintaining the centrally planned management of capacity expansion, rather than transferring it to a liberalized generation market.

In a spot market, expansion of generating capacity results from the initiative of individual investors, based on their expectation of future spot-market prices (or hedging contracts issued by intermediaries in wholesale markets). The spot-market model seeks to replace PPAs, which are hedging contracts in which the system passes, from the investor to the consumer, the risks associated with the decision on capacity, via guaranteed capacity payments. In the PPA-based model, an authority decides, through a public auction, which project will be awarded the capacity contract.¹⁶

PPA prices may be out of line with ex-post efficient prices. Consequently, it may be beneficial to allow prices to adjust to development of actual costs. A spot market allows for this adjustment; however, this benefit must be weighed against the increased effect of inefficient pricing that may emerge in a spot market with few players and a weak regulator who cannot deter imperfect competition.

A PPA market can operate well or poorly, as Honduras' mixed track record illustrates. Obstacles to competition in state-managed, capacity contract auctions have been important, and the cost of several early PPAs

¹⁶ It would also be possible to have a decentralized decision process based on a capacity market, as in Guatemala.

was far higher than international benchmarks. The good news is that the cost of recent PPA contracts has decreased, partly because of technological progress and partly because of more competitive pressure. The new costs provide the regulator valuable information for designing the capacity addition bids, especially the evolution of risk premiums levied by investors. The bad news is that lack of timely capacity auctions to establish new PPAs has recently led to contracting extremely expensive, emergency-generation capacity through leasing contracts, with prices as high as 18 cents per kWh.

The proposed solution is organizing transparent and competitive capacity auctions carried out by a private agency under the purview of the regulator, but not subject to public-sector procurement rules. There would be no sovereign guarantee in these contracts. Generation would then be dispatched by least-cost scheduling models. The total cost of capacity payments, plus the financial cost of short-run dispatch, would be passed on to consumers pro rata with their total consumption. This would ensure the financial solvency of the system.¹⁷ There would be no immediate role for spot-market prices to intervene in the formation of consumer prices.

This proposal does not mean that generators would not be subject to market discipline. This would take the ex-ante form of periodic auctions to meet capacity needs, coupled with real-time economic dispatch of power requirements. Determining capacity needs would continue to be a central planning decision. Shifting to a fully-fledged open and competitive generation market should be postponed until the Central American regional electricity market becomes a reality. Meanwhile, remuneration schemes should be made more homogenous for generation technologies and move toward standardized contract formats.

System growth and institutional development will eventually reach a point where the balance of risks and benefits favor full liberalization in generation. At that time, Honduras and Central America will be positioned to profit from other countries' lessons on how to design market architecture and handle associated regulatory constraints to maximize expected gains from the transformation.

¹⁷ Eventually, this system may lead to overexpanded capacity, as the capacity decision is made by a planner who does not have to incur the corresponding costs and who is exposed to political embarrassment if shortages emerge.

Coverage Expansion via Universal Service Fund

Increasing service coverage is critical in any sector reform. To date, donor grants have been relatively successful in expanding electricity coverage in Honduras. But this is not sustainable. New funding sources to service the poor need to be explored.

One alternative is to privatize distribution, obligating the concessionaire to meet annual coverage goals. However, this type of arrangement requires ex-ante bargaining between the sector planner and the concessionaire to determine the beneficiaries, technologies, and pace of the process. These ex-ante decisions may turn out, ex-post, to be severely sub-optimal.

A better option is to establish a Universal Service Fund (managed by the suggested new Ministry of Energy), which would have three funding sources: 1) funds from privatization of distribution and private participation in generation, whenever these alternatives are undertaken; 2) fiscal transfers based on incentives; and 3) innovation grants from donors and equipment firms, matched to rural communities' efforts.

The Universal Service Fund would subsidize the connection of new customers to existing networks (subsidies would be restricted to connection fees). The Fund would issue customers bonds with which to pay distribution companies for connection costs when installation is completed.

Design of a delivery solution for decentralized, rural energy has two organizational alternatives: 1) award supply through concessions to Energy Service Companies (ESCOS), using the concept of output-based aid; and 2) use grassroots organizations and micro-financing techniques to self-procure energy services. The governance choice depends on the magnitude of investment and established traditions of cooperation and rural finance networks.

Preparatory work is needed to determine coverage goals, identify feasible technologies, specify arrangements for maintenance, determine community contributions, and set rules for choosing recipients of the aid.

Within the context of privatization of distribution, other key coverage-expansion issues include coordinating the award criteria with expansion goals and maintenance obligations of the concessionaire, proper specification of procedures for procuring grid extension, and accounting for new assets in the tariff-setting process.

Single Buyer

The size of the Honduran power market does not leave many options for dealing with capacity expansion if the costs of vertical integration are to be avoided. In this setting, the single-buyer solution is a feasible choice to guarantee security of supply. It solves the fundamental problem of concentrating supply of nationwide power requirements in a single, sizeable transaction at a minimum, ex-ante cost. This minimizes the holdup new generators would face if they had to negotiate with two or three small distributors simultaneously. Some scale economies could be gained, and the added time and cost associated with an ineffectual, public-contracting system would be avoided.

We suggest two alternatives for implementing the single-buyer solution. The first is creating an association of distributors to function as the contractual counterpart of generators, in both capacity contracts and dispatched energy.¹⁸ Incentives for timely payment by distributors should be introduced. Ideally, the association would act as a clearinghouse to guarantee performance of individual distributors. In addition, the association would request that each distributor fund an individualized, commercial default guarantee.¹⁹ This would reduce the regulator's workload and contribute to the financial sustainability of transactions. Under this alternative, the system operator would not get involved in any commercial deal between generators and distributors.

Alternatively, a private system operator could conduct both the physical dispatch and commercial arrangements between generators and distributors. While this solution requires more sophisticated, middleman resources, it is a neutral financial instrument that would not be under the control of distributors. It would also facilitate transition to the regional generation market.

It must be warned that the single-buyer proposal confronts various agency problems. First, the government may commission excess capacity and gold-plate the technologies. Second, the pass-through of the generation

¹⁸ To function, this scheme requires vertical separation of generation and distribution to avoid conflict of interest.

¹⁹ The political economy of electricity makes it difficult to fully hedge commercial risks, but the same is true of any other conceivable governance and contractual scheme that could be devised; however, it would be reasonable to achieve at least partial hedging via self-funded guarantees.

component to customers does not stimulate responsive pricing by distributors. Third, public-generation firms may press to modify the level of privately commissioned capacity. Finally, private generators may not be able to respond directly to the differential commercial performance of distributors.

Complementary measures must be implemented to mitigate these shortcomings. These include:

- ◆ Introducing time-responsive pricing and tariffs.
- ◆ Making capacity payments of distributors proportional to their peak demand.
- ◆ Conducting public hearings to analyze the trade-offs between tariffs and supply reliability, when defining the need of new capacity requirements.
- ◆ Facilitating non-regulated customers to deal directly with generators.
- ◆ Generating a settlement contract system that avoids frictions between distributors and non-regulated customers.
- ◆ Introducing incentives to reduce risk of default by individual distributors.
- ◆ Negotiating callable capacity contracts when the size of additions is determined by supranational considerations; this would enable the planner to contract lesser firm capacity.

In sum, under the single-buyer scheme, the system planner would define the size of the capacity addition and its technology. The single buyer would then conduct public-capacity auctions under the regulator's supervision. Each distributor would pay the capacity element pro-rata with its peaking demand.²⁰ The association of distributors would partially guarantee performance of the distributors.

Privatization

Privatization of distribution is more likely to attract investors once unbundling of ENEE is completed and the reformed tariff and subsidy structures have been proven politically feasible. Ideally, the new distribu-

²⁰ In this way, distributors would have the incentive to introduce demand-side reduction measures.

tion firms should group customers together to be financially viable. A portion of the proceeds from privatization should go into the Universal Service Fund for expanding coverage. Another portion should be frozen for future financing of PPA renegotiation. Privatization of hydroelectric generation is a more politically sensitive issue. However, Colombia's positive experience in reaching a public-private partnership in the Bogotá Energy Company (EEB) (the formerly vertically integrated electricity firm) should be carefully assessed. A partnership of this sort would boost the Honduran investment climate and prospects for competition in the regional generation market.

Transition to the Regional Market

Construction of the SIEPAC project (*Sistema de Interconexión Eléctrica para los Países de América Central*) will greatly reduce the physical constraints on power trades between Honduras and the Central American region, offering the prospect of sufficient market size to permit a competitive generation market. In the medium term, however, it appears unlikely that this will develop into an integrated market with a single, unified dispatch system. Rather, the regional market will operate, for the foreseeable future, as an added layer upon the national markets, with considerably different rules and regulations, which are embedded in recent legislation. Trade will be channeled through the national dispatch systems.

For now, Honduran reform design should assume there will be a national market with increased options for international trade, rather than a fully-fledged regional market. The major transition task for the country's market will be shifting toward standardized contracts of shorter duration. This change will create contract liquidity and downward price pressures. The cost of the transition is renegotiation of the current PPAs.

Renegotiation of Contracts

The rationale for renegotiating a contract is to anticipate the benefits of new deal formats at actuarially fair costs of stopping short current procurement arrangements. The benefits grow with the proximity of outside trading options, and the costs decrease as contracts approach maturity. From the perspective of Honduras and the regional market, it should be

stressed that the primary goal of renegotiating PPAs is to introduce more liquid contract formats to facilitate future trade and competition.

Renegotiating a contract is not an easy task. A poorly conceived renegotiation may send negative signals to future private investors and generate a war of attrition between customers and producers. In Honduras, renegotiating PPAs will be easier once the SIEPAC project has facilitated international energy trade and the regional market has been developed.

A later renegotiation reduces the cost of expected compensations because the time until maturity is less. Also, it reduces the political risks and costs of having two rounds of contract renegotiation. (This could occur if the reform started now, with renegotiation based on price expectations that again turn out to be wrong.)

One feasible way to renegotiate PPAs is to shorten their duration and track the differences that their owners would have received if no changes had been introduced (Woolf and Halpern, 2001). This solution would provide investors an acceptable setting. The problem would be how to fund the difference. The literature on renegotiation shows that it is not credible to pay compensations as flows. This would exclude the possibility of using increased tariffs to pay off old contracts by installments. The stock of funds necessary to renegotiate would need to come from outside the sector (fiscal transfers or loans, both of which are remote possibilities) or from selling less politically sensitive assets in the sector.

Sequencing of Reform

Reform should proceed gradually for two main reasons. First, the stock of political capital is insufficient for any reformer to achieve far-reaching sector reform under current conditions. Second, even if resources were available to implement a formal reform immediately, it would take time to strengthen the sector and build a stable constituency to support the changes. Any attempt to introduce reform packages that are not coherent with the country's political economy may provoke costly backlashes.

Based on these considerations, we suggest that the Government of Honduras consider a two-part strategy: 1) move immediately to implement measures consistent with the overall reform envisioned in this chapter that do not require primary legislation and, at the same time, 2) prepare reform

legislation to rationalize sector governance and, when this becomes feasible, open the pathway to a more competitive market architecture.

The following measures could be implemented without the need for primary legislation:

- ◆ Unbundling and incorporating ENEE.
- ◆ Contracting new generation capacity via PPAs, through transparent, public-bidding processes, on a scale that will permit reasonable expectation of prices under \$0.065 per kWh. A first step could be successful completion of the contract presently being let.
- ◆ Privatizing distribution, with contractual terms (price caps) that stimulate feasible but sustained improvements in technical losses. Technical losses could be reduced to 12 percent within three years. This would be equivalent to adding about 10 percent more capacity to the system. Reducing theft and requiring users to pay the legal tariff for energy would further enhance the saving in capacity expansion. This approach would assign concessionaires the commercial risk of billing and collection, but would not require them to act as market intermediaries between generators and consumers. The distribution tariff would be regulated, based on efficient cost considerations. This measure would require that Congress approve the concession contract, but would not require primary legislation.
- ◆ Creating an Electrification Fund and a coverage-expansion plan.
- ◆ Reviewing the final user tariff to ensure that it fully covers the financial cost of generation and the efficient cost of transmission and distribution to assure financial sustainability of the system.
- ◆ Rationalizing the demand subsidy, either abolishing it altogether or reducing its scope for those who consume less than 100 kWh per month. The resulting savings would be reassigned to the Electrification Fund.

Implementing these measures would result in immediate gains for users in terms of supply security and cost reduction. It would also remove from the field or seriously weaken those major players who are opposed to sector reform. However, customers whose subsidy has been reduced

may oppose the measures if the change does not quickly deliver tangible improvement in service. Therefore, complementary actions to empower users through public hearings, quality campaigns, and other means should be implemented to maximize user input into the reform process and minimize consumer resistance.

Along with this effort, a task force should be established to work on sectoral reform legislation. Its goals should include:

- ◆ Creating a credible sector-governance structure, including a policy and planning agency (possibly a Ministry of Energy and Water), and a strengthened regulator, with greater technical capacity and functional independence than the present one, with potential cross-sector responsibilities.
- ◆ Leveling the playing field for generation remuneration, including renewable sources (hydro and small hydro plants), which should be developed on a competitive basis through concessions.
- ◆ Creating a private, single-buyer agency and defining its relationship with sector policy and regulatory agencies; defining a new format for contracts.
- ◆ Fixing a new system of financially sustainable tariffs and properly targeted, rational subsidies.
- ◆ Creating and nurturing channels for consumer participation.
- ◆ Clarifying how Honduras will participate in the regional electricity market.

As the government takes more decisive actions based on its existing executive mandate and demonstrates positive results to current and potential system users, it will become increasingly easier to convince Congress to pass a new law dealing with this set of issues.

Political Feasibility of the Proposed Strategy

Honduras' new administration is aware of the need to modernize the State and deepen changes in the electricity sector initiated by the 1994 Framework Law. The government includes cadres with vision and managerial skills that are vested with considerable authority resulting from the November 2001 presidential election.

On the other hand, the ruling party does not have a majority in the new Congress, and the political capital accumulated in the election campaign needs to be used on many fronts, in addition to energy. This suggests favoring strategies with minimum legislative content.

This is the rationale for suggesting that, in the concrete planning of strategy implementation, the executive branch should identify opportunities for action, based on its current mandates, rather than taking a tabularasa approach to legislation prior to implementing any change.

We believe that, notwithstanding constraints that the government faces, the strategy proposed herein is politically viable. In summary, the strategy will:

- ◆ Allow Honduras to cash in on the large efficiency gains still to be harvested in the distribution system, via its quick privatization. This could be done based on the existing law, as long as the government declares it will not exercise the option of purchasing stock through State pension funds on favorable terms. Both the windfall income from privatization and the resulting efficiency gains could be channeled quickly into benefits for users, especially the poor. This would, in turn, increase the credibility of the reform process, making it easier to have legislative changes approved in other areas later on.
- ◆ Play down the privatization of transmission and generation assets, which was a major source of political opposition to the earlier reform proposal.
- ◆ Give high priority to continuing expansion of distribution coverage, which should make it possible to organize a coalition of mayors from remote communities and marginal rural organizations in support of the proposal.
- ◆ Preserve subsidy mechanisms in favor of the poorest users, but end fiscally unsustainable subsidies to the middle class. With strong political leadership, this proposal can be sold to the press and public as a coherent part of the poverty reduction strategy.
- ◆ Guarantee capacity expansion in line with demand, avoiding the political risk of supply crises. Better planning and timely, more transparent contracting will improve the composition of the stock of generation assets and reduce the average and marginal

price of generation, compared with the “no-reform” scenario. It will also offer relative price stability in the generation market. All of these points favor the interests of current users, including the urban middle class.

- ◆ Continue, over the medium term, a market architecture system similar to the one now in place. This will reduce uncertainty and confusion among the sector’s technical cadres, which would occur if the strategy proposed to reform everything at once.

Current private-sector actors will have nothing to lose from this strategy. At the very least, they can be expected not to oppose it, and many will welcome opportunities to increase their business in the electricity sector. From this perspective, clarification of the rules for private development of renewable energy sources would be a major breakthrough.

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CHAPTER FOUR

Guatemala: Reforms in the Balance

Fundación Solar and Carlos Rufin*

Following a worldwide trend toward transferring ownership from the public to the private sector, economic opening to greater foreign investment, and reliance on competitive forces for allocating scarce investment resources, recent Guatemalan administrations have undertaken privatization and deregulation of various sectors.¹ In the process, infrastructure services have played a prominent role in terms of the complexity of the reforms and the investment involved.

Guatemala's electricity sector has been at the forefront of reforms. The new Electricity Law, approved in 1996, came several years after the first contracts were signed with several private power-plant developers. The law resulted in the creation of the National Electrical Energy Commission (*Comisión Nacional de Energía Eléctrica* - CNEE), the sector regulatory agency and fully functioning wholesale market.

Like reforms in several other countries of Latin America and the Caribbean, those in Guatemala's electricity sector face challenges to their economic and political sustainability. The root cause of these challenges is

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¹ Deregulation is understood to mean freedom or greater ease of entry and less price regulation; it does not imply a complete retreat of the public sector from such matters as pricing for small consumers.

the inability of post-reform governments to keep their side of the basic privatization “bargain,” which promised private investors a reasonable expectation: an acceptable rate of return on the privatized electricity assets over their long, useful lives. Following the theoretical framework of transaction-cost politics, as outlined in Chapter One, this chapter examines the prospects for sustainability of the reforms.

In the electricity sector, consumers and other participants have a short memory. Lack of capacity to meet demand for electricity and the inability to extend service to the entire population, which forced changes in the electricity sector initially, have been forgotten. The power-purchase contracts executed before approval of the law have caused rate increases and created discontent among the population. This, in turn, has led to government intervention in the sector through temporary expedients to keep prices for small consumers as low as possible. It has also encouraged a populist and confrontational reaction by the governing party coalition, which blames the rate increases on the new model of sector organization. These and other issues clearly show that sustainability of reforms cannot be taken for granted.

The section that follows provides a historical overview of the Guatemalan electricity sector and summarizes the reforms, as well as the motivations and expectations behind them. This is followed by an analysis of the reforms’ effects on the current state of the sector. Next, the chapter identifies and describes the major threats to reform sustainability and makes recommendations to tackle those threats.

History of Reform

Guatemala’s early history in electrification, 1885-1959, was marked by private sector participation. In distribution, the Electricity Company of Guatemala (*Empresa Eléctrica de Guatemala - EEGSA*) was granted a 50-year concession to supply energy to the Departments of Guatemala and Sacatepéquez. In 1945, the Electrification Department of the Ministry of Development’s Public Labor General Direction was created, and it soon starting building hydropower generation plants.

In 1959, the Guatemalan State assumed a regulatory and business role. That same year, the National Electrification Institute (*Instituto*

Nacional de Electrificación - INDE) was created. All private hydroelectric-generation plants, as well as overall control of the electricity sector, were transferred to INDE. The State also acquired majority control of EEGSA when its concession expired. Great strides in extending electricity service coverage and investment programs were made during this period in which the two State entities molded the electricity sector.

State as Generator, 1969-90

The period 1969-90 is characterized by a vertically integrated, public monopoly, in which generation falls mostly to INDE and distribution (in the area of greatest demand) to EEGSA. Energy supply increased considerably with construction of the Aguacapa and Chixoy hydroelectric projects, funded largely by the multilateral banks. However, with the oil shocks of 1973 and 1979, currency depreciation, and delays in completing new hydroelectric plants, abundant supplies became less secure. The government's reluctance to increase rates resulted in a highly subsidized rate policy.

Starting in 1986, INDE froze its investment programs. International financing for new projects became scarce, and the Institute limited itself to concluding the feasibility studies of certain geothermal and hydropower projects, which private investors would take up years later. Investment in the sector fell behind. Moreover, failures in such plants as Chixoy, combined with numerous accusations of corruption in INDE's financial management, further weakened sector institutions.

Prologue to Reform, 1990-96

Starting in 1990, demand increased rapidly while supply stagnated. Subsidies began to be eliminated and the existing model was questioned. INDE and EEGSA were unable to invest because of their fragile financial situation. Moreover, devaluation of the quetzal put them in a difficult position, as their revenues were in quetzals, but they had to pay for fuel and debt service in dollars.

In 1990, the Ministry of Energy and Mines (*Ministerio de Energía y Minas - MEM*), with the support of the United States Agency for International Development (USAID), conducted studies to promote private generation, especially through use of sugarcane bagasse. The

studies continued in 1991, with the support of other development assistance agencies.²

That same year, the existing model suffered its worst crisis: blackouts of up to eight hours daily and insufficient company finances to provide the energy needed to match demand. As a result, some of the ideas under discussion began to be implemented; the first dealt with the most urgent problem—lack of generation capacity—by contracting private generators. Thus, the first power purchase agreements (PPAs) were signed, with bagasse from sugar mills used for co-generation. Finally, in 1992, the INDE-EEGSA monopoly began to break apart when the 100-MW Puerto Quetzal project (PQPC), led by Enron, came on line.

The movement toward reform stalled in 1993, when President Jorge Serrano's term ended, and Ramiro De León Carpio took office. The De León Carpio administration chose first to negotiate additional contracts with the private sector. International investors followed in Enron's steps and sought alliances with local investor groups. Earlier INDE studies were used to develop hydropower and geothermal plants.

During 1993-96, the policy of growth through private participation led EEGSA to execute 13 generation contracts or PPAs. A substantial increase in private generation of electricity, backed up by PPAs in all cases, led to the commissioning of 383 MW of new generation capacity, at a cost of approximately \$300 million (Box 4.1). Moreover, the PPAs led to substantial diversification of the country's energy matrix. It moved away from oil toward biomass (bagasse); hydropower; and orimulsion (an emulsion of heavy Orinoco oil, with certain physical properties like coal and priced similarly), whose use was pioneered by the Guatemala Generator Group (*Grupo Generador de Guatemala - GGG*).

Unfortunately, the urgent need for additional capacity, among other reasons, meant that no PPA executed during 1991-96 was subject to open bidding. This resulted in allocating much of the projects' operating and financial risks to the Guatemalan government, through INDE and EEGSA as buyers.

² With the support of USAID, MEM contracted Sebastian Bernstein, former Executive Director of Chile's National Energy Commission, who advocated implementing the Argentine-Chilean model, characterized by vertical separation of the industry and creation of a wholesale electricity market.

Box 4.1. Contracts with Private Power Generators, 1991-96

At the time of the contract with the Puerto Quetzal Project (PQPC), INDE and EEGSA granted sellers good conditions because of the need to attract investors at a time of crisis and high risk for investment in Guatemala, as well as buyers' lack of experience in negotiating PPAs. The PQPC contract involved the sale, over a 15-year period, of 110 MW of capacity and associated energy, at an average plant factor of 85 percent. It contained take-or-pay clauses of 50 percent of the above level of energy per month, fuel indexing based on international oil prices, and exemption of all generators from fuel import and distribution taxes.

In 1993, Agreement 4-93 was issued, which declared the execution of energy purchase and sale contracts of national interest and social benefit. It empowered INDE to enter into private-generation contracts without meeting the requirements for competitive pricing and a bidding process.

The contracts had two important features. The EEGSA PPAs involved co-generation from sugar mills and thermal plants. With the exception of the Santa Elena thermoelectric plant in Petén, INDE entered into contracts with renewable energy projects. Of the contracts signed, 20 are in effect and represent a current purchase commitment of 518 MW, which will be increased to 609 MW when certain hydropower plants under construction begin operations.

PPAs Contracted before General Electricity Law Entered into Force

Buyer	No. of Contracts	MW in Operation	Entry into Operation (MW, 2000-2002)	Life of Contract
EEGSA	11	462		2008-2021
INDE	9	47.7	99.2	2009-2022

Source: ECLAC (2000a).

Despite political pressures during this period, only one PPA was cancelled for being inimical to national interests. This occurred in 1993 but did not prevent further private investment in the sector, as additional PPAs were subsequently executed by INDE and EEGSA. Furthermore, generation projects based on renewable resources were subject to a tax deduction, which made them attractive.³

However, quality of service was mixed. At the generation level, new investment, plus contract incentives, led to fewer plant outages and increased stability and certainty of delivery. At the distribution level, the situation failed to improve significantly, at least in rural areas. In coverage, significant increases were achieved.

Meanwhile, work resumed on design of a new structure for the country's electric power industry. Following a complex political process, the new Organic Law of INDE was signed in 1995, and the next year, the General Electricity Law of Guatemala was approved.

The 1996 Reform

The government's motivation for passage of the General Electricity Law was the public sector's inability to satisfy the country's electricity needs. The law aimed to lower electricity cost by creating a spot market that would foster short-term competition and send signals for private investment in new generation capacity, whereby private investors and consumers would share investment risk and taxpayers would no longer bear it. The major flaw was the effect of pre-existing PPAs, later amplified by large fluctuations in international oil prices, as PPA prices were fully indexed against international oil-price movements and foreign exchange risk.⁴ PPA owners, by contrast, were aware of the potential for such effects and ensured that the law clearly stated that their contracts would be respected.

³ Decree-Law 20-86 provided the incentive deduction of 100 percent of investment from income tax, in the case of investments in renewable energy. If a company had large prior-tax liabilities, the project could thus be developed at practically zero incremental cost.

⁴ Soft oil prices during 1996-98 masked this problem; however, the upturn in prices during 1999-2000 exposed the risks to reform posed by indexing clauses. Also, fuel and exchange risks were not the only ones transferred to the buyer (i.e., INDE or EEGSA). PPAs limited penalties for plant unavailability.

Although the law mandated unbundling the industry and introducing competition where viable, without explicit mention of privatization, it was perceived as a prologue to privatization. The concept of selling State property was new, and certain sectors were clearly opposed to privatization. MEM had the support of international organizations, including the Inter-American Development Bank (IDB), World Bank, and USAID. INDE and EEGSA unions initially opposed the first indications of change in 1986; however, this opposition was reduced in the run-up to the 1996 passage of the law, as attractive severance packages were granted to INDE and EEGSA employees, who had received relatively high salaries and benefits levels under State ownership. Because of questioning by the press and the climate of distrust toward privatization, the government did not gain the support of congressional opposition. Lacking the necessary majority to create the CNEE as an autonomous institution,⁵ the government decided to let it remain a part of MEM.

Aftermath of Reform, 1997-2000⁶

After the General Electricity Law had been approved and regulations of the two main institutions—CNEE and the Wholesale Market Administrator (*Administrador del Mercado Mayorista - AMM*)—had entered into force, a new phase began in development of the sector. Implementing regulations of the law went into effect as Decree No. 93-96. CNEE was created in 1997, and AMM was established the following year. Article 1520 of the Civil Code, which made the executive branch responsible for setting rates for public services, was repealed.

The government made it State policy not to effect new public investment in generation, although it also decided to defer indefinitely the sale or concession of hydroelectric generation assets under the control of INDE through its Electricity Generating Company (*Empresa Generadora de Energía Eléctrica - EGEE*). The new legal framework began to attract private merchant investment, the first of which occurred through the Northern Electricity Generation Company (GENOR) and the GGG. Various other

⁵ To create and approve the autonomous entity, a qualified two-thirds majority of congressional votes was needed.

⁶ See Appendix Figure 4.1 for performance indicators of the Guatemalan electricity sector for 1997-2000.

plants entered into operation, bringing the post-reform increased capacity to 535 MW. During this period, total private investment in the sector was close to \$535 million.⁷ Marketing was also opened to private participation.

Public investment was concentrated in the transmission network, through INDE as the monopoly owner and operator of the transmission system. In several PPAs, INDE committed to build interconnection lines for renewable generators. With funds from privatization, the 230- and 69-kV transmission lines were expanded. In addition, INDE agreed to make improvements to the Escuintla and Guatesur substations to improve system reliability. Despite these efforts, however, potential transmission bottlenecks were not entirely eliminated, as provisions of the General Electricity Law for expansion of the transmission system proved insufficient. The law envisaged that generators would pay for incremental investment in transmission to avoid congestion costs (in the form of shared forced generation costs). Yet, in practice, this was not the case; as a result, the system still relies excessively on a limited number of crucial substations, including Escuintla (with more than 520 MW connected at its bar).⁸ This represents a large percentage of total generation capacity; since there is no alternative if this bar fails, reliability of the transmission grid is put at a high risk.

At the distribution level, EEGSA was privatized through sale to a group controlled by Iberdrola of Spain, with participation of Tampa Electric, EDP of Portugal, the Government of Guatemala, and local private investors. INDE sold its Western Electric Distributors (*Distribuidora Eléctrica de Occidente - DEOCSA and Distribuidora Eléctrica de Oriente - DEORSA*), to a consortium led by the Spanish utility, Unión Fenosa. The Rural Electrification Trust was created to increase service coverage in rural areas, using a portion of privatization funds.

Unfortunately, the 1999-2000 increase in world oil prices and devaluation of the quetzal resulted in significantly higher prices for PPA-related purchases. As a result, CNEE initiated contacts with PPA owners in late 1999 to renegotiate terms of the contracts. However, the PPAs anchored

⁷ In addition, in 2001, La Esperanza, the first significant merchant investment (with 126 MW), began operation; the second one, Duke Energy's Arizona plant, began construction in January 2002 and, at the time of this writing, was expected to add another 315 MW between late 2002 and early 2003.

⁸ Tampa (80 MW), Sidegua (38 MW), PQPC and La Esperanza (230 MW), San José (120 MW), and Aguacapa (60 MW).

financing for private generation projects because the financing entities were sensitive to lack of legal security in Guatemala. Either because of strong opposition from private generators or their financiers or lack of support from other sector institutions, renegotiation did not make any progress at that time. The government, through various subsidy measures, blocked the effects of higher PPA prices on retail rates. This situation created one of the major threats to the sustainability of reform.

Guatemala's Electricity Sector in 2001

As Table 4.1 shows, the structure of Guatemala's electricity market in 2001 included a range of participants across legal, regulatory, and business aspects of the sector.

Table 4.1. Structure of Guatemala's Wholesale Electricity Market

Legal authority	Ministry of Energy and Mines (MEM)
Regulatory authority	National Electrical Energy Commission (CNEE)
Market operator	Wholesale Market Administrator (AMM)
Generation companies	Electricity Generation Company (EGEE) (subsidiary of the National Electrification Institute, INDE); Guatemala Generator Group (GGG); Northern Electricity Generation Company (GENOR), PQPC, Poli watt, Sidegua, Lagotex, 6 sugar mills, Secacao, Pasabién, Comegas (Poza Verde), Orzunil, San José, Teco
Transmission company	Electricity Transport and Control Company (ETCEE) (INDE subsidiary)
Distributors	Guatemala Electric Company (EEGSA) Western Electric Distributor (DEOCSA) Western Electric Distributor (DEORSA) 16 municipal companies 1 small private company
Brokers/Marketers	Electricity Marketing Company, Inc. (COMEGSA) CEI CECSA ELECNO JACSA MEL
Large consumers	Industries with high consumption and users grouped with above 100 KW of monthly demand.

Source: Wholesale Market Administrator (AMM) (2000).

Various indicators show the presence and participation of more than 110 agents in the wholesale market, although INDE controls a major portion of capacity and most IPPs are not active because they sell under long-term PPAs. Nonetheless, according to the Economic Commission for Latin America and the Caribbean (ECLAC, 2001), the electricity markets of Guatemala and Panama show least relative indices of concentration, even if they are still far from levels considered fully competitive.

In 2000, the generation structure (by share of energy generated) represented close to 51.6 percent thermoelectric and 48.4 percent hydroelectric and geothermal; private-generation supply (mainly thermoelectric) reached 63 percent; and INDE, through EGEE, remained the principal generator, with close to 47.5 percent of total generation (Appendix Table 4.1). In terms of installed capacity of electricity generation plants by ownership, 26 groups participated at the level of the generation business (Appendix Table 4.2). Five major agents accounted for about 85 percent of electric energy supply. In terms of share of energy supplied, EEGSA led with 46.8 percent, followed by Unión Fenosa Consortium (through DEOCSA-DEORSA) (20 percent), and COMEGSA (an EEGSA affiliate) and exports (each with 14.2 percent). The 14 existing municipal companies handle only 4.2 percent of demand (Appendix Figure 4.2).

According to official information provided by AMM, the average annual weighted spot price for energy in the year 2000 was \$60.84 per MWh, with a weighted maximum of \$90.4 per MWh in April and a minimum of \$39.68 per MWh in December.

The contract market continues to dominate the spot market in Guatemala—that is, the major part of energy trade is at contract prices, while only a minor portion is traded at spot prices. For years 1999 and 2000, contract prices represented 87.2 percent and 89.2 percent, respectively, of energy traded in the electricity market, while spot prices represented 12.8 percent and 10.8 percent. For term purchases, post-reform contracts accounted for 68 percent of all energy transacted under contract in 1999 and 65.7 percent in 2000, while pre-existing contracts covered 32 percent and 34.3 percent, respectively.

The electricity transmission system consists of a main and secondary system. INDE's Electricity Transport and Control Company (*Empresa de Transporte y Control de Energía Eléctrica - ETCEE*), with nationwide reach,

handles the following infrastructure: 647 km of 230-kV lines, 222 km of 138-kV lines, and 1,216 km of 69-kV lines; the system includes six 230-kV substations, four 138-kV substations, and thirty-two 69-kV substations. ETCEE owns both the main system and a large part of the secondary system.

For 1999-2000, electricity consumption was distributed as follows: 36.3 percent residential, 25.3 percent commercial, 27.2 percent industrial, and 11.2 percent exported to El Salvador. Annual demand growth was estimated at 8.5 percent. Nearly 170,000 new connections were made, bringing the annual growth rate close to 12 percent (with respect to new connections during 1998-99). According to MEM, electricity coverage reached 76.4 percent of the national average in the year 2000.⁹ In urban areas, this index reached 93 percent, compared to 55 percent in rural areas. Distribution of electrification varied considerably, according to population density and topography of country departments. Energy demand grew 9.68 percent over 1998-99.

Institutional Governance

MEM and CNEE bear on legal and regulatory market authority, while AMM handles organization and regulation of market segments. In performing their duties, all three bodies must not only apply legislation and specific regulations consistently, in accordance with legal norms of the electricity sector, but also in accordance with other legislation (mainly the Arbitration Law, Law of the Judicial Organism, and Public Administration Litigation Law).

Legal Authority: Ministry of Energy and Mines

Under the 1997 executive law,¹⁰ MEM is given considerable legal authority. Its responsibilities include issuing and enforcing policies relative to the study and development of new and renewable sources of energy, recommending a national energy policy that takes self-sufficiency into account,

⁹ Electricity coverage is measured as the ratio of the number of connected residential users to the number of residential structures; the rural electrification index is the ratio of rural residential users to rural residences.

¹⁰ Decree 114-97, p. 17.

coordinating actions to maintain an adequate and efficient supply of oil and its derivatives, exploring resources, and marketing crude or reconstituted oil. In general, MEM acts as the center of expertise on energy matters within the executive branch. As such, it is a key actor (not a mere executor of presidential directives) through which policy initiatives are developed and analyzed. Thus, other MEM roles include formulating policy relative to the commercialization of hydrocarbons and minerals, proposing and implementing all environmental standards in energy matters, issuing opinions in its areas of competence on the policies or projects of other public institutions, and exercising ruling functions and control and supervision of electricity matters as assigned by the law.

In compliance with its legal mandate, MEM prepared the Electric Subsector Indicative Program (published in November 2000), which diagnoses the sector and outlines future plans. However, it does not analyze the sector in depth or list threats and opportunities. It is optimistic in terms of sector growth.

Relative to policy, MEM has acted in the renewable energy arena. In response to growing dependence on imported fuel and the difficulty of renewable energy projects to compete in the short-term market, MEM has outlined a three-part project: 1) a policy proposal of incentives for generation, based on renewable resources; 2) an information and promotion center for renewable resources; and 3) formulation of an investment fund to achieve these aims.

Oil supply falls under the purview of the Hydrocarbons General Direction within MEM. In relation to exploration of new wells, a new round of bidding was recently carried out for exploration rights in new areas of interest.

Regulatory Authority: National Electric Energy Commission

CNEE, technically a part of MEM, has functional independence and is responsible for formulating, implementing, and supervising the regulatory framework. CNEE has its own budget, derived from applying a rate on electricity sales and violation fines. According to the 1997 law, CNEE must abide by, enforce, and levy sanctions on violators of the law and its regulations; comply with their obligations to awardees and concession-

aires; protect the rights of users; and prevent attempts against free competition, as well as other abusive and discriminatory practices. The Commission must define transmission and distribution rates, subject to the regulations contained in the current law, settle controversies that might arise between subsector agents, and supervise prudent operation in line with international practices. In addition, it must issue technical standards for the subsector and supervise their compliance, and issue provisions and regulations to guarantee free access and use of transmission lines and distribution grids. Lastly, it can review threshold requirements for participation in the wholesale market.

The Commission is governed by a three-member board elected by the president. For each board seat, the president selects from three sets of candidates nominated by the State, private agents, and universities. The law does not consider staggered terms for the commissioners, so the three can be replaced at the same time. This makes CNEE vulnerable to losing its institutional memory at the highest level, as well as significant shifts in policy direction. (During the third quarter of 2001, CNEE experienced serious interference; the current administration forced a commissioner to resign, replacing him with a politician from the ruling party.)

Under the 1997 law, CNEE is authorized to make technical audits of AMM. The Commission conducted its first audit in the second quarter of 2001, with AMM submitting and documenting all calculation procedures for the various standards and transaction clearance.

Market Operation: Wholesale Market Administrator

The 1997 law defines AMM as a private, nonprofit entity charged with administering the wholesale electricity market; coordinating operations of generating plants, international interconnections, and transportation lines, at minimum cost, within a free-market framework for transactions between generators, brokers/marketers (including importers and exporters), large users, and distributors. AMM must establish short-term market prices for the transfer of capacity and energy between generators, brokers/marketers, distributors, importers and exporters when they do not correspond to freely agreed upon long-term contracts, and guarantee the security and supply of electrical energy.

AMM's board is represented by five groups of agents: generators (capacity above 10 MW), distributors (more than 20,000 users), transmission-service providers (more than 10 MW of transfer capability), marketers (purchase and sale transactions between generators and final users resulting in a peak load of at least 10 MW), and users (demand of at least 100 kW). Each of these groups elects one representative to the board, based on a participant's relative share of transactions in kWh with respect to other members of the group.¹¹ The board's presidency rotates annually among the five representatives.

The AMM started operation in November 1998, and, in mid-2001, its operational rules were approved. At a forum where agents, AMM technical personnel, and an international advisor convened, consensus was reached on approving both commercial and operating standards. The basic agreement was that current and future application of wholesale-market rules requires a process of transition from past rules. However, standards and rules are already being published and implemented, with the approval of both AMM and CNEE. In mid-2001, AMM's market-operation standards—19 in all—were approved and published.

The next step in approving the rules was calculating the technical and financial components required for each standard. These issues were addressed at a forum, in which all agents and AMM technical staff participated. As of this writing, all calculation processes have been implemented for the standards that require them, and the wholesale market is operating with all standards and standards-based clearance operations in effect.

AMM requires that its technical staff and board members participate in a training program on operating second-generation electricity markets (conducted in cooperation with the Unión Fenosa Corporate University).

Other Influential Institutions

Peace Agreements. The Peace Agreements are investment programs and productive projects within the context of a commitment to reducing rural poverty. The terms are general and do not affect the system of governance.

¹¹ In the case of transmission-service providers, based on total toll revenues (i.e., transmission asset values).

One visible, and thus far satisfactory, outcome of the Agreements is the Rural Electrification Trust.

Human Rights Ombudsman. The Office of the Human Rights Ombudsman played a vital role in 1993, when then Procurator Ramiro De León Carpio filed an appeal against raising the electricity rate. De León Carpio claimed that it was an administrative act that would be harmful to the people; he managed to stop the rate adjustments because EEGSA was more than 90 percent government-owned and INDE was under public ownership entirely. He further claimed that the increases (500 percent and 600 percent) were unreasonable. In 1995, with De León Carpio as President and Jorge Mario García Laguardia as ombudsman, the case was revisited, thereby paralyzing the new rate adjustments.

The current ombudsman cannot challenge a rate increase because rates no longer require presidential approval, and the State no longer determines electricity consumption rates.

Institutional Development

Reform of the Guatemalan electricity sector has involved transforming the sector's institutional framework by shifting from a public to a private asset structure and creating semi-autonomous public institutions—CNEE and AMM—to oversee and structure resource allocation. Moreover, it is at the institutional level where major threats to sustainability may occur.

The fundamental challenge facing the new institutional structure, with its overall reliance on private investment and competition, is its fit within a broader institutional framework, with regard to support for private ownership and competition in an industry with long-lived fixed assets and high political and economic visibility. Specifically, the political and judicial systems must respect and protect the rights of private investors with assets in the Guatemalan electricity sector, while also taking into account the interests of electricity consumers. For these reasons, review of major institutions in the electricity sector necessarily involves broader institutional developments that affect the sector (Appendix Table 4.2).

Policy formulation and planning. Given Guatemala's presidentialist political system and fluidity of parties, the President plays a key role in

defining and implementing electricity-sector policy. Experience in Guatemala and elsewhere shows that voters hold the executive branch ultimately responsible for major rate increases or disruptions in electricity supply; as such, presidential post-reform interests focus strongly on preventing major rate increases or similar shocks.

However, MEM is equally vital as it is the repository of technical know-how in defining and implementing sectoral policies. The need for technical expertise in the area of sectoral planning and information has kept MEM relatively unpoliticized and supportive of reforms. By contrast, the congressional Energy Commission reflects broader political forces, although it tends to align with the executive branch.

Although it plays a regulatory role, CNEE provides useful information and, despite its relative lack of autonomy, can at times help in formulating policy. Another major public actor is INDE, which operates the transmission network and most hydro generation. Constrained by its political use as a buffer against rate increases, INDE has not opposed reforms.

At the private-sector level, thermal generators and the two distribution concessionaires have had the greatest influence on sectoral policy to date. Most thermal generators have PPAs with distribution companies and have successfully defended their interests through the National Association of Generators (*Asociación Nacional de Generadores - ANG*). ANG is a powerful defender of private participation in the sector and has cooperated in development of the wholesale market and regional integration through cross-border trading with El Salvador. During and following reform, these firms lobbied strongly to protect their contracts in the new electricity market. Over time, given strong threats of political intervention and potential declaration of the contracts as harmful to the country, the generators have renegotiated their contracts in order to participate in the new market setting. The distribution concessions are partially owned by two major Spanish utilities, Unión Fenosa and Iberdrola, which can mobilize support of the Spanish government. They have moved into marketing to unregulated users and apparently are pursuing a strategy of vertical integration.

Few consumer-oriented groups are well organized, with the possible exception of large electricity users. Thus, policymaking and regulatory participation involve large asymmetries. During the period leading up to reform, unions and popular organizations were strongly opposed; however,

during the reform process, their participation gradually weakened. Currently, unions are not active players in defining sectoral policy. Popular organizations have been further excluded because of secrecy surrounding the process to approve legislation. As reforms have been implemented, popular participation has gradually increased, particularly with regard to electricity rates and demand for subsidies. Another emerging interest among popular organizations is disputes with and complaints to CNEE; however, their participation has been hindered by CNEE's refusal to grant committees or popular organizations the authority to represent small consumers.

Policy initiatives currently center on the proposed Renewable Energy Incentives Law (in discussion at the time of this writing) and the Social Rate Law, which the government designed to soften the social effects of post-reform rates. However, energy policies are still not clearly formulated. Although investment decisions have largely been left up to the market, the government must continue to address key policy areas. These include electricity access—both service connection and unit cost of energy—given Guatemala's extensive low-income population. Another key area is optimizing Guatemala's energy matrix, given that the decisions of private investors and optimal exposure of the overall economy to oil-price and foreign-exchange shocks may differ.

Unfortunately, technical capacity is coming unhinged as a result of inadequate planning discussions during the reform process. Prior to reform, INDE prepared sector plans, which MEM approved. Transformation of roles in both MEM and INDE contributed to the breaking up of planning teams, thereby losing the capacity to support this function. Particularly noteworthy was the failure to transfer INDE's information-management capacity to MEM; as an outsider to the circle of information flows, the Ministry was prevented from playing a supporting role in managing market transparency. At present, Guatemala lacks reliable models of electricity demand growth among its public-sector agencies.

Sectoral regulation. This segment is still threatened by political intervention since CNEE was established as an office attached to the executive branch, which limits development of certain institutional actions that could make regulatory processes more transparent. On the positive side, the regulatory sphere has gradually developed processes for managing and resolving conflicts among participants.

A second and fundamental problem of CNEE is lack of sufficient resources to implement its functions. CNEE is financed through a 0.3 percent surcharge on all final sales of electricity in Guatemala (approximately \$1 million in revenue). Salaries for commissioners alone consume 25 percent of the budget; another 60 percent covers quality of service and complaints monitoring. After deducting fixed administrative, equipment, and space-related costs, little is left for regulatory tasks. As a result, over the last three years, CNEE has had to rely on a \$3 million government budget allocation, supported by loans from multilateral and aid organizations.

Environment. Major players are the Ministry of Environment and Natural Resources (*Ministerio de Ambiente y Recursos Naturales - MARN*), charged with making environmental policy and supervising environmental impact studies, and MEM's technical environmental units. Nongovernmental organizations (NGOs) play an important role in verifying and evaluating transparency of the process, including reporting on rules compliance. In this area, developers of business projects play a key role.

The institutional complexity of Guatemala's environmental sector and strong vested interests in environmental matters limit sector operations; they are inadequately integrated at the cabinet level, where decisions are made that will have repercussions on sustainable development and energy policy.

The recent creation of MARN and the dismantling of the National Environmental Commission (*Comisión Nacional del Medio Ambiente - CONAMA*), the institution charged with assessing environmental impact studies, has brought an unfavorable transition to the sphere of environmental permits, where a cartel of consultants manages the studies in ways that are not necessarily transparent to the public. Partly for this reason, the environmental permitting process is slow, creating excessive "down time" for project development.

Business organizations. Among the major business organizations operating in the sector, the remaining public-sector entities should be mentioned. Foremost among them are INDE, which was unbundled into generation and transmission, and the Municipal Electric Companies (*Empresas Eléctricas Municipales - EEMs*). Although INDE and the EEMs share many general features, they differ in specific ways. For example, INDE companies behave in response to commands from the executive branch and

dominance in the wholesale market. EEMs, by contrast, are smaller, have fewer problems defining strategies, but need strengthening to prevent future vulnerability (this must be viewed in light of the relative importance of decentralization processes and rural access). The reform strongly affected these companies by further limiting the flow of resources to the public electricity sector; as a result, they lack managerial capacity to operate successfully in the new market-oriented environment.

The private sector includes a broad diversity of local and international generation groups. They entered mostly through the PPA process; however, more recently, they have included merchant-plant developers. These groups share a private vision of the market, and, as market competition is encouraged, they are gaining in competitive capabilities and political weight, as evidenced, for example, by the formation of ANG. While their viewpoints do not necessarily coincide, owing to their competitive market positions, they have been able to establish common ground with regard to certain threats, particularly those involving investment climate and potential political intervention in the market.¹²

A third type of player consists of companies or consortia, mostly international, that enter the field of electricity distribution and have corporate capacity for this type of market in countries like Guatemala. Spanish electricity companies, some of which are interested in taking advantage of niches (e.g., marketing energy to large users and generation by means of parallel investments to reduce participation risks), are a good example. Although the Spanish companies occupy separate niches in the distribution market, so that there is no serious friction between them, they strategically share strong positions as buyers of electricity, which could lead to future alliances, particularly with regard to commonly held, vertical integration interests.

Electricity marketers are largely affiliated with sector participants and clearly differentiated between generator affiliates, which have focused on export markets, and distributor affiliates, which have targeted large domestic users.

¹² The Association of Co-Generators, a group of local investors, has developed joint efforts to promote their market participation. Being renewable developers (because of their sugarcane bagasse component and having small-scale individual plants), they have a long history of shared strategies.

The Wholesale Market

Guatemala's wholesale market is composed of the purchase-and-sale transactions of energy and capacity. As all final electricity consumers must be backed by commitments from generation-plant owners, capacity contracts and adjustment transactions are included in the wholesale market to enable fulfillment of this obligation.

AMM administers the spot-energy and capacity-adjustment markets, in contrast with the contract markets, which are fully decentralized (i.e., each contract is executed and administered by the contracting parties). As market operator, AMM has a variety of functions, the most important of which is programming and execution of economic dispatch.¹³ For this purpose, the administrator first identifies the need for capacity and energy. Based on this information and the variable costs provided by the generating units (adjusted by the nodal loss factor), the program orders the dispatch by "merit" or marginal costs, and lists the hourly dispatch order. Contracts executed after the wholesale market was created do not affect merit order, but only the financial flows between contracting parties.¹⁴ The only exceptions to the merit order are the minimum energy, take-or-pay levels in the PPAs with such clauses, which are dispatched regardless of cost.¹⁵

AMM also coordinates and supervises operation of the interconnected system. AMM is not the direct operator; rather, it issues operational instructions and guidelines to the National Dispatch Center (*Centro Nacional de Despacho - CENADO*), which is located in INDE and contracted by AMM to perform this function. AMM is also responsible for clearing economic transactions between wholesale-market agents. For these calculations and corresponding invoicing, it must consider all operations carried out in the contract, spot, and capacity-adjustment markets.

¹³ See Commercial Coordination Norm (NCC) (Norma de Coordinación Comercial) No. 1.

¹⁴ See NCC No. 13.

¹⁵ Contracts executed after the enactment of the 1997 law must be made public and cannot contain take-or-pay clauses requiring physical dispatch of plants.

Power Purchase Agreements

Most PPAs were signed before the 1997 General Electricity Law entered into force. As they have already been the subject of exhaustive study elsewhere (ECLAC, 2000a, 2001), only market- and efficiency-related considerations are considered here.

Dispatch of existing contracts with take-or-pay clauses is obligatory, which causes market rigidity and inefficiency. Only certain INDE hydro contracts have a take-or-pay clause at 100 percent of the entire year's generation. Contracts signed with EEGSA depend on negotiations carried out with each generator. Sugar mills have take-or-pay at 100 percent capacity only during the harvest season when sugarcane bagasse is available. In the case of PQPC, take-or-pay applies to 50 percent of generation.

PPA energy prices were established directly, without open bidding processes. Moreover, kilowatt-hour prices are indexed to the cost of fuel. Sales prices for the take-or-pay portion of energy are about \$35 per MWh, indexed to the international cost of bunker (No. 6 Fuel Oil), with a base of \$16.25 per barrel.

Since the contracts adjust their energy prices to the international fuel-price variation, the indexing procedure introduces a distortion because operation and maintenance costs are not fuel related, and not all costs are denominated or indexed in dollars.

Most of these contracts have capacity-payment obligations. Procedures to determine demonstrated capacity tend to be lax. They favor generators because of the bargaining power generators had during contract negotiations when additional capacity was sorely needed and Guatemala was considered a high risk for long-term investment.¹⁶

Charges for capacity of existing contracts increase annually by a factor of 2.4-3.3 percent. This increase continues until the year 2006, before all contracts expire. This also introduces distortions, as most power-plant

¹⁶ Detailed capacity-testing procedures were a typical feature of most pre-market PPAs around the world, since capacity payments were tied to available capacity; with the market in place, capacity obligations take on a more financial aspect, because liquidated damages can be easily calculated with reference to market prices; thus, it is no longer necessary to have physical testing procedures in purchase contracts.

fixed costs correspond to the cost of original construction and are thus not affected by inflation.

Other PPA-related issues include the amount and allocation of excess costs caused by generator outages, and lack of obligation to provide ancillary services.

Following the enactment of the 1997 law, contract terms have affected the sector, as follows:

- ◆ With the gradual shift of larger users toward the wholesale market and smaller users to the social rate, distributors have not had to call for bids for additional power supply contracts as the law requires; in fact, EEGSA is burdened with substantial excess capacity, which it has not been allowed to sell in the capacity market.¹⁷
- ◆ As a result of the take-or-pay clauses, there was concern that water spillage from INDE's hydro plants could occur from June to November, while existing contracts would continue operating. (In the three years of AMM operation, this has not occurred; on occasions when it could have, arrangements were made between the contracting parties and AMM.)
- ◆ As the pre-existing PPAs were executed before enactment of the 1997 law, the sellers claimed that the plants involved were not governed by wholesale market rules, including those involving supply and pricing of ancillary services. Although the concepts for which penalties were charged under the PPAs generally coincided with those of the wholesale market, calculating penalty amounts differed, which created a disconnect. For example, when a plant was unavailable, the buyer would collect the penalty specified by the PPA from the seller and then pay AMM the penalty specified by market rules.¹⁸ This was a powerful motivator for amending the PPAs.

¹⁷ DEOCSA and DEORSA contracts with INDE expire in 2003, while EEGSA's contract is expected to end in 2004.

¹⁸ Several PPAs require delivery of 85 percent of plant capacity recorded during the capacity test 24 hours per day, 365 days per year. By contrast, wholesale market penalties are assessed only during the peak period (6:00-10:00 p.m. weekdays) and calculated on the basis of prices in the capacity adjustment market.

- ◆ Increased international fuel prices and devaluation of the exchange rate (both of which affected electricity prices), as well as increased awareness of the implications of existing contracts, created strong political pressure for renegotiation, which finally occurred in 2001. According to official numbers, the total savings from modernization of the PPAs was approximately Q825 million.¹⁹

Box 4.2. Renegotiated PPA Terms

In 2001, the terms of PPAs were renegotiated as follows:

- ◆ Delivery during the peak period (6:00-10:00 p.m.), with the generator's obligation extended to all contracted capacity, whether directly owned or subcontracted from third parties.
- ◆ Elimination of annual escalation of capacity price.
- ◆ Reduction of capacity price, taking the 1998 contract prices as a base.
- ◆ Elimination of generator's annual capacity test and responsibility for supply of total contract capacity remaining with the generator, with recourse to capacity markets to compensate for shortfalls.
- ◆ The generator, not the contract owner, is responsible to the wholesale market for penalties incurred.

New Contracts

For new contracts (those executed after the General Electricity Law entered into force), take-or-pay clauses are no longer permitted. Four types of standardized supply contracts have been defined for the wholesale market, in addition to import and export contracts, which vary according to the types of products and pricing schemes included in the contract (Table 4.2).

Spot Market

The spot price, fixed every hour, is the maximum variable cost of the generating units, which generate at that corresponding hour.²⁰ For each spot price, there is a price for each node in the transmission grid. The

¹⁹ Siglo Veintiuno, "Renegociación de Contratos," Sept. 17, 2001.

²⁰ See NCC No. 4.

Table 4.2. Summary of Wholesale Market Contract Types

Contract type¹	Fixed capacity price	Fixed energy price	Pre-determined capacity and associated energy
Differences in load-curve contracts	No	Yes (hourly)	Load following (hourly energy commitment)
Capacity contracts without associated energy	Yes	No	Yes (capacity only)
Capacity contracts with associated energy	Yes	Yes (peak)	Yes (capacity and associated energy)
Demand shortfall difference contracts	Yes	Yes (peak)	No (buyer's needs fully served by seller)
Capacity reserve contracts	Yes	No	Capacity (but only as contingency, in case of unavailability of other generation resources)

¹ Wholesale-market consumers (distributors, brokers, and large users) are required to have capacity contracts covering their firm demand requirements.

producer sells its energy to AMM at the node in which it is connected to the grid at the price corresponding to that node.

Generators' spot-market bids must be limited to variable costs, as specified by market regulations. Thermal generating units not committed to dedicated (physical) capacity, and energy contracts base their variable generation costs on the variable cost of fuel, start-up and stopping costs of machines, and other costs based on machine characteristics, as approved by law; the sum equals the variable cost of production. Each week, thermal generators must declare their variable operating cost and available capacity. CNEE may audit variable costs, while AMM uses capacity declarations to dispatch the plant; a plant's inability to meet its declared capacity may be reported to CNEE for further investigation and potential penalties. Hydroelectric units without contracts relate their variable costs to the value of the water determined by themselves. Hydro units with regulation capacity (reservoirs) are free to declare whatever opportunity costs of their water they wish. In addition to supply-side bids, demand-side market participants can make demand-reduction bids, involving, for example, automatic disconnection of specific equipment from the grid above predetermined spot prices.

The spot price is not applied to machines generating under AMM's mandatory conditions or those requested by a wholesale-market agent because their generation does not come from economic dispatch. In such cases, the unit is paid according to operating cost. The price of energy already includes an additional remuneration to the generators that covers the primary regulating reserve with which the wholesale market operates.

Given the spot market's structure, it is assumed that its operation is competitive; however, direct evidence is lacking, and the subject requires further study (ECLAC, 2000b).²¹ When the merit-order curve of the wholesale market tips sharply, it might be possible to manipulate prices up through production restrictions (Appendix Figure 4.3). This suggests that, with high levels of horizontal ownership, abuses of market power are a real

²¹ Given hydro generators' ability to bid freely and the potential difficulties of ex-post, variable cost audits, it seems fair to consider conditions for competition and the potential for price manipulation; for example, someone with both hydro and thermal could price the hydro unit high and push prices up.

possibility in the Guatemalan market. However, while market concentration is high, there are two important countervailing forces: 1) hydro and thermal ownership are still separate, and hydro is largely owned by INDE, which is motivated to keep prices low to meet its social-rate obligations; and 2) the obligation to contract for regulated consumers limits market power because contracts facilitate new entry if market prices are pushed too high.

*Exports and Imports*²²

At this time, firm medium- and long-term exchanges can be agreed on by a wholesale market agent and a company in another country through the contract market. Imports are considered additional generation, while exports are added to the wholesale market as additional demand. An import or export contract requires the seller to have backup capacity for delivery at the border node for the duration of the contract. Both operations must pay the applicable transmission toll.

An export contract does not give the seller dispatch priority, but is a demand added to the wholesale market. In this regard, a machine committed to a contract generates only when it is economically dispatched by AMM. The seller may cover contract-related, energy-supply requirements with its own generation, if dispatched, or with energy from the spot market. As the export contract involves a capacity commitment to guarantee the demand located in another country, the exporter cannot sell the capacity contracted within the wholesale market, but can sell the energy dispatched and produced by that capacity when the contract does not call for it and the exporter has an available surplus.

The import contract refers to additional generation production that does not belong to the wholesale market, but that, if economically dispatched or called for in real time at the border node, is required for compliance.

Although current trade between the markets of Guatemala and El Salvador is positive, imports in 1999-2000 represented only 5.18 percent and 13.16 percent, respectively, of total country demand. These low percentages reflect electricity exchange limitations between the two countries, as follows:

²² See NCC N. 10.

- ◆ The 130-MW maximum exchange capacity, caused by constraints of the Salvadoran electricity system.
- ◆ Normative differences in spot-price determination, since Guatemala is a cost-based market and El Salvador is a bid-price market (although, as the bidding rules of the Guatemalan market show, the differences are only of degree).
- ◆ Technical problems involving frequency regulation, flow control, and quantity of energy delivered by hour (in late 2000, the Salvadoran dispatch center restricted imports from Guatemala, alleging threats to service quality; the charge, contested by Guatemalan exporters, had the effect of reducing exports to El Salvador by 50 percent during 2001, according to PQPC).
- ◆ Administrative problems, such as rejection of system outage charges; delays in transaction clearance between agents of the two markets; incorrect charging of value-added tax on import and export bills; and the need for guarantees of firm capacity.

Markets have had a more difficult time than agents in reaching an agreement. Boards of directors have held several meetings attempting to resolve differences, and are now analyzing the framework treaty for operating the Central American interconnection to resolve the problems definitively. In fact, spot-market prices are already converging because of cross-border trade arbitrage.²³

Capacity Adjustments and Ancillary Services

Capacity adjustments are the pool of exchanges that result from the capacity shortfall of contracts, calculated by business day and at peak hours.²⁴ The producing participants must buy in the capacity adjustment market the difference between their available firm supply and the capacity committed in contracts at peak hour. The consumer participants whose

²³ Systematic, spot-market price differences between the two markets began to disappear in late 2001, with implementation of AMM's operation and trading regulations, which have reduced uncertainty about cross-border trading and increased arbitrage between the two markets. Negotiations between Guatemalan marketers and Salvadoran distributors for 2002 already reflect this trend.

²⁴ See NCC Nos. 3 and 8.

firm demand is not covered by capacity contracts buy the shortfall through capacity adjustment transactions.

Capacity adjustment transactions are valued at the capacity reference price. For this purpose, AMM first calculates the peak price of capacity as the marginal cost of a peaking generating unit. The result is adjusted by a factor that measures the risk of shortfalls to arrive at the capacity reference price. Sellers failing to meet generation capacity commitments and load with peak demand not covered by capacity contracts are charged the capacity price for their respective deficiencies. The total charged for adjustments is then distributed among those participants who have available capacity, and prorated to the capacity adjustment market shares at that point in time.

Ancillary services in the Guatemalan wholesale market are: regulation of frequency; black start capability; cold reserve; fast reserve for emergencies and contingencies; and the technical requirements for production or absorption of reactive power, as required by AMM (based on the “capability” curve reported by the generator).²⁵

Until AMM developed ancillary pricing rules, INDE provided these services at no charge to encourage market participation. The prices of ancillary services are now determined by market rules and computed and collected by AMM. Market rules establish the computational method, which is based on spot-market prices. Charges for ancillary services are included in the report of wholesale costs for the cost transfer of capacity and energy to the distributors’ rates for regulated users. At the end of each month, AMM calculates the charge that each consumer participant or producer of ancillary services must pay. The net result for each participant is the remuneration of services rendered, minus the purchases of other services required, minus charges for noncompliance in their commitments relative to such services.

²⁵ Ancillary services could become a significant element of the wholesale market in terms of transaction value. Apparently, significant stability effects occur throughout Central America when large loads enter the system..

Regulated Sector

Ratemaking Process

CNEE, charged with setting rates, approves rate structure options for each distribution company. It estimates the various elements that determine regulated rates. Of these, the ones for which CNEE has greatest responsibility are the transmission tolls and value added distribution (*valor agregado de distribución* - VAD). The VAD corresponds to the capital and operating cost of an efficient distribution business, given the characteristics of load and the area served. Article 72 of the Electricity Law specifies the VAD calculation method. The VAD comprises customer-related, investment, and operation and maintenance (O&M) costs, in addition to losses (discussed below as a separate component of regulated rates). The cost of capital (investment) of the VAD is calculated as the capital recovery factor for an asset life of 30 years, at a market-based rate of return for distribution businesses in Guatemala, with a floor of 7 percent and a ceiling of 13 percent real return.

CNEE also develops a set of cost-related indicators (value of assets, number of consumers, energy sales, line length), which are used to determine levels of efficiency (i.e., efficient levels of investment and manpower that determine the VAD cost basis) to be used in VAD calculation for two-to-three representative distribution areas, generally chosen as a function of load density (especially urban versus rural areas). Efficiency levels cannot be less than for the previous five-year period, and an annual productivity improvement factor may be included to further reduce VAD levels over the five-year period.

On April 30 of each year, CNEE publishes the electricity rates to final users for each distributor, which are then applied on May 1. For this purpose, AMM must present CNEE the calculation of energy and capacity prices projected for the next 12 months. Capacity prices are passed through from the supply contracts executed by the distributor, including contracts assigned to the distributor that predate the Electricity Law. Energy prices are the weighted average of projected market prices for the next 12 months, plus excess contract-capacity costs over projected capacity costs at market prices.²⁶ These prices are corrected every three

²⁶ That is, excess capacity costs are recovered through energy charges.

months. The difference between the average purchase price of energy and capacity for the previous three months, and the average price calculated for the year, is estimated. This difference, divided by projected demand for energy over the next three months, is the value of the rate adjustment factor for that period. Distributors are not compensated for working-capital costs that such a process may cause when actual energy or capacity prices differ significantly from expected annual values.

Rates for regulated services—transmission and distribution—are recomputed every five years, unless automatic adjustments during the interim period result in increases above 300 percent of the starting level. Every five years, distributors must hire a consulting firm pre-qualified by CNEE to prepare a VAD calculation study to be carried out under CNEE supervision. Differences between CNEE and distributors regarding the resulting VAD are settled by a three-member arbitration commission (one member is appointed by each side and a third one by common agreement).

The first tariff was calculated in 1997 (before privatization of EEGSA), with the first review in mid-2002. When the first estimate was made, the value of EEGSA assets, along with all other necessary factors, was accounted for in calculating the tariff. It must now be recalculated, based on the guidelines contained in the law.

To offset increased oil prices, the State created a social rate in the electricity market; this rate is applied to those who consume less than 300 kW, representing 92 percent of residential users. This means that INDE occasionally sells below market value; therefore, it is forced to buy energy from its contracts and the spot market at a higher price than the one at which it sells its own in dry summers (as was the case in 2001).

CNEE is in the process of contracting an arbitrator with international experience to define guidelines and determine whether the distribution companies' proposal is within acceptable parameters for redefining the VAD calculation. It will remain as is, be reduced, or elements that can be transferred to rates under the newly defined VAD will be covenanted over the next five years.

Experience with CNEE-organized public hearings has been negative. The last such hearing, organized in the city of Chimaltenango, ended with a machete wound to a CNEE staff lawyer. Guatemala has no culture of public hearings, and, after this experience, none have been organized. People still feel insulted whenever someone tries to explain why tariffs

may rise. They harbor mistrust, and do not wish to hear that they must pay more. These tentative steps are the first in this slow process.

Transmission Tolls

Transmitters and users of the transmission system may freely agree on the level of transmission tolls.²⁷ If no agreement can be reached, AMM determines the toll according to the criteria for regulated rates; this has been, in fact, the toll applied in all cases to date. Transmission tolls are charged to generation and imports. In addition to tolls, connection charges are similarly estimated and are paid by the generator in proportion to the capacity connected at the corresponding node. The connection charges compensate the transporter for installing, operating, and maintaining the equipment necessary to allow for connecting a generator or large user to the transporter's facilities and for transforming the energy as required.

Transmission system tolls are calculated every two years. Based on quotations from international and local suppliers, AMM determines the cost of constructing and installing various system components. For each component, the Annual Cost of Transmission (*costo anual de transmisión - CAT*) is calculated, taking into account the capital recovery factor (for a 30-year asset value and 10 percent cost of capital), new value of replacement, annual operation and maintenance expenses (not to exceed 3 percent of annual capital cost), and estimated annual amount of penalties to be paid by the transporter for not maintaining the component reliably and efficiently. The system CAT is the sum of the annual costs of each component.

CNEE analyzes and approves AMM's estimate of the CAT. AMM determines the economically adapted transmission system (i.e., the system that allows electricity transmission at the lowest installed and operating cost). Each generator pays monthly the percentage corresponding to use of a system portion of the CAT, which is proportional to the percentage of its firm capacity under contracts, with respect to the annual maximum firm demand of the total system. The CAT calculation procedures are repeated in the case of a new generator's connection to the grid, or the commissioning of new lines or additional transport grid equipment.

²⁷ See NCC No. 9.

A major source of contention in deregulated electricity markets is the procedure for approving inclusion of new transmission equipment into the CAT cost base. In Guatemala, implementing regulations of the Electricity Law allow for capacity expansion in the transmission system by a group of parties who mutually agree to bear, or develop a fee scheme to cover, the full cost of the facility. Under the former system, the new facilities become part of the secondary system and are thus subject to its rate regime. Under the latter system, market participants can propose expansion to CNEE, which, based on expansion benefit studies, will decide whether the fee scheme is applicable. If so, generators can decide (by a qualified majority of 70 percent of all generators by installed capacity) to carry out the requested additions on a fee basis. Generators are charged the fee on an accelerated eight-year basis, and the associated investment becomes ETCEE's property.²⁸ Since transmission congestion costs (forced generation) are, in principle, allocated to generators, this scheme aligns costs and benefits of transmission investment: generators have the option of paying the fee or bearing forced generation costs. However, thus far, neither system of privately financing transmission facilities has encouraged significant investment in new transmission capacity, leaving the burden of investment to ETCEE.²⁹

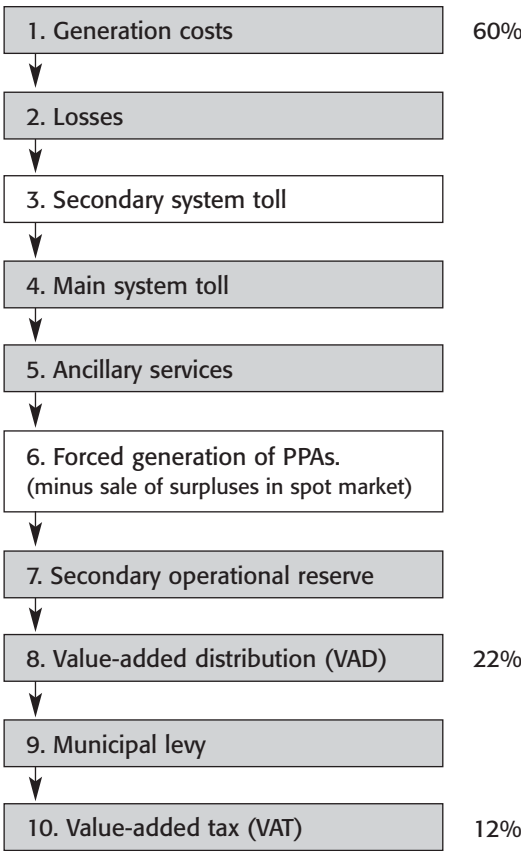
Calculating Regulated Rates

Calculating electricity rates involves 10 components, two of which (secondary system toll and forced generation of PPAs) may not apply (Figure 4.1). The generation cost usually represents about 60 percent of the total cost of the electricity tariff, while the VAD represents 22 percent and the value added tax (VAT) 12 percent. Other components vary, depending on the distribution company, distance from the generation location to users, losses, and municipal taxes.

²⁸ CNEE can also act as arbitrator and allocate the fees to another set of parties.

²⁹ Thus far, ETCEE appears to have been able to continue to invest in system expansion by upgrading lines from 69 kV to 138 kV and installing capacitors to increase voltage stability in remote areas. In addition, the Rural Electrification Trust has allocated funds to construct 23 kV and 69kV substations needed to reach certain areas.

Figure 4.1. Ten Components in Calculating Electricity Tariffs



1. Generation Costs

To determine generation costs (the kWh of capacity and energy), quarterly calculations are made to set the rate for the next three months.

2. Losses (Calculation regulated by NCC No. 6.)

AMM calculates average and peak losses (i.e., the difference between generation and consumption). Allocation of losses depends on where generation and load are located and whether they are included in regulated rates. Some generators have positive load losses, meaning they are paid a higher price than the price at the node where the energy is delivered (this is the typical counterflow case, whereby a generator located in a deficit area can contribute to a reduction in congestion; Panama uses a similar compensation mechanism).

Figure 4.1. (continued)**3. Secondary System Toll**

The secondary system toll may be applied, depending on the generator's location and who owns the line. For example, if PQPC connects to EEGSA's secondary system but not directly to its main system, then it must pay this toll. The main system consists of looped segments, where electricity flows in both directions along the line; while the secondary system consists of radial lines, where flow is unidirectional (from production to load.)

4. Main System Toll

To calculate regulated rates to end users, the regulated toll for the main system is used, on the basis described above. To calculate the unitary rate, each year, the kilowatts demanded in the second week of December (the week of greatest demand annually) are divided by the result of the cost of replacing assets. (Suppose that ETCEE invested nothing in 2001; in this case, the kilowatts demanded in the second week of December 2001 would be divided by demand, estimated to have risen by 8 percent, and cost of the toll would be reduced.)

5. Ancillary Services

AMM calculates the cost of ancillary services in accordance with the pricing criteria previously described. The amounts are not significant.

6. Forced Generation of PPAs

This rate component is included only in a situation of forced generation, and its cost is borne by the distributor under the terms of its contract with the generator. In general, forced generation charges are borne by generators, or for contractual transactions, by the party using the transmission grid, in accordance with the point of transfer of ownership of the electricity specified in the contract. PPA-related surpluses are liquidated in the spot market, and offset forced generation charges are payable by the distributor.

7. Secondary Operational Reserve

The secondary operational reserve is contracted by the load and, in the case of the regulated rate, is part of it. The cost is passed through to the rate.

8. Value-added Distribution (VAD)

The VAD is calculated every five years according to the method described above.

9. Municipal Levy

The municipal levy was created to cover the cost of public lighting, whereby each municipality defines its municipal levy (levies vary widely between municipalities). The municipalities then use this charge as a source of revenue, and they strongly defend it. INDE does not audit it.

10. Value-added Tax (VAT)

To the total of the above costs must be added the 12% VAT, with the exception of users covered under the social rate, who still pay 10%. INDE subsidizes the 2 percent difference.

Rate Subsidies

Historically, INDE fixed electricity rates using economic and political criteria. In 1993, an attempt was made to revalue the rates in order to adjust them to the dollar exchange. This action led the Human Rights Ombudsman to challenge the rate increase, which was stopped, creating serious financial difficulties for EEGSA.³⁰ Subsequently, EEGSA restructured the rates. Action by the Human Rights Ombudsman could not affect the restructuring, but it did affect users above 11 kW.

In 1996, the General Electricity Law was approved, and CNEE was created to take charge of the rate structure. EEGSA was sold, and four rate increases were negotiated. Fortunately, the price of imported fuel remained constant for a time, and no major rate effects occurred.

Every three months, the energy and capacity prices included in regulated rates are adjusted for variations in distributor purchase prices for the previous quarter. Since distributors purchase energy and capacity through PPAs and spot-market transactions, considerable quarterly price variation can occur because of hydrological conditions, fluctuations in world oil prices, and foreign-exchange movements. Regulated rates do not include working-capital adjustments related to the lag in the rate adjustment process. If purchase prices are decreasing, then the distribution company has a savings; however, if prices are increasing, the company must absorb the working-capital expense, although the law does allow for extraordinary rate adjustments in cases of significant distributor hardship. Increasing diversification of the electricity generation matrix away from water and oil is helping to dampen sudden cost changes.³¹

The adjustment mechanism was to have become fully operational in mid-1999. However, with elections in late 1999, the National Progressive Party (*Partido de Avanzada Nacional* - PAN) administration could not afford to raise rates in October, November, and December to reflect oil-price increases and depreciation of the quetzal in July, August, and September. As these costs should have been collected in the last quarter, the

³⁰ EEGSA stopped paying INDE for its purchases and thus accumulated substantial debt, which Iberdrola was required to assume when it bought EEGSA. The debt was fully repaid by mid-2001.

³¹ The Arizona project, for example, is designed to run using orimulsion, whose price is tied to coal rather than crude oil.

PAN government decided to subsidize the rates to avoid the rate increase.

The government then established a subsidy equivalent to a 12 percent rate reduction for users of up to 650 kW. Because all generation is centrally dispatched, INDE's exposure to having to cover this subsidy was purely financial—a reduction in revenue relative to what INDE could get at average market prices. ECLAC recently estimated that, during the 18 months the subsidy was in place, its cost to INDE was \$59 million (ECLAC, 2002). Although the subsidy did not create any immediate difficulties for INDE—because it has few obligations to shareholders or lenders that could be affected by the lower margins it now made on its energy sales—the social rate that succeeded this subsidy could deprive INDE of needed funds.

Establishment of Social Rate

Despite its rate subsidy, PAN lost the elections, leaving the current Portillo administration another increase corresponding to the last quarter of 1999. This was caused by ongoing rises in international oil prices and further depreciation of the national currency, resulting from election uncertainty and poor handling of macroeconomic policy. Faced with protests over rate increases, the government started planning how to lower rates in order to keep its campaign promises.

The Portillo administration decided to establish a social rate, drawing on the PAN administration's 650-kWh subsidy precedent. The social rate subsidizes all who consume less than 300 kWh per month, which includes most of the middle class. This proposal was created through issuance of Law 96-2000, Law of the Social Rate for the Supply of Electric Energy, which was implemented July 1, 2000. Approval of the social rate did not violate the law, as the vehicle for implementing the social rate was a low-cost contract for supplying electricity under open bidding conditions. According to MEM, the social rate was designed to keep the reform politically sustainable in the face of protests against rate increases and congressional intention to abolish all PPAs and restructure the General Electricity Law.

The idea behind the Social Rate Law is to transfer the economic surplus of hydropower generation (the difference between average spot-market price and out-of-pocket cost when plants are dispatched according to optimal water use) to less favored sectors. Supposedly, the price is stable because, despite annual hydraulic variations, some INDE plants are already

paid for, and the variable cost is minimal. Although users receiving this benefit represent about 92 percent of the population, politicians do not consider it a subsidy; as a result, State finances are affected. INDE is affected by the opportunity cost of having to sell energy from its hydro assets at below-market prices; during dry spells, it incurs out-of-pocket costs because it must buy at the market to sell at subsidized prices.

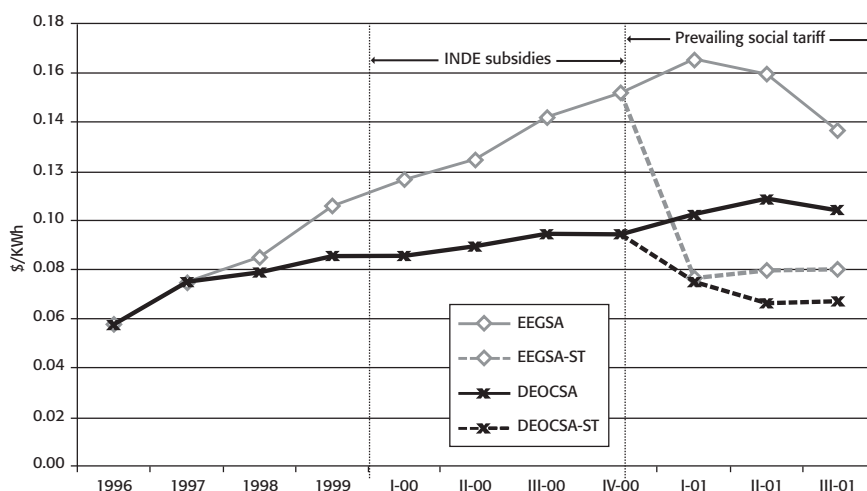
To comply with the General Electricity Law, EEGSA was required to tender bids for a 110-MW block of demand, at \$0.045 per kWh; INDE was the sole bidder. Because of this scheme, market prices were affected, as 110 MW of low-cost generation was diverted from the spot market. INDE's income was also affected, as it could no longer offer this block of demand at the market. However, the General Electricity Law was not itself broken; the Social Rate Law simply affected EEGSA's contracting for energy and capacity, moving away from the pass-through of average market prices to the regulated rates, to a contract value.³²

Because the number of consumers who use less than 300 kWh per month increases as coverage of rural areas expands, government hydropower generation will eventually be unable to maintain this subsidy instrument. It is still unclear how it will proceed when this point is reached; most likely, a policy re-evaluation will reduce the number of kilowatt hours considered under the subsidy.

Before the social tariff, EEGSA had 550 MW of capacity under contract, with a 70-MW surplus. With the creation of the social tariff, it was forced to contract 160 MW of additional capacity, resulting in a surplus of more than 200 MW.³³ When the government approved an increase in the VAT rate in August 2001, the 2 percent difference was absorbed by INDE, as this tax increase was not added to the social rate. Figure 4.2 dramatically illustrates the gap created by the social rate among EEGSA's residential consumers (and INDE's ongoing support for small consumers at DEORSA and DEOCSA through low-cost supply).

³² The spirit of the General Electricity Law, however, would dictate that CNEE decide on power-purchase portfolio matters concerning regulated customers.

³³ EEGSA estimates that, under current demand-growth trends, its 710 MW of contracted capacity will not be fully used by its regulated consumers until 2013.

Figure 4.2. Evolution of Residential Rates, 1996-2001

Source: ECLAC (2002).

Notes: ST = Social tariff. The years 1996-98 refer to the residential tariff.

According to the Guatemala Poverty Assessment (GUAPA) report prepared by the World Bank, the social tariff does not reach the poorest households (Foster and Araujo, 2002). Although it establishes a ceiling of \$0.08 per kWh for customers who consume less than 300 kWh, evidence suggests that this measure only modestly affects poor households. Owing to poor households' relatively low connection rates and the relatively high consumption threshold of the social tariff, about 65 percent of its beneficiaries are non-poor households, who capture 90 percent of the subsidy's total value, while 60 percent of poor households receive no benefit at all since they are not connected. Lowering the threshold from 300 to 100 kWh per month would improve matters somewhat, by reducing the percentage of non-poor beneficiaries to 55 percent and reducing the cost of the subsidy by 80 percent.

A more pro-poor policy would channel these resources into expanding electricity coverage to unserved households. (Poor households without access to electricity pay an estimated \$11 per kWh equivalent of energy, compared with full electricity tariffs of \$0.11-0.15 per kWh.) It is

estimated that 50,000 additional connections could be financed this way each year. Moreover, given that more than 70 percent of non-electrified households belong to the poorest segments of the population, such a policy would effectively reduce social inequity.

Quality of Service

As noted previously, the rate-setting mechanism creates incentives for efficiency improvements by basing rates on the needs of an ideal efficient company rather than the distributor's actual costs. However, this requires that an effective quality-control system be in place so that the distributor does not cut costs at the expense of service quality.

Implementing Electricity Law regulations requires that distributors keep records of the following indicators (submitted to CNEE every six months):

- ◆ Outages (System Average Interruption Duration Index [SAIDI] and System Average Interruption Frequency Index [SAIFI]), voltage fluctuations outside permissible limits, phase imbalances, and harmonics distortions, by node of distributor electricity receipt.
- ◆ Customer complaints (number, reasons, and average response period).
- ◆ Invoices issued (number, broken down by user type and estimated versus actual meter reading).
- ◆ Service orders (number by user type, capacity, and need for network adjustments, with average time for job completion).
- ◆ Service disconnections (number resulting from nonpayment and average reconnection time after receipt of payment).

CNEE is empowered to audit any of the above indicators at its discretion. In addition, all components of the quality-of-service regime have specific levels and penalties, as follows:

- ◆ New service connections must be made a maximum of 30 days from the request date; if network capacity is sufficient, reconnections must be made within 24 hours of payment.
- ◆ Distributors must compensate users, even for transmission- and generation-related extended outages (other than *force majeure*) at

the value of lost load, which is equal to 10 times the energy component (“C”) of the prevailing single-part rate for low-voltage users in Guatemala City; short-duration outages are compensated through a customer bill discount proportional to the length of outages; planned outages must notify users at least 48 hours in advance.

- ◆ Technical Norms for Distribution Service lay out specific calculation methods, parameters, tolerances, and penalties for the quality-of-service indicators mentioned above; most penalties are also based on the “C” value used to compute the value of lost load;
- ◆ In extreme cases of poor-quality service or exceptional delays in connecting new customers, the distribution concession can be terminated.

CNEE can impose fines on wholesale market participants, transmission service providers, and distributors for failure to provide required information and for quality-of-service problems, including, in the case of distributors, failure to meet the above quality requirements. Fines are based on the cost of 1 (residential) kWh at current rate levels; in the case of distributors, the number of kilowatt hours can range from 10,000 to 1 million.

In addition to survey data on quality of service, in the year 2000, CNEE began collecting data on the above-mentioned quality indicators and penalizing distributors for failure to meet the required standards. The available data show that EEGSA’s overall quality of service has been improving, while the opposite occurred for DEORSA and DEOCSA. For all three companies, actual levels are far above the goals set in the current tariffs (ECLAC, 2002). In addition, the authors have been able to obtain unaudited information on service quality from the distribution companies.

During 1998 to 2001, EEGSA increased bill payment locations from 16 to 250, reduced the percentage of unread meters from 5 percent to 1.5 percent, and reduced billing errors from 1.6 percent of all bills to 0.5 percent. The number of customer calls handled annually increased from 4,000 to 50,000, and average complaint response time decreased from 39 days to 7. The average waiting period for obtaining new service fell from 90 days to 9. Over the same period, the annual SAIDI decreased from 16 to 8.7 hours, while the annual SAIFI fell from 30 to 12 outages per year.

In 2001, DEORSA and DEOCSA had 802 bill-payment locations, and the company claims that all meters were read. From 2000 to 2001, the percentage of billing errors was reduced from 0.4 percent to 0.2 percent. The number of customer calls handled increased from 78,576 in 2000 to 328,953 in 2001, and average complaint response time fell from 4 days to 1 over the same period. The average waiting period to obtain new service fell from 16.5 days in 2000 to only 4.7 days in 2001.³⁴

With regard to customer perceptions, as measured by customer complaints handled by distributors, the main complaints for DEORSA and DEOCSA involved outages and voltage variations, while EEGSA customers complained mostly about billing problems. CNEE's annual surveys on quality show that EEGSA customers are more satisfied than those of DEORSA or DEOCSA. In 2001, about 40 percent of EEGSA survey respondents—compared to more than 70 percent of DEORSA and DEOCSA respondents—said they experienced voltage variation problems. Some 80 percent of respondents, representing customers of all three companies, experienced outages. Customer-service satisfaction was above 80 percent for EEGSA, but less than 70 percent for DEORSA and DEOCSA. Over time, voltage variations, as perceived by survey respondents, have been reduced for all three companies, while outages and customer service have improved little.

Enforcement of Regulatory Norms and Decisions

While CNEE can levy sanctions, it lacks the power to enforce them; in fact, market actors can use numerous ways to extend the time for applying sanctions in cases of conflict. CNEE's office levies sanctions following its own inspections or at the request of one or more concerned parties. CNEE plays a supervisory role primarily, using supporting documentation from complaints records that distributors are required to keep; secondarily, it investigates upon receipt of reports. Some distributors claim that the level of fines established by CNEE is often out of proportion with the distributor margins involved in the specific type of infraction. For example, these distributors claim that CNEE has applied fines for

³⁴ The authors could not obtain SAIDI and SAIFI data for DEORSA and DEOCSA.

failure to reconnect service within 24 hours that far exceed the current value of customer revenues over the life of the account.³⁵

When market participants receive notice of a sanction, they may or may not accept it. Generally, they appeal to MEM. In all cases, MEM confirms the CNEE sanction. Once the sanction is confirmed, participants can accept the sanction, which settles the matter. If they do not accept MEM's decision, they can appeal through mechanisms of the Public Administrative Litigation Law, thereby extending the process greatly. Although participants are aware that they will one day have to pay the sanction, legal challenges can delay payment for years.

In many cases, CNEE plays the role of mediator. Sanctions are often applied to multiple market participants—generally for payment-related matters—and agreements have been reached to settle differences. Although opinions across the sector differ at times, dialogue has been maintained. Several cases on the topic of transportation have been arbitrated, and differences between generators, large users, and distributors have been successfully mediated.

Of the appeals resolved for the period analyzed (July 2000-August 2001), 45 can be variously grouped. For example, under the Public Administration Litigation Law appeals process, 12 are in process (24.4 percent), six of which are for capacity adjustment transactions; 10 are for general fines (lack of or wrong information or noncompliance) (22 percent); and eight are for invoicing errors (17.7 percent). Other sanctions include fines for delays in connection services, noncompliance, and unscheduled interruptions. CNEE is waiting for the fines to be paid in the coming quarter. It is perhaps prudent to review the process in order to propose measures for accelerating it.

Major Threats to Sustainability

At the initial stages of Guatemala's electricity-sector reform, private investment in generation was attracted at the expense of what later

³⁵ Article 71(c) of the NCC specifies that the distributor penalty equals 1 percent of the monthly average bill value for the last six months for the first six hours of delay (over the 24-hour reconnection requirement), and 2 percent of this value for each additional hour. The amount of distributor margin wiped out by a 48-hour reconnection period (20 percent of a month's bill) depends on the actual margin made by the distributor.

became onerous PPAs—at the time, they favored generators, as well as INDE and EEGSA. While their effect has been diluted by additional generation, PPAs continue to exert heavy financial pressure on the sector. In addition, political opportunism and lack of knowledge about the electricity market create pressures to force prices downward through legal maneuvers.³⁶ Opportunistic politicians follow a political strategy of promising voters attractive, but financially or politically infeasible, goods and services, such as cheap electricity. Moreover, foreign companies—key players in recent decades—may tend toward vertical and horizontal integration, creating anti-competitive risks.

Sector-specific pressures are compounded by political and economic uncertainties, both national and international. Although new investment in generation continued until recently—under the umbrella of the Central American positioning strategies of large companies—world capital markets are currently negative toward the electricity sector, particularly electricity-related investment in Latin America. Dearth of investment, in turn, could lead to reform failure. Without Duke Energy's Arizona investment, generation would likely be overtaken by demand in the short term (probably in 2004). While allowing prices to rise could dampen demand growth and delay the need for further investment in generation, the political effect on reforms could be negative.

Categories of Threat

Threats to sustainability of Guatemala's reform process, discussed in the sections below, can be divided into five major categories: sector governance, sector institutions, electricity tariffs and rates, sector-related vertical integration and monopolies, and external factors.

Sector Governance

Guatemala's General Electricity Law lacks constitutional status. It was approved by a simple majority in 1996 and therefore can be amended at

³⁶ No poll data is available on the degree of knowledge of the population or specific groups, such as parliamentarians, about the post-reform framework; only in recent months has Guatemala begun to offer courses on electricity markets and regulation.

any time by a simple congressional majority, subjecting it to the designs of the incumbent government, present or future.³⁷ If this political party has not made any change in the law, this is probably because of the leadership of MEM, one of the few ministries that has not been questioned during the present administration and that gives the impression of technical and professional management—contrary to the more populist vision that predominates in other spheres of government. Obviously, if the law can be changed so easily, its regulations and those of AMM can be amended with even greater ease.

Major threats to the law are likely during the pre-election period. Electricity rates are politically sensitive. Since electricity is widely perceived as essential to modern living, particularly in urban areas where political mobilization is often high, rate increases have high visibility. This means that political interest in manipulating rates can be deceptively low during times of falling or stable rates, but will flare up when costs rise. In Guatemala, this is exacerbated by the perception of electricity supply as a public service or even entitlement, and the precedent created by such subsidy schemes as the social rate, which can lead to widespread voter perception that the government is responsible for keeping electricity cheap. Thus, it would not be surprising for the governing party, or even opposition parties, to decide to promote changes to achieve temporary—and unsustainable—rate reductions.

Sector Institutions

Guatemala lacks an institution with a global vision of the electricity sector that can make long-term plans. Although MEM should play this role, to date, its only goals have been related to rural electrification. MEM is developing plans for the sector, but needs to follow the performance of regulated companies more closely, particularly in terms of cost, quality of service, and especially development of sufficient transmission capacity through oversight of ETCEE's plans to ensure long-term reliability at minimum cost.

³⁷ With the exception of the 1991-95 period, Guatemala's legislature has been dominated by a single party since the country's 1986 return to democracy. The Christian Democracy (DC) had a majority of more than 50 percent of deputies during the 1986-90 period, followed by the PAN in 1996-2000 and now the Republican Front of Guatemala (FRG).

CNEE. CNEE is the weakest sector institution because it lacks full financial and other autonomy. When the General Electricity Law was approved, the government did not have a two-thirds majority in Congress. Although CNEE is under the MEM umbrella and is not a ministry department, the law mentions its creation and management (unlike other public departments, which are created by simple ministerial order), and the president designates its members. That CNEE lacks the status of an autonomous public entity diminishes its authority, making it more vulnerable to political pressures from the current administration.

CNEE's vulnerability is made more acute by the fact that designation of its members is subject to pressures from the Office of the President, especially recently. For example, when new commissioners had to be elected in May 2002, the government demanded and won the resignation of a commissioner that it wished to replace with a party leader. Such extra-legal pressures can permanently threaten sector governance and diminish the credibility of provisions under the law. Other recent experiences indicate that attempts are regularly made to evade the law; if unsuccessful, changes are forced in order to accommodate the governing party's wishes.³⁸

Substitution of members en bloc weakens CNEE's institutional memory and can cause appreciable shifts in direction, resulting from the country's political ups and downs. The period for which members are elected is relatively short, exceeding the presidential and parliamentary period by only one year.

In addition, CNEE lacks adequate funding and staffing. As a result of current funding inadequacies, the commission must rely on external funding sources to cover implementation of its regulatory functions. However, external funding may be far less stable, which can severely disrupt CNEE resources and reduce its independence. The government may make budget allocations to CNEE conditional on compliance with its policies, and foreign donors can impose their programmatic views and consultants. Moreover, current regulations limit CNEE's permanent staff to 18—an unnecessary limitation that can hamper the Commission's

³⁸ In the year 2000, the Social Investment Fund (FIS) Law was amended so that a government-party leader who did not meet the requirements established under the original law could be appointed president of that institution.

ability to develop a competent team of professionals to support commissioners' work.

These threats to CNEE were particularly noticeable when the first review of VAD levels was undertaken in 2002. Although CNEE had apparently obtained sufficient funds to contract consulting services for this task, additional resources were needed for the overall process. It was also essential that commissioners not be replaced all at once so that sufficient institutional memory about how the initial VAD was set could be preserved.

AMM. Although less well known than CNEE to market outsiders, AMM is no less immune to threats. Its early days were not easy, as the market needed to operate without approved rules. Because an entity of this nature had not existed previously, AMM represented a learning process—involving debate and conflict resolution—for market agents. The relation between AMM and CNEE also had to be forged, which has not been easy.

A new AMM governing body was elected in July 2002. While the first governing body made decisions by consensus, competitive voting has been the norm for the second one. The third election passes control to the private sector; the representative of generators will no longer be INDE but private generators. Change in wholesale-market governance could cause tensions between the public sector and private agents.

INDE. Another threat to sector institutions are companies that are still public property. In the case of INDE, a major threat involves transmission. With INDE financially stretched by its funding of the social rate, expansion of transmission capacity should fall squarely on the shoulders of private initiative. Although the rules permit private investment in the transmission grid, the current legal and regulatory framework for investment in grid expansion does not provide sufficient incentives for grid improvement or expansion. The fee system for repayment of transmission sets an excessively high approval threshold of 70 percent of generators, while the alternative system of mutual agreement may allow free riding by other users of the transmission network and therefore fail to induce new investment. As a result, no new transmission projects have been approved under the new alternatives, leaving INDE to shoulder the burden of transmission system reinforcement and expansion.

INDE's lack of resources could well result in constraints due to lack of needed investment to expand the transmission grid. In fact, weakness in

certain points of the national transmission grid already constitutes a serious threat. The Escuintla substation, in particular, receives 520 MW—one-third of the country's installed capacity—and thus is in urgent need of reinforcement to improve system reliability.

Lack of sufficient separation between ETCEE and ETGEE within INDE, as well as INDE's domination of AMM resulting from its weight as transmission provider and generator, can create serious obstacles to competition; for example, by having ETCEE favor EGEE in grid management. On the generation side, the problem is INDE's potential distortion of the wholesale market; given its relatively large size and highly competitive resources, its imperatives could be based on political motivation rather than financial considerations, as is the case with private generators. In fact, this situation arose with the use of INDE resources to supply low social-rate users and municipal utilities.

Municipal companies. Other public entities of importance in the electricity sector are municipal companies. Following sector reform, corruption and mismanagement by such companies have become more serious because INDE is not as flexible in accommodating or compensating them through preferential sale of electricity. If municipal companies lose their financial viability, rural populations' access to electricity could be threatened; even stronger negative reactions to sector reform could occur, given that political representatives of the affected zones would attribute the problems to reform, rather than their lack of capacity or corruption.³⁹

Electricity Tariffs and Rates

The greatest rate threat arises from distortions created by the social rate. Although the social rate deflected measures that might have killed reforms, its negative effects call for immediate alternative measures to sustain them. Approval of the social rate has effectively excluded most household users from other suppliers. As evidenced by the request for bids to supply the block of capacity and energy corresponding to social-rate customers, where only INDE could meet the price conditions, supply

³⁹ That less public information is available on municipal companies than on private distributors—even though municipal companies are in the public sector and receive significant electricity subsidies at below-market prices—is indicative of their perilous state.

prices for social-rate customers are below competitive levels. Other than INDE, with its substantial and largely amortized hydro plant, no other supplier can profitably supply social-rate customers under the requirements of the Social Rate Law. The 300-kWh-per-month threshold for rate subsidies under this law is too high. Taking such a large block of small-consumer demand out of the market weakens its effectiveness

The electricity subsidy is poorly targeted—and may even be regressive—because Guatemala's poorest households lack access, and those in the next lowest level consume substantially less than 300 kWh.⁴⁰ Moreover, as rural electrification advances according to the goals initially set, new users are entering automatically at the social rate, which imposes an increasing burden on INDE or the distribution utilities—the institutions that must cover the cost of supplying these users.

Currently, INDE has sufficient income to maintain the social rate; 110 MW at an 8 percent annual growth rate is sustainable. The medium-term threat is that, if the rate ceiling is not lowered, INDE could find itself in serious financial difficulties, to the extent that the central government may have to add a direct subsidy or the subsidy may become unsustainable and need to be abruptly suppressed or reduced substantially.

The middle class and organized lower class, the groups that benefit most from the social rate, can best make themselves heard by the government in public venues, such as the Fiscal Pact or the Guatemala Forum. They therefore avail themselves of their privileged political situation to promote maintaining the status-quo rate. However, lower-income users (particularly non-electrified households) have no major organization or opportunity to lobby for prioritizing their own rural electrification over the social rate.

The presence of such an ample social rate, combined with the shift of large users toward marketers, has the disadvantage that the weight of any cross subsidies and PPA-related stranded costs in the current rate structure falls on a shrinking number of users. The situation is absolutely asymmetrical since both small and large consumers have the more convenient option, while the heaviest burden falls on a small users group.

⁴⁰ Twenty percent of customers use less than 100 kWh, 30 percent use 100-200 kWh, and 50 percent use 200-300 kWh.

This explains why the present system is tremendously weak; that is, it did not distribute stranded costs—caused largely by the high cost of supply from the pre-reform PPAs—between all users, but had exclusively targeted regulated users above the social-rate threshold (demand side) and INDE (supply side). Regulated users are decreasing in numbers (presently, there are fewer than 100,000). Of these, another 25 percent could still become free agents, causing either a substantial increase in regulated rates or a major shortfall in EEGSA revenue to cover PPA-related supply costs. Customer shifts, together with fuel- and exchange-related increases in energy and capacity supply costs, were predicted to double regulated rates by the end of 2002.

Large users benefit further from their ability to free ride on the capacity provided by EEGSA, a problem compounded by EEGSA not having been allowed to sell its excess contract capacity in the market.⁴¹ As of January 2003, EEGSA had 618 MW of capacity under contract, against a peak demand of its regulated users of only 320 MW. Excess capacity costs amount to approximately \$4.5 million per month, which are added to regulated users above the social rate. These excess costs will increase substantially over the next two years because of fixed-capacity price escalation rates in the PPAs. The projected rate effect on users who bear this burden—for excess capacity costs only—is 20-25 percent of the rate on a per-kilowatt basis. In sum, a diminishing regulated sector with increasing costs encourages more migration, which could propel the EEGSA system into serious financial difficulties. This poses yet another threat: near-term inability to honor payment commitments to PPAs and others.

A parallel threat is INDE's energy subsidy to DEOCSA and DEORSA in rural areas. At the time that both distribution companies were sold, existing rates were left unchanged but were to be adjusted over three years to reach the level of unsubsidized rates approved by CNEE. This adjust-

⁴¹ System peaks typically occur in the evening (6:00-10:00 p.m.), when consumers return home from work. In contrast to households, large users, especially manufacturers, have a fairly constant consumption profile and can also program their consumption to avoid the system peak, which greatly reduces their capacity responsibility and associated charges. In conjunction with the ability to avoid PPA-related stranded costs, this significantly reduces (up to 50 percent) the total cost of electricity supply for large users, thereby exacerbating market distortions. Perhaps influenced by generators who benefit from sales of capacity at the regulated price, AMM does not allow distributors to sell capacity on the wholesale market, but does allow them to sell energy.

ment has not been completed because of government influence, which has buckled under local political pressures. As a result, marketers have been excluded, and even large users have better rates with DEOCSA and DEORSA. Thus, this State subsidy, which leads to suppressed rates, must end sooner or later.

With the electricity market segmented into three major sections—social, regulated, and competitive rates—it is not surprising that so little is known about the process of setting sector rates. Segmented markets, combined with confusion about the exact form of determining rates, lead to a poor understanding of how prices are set. CNEE receives and publishes insufficient information about regulated entities, and little coordination is evident between MEM and CNEE on the type of information market participants should be required to submit to them. Lack of information and poor understanding of electricity rates, in turn, favor opportunistic reactions against rate increases and thus are at the core of political threats to reform.

The public perception is that PPAs have yielded generators extraordinary profits at users' expense. PPAs were executed before the reform, however, and although they impose significant transition costs, they are now competitors in the wholesale market. Recent renegotiation of these contracts has shifted the price burden by restructuring the payment schedule over a longer period. In addition, the potential market threat is reduced year after year because of growth in market demand and entry of new generation players. However, to avoid repeating the negative perceptions of PPAs and the potential for market distortions through vertical integration, CNEE must define clear rules for the next round of supply contracting for regulated consumers; these include lead contracting times, contract terms (especially prices), generation technology, risk-management considerations, and bidding processes.

According to the Electricity Law, regulated rates are adjusted every quarter for changes in energy and capacity purchase prices, which are mainly affected by hydrology, fuel prices, domestic inflation, and exchange-rate movements. This quarterly re-estimation introduces rate volatility, leading to problems for consumers and distribution companies and potentially threatening the financial viability of distributors.

Consumer resistance to significant rate increases at times of rising oil prices or currency depreciation can, in light of recent political reactions to rate increases, cause political interference in the rate-setting process, CNEE independence, and the financial health of distribution companies.

According to EEGSA, CNEE's delay in applying the adjustments required by the law to the energy element of the regulated rates threatens to bankrupt the company. The price stability sought by consumers clashes with the financial reality of the distribution companies, which incur working capital losses at times when the price of fuel is on the rise. When consumers receive price signals that reflect the generation cost, economic efficiency is higher. The working-capital cost of absorbing purchase-price increases between quarterly adjustments is not recoverable through rates, under the assumption that cost becomes a gain when prices fall, and thus this item cancels out over time. However, this need not be true if oil prices are rising in nominal terms, or if real prices are experiencing secular trends. EEGSA claims that the upsurge in oil prices during 1999-2000 resulted in an accumulated liability of Q380 million (about \$51 million). Distribution companies would therefore prefer monthly adjustments or inclusion of a working-capital adjustment factor in regulated rates.

The effect of foreign exchange movements surpasses quarterly adjustments. VAD levels and all market transactions are set in dollars, as external financing, as well as many industry inputs, are themselves denominated in dollars. This means that the slide in the quetzal vis-à-vis the dollar affects regulated rates significantly.

Lastly, quality problems at the distribution level, often manifested as frequent blackouts and voltage variations, can create negative public reaction to the regulatory process. As noted above, perceptions of service quality have changed little in recent years, despite indications from distributors that customer service and outages are being addressed. This is a major problem because it is closely tied to the rate-subsidy issue. Consumers are unwilling to pay more if they do not perceive higher quality of service in return. While CNEE appears to have been lenient in enforcing detailed quality requirements specified in the regulations, distributors complain of disproportionate penalties, which they systematically appeal. In short, while the regulations are comprehensive, their enforcement is deficient. A key issue that should be considered is that, at

the time of their privatization, DEORSA and DEOCSA distribution networks were in extremely poor condition; thus, it may take several more years and significant investment, in addition to that already committed, before significant improvements in service quality occur.

Sector-related Vertical Integration and Monopolies

The law weakly prohibits vertical integration. It states that a company may not participate simultaneously in two of the three electricity market stages: generation, transmission, and distribution. However, this prohibition can easily be evaded by creating different companies. In short, the law treats integration loosely by not including provisions for treating business groups. Vertical integration creates information problems that can reduce market competitiveness.

Under the current legal framework, business groups can easily have important interests in generation, marketing, and distribution activities. Vertically integrated groups can incur cross subsidies to their brokers from their distribution companies—from the regulated to the non-regulated sector—to increase the corresponding VAD that the law and regulations allow them. The end result would be an unjustified increase in electricity rates, given the regulator's difficulty in distinguishing precisely whether costs belong to the regulated activity and a corresponding unfair advantage for the broker/marketer vis-à-vis its competitors.

Another effect of vertical integration is the advantage that can be gained from having access to information about individual customers. The broker linked to EEGSA has better access to customer information (e.g., historic user consumption) than do independent brokers. Untangling these informational advantages of vertical integration to ensure that consumers are not overcharged for competitive services places a great burden on regulators because accounting information can be easily manipulated and difficult to audit; thus, it is more efficient to rely on ex-ante measures (prohibition of vertical integration) than on ex-post regulatory fixes.

Another weakness in Guatemala is lack of an anti-monopoly or competition law. Article 130 of the Political Constitution explicitly prohibits monopolistic attitudes or restrictions to competition; however,

16 years after the law's 1985 approval, Congress still had not issued a law to develop this constitutional mandate. Thus, there are no obstacles to monopolistic or collusive practices.

Another issue that potentially affects competition is the price-formation process in the spot market. Although the current system of cost-based bids for thermal generators could, in principle, offer some protection against market power, this is unlikely to occur in Guatemala for two major reasons. First, a significant part of the generation park—hydroelectric plants—is not subject to bidding restrictions. Second, as the Colombian experience indicates, the obligation to submit cost-based bids is only as good as the regulator's threat of audits. The reality is that audits are not necessarily simple; they place an extra burden on the regulator, which jeopardizes their credibility as a market-power deterrent. This suggests that moving to a free-bidding system, as in El Salvador, would probably matter little in formulating spot prices in Guatemala. Moreover, as increasing price arbitrage across Central American markets leads to increasing convergence of spot prices, whether cost-based or not,⁴² the authors do not view the format of spot-market bids as an important issue; the rules, for example, can easily be changed when SIEPAC is finally implemented.

External Factors

Regional uncertainty. At the regional level, uncertainty about Central America's electricity-market rules and the inclusion of Mexico under the PPP (Puebla-Panamá Plan) can deter investment in generation over the short run. Supported by the PPP, the first phase of SIEPAC interconnection started to operate in the first quarter of 2002, and construction design for the second phase occurred during the same period, increasing the exchange capacity of electricity. However, constructing the necessary infrastructure is proceeding considerably ahead of developing an institutional framework. In addition, the diverse reform paths that countries take lack convergence. The market is still susceptible to protectionist pres-

⁴² In general, arbitrage eliminates systematic differences between free and cost-based bids because bidders have the option of exporting to the free-bid market if its prices are higher, and cost-based bids have no effect on prices if such capacity is undercut by cheaper imports. What matters is that the market as a whole is sufficiently competitive to prevent sustained price manipulation.

asures under the excuse of technical considerations. Uncertainty about rules can deter investment in the short run, as investors wait to see how the market will function. For example, the possibility of developing the 800-MW El Faro plant could paralyze investment decisions in Guatemala because of concerns about abuse of dominant power by such a plant in the absence of a clear regulatory framework for the regional market.

Fiscal threats. On the fiscal side, volatility of the tax policy increases uncertainty among investors and impedes investment. Eliminating the income-tax deduction on interest paid on loans made abroad resulted in cancellation of a 300-MW project envisioned by the Iberdrola Group. Not only have direct taxes been modified; indirect taxes (including the VAT) and the tax on commercial and agricultural enterprises have also been changed.

Economic and political threats. Other threats are related to the country's economic and political turmoil. Government decision-making appears unclear at times, owing to the variety of opinions and tendencies within the administration and the governing party's parliamentary group. In addition, public and foreign observers alike perceive significant levels of corruption, which can hurt investment or alter its direction. For example, the recent increase in the VAT rate was widely opposed, not so much because of the increase but because of wariness about the final destination of those taxes. Reports of corruption have appeared constantly in the press since early 2000, with references made to numerous ministries and government secretariats. PricewaterhouseCoopers' most recent opacity index ranked the country low. Similarly, Transparency International's index of corruption placed Guatemala unfavorably.⁴³ The Economist Intelligence Unit even degraded the country's ranking because of political and economic uncertainty. Finally, confrontations between the current administration and the private business sector have occurred because of the president's opportunistic political discourse.⁴⁴

⁴³ In its 2001 assessment of corruption levels, Transparency International, an anti-corruption NGO, assigned Guatemala a level of 2.9 (where 0 is most corrupt and 10 is least corrupt). Out of 91 countries (ranked from least to most corrupt), Guatemala scored 65 (index is available at <http://www.transparency.de>).

⁴⁴ In 2001, the Economist Intelligence Unit stated: "Mr. Portillo's populist style and anti-oligarchic stance have led to confrontations with the private sector, particularly over efforts to clamp down on tax evasion and raise the value-added tax...."

Exogenous factors have aggravated economic performance. In 2000, for example, the price of fuel increased and the price of coffee fell. The latter was further aggravated in 2001. The U.S. economic slowdown, complicated by the 2001 terrorist attacks, has negatively affected Guatemala in terms of tourism, development aid flows, domestic and foreign investment, “maquila” (garment operations) and other exports, and family remittances.

In its last business survey, the Association for Social Research and Study (ASIES) said that investment in machinery and equipment was stagnant. Sixty-four percent of companies said they were maintaining the same level of investment, and only 22 percent recorded increases. With regard to investment expectations, 73 percent believe that investments will hold at the same level for the next six months, while only 21 percent believe they will increase. Such a pessimistic business outlook originated in the first half of 2000. Indeed, as of June 2000, surveys showed greater caution and pessimism among business people, in contrast to the more aggressive, optimistic tendency of the previous administration.

Effects on Sector Investment

All five of the threats described above affect the climate of Guatemala’s electricity sector. Sector agents consider that, in light of precedents set in attempting to modify the Civil Code and the Electricity Law, the present administration is more likely than its predecessor to change the rules of the game (as established under the law and in the regulations) in order to pursue an opportunistic rates policy. This attitude contrasts markedly with that of the previous administration, when it was thought that the new legal and regulatory framework had been approved in order to set forth long-term guidelines for the country.

Neither MEM nor CNEE maintains a record of investment in the electricity sector. However, if one takes new plant construction as a proxy, it becomes clear that the boom years have fallen behind. Although the Renace and Matanzas plants (both with full PPA cover), as well as the Las Vacas merchant plant, are under construction, these three projects originated during the previous administration.

However, Duke Energy’s recent construction of the Arizona plant on

a partial merchant basis should be noted. Duke purchased GGG, which has a 150-MW contract, of which 60 MW are installed, and 90 MW more are needed to cover the PPA. The 300-MW generation facility will have 90 MW under a PPA, with the remainder in a merchant mode. This is a positive development in what had been a worrisome investment record for the current administration. On the negative side, the current flight of investment capital from the energy sector in world financial markets—caused by the Enron and other scandals, as well as crises and low returns in Argentina and many other markets—may force Duke to slow investment in the Arizona project.

If the Arizona project progresses as planned, earlier ANG projections, which warned of potential shortages by 2004, are unlikely to occur. Even if, as expected, much of the Arizona output is exported to El Salvador, where Duke has distribution investments, the plant could certainly help stave off curtailments in Guatemala.

Another reason for optimism is that the recent fall in generation investment may not be caused by the current administration's poor policy but by the fact that electricity generation had already increased appreciably during the previous administration and that, therefore, the growth rates reached in generation were unsustainable over the long term. Investors could also discount the negative effects of short-term populist policies, aware that the country will require considerable levels of electrical energy in coming years.

In terms of transmission, when the wholesale market was created, there were already bottlenecks in the central region, which resulted in forced generation and related congestion costs that had to be absorbed by generators or those paying the transmission tolls on the main system. However, a consensus was reached that ETCEE would pay for transformation expansions in the Escuintla and Guate Sur substations, and, starting with that scenario, expansions should be made as indicated in the General Electricity Law and AMM regulations.

At the level of distribution, rural coverage is advancing by the percentages predicted in the National Plans. (In 1995, nationwide electricity-service coverage was 52 percent, which increased to 63 percent in 1998 and to 76.4 percent in 2000.) The goal of the Electrification Trust is to reach 80 percent coverage by 2004. The trust has sufficient capital to fulfill its commitment and

has envisaged two loans: one in the amount of \$40 million from the Central American Bank for Economic Integration (CABEI) and a second for \$90 million from the IDB. The government has already invested \$51 million from treasury bonds, thereby supplementing amounts allocated from the sale of electricity distribution companies. Termination of the trust in 2004, however, raises serious questions about the future of rural electrification.

Recommended Actions to Counter Threats

Various measures—institutional, regulatory, competition-related, and political—could counter major threats to reform. Outlined below, these measures consider both the nature of the threats, as well as the economic and political feasibility of their implementation, in accordance with sector and stakeholder analyses presented earlier in this chapter.

Institutional Measures

MEM must develop a global view (short, medium, and long term) that emphasizes not only the sector but also its interrelationship with other sectors in the national economy (including environmental and social considerations). To this end, it is important to strengthen MEM's technical capacity in a way that does not limit the ministry to administrative actions—which have absorbed its attention to date—but that allows it to develop analytical and policymaking capacity.

At a broader level, it is important to develop institutional mechanisms for coordinating government policies that affect the electricity industry. While primary responsibility for sector policy rests with MEM, recent crises in California and Brazil show that, even with ministries or agencies dedicated to sector oversight, policies controlled by other agencies or departments can have significant, and often unintended, effects on the electricity industry. In California, for example, environmental obstacles prevented construction of new power plants, thereby paralyzing new generation for several years. Economic policy is another area of particularly strong interaction with the electricity sector, given the relatively large size of electricity-related investment in foreign capital inflows and domestic capital formation. A variety of coordination mechanisms can be considered, ranging from formal, high-level mechanisms (such as an Energy Cabinet,

consisting of the ministries of energy, environment and economy and patterned after the Economic Cabinet [for economic policy coordination] or the Social Cabinet [for education, health, and basic infrastructure]) to informal, lower-level mechanisms, including periodic meetings of officials in the three ministries. The government can choose the mechanism that best fits its style and approach to policymaking and implementation.

Whatever the mechanism chosen, a critical task for MEM, which ideally should be developed in coordination with the Social Cabinet, is to devise a new rural electrification plan that can continue the work of the Rural Electrification Trust after this entity is dissolved in 2004.

Improving the executive branch's technical capacity should be paralleled by a similar process in the legislature, since, as the recent Civil Code amendment dispute shows, threats to CNEE autonomy also originate in the legislature. Development of competent staff in the Congressional Energy Commission would give the legislature more informed control over CNEE, rather than having it resort to populist temptations when adverse shocks occur.

The law would have to be adapted to bring about, at a minimum, the following changes:

- ◆ More autonomy for CNEE (the commission should no longer be a technical branch of MEM; rather, it should be an autonomous institution whose statute can only be altered by a two-thirds legislative majority).
- ◆ Staggered appointment of commissioners.
- ◆ A higher CNEE surcharge on electricity sales (e.g., 1 percent instead of the current 0.3 percent), together with stronger penalties for failure to make payments on time.

Given Congress' control in the current administration, these measures will clearly have to wait, given the risk that changes will weaken, rather than strengthen, autonomy. Any amendment to the law, therefore, should wait until the arrival of the new legislature in 2004.

A less optimal, but more realistic, option is for international agencies and research centers to emphasize the importance of strengthening CNEE's autonomy. Both politicians and the media must be informed about the advantages of autonomy. This would be the only way to

generate a climate favorable to the legal reforms that should be adopted in later years, and would reduce the likelihood of making wrongheaded decisions.

It is also necessary to launch a campaign requiring greater transparency in CNEE. First, CNEE must, in coordination with MEM, define exactly the type of information it requires from market participants for public disclosure (especially information on distribution companies as suppliers to regulated consumers, computation of rates every four years, and revision of rates according to the indexing formulas envisaged in the law and regulations). CNEE must make public all regulated rates and their components, as specified in the law and its implementing regulations. Any controversial decision by CNEE must be brought to light. In addition, CNEE should be required to report to the Congressional Energy Commission, even when this is not provided for in the law, and to publish not only an annual report, but also a multi-year program of objectives.

Moreover, mechanisms to encourage participation in CNEE processes should be developed (e.g., through public hearings). These would contribute to CNEE's legitimacy and reduce executive or legislative temptations to control it. As is well known from U.S. regulatory experience, increasing public hearings and the rights of standing for various social groups (e.g., NGOs or indigenous communities) can have many positive outcomes: increased legitimacy of regulatory decisions, less conflict among sector stakeholders (producers, consumers, and investors), and reduction of the informational and analytical burden (in this case, by subjecting CNEE and stakeholder-group analyses and information to scrutiny by multiple parties).

Experiences in other countries reveal that a variety of mechanisms can be used to help small consumers overcome significant knowledge barriers and increase their participation in this regard (large consumers generally have well-established industry associations that can develop or acquire technical expertise). Within a broader framework of consumer representation and defense, parastatal consumer councils can be empowered to represent small consumers in hearings and handle consumer complaints on a recourse basis (distributors are the first to service complaints, and their effectiveness in doing so is included in the overall quality-measurement system).

In relation to AMM, it is important for private agents, even if they hold the majority in the next governing body, not to attempt to conduct the work through voting alone. Rather, decisions should be adopted by consensus, even if this is a slower process. If private agents do not follow this suggestion, believing that they are the “majority,” they will only provoke an immediate reaction by the government to try to change the General Electricity Law and AMM regulations to suppress this “majority.” The idea is not for private agencies to bend to MEM or INDE on the governing body, but to always attempt to adopt the most appropriate decision for the electricity sector as a whole, not only for the private sector. In this regard, CNEE must actively oversee AMM decisions and actions, with the overarching goal of promoting competition and entry in the wholesale market.

It is also important for AMM to strengthen its internal mechanisms for resolving conflicts. Arbitration must be integrated into AMM rules to facilitate more cost-efficient resolution of conflicts between two agents of the wholesale market or between a wholesale-market agent and AMM. The more that wholesale-market conflicts can be solved internally, the greater will CNEE’s relevance become as an authority to which the parties can appeal if they fail to reach an agreement voluntarily.⁴⁵

Rate-related Measures

The social rate’s maximum limit of 300 kWh must be reduced. To this end, it will be necessary to follow a policy to include, at a minimum, three measures. First, results from the GUAPA study, which clearly establishes the inefficient structure of the social tariff in helping the country’s poorest population, should be made public. The study also provides data on increasing access to electricity, resulting from the savings achieved by lowering the social tariff to 100 kWh, thereby concentrating the subsidy in poorer households.

Second, and based on INDE’s financial information, sustainability of the subsidy under present conditions should be estimated. This can be expected to lead to the conclusion that the subsidy, over a given period of time, would

⁴⁵ In addition, AMM should have external experts evaluate the behavior of the wholesale market in the context of the national economy and detect, at the sector level, anti-competition threats by market agents. This group of experts could support both AMM and CNEE.

bankrupt INDE, implying the need for direct State subsidies or a forced, sudden rate change. Ideally, subsidies should be directly allocated from the government's budget, perhaps in connection with social programs; this would free up INDE to participate fully in the spot and contract markets, thereby reinjecting greater competition in the wholesale market.

This rate adjustment is more viable now that PPAs have been amended. This favorable situation should be taken advantage of. In fact, the terms of the renegotiated PPAs should be made public to the greatest extent possible; in turn, this will make stranded costs more transparent and facilitate a solution to sharing this burden. Of course, it would also be appropriate for the rate negotiation to coincide with a period of low, or at least stable, world oil prices, thereby softening the effect on users. Without changing rates in mid-2002, any later change will be practically impossible, given that 2003 is a campaign year.

If there is no complete suppression of the subsidy in the 200-300 kWh range (i.e., if it is not politically feasible to eliminate subsidies altogether or in part), the subsidy should at least be gradual. Full subsidy should only be received by those who consume less than 60-70 kWh, while consumer groups of up to 300 kWh should receive lesser percentages of the subsidy.⁴⁶

Third, EEGSA should be allowed to sell its current capacity surpluses resulting from displacement of demand to the social rate in order to lower prices in the capacity market; this would counteract the effect of INDE's exit from the market to serve social-rate customers. This would partially compensate EEGSA for the loss of customers to the social rate and marketers, allowing it to mitigate the negative effect on consumers squeezed in the middle. Moreover, this measure could be used to stop the free-rider effect, resulting in more efficient allocation of stranded costs through a market mechanism.⁴⁷ Since the market price of excess capacity

⁴⁶ From the Survey of Living Conditions (ENCOVI) it is not difficult to extract users' ability to pay for electricity service. Specific surveys, such as those on the quality of service, could also inquire about willingness to pay. Although a fixed subsidy would work better in terms of keeping the total cost of the subsidy stable and not creating an incentive for excess consumption, it would be harder to sell politically. This is because the current subsidy is variable, and the main problem is in the cost of energy per se, rather than the cost of connection; in addition, greater rate stability may do much to diminish rate protests.

⁴⁷ In addition, capacity prices could be set hourly by AMM to reduce the effect on large users now faced with the need to purchase capacity.

is unlikely to cover more than a portion of the contract price,⁴⁸ it would be necessary to distribute the capacity costs derived from the PPAs through other measures, such as a universal stranded-cost charge, or—perhaps more unrealistically—the buy-down of all PPAs (making all IPPs merchant plants) by the government.⁴⁹

The same applies to the subsidy that INDE gives DEOCSA-DEORSA to keep the price of generation low. The pricing readjustment would have to be scaled until INDE no longer granted different generation prices according to geographic area, and EEGSA and DEOCSA-DEORSA received their energy at the same prices.

In preparing for the next round of contracting for regulated consumers, CNEE must define the conditions for such contracts to avoid repeating problems caused by the PPAs and potential vertical integration. The commission must address a variety of issues in a transparent way, including contract lengths and major terms and conditions (e.g., price and price adjustments, generation technologies, risk-management provisions, and contract-bidding procedures). In this regard, implementation of retail competition would facilitate CNEE's task by drastically curtailing the number of contracting conditions to be defined and monitored; for example, it would be possible to let marketers offer consumers different supply options, whereby CNEE's role would be limited to ensuring that marketers are properly capitalized or backed by physical resources to meet consumer commitments.

It would also be wise for MEM and CNEE, with the support of distribution companies, to launch an extensive information campaign on new energy-efficient technologies. It would not be necessary to reach the subsidy stage, which would risk capture by higher-income strata; however, users should be informed about lower-consumption light bulbs and appliances.

In relation to rate volatility, several measures are possible. One is to include a working-capital adjustment factor in regulated rates and move

⁴⁸ For 2003, the projected average cost of excess capacity is \$20 per kW-month, while excess capacity currently sold by EEGSA under social-rate terms is \$4 per kW-month.

⁴⁹ This measure could be combined with eliminating the INDE subsidy to the social rate by requiring a new tender for supply contracts with all regulated consumers and the subsequent privatization of INDE (with proceeds going to cover PPA buy-downs and a low-income electricity subsidy).

to a lower adjustment frequency (e.g., every six months or annually). However, this would dampen demand response to adverse hydrological and fuel-price movements, which would increase the overall cost of supply (due to the need, for example, to contract for more back-up capacity during dry seasons). Hence, it is advisable to move to a monthly adjustment process without including a working-capital adjustment factor, or at least a partial factor only. Because monthly movements are likely to be proportionately smaller than cumulative, quarterly adjustments, they are likely to be less visible to consumers and thus meet with less political resistance. Moreover, an educational campaign showing consumers the similarity to adjustments in gasoline prices and other household purchases subject to price variability would increase acceptance of the change. In this scenario, distributors would have an incentive to hedge fuel price and foreign exchange movements if this lowers their working-capital needs, since the savings would directly accrue to them and not to rate payers. Finally, implementation of retail competition would allow consumers to choose from among various retail-supply options, trading off average price versus price stability.⁵⁰

In addition to implementing its quality-of-service surveys, CNEE urgently needs to make effective the mechanism for systematic collection and auditing of such indicators, which are called for in the regulations. The system, in turn, must be used to strengthen the current regime in terms of penalties and rewards, comparison with regional quality-of-service standards, and shaping of public perceptions and regulatory decisions based, to the extent possible, on fact. Finally, the enforcement regime for quality of service must be re-examined, including the possibility of rewarding distributors for exceeding quality standards, instead of merely penalizing them for failing to meet them.

It should be stressed that the quality control system must be improved in the transmission area, mainly in grid reliability. Current incentives for construction and investment in new transmission lines must be expanded to cover reliability, thereby avoiding under-investment in grid expansion.

⁵⁰ For example, in the U.S., where retailing of home heating oil is an unregulated, competitive business, distributors offer consumers the option of locking in maximum prices at the beginning of the heating season.

For this purpose, regional quality-of-service standards can be used in each distribution area.

More generally, CNEE's statutory powers to require and audit information from regulated companies and market participants should be strengthened in the Electricity Law and, to prevent abuses, the major categories of information requirements should be specified in the law's implementing regulations. For regulated companies (mainly distributors), these requirements could include:

- ◆ Financial statements (for Guatemalan legal entities that are not consolidated),
- ◆ Operating information (including number of customers and quality indicators), and
- ◆ Cost of service, by rate category and type (including billing, meter reading, maintenance, and operations).

Competition Measures

Because electricity is Guatemala's most complex market, explaining its operation should not be limited to rates, but should be the rationale for launching an educational campaign at all levels, starting with political parties, business people, social leaders, and researchers. Until its operation is understood and compared to those of other countries, some will always believe that it is a market with oligopolistic rents. It would also be appropriate to consider extending competition to small consumers.⁵¹ This could lead to greater efficiency in the supply of electricity and the development of new products.⁵² It is recognized that this measure would not be viable in the short term, but could be considered when the next administration takes office.

⁵¹ Retail competition could be implemented cheaply along the lines pursued in Scandinavia (i.e., using standard load profiles for residential users to keep metering costs at a minimum). The currently installed meters would be used, and a typical load-use profile would be imputed to small consumers by retailers making electricity-service offers. Retailers would be regulated through the obligation to enter into capacity contracts or through financial capitalization requirements based on number of customers (similar to insurance companies and banks).

⁵² An example would be supply contracts protected against fuel-price variations.

This educational effort, however, must go hand in hand with studies to evaluate periodic increases in market competition. Given the country's scant domestic expertise on competition issues, especially in a market as complex as electricity, and the deregulated nature of the Guatemalan market, developing expertise and monitoring capacity on competitive matters is key to correcting problems and preempting populist accusations of consumer exploitation by foreigners. Indices of concentration, electricity rate behavior, their correlation with world fuel prices, and analyses of potential vertical reintegration should be studied so that, if negative phenomena arise in these areas, they can be identified in time and their importance made public. Currently, no research center specializes in analyzing the electricity market or others with infrastructure similar to the telecommunications market. Promoting the creation of such a center is advisable, given the difficulty research centers—characterized by a broad range of political and economic goals and objectives—would have promoting such specific subjects.

A well-known challenge faced by small countries like Guatemala is the scarcity of experts in monitoring and evaluating competition in the domestic wholesale-electricity market. Evaluating the degree of competition is a difficult undertaking in any market; in the case of electricity, technical constraints further complicate the task, requiring a high degree of specialization on the part of analysts. Developing in-depth expertise in this subject area in small countries is unlikely to be cost-effective; given the incipient nature of most wholesale electricity markets around the world, it is important to share experiences across countries.

For this reason, the authors recommend considering the possibility of forming a market surveillance committee, along the lines pursued in several European countries, Canada, and the United States. Such a committee would give MEM, CNEE and AMM permanent access to internationally recognized experts who could share international best practices on specific market-power issues with Guatemalan policymakers and oversee an annual evaluation of competition in the Guatemalan wholesale market. The committee's role would, in all cases, be purely advisory and consultative, in no way limiting the powers of MEM, CNEE and AMM. Given the likely high cost of such an advisory body, however, it would be essential to include the initiative within a regionwide program, particu-

larly within the institutional structure envisaged for the regional electricity market. As all Central American countries face similar competition issues, sharing expertise can be cost-effective.

Lack of an anti-monopoly or consumer-protection law providing for the defense of competition makes it difficult to penalize conduct that is harmful to electricity consumers. This matter should be raised as an objective to be developed as soon as possible. Such a law would benefit not only the electricity sector, but many other sectors across the Guatemalan economy.

With regard to the danger of vertical integration, such a law should be specific on prohibition, including a complete definition of business groups⁵³ (rather than treating them as separate companies). Moreover, prohibition should not be absolute, but exercised to the extent that competition is impaired. It may be difficult to place small hydro projects—which can provide significant reliability and stability benefits—outside the hands of local distributors; thus, it is desirable to leave a margin (e.g., 10 percent of a distributor's peak load) that can be placed under distributor ownership. The second-best option (if vertical integration cannot be limited) is to permit it without limitation, but to establish—as does the British market—that part of the revenue obtained from non-regulated activities will be transferred to the regulated sector, thus contributing to reducing costs and, consequently, sector rates. Whatever option is selected, it will always be necessary to compel companies to share user information to avoid discrimination in handling asymmetric information among market agents.

Development of a clear regulatory framework for the Central American electricity market, including possible exchanges with Mexico as part of the PPP, should be concluded as soon as possible. This can dispel uncertainty among potential investors and bring the benefits of new investment more quickly.

The future of public sector entities should be studied.⁵⁴ For the municipal companies, two scenarios are possible: 1) strengthen them

⁵³ At the level of financial legislation, this route is being followed.

⁵⁴ In the cases of both the municipal companies and INDE, studies are urgently needed to evaluate their financial sustainability. In the case of municipal companies, co-participation of the Municipal Development Institute (INFOM) would be important.

through a program of professional training and institutional reform, making them less susceptible to control by corrupt or patronage-oriented local authorities, or 2) sell them to the private sector via concession contracts. In the case of INDE, it is also necessary to avoid manipulation with shortsighted political ends. This can be achieved by:

- ◆ Granting INDE greater autonomy by amending its charter to give INDE private-enterprise status (regarding employment law, taxes and accounting, and environmental compliance); give INDE managers the same latitude as private-sector managers; and de-politicize the appointment of managers (e.g., through a board of directors with staggered, long-term mandates of more than four years to avoid coincidence with political cycles, and with possibility of reappointment).
- ◆ Auctioning off contracts to control INDE production, thereby splitting INDE “virtually” rather than in terms of asset ownership.
- ◆ Placing dispatch of INDE plants under AMM, using a clearly specified, transparent calculation of value of lost load and dispatch program, like SDDP.

Finally, with regard to obstacles to the development of hydroelectric and other renewable energy projects, the government is already drafting a Renewables Law that provides tax incentives for such projects.

Macroeconomic and Political Measures

Macroeconomic suggestions for maintaining stability and political suggestions for improving governance must come from various sources, including the press, political parties, research centers, and international agencies. At the sectoral level, what can be mentioned is that it is necessary to insist that investment in electricity depend largely on the country's general investment climate, which, in turn, depends on the macroeconomic and political conditions of the day.

Finally, 2002 and 2003 are difficult years for the electricity sector because of general elections held during this period. If difficult decisions are not made today, it will be nearly impossible to approve them during the pre-campaign and campaign months. Moreover, given Guatemala's

excessive turnover in government officials, which each electoral process tends to generate, 2004 will be another year of learning and hardly propitious for firm decision-making.

Looking Ahead

Following this effort to analyze the sustainability of reforms in the Guatemalan electricity sector, the next step is to define an action plan, based on the measures proposed above. This plan should be adequately structured, based on appropriate sequencing of measures, and include the resources necessary for their effective implementation and the range of stakeholders needed to ensure their political feasibility.

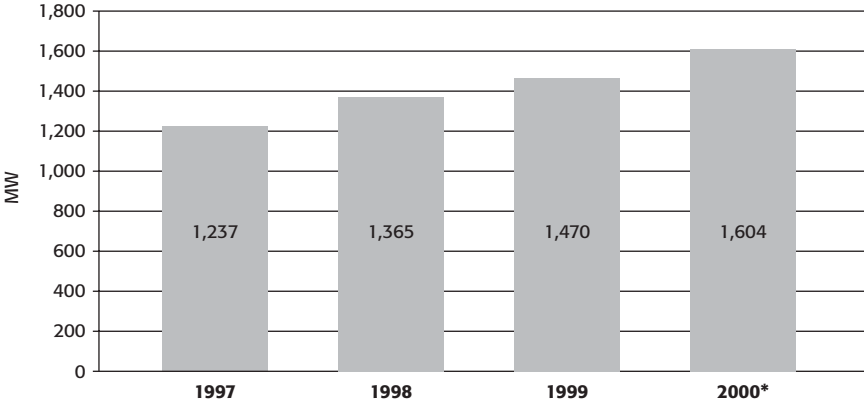
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Appendix Figure 4.1. Overview of the Guatemalan Electricity Sector, 1997-2000

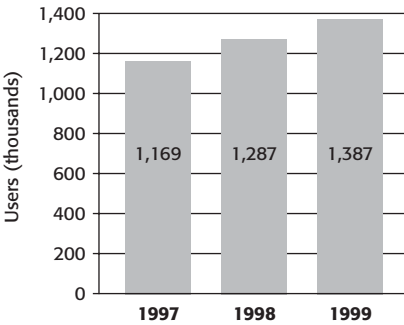
Installed Capacity of National Interconnected System (SNI)



* As of August 2000.

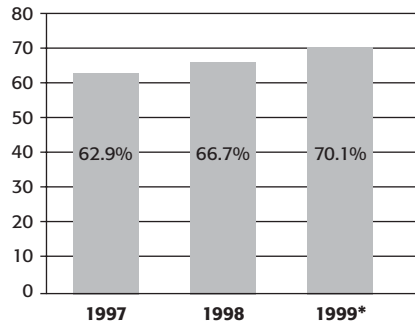
Source: INDE Statistical Report.

Number of Electricity Users



Source: ECLAC (2001b).

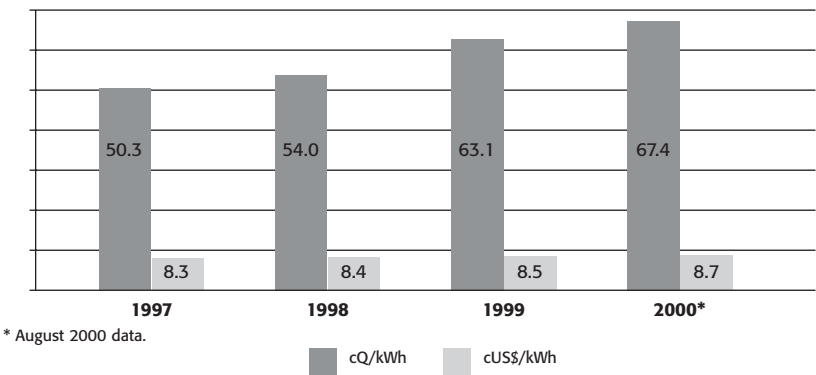
Rate of Global Electrification (%)



* Based on number of users.

Source: INDE Statistical Report.

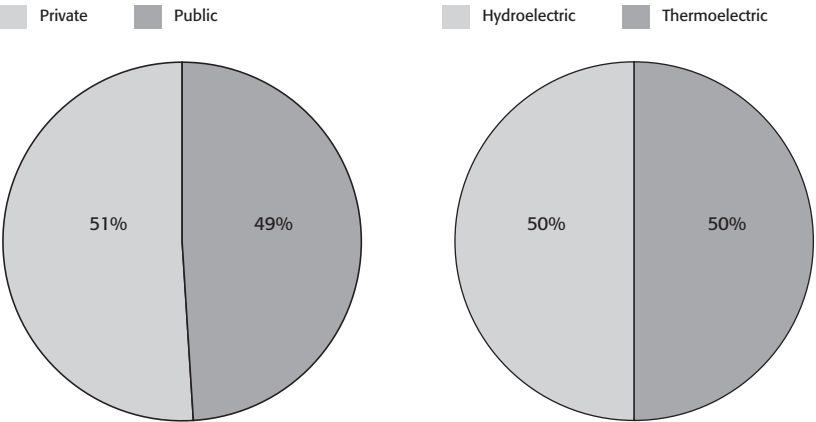
Average Consumer Price of Electricity (EEGSA)



Source: National Association of Generators (ANG) (2000).

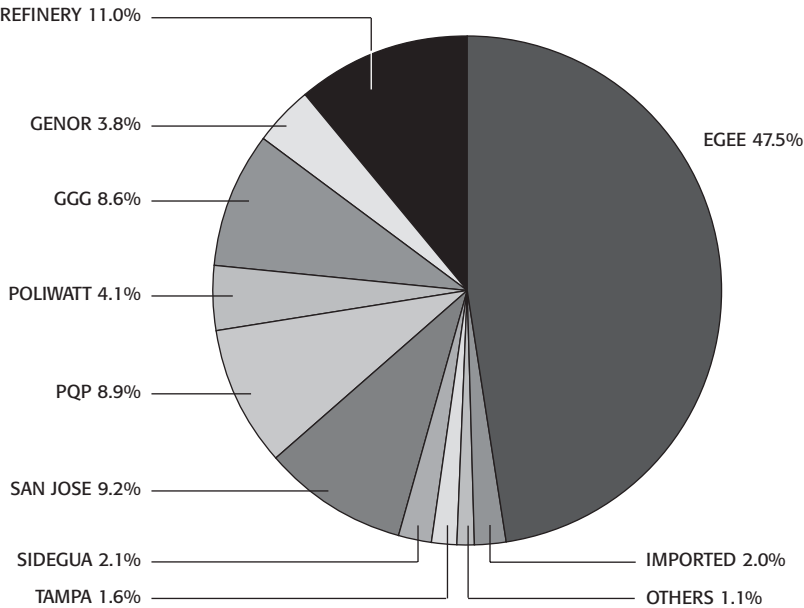
Net Energy Production in SNI in 1999 (GWH)

INDE hydroelectric	2,424	INDE thermoelectric	82
Private hydroelectric	162	Private thermoelectric	1,814
Cogeneration	644	TOTAL	5,126

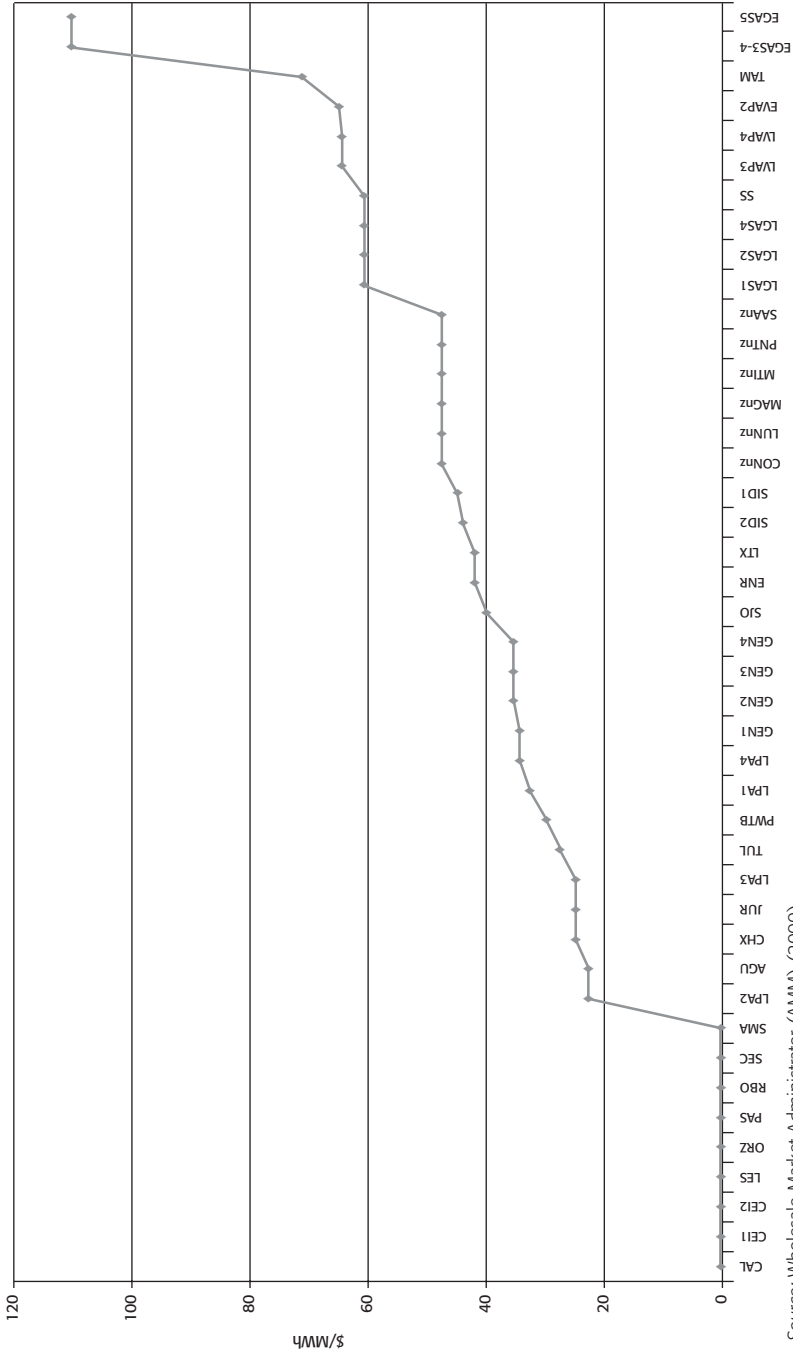


Source: INDE Statistical Report.

Appendix Figure 4.2. Energy Production by Company, 2000



Appendix Figure 4.3. Merit Order, August 2001



Source: Wholesale Market Administrator (AMM) (2000).

Appendix Table 4.1. Wholesale Market Overview, 2000

Generation, by type of plant		
	GWh	%
Thermal	3,071.47	51.60
Hydro	2,673.64	45.00
Geothermal	202.18	3.40
Total production	5,947.29	
Energy, by source		
	GWh	%
Production	5,947.29	97.97
Imports	122.94	2.03
Total	6,070.23	
International transactions		
	GWh	
Imports	122.94	
Exports	827.34	
Net	704.40	
Net without export losses	950.28	
Export losses	13.53	
Spot prices		
	\$/MWh	Month
Annual weighted average	60.84	
Maximum	90.40	April
Minimum	39.68	December
Annual simple average	57.47	
Maximum	82.74	April
Minimum	37.46	December
Major indicators		
	2000	1999
Demand*	5,068.26	4,621.11
Demand growth rate	9.68%	
International transaction growth	49.87%	
Losses	2.65%	2.43%
Export losses	0.22%	
Peak demand [MW]**	1,017.30	940.10
Peak demand, including exports	1,105.30	
Peak demand growth	8.21%	

* Excluding exports. ** Excluding self-generation.

Source: Wholesale Market Administrator (AMM) (2000).

Appendix Table 4.2. Current Stakeholders in Guatemala's Electric Power Industry

Player	Importance	Interest	Position on reform
Presidency of the Republic	Has the power to accept or reject the commissioners of the CNEE proposed in short lists, as required by law. Exercises discretionary power and power for potential sector intervention.	Avoiding large rate increases or disruptions in service, for which voters will hold the government ultimately responsible. Maintaining political control of the sector. Containing negative social effects of the reform process. Subsidizing consumption.	Considers it necessary, at present, to take action on the impact of the reform. Radical changes of vision, with respect to the processes, passing from total support in 1996–2000 to an interventionist position in 2000–2004.
Ministry of Energy and Mines (MEM)	Enforces the General Electricity Law and its regulations. Formulates and coordinates policies, plans, and programs, including the presentation of new legislation or changes in existing laws before Congress, as in the case of the Law of Renewable Resources. Grants authorization for hydro plants, transportation and distribution, and the constitution of rights-of-way. Presides over the governing council of INDE. Prepares socioeconomic evaluation reports for investment in rural electricity, for public or social benefit. Facilitates the action of the Rural Electrification Coordinating Body (CODERURAL).	Supply security. Supporting search for diversified generation. Taking initial steps to formulate sector policy. Maintaining credibility of the process as a fundamental matter in the medium term. Sector planning. Ensuring compliance of investment programs and goals defined in the Rural Electrification Trust. Relations between players. Defining structure for subsidy to electricity consumers in the country. Improving its energy policymaking capacity.	Considers it necessary at the time, although it may have had adverse environmental and social effects. Over time, has supported various strategies to counteract the effects of reform on the composition of the generation asset base and social impacts of electricity rate changes. Wants to adapt to new oversight and planning role. The reform weakened sectoral modeling and planning capabilities because of the change in type of sectoral planning (from mandatory to recommended).

Appendix Table 4.2. Current Stakeholders in Guatemala’s Electric Power Industry (Continued)

Player	Importance	Interest	Position on reform
Ministry of the Environment and Natural Resources (MARN)	<p>Promotes, formulates, and defines the environmental policy to be followed by the electricity sector.</p> <p>Certifies companies specializing in environmental studies and approves these studies in the case of electricity sector projects.</p> <p>Recently created player, MARN’s relation with the electricity sector is inherited institutionally from the earlier CONAMA (together with CONAMA officers), which was absorbed into the new Ministry.</p>	<p>Including clean generation and renewable energy in national environmental policies.</p> <p>Improving regulations and processes for environmental permits for sector projects.</p> <p>Formulating policies affecting the electricity sector, with regard to air and effluent emissions.</p>	<p>Recently created; has no explicit position on the process.</p>
Secretariat of Strategic Affairs (SAE)	<p>Development of strategic studies in support of the Executive branch.</p>	<p>Technical follow-up to the subject of pre-existing contracts in the electricity market.</p>	<p>Role and institutional permanence subject to decisions of the Executive branch. In the electricity sector, arranges for international support for the technical evaluation of contracts and their effects in the country.</p>
Energy Commission of the Congress of the Republic	<p>Congressional body charged with sector follow-up through legal initiatives and political control of public officers; vehicle of expression of the political parties represented in the Congress.</p>	<p>In the present administration, facilitating ongoing discussion on the role of the State in the electricity market, leading to calls for the intervention of CNEE, discussion of contracts, and proposals (not approval) of amendments to the Electricity Law.</p>	<p>Since 1996, has been aligned with the Executive branch, either in favor of or against the reform process.</p>

Player	Importance	Interest	Position on reform
National Electric Energy Commission (CNEE)	Regulates the market. Settles conflicts. Protects regulated users. Approves entry of players into the market. Levies penalties in the market. Defines transmission and distribution rates and methods of calculation. Issues technical rules and ensures their compliance, according to accepted international practices. Issues rules to guarantee open access to transmission and distribution grids. Participates in the preparation of rules for the future Regional Electricity Market within the framework of SIEPAC, as well as the Association of Central American Regulating Bodies.	Strengthening market sustainability. Encouraging participation and support of conciliatory solutions. Standardizing and expanding regulatory processes.	Created out of the reform, although with limited autonomy through the commissioner appointment process.
Wholesale Market Administrator (AMM)	Regulates, operates, and settles for the market. Acts as technical and service liaison center. Empowered to interrupt electricity service to safeguard system (in case of supply deficits). Coordinates player relations at minimum costs in a framework of free contracting, including international transactions with other countries of the Isthmus.	Market sustainability. Modernization, improved information, and technological services in the market.	Created out of the reform; committed to improving the wholesale market processes and operation. Has important know-how and experience in the electricity sector.

Appendix Table 4.2. Current Stakeholders in Guatemala’s Electric Power Industry (Continued)

Player	Importance	Interest	Position on reform
(AMM) (cont.)	Establishes short-term market prices for the transfer of capacity and energy. Participates in the preparation of market operating standards.		
National Association of Generators (ANG)	Created as a result of the threat against PPAs. Covers nearly 60 percent of generation capacity and has investment know-how and technological knowledge. Is an emerging cluster of generators seeking to consolidate as a platform for negotiation and lobbying, as well as to promote exchange of know-how within the sector.	Protecting their contracts and the image of Guatemala as a country that abides by the law. Avoiding negative signals to the international investment sector. Preventing the Government from retaking control of sector investment. Preventing increased public debt in the sector. Preventing price and market politicization. Formulating a competitive strategy within the electricity power sector.	In operation for about 1.5 years and in the consolidation stage; that is, strategic strengthening and creation of trust among its members who, due to differing interests, often do not share positions regarding specific matters in the electricity market. At present, in the process of proposing strategies and ways and means of strengthening the group.
Private Generators with INDE Contracts	All of these generators are renewable (hydroelectric). Members of ANG.	Using experience in the deregulated market to develop additional generation projects.	Market norms and forces affect contracts; will depend on INDE business strategy after they end in 2008–2009. Because generators’ participation in market transactions is through INDE, they have not had direct market experience, although some conduct transactions through marketers. Some groups consider this positive and others negative.

Player	Importance	Interest	Position on reform
Private generators with EEGSA contracts	<p>Holders of contracts affected by the market, but also with incidence on costs of transition to the new market model and distortions through price indexing.</p> <p>Prior to implementation of the market and during the transition to the new scheme, solved supply crises in the country.</p> <p>Play key role in the supply of power and energy to the market.</p> <p>Members of ANG.</p>	<p>Modernizing their contracts to preempt political attacks caused by high transition costs.</p> <p>New openings for market participation through their knowledge and advantages and additional investment in merchant projects.</p>	<p>Want to be viewed as promoters of market sustainability; thus, have been willing to renegotiate their contracts.</p>
Merchant generators	<p>In the future, all expansions of investment will be of the merchant type, so that learning about them and the signals received from them are important.</p>	<p>Making alliances with marketers in the short and medium term.</p>	<p>Market favors them, especially if they have a solid, competitive position in the spot market.</p> <p>Developed by investors who are sensitive to the investment climate and political signals, except for some players positioned through existing contracts that have allowed them to gain experience and design strategies for the mitigation of risks in such countries as Guatemala.</p>
INDE (EGEE) (ETCEE)	<p>The most important generator in the country (EGEE) and owner of the transmission grid (ETCEE).</p>	<p>Remaining a public institution.</p> <p>Promoting Central American interconnection.</p>	<p>Promotes reform. Has never fully opposed it and has generated incipient knowledge of elements of sector reform.</p>

Appendix Table 4.2. Current Stakeholders in Guatemala’s Electric Power Industry (Continued)

Player	Importance	Interest	Position on reform
INDE (Cont.)	<p>Operates as a public institution.</p> <p>Has the legal mandate to promote the development of renewable resources.</p> <p>Formulates plans for rural electrification; contributes financial resources to the Trust.</p> <p>Source of economic and political rents.</p> <p>Manages the PPAs of renewable projects executed before market reforms.</p> <p>Promotes the regional electricity market, especially with regard to regional interconnections as part of SIEPAC and PPP.</p>	<p>Facilitating continuity of investment in transmission infrastructure.</p>	<p>Reform affected its original roles and structures, causing the loss of much of its planning capacity and know-how.</p> <p>Political manipulation of electricity rates affects its financial resources and, hence, its capacity to act as a counter-part in investment programs for rural electrification.</p>
Distributors (DEOCSA- DEORSA) (subsidiaries of Union Fenosa of Spain)	<p>Supply the regulated market and point of contact with users.</p> <p>Assumed the distribution functions of INDE.</p> <p>Implementation of the Rural Electrification Program (PER) as defined and financed by the Trust.</p>	<p>Maintaining good relations with the regulator.</p> <p>Ensuring favorable policies in rate matters and rural electrification.</p> <p>Improving business efficiency.</p> <p>Investing in generation and marketing.</p>	<p>Inherited a structure that depends largely on the Trust. Support most aspects of the reform and would like to change aspects they find limiting, particularly constraints on vertical integration.</p>

Player	Importance	Interest	Position on reform
Empresa Eléctrica de Guatemala (EEGSA) (controlled by Iberdrola of Spain, with participation by Tampa Electric [U.S.], EDP [Portugal], Government of Guatemala, and domestic investors)	Handles the largest percentage of users. Highly consolidated company in Guatemala for many years, with know-how and relations in the sector. Only institution currently open to the signing of new contracts for the purchase of energy and capacity, due to the obligation to guarantee supply to its customers two years in advance.	Promoting diversified investment (including generation) and investment alliances with other market players. Stimulating marketing niches by encouraging migration of internal customers. Also signing contracts with new renewable generators for diversification of generation sources. Continuing to receive subsidy to handle issues from pre-existing contracts.	Given its level of consolidation, the reform has been positive for its interests.
Large users	Constitute current and potential customers for marketers.	Maximizing competition among marketers. Reducing threshold of wholesale-market access.	Support reform, which has greatly benefited them. Relative lack of unity, but have great negotiating power individually.
Brokers/Marketers	Provide innovation and flexibility to the market (technological, financial, and contractual).	Continued existence of market surpluses. Greater technological diversification in generation.	Strongly supportive of market reforms, as they enable marketers to exist.

Appendix Table 4.2. Current Stakeholders in Guatemala's Electric Power Industry (Continued)

Player	Importance	Interest	Position on reform
Brokers/ Marketers (Cont.)		Better spaces for participation in regulation to attract new customers to their sphere of action, including other countries of the region. Developing distribution and generation alliances.	
Multilateral and international aid agencies	Provide technical assistance to the process of reform, especially in MER and SIEPAC. Incidence on the domestic availability of capital through sovereign and project lending, as well as aid.	Sector reform and sustainability.	Supportive of the process and establishing institutional bases. Follow up on effects of the reform to reduce threats to sustainability.
Municipal electric companies (EEM)	Key players in decentralization process. Relieve needs of remotely located administration. Establish important local commercial operations. Increase the politicization of the sector. Strongly represented by National Municipal Association (ANAM), Municipal Development Institute (INFOM), and elected representatives to Congress.	Improving and strengthening finances and quality of service. Extending service to rural customers. Electricity generation in small projects (Xelaju and San Marcos). Technological improvement. Extracting economic and political rents.	Has supported change to maintain privileges, consisting mainly of access to cheap energy from INDE and advantageous commercial conditions. Low management capacity. As of 2003, may compete with DEORSA and DEOCSA under still undefined rules.

Player	Importance	Interest	Position on reform
Users (residential consumers)	Represent a high percentage of the regulated market of approximately 1.7 million customers (households).	Improving service quality and low rates (through subsidies, if necessary).	Not integrated in representational entities or forums; lack of empowerment. Poorly informed about the reforms, but some protest emerging committees. Incipient questioning of representation of civil society through process of the CNEE commissioner appointment.
NGOs	Provide voice to various social groups and interests. Support, facilitate, and mediate electrification programs and decentralized projects.	Understanding the dynamics of reform, as well as environmental and social impacts. Participating in portfolios of rural projects. Verifying transparency and legitimacy of operations of the market and regulatory framework.	Varied, but few NGOs are working and following up on the reform process.
Population without access	Represent an important unmet demand.	Ensuring availability of financial resources for extension of the grid or solutions outside the grid. Specific interest in continuity of the subsidy for access to energy, through the Rural Electrification Trust.	Not integrated into the process of reform, with the exception of CODERURAL (which supposedly represents their interests) and a group of institutions working on grid planning.
Unions	Do not play any leading role in the market at this time. Have mass mobilization capacity through union rank-and-file.	Interested, at one time, in redundancy guarantees or severance payments and job maintenance for their members in the reform process.	The reform process and other national-level changes have weakened them and, at present, they have no power in the sector.

Appendix Table 4.2. Current Stakeholders in Guatemala’s Electric Power Industry (Continued)

Player	Importance	Interest	Position on reform
Other suppliers (contractors, construction firms, and professional associations)	Engaged in the design, construction, and maintenance of electric works (transmission and distribution lines and grids, substations, etc.) and other services.	Development of the electricity sector (investment in all activities in the chain of production).	Affected by the displacement of activities abroad, as well as development of an internal dynamic market. Environmental studies companies, certified by MARN, currently block the entry of competitors.
Media	Have relative power to inform the public with respect to the effects of reform; also serve as a government outlet for presenting arguments on effects of reform.	Rates and occasionally their relation to the handling of energy contracts.	Have not taken strong positions or developed forums for discussion of the subject.
Political parties	Have a diffuse, populist agenda.	Unclear. No party positions on the subject of electricity.	Party agenda is more influenced by particular politicians than by groups with clear positions, with respect to reforms.
Universities, academic centers, and researchers	Train human resources for CNEE, MEM, and the private sector. Develop sector-related research. Propose short lists for election to CNEE.	Contributing to national reform processes; being critical and rigorous.	Segment with little representation. Only the University of San Carlos maintains a program dedicated to the subject of energy; other institutions have done only occasional research on the subject of reform.

Source: Fundación Solar.

CHAPTER FIVE

Supply Security Solutions: Principles and Practices

Nils-Henrik M. von der Fehr

The primary goal of any electricity supply industry should be to ensure continuity of supply—the lights must stay on! This is no easy task, requiring the ongoing balance of supply and demand, in both the short and long run.

The short-term problem is maintaining equilibrium within existing electricity capacity limits. Otherwise, frequency will deviate out of bounds, causing damage to power-consuming equipment, and, in extreme events, lead to a complete system breakdown. The problem is complicated by lack of responsiveness on the demand side, either because price signals cannot be transmitted to final consumers (caused by metering technology limitations) or because prices are not allowed to adjust sufficiently (e.g., because of political reluctance to allow price volatility). Balancing, therefore, generally occurs by adjusting supply to prevailing levels of demand, or, when demand exceeds capacity limitations, by rationing (either forced or based on pre-negotiated voluntary agreements).

The long-term problem is to ensure balanced growth of capacity, given the electricity industry's unique features: non-storability of the product and randomness of both supply and demand (supply variability is particularly prevalent in hydro-based electricity industries). In such an industry, least-cost investment requires an appropriate mix of base-load, cycling, and peaking capacity to meet expected demand at minimum cost, taking into account the pattern of supply-and-demand fluctuations and cost of not meeting demand during all periods—rationing costs.

In addition, long lead times and investment time frames, when coupled with associated risk—including regulatory uncertainty—make investments in generation capacity unusually risky. The problem is further complicated by the need to coordinate investments in generation and transmission and distribution capacity.

The supply-security issue also has wider implications. Recent rationing events in California and Brazil are reminders that, whatever the reasons for disruption, the government will be held accountable for ensuring continuity of supply; failing in this task could lead to its downfall. Thus, it is tempting to maintain a strong grip on the industry, even when economic and other arguments favor deregulation and privatization. In short, solving the supply-security problem is critical for both the acceptance and sustainability of regulatory reforms.

While no one solution fits all situations, three basic conditions must be satisfied:

1. The problem must be properly and thoroughly understood.
2. Intentions and concerns must be made explicit.
3. The chosen solution must be implemented consistently, respecting its likely technical, economic, social, and political aims and constraints.

This chapter illuminates key theoretical and practical issues that should be addressed when designing a regulatory framework to solve the supply-security problem. The major question is: How can one ensure efficient use of existing generation facilities and provide incentives for new investment in generation capacity? While recognizing the importance of related issues, such as coordinating generation and transport capacity or market power,¹ the author does not consider them in depth here in the interest of maintaining focus on other, equally important issues.

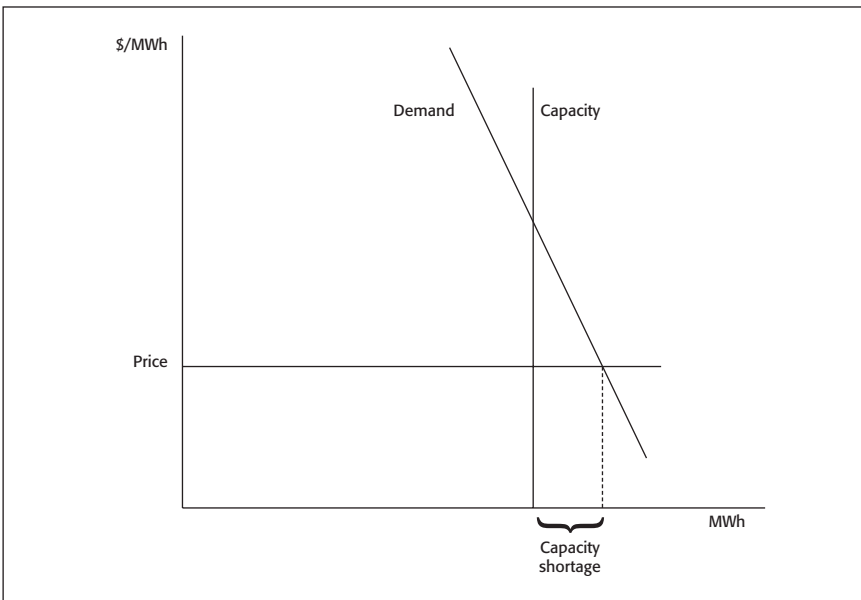
¹ It is recognized that economies of scale in generation and the large sunk costs associated with investments in capacity mean that markets for generation capacity (and associated spot markets for energy) are unlikely to be perfectly competitive.

The Problem: Shortages

The supply-security issue arises as a result of variability in supply and demand. Without such variation, the optimal solution would simply be to build enough capacity to ensure that, at prevailing prices, all demand can be served. Given that supply and demand inevitably vary over time—sometimes unpredictably—it is always possible that available capacity will be insufficient to meet demand.

Figure 5.1 illustrates such an event. The horizontal axis measures volume of output (in MWh),² while the vertical axis measures price of output (in \$/MWh). Output capacity is given independent of price. Demand, however, depends on price; the lower the price, the greater the demand. At the prevailing price, demand exceeds capacity; that is, installed capacity is insufficient to satisfy demand.

Figure 5.1. Capacity Shortage



² The system over a given period of time is considered here. Alternatively, one might consider instantaneous output and capacity, measured in megawatts. As long as the time period is fixed, with no variation in output or capacity, the two approaches are equivalent.

Eliminating capacity shortage requires reducing demand by either increasing the price or rationing. Effectiveness of the price measure depends on the responsiveness of demand to price changes. In the short run, price elasticity of demand is typically small. In the longer run, however, demand responsiveness to price changes is more elastic. Thus, the character of the supply-security issue depends on the time frame.

Short-term Issue: Power

Within any day or hour, a demand-side shock (resulting from an unusual peak in demand) may cause a capacity shortage. More commonly, however, capacity shortage results from a supply shock. Such a shock may be caused by reduced generation capacity, resulting from a plant outage. Alternatively, failures in the transmission system that reduce the ability to transport power from generation to consumption sites may make it impossible to satisfy all demand.

In the short run, capacity shortages must be dealt with by rationing. In principle, one could envisage a real-time market in which price reacted continuously to shifts in demand and supply. Modern telecommunications and metering equipment, as well as price-sensitive controls installed in power-consuming devices, would ensure sufficiently rapid response to shifting market conditions in order to achieve electrical equilibrium at all times. Electricity markets should—and probably will—move in this direction (Borenstein, 2001a, b). Even so, large-scale supply-and-demand shocks can occur so rapidly that serious imbalances eventually result. Consequently, a rationing scheme must be in place to avoid such imbalances, which lead to out-of-bound frequencies (“brownout”) or, in the worst case, a physical breakdown of the system (“blackout”).

Long-term Issue: Energy

Longer-term shortages—over a season or year—are associated more with energy than power. For example, demand may fluctuate over time in response to changes in outdoor temperature. Furthermore, in a largely hydro-based generation system, output tends to vary between wet and dry periods. In particular, extreme events leading to long spells of low precipitation may severely reduce the system’s ability to produce energy.

Therefore, hydro-based electricity industries, as opposed to thermal industries, tend to be energy, rather than power, constrained.³

The scope for curtailing demand by means of price is much larger in the longer term. Energy shortages seldom occur suddenly and may often be foreseen well in advance. Consequently, prices can be adjusted before the actual event (there is no need for the costly technology required for transmitting price signals and metering consumption in real time). Demand is generally more responsive to higher prices when these prevail over a longer period of time. As a result, energy shortages, in principle, are avoidable as long as prices are allowed to adjust sufficiently in line with underlying changes in supply and demand.

However, the types of price changes necessary to avoid energy shortages may be large. In extreme events, prices may have to rise to unprecedented heights in order to curtail demand within the available energy capacity. Such price variations may be deemed unacceptable, either because of risk aversion or for equity reasons. Risk-averse consumers, wishing to protect themselves against large price fluctuations, may enter into long-term contracts at fixed prices. When consumers isolate themselves from price changes in this manner, demand becomes less responsive to short-term price variations, making shortage events more likely.⁴ Furthermore, equity concerns may mean that high electricity prices are viewed as socially unacceptable. In relative terms, higher prices may affect consumers more severely as the proportion of their income spent on electricity increases. High prices also hurt industry, particularly those sectors in which electricity accounts for a large portion of costs. As a result, rationing, undertaken according to specific social or economic criteria, may be viewed as less costly to society than high electricity prices.

³ In hydro systems, power capacity design is typically related to the ability to produce under maximum inflow conditions and is therefore generally large relative to peak demand levels. For example, during the 1992 drought in Colombia, when demand was rationed for 18 months, capacity power reserve was more than 30 percent.

⁴ One can envisage price protection schemes that allow for at least some exposure to short-term price variations; for example, if long-term contracts cover only part of total consumption, consumers will be exposed to residual price variations.

Optimal Supply Security

In view of the above discussion, the solution to the supply-security problem has two components. First, a rationing system must be in place to allow for continuous balancing of the system. Second, sufficient capacity must be installed to ensure a reasonable balance between demand and supply, both in the short and long term.

Rationing

Disregarding administrative costs, the cost of a supply shortage equals the value of unserved demand or “lost load.” From an economic viewpoint, therefore, the rationing scheme should be chosen to minimize the value of lost load.

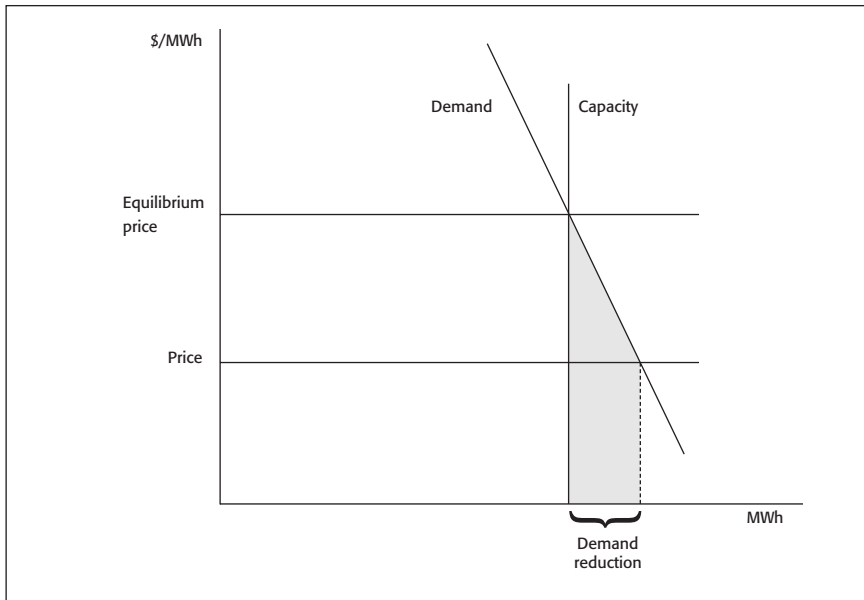
If one accepts consumer willingness to pay as reflecting the value of electricity, rationing should aim at shedding the load for which willingness to pay is lowest. If completely successful, this would correspond to an outcome in which the price is raised to the level at which demand equals supply.⁵

Compared to the outcome at the actual price, demand at the equilibrium price is reduced sufficiently to fall within available capacity (Figure 5.2). The increase in price eliminates the portion of demand for which willingness to pay is below the higher price (the total value of which is reflected in the shaded area below the demand curve).

In practice, efficient rationing is infeasible because it is impossible to design rationing criteria that are perfectly aligned with willingness to pay (although it may be possible to approximate).

Rationing is usually undertaken according to some form of random ordering of consumers (either explicit or implicit). One method is rolling zonal load shedding; another is proportional rationing, such as the recent

⁵ A caveat to this argument is that willingness to pay for additional supplies is not necessarily equal to willingness to pay for avoiding a reduction in supply. In a rationing event, cost to the consumer may exceed the value of the lost energy because of stoppage and start-up costs and—particularly when the event is unforeseen—possible damage to electrical equipment. Since these additional costs are typically fixed, their relative importance will be less when the rationing event is of long duration.

Figure 5.2. Efficient Rationing

Brazilian events. Since, with random rationing, consumers have the same likelihood of being rationed (i.e., independent of the value they place on electricity), the cost of unserved demand necessarily exceeds the minimum.

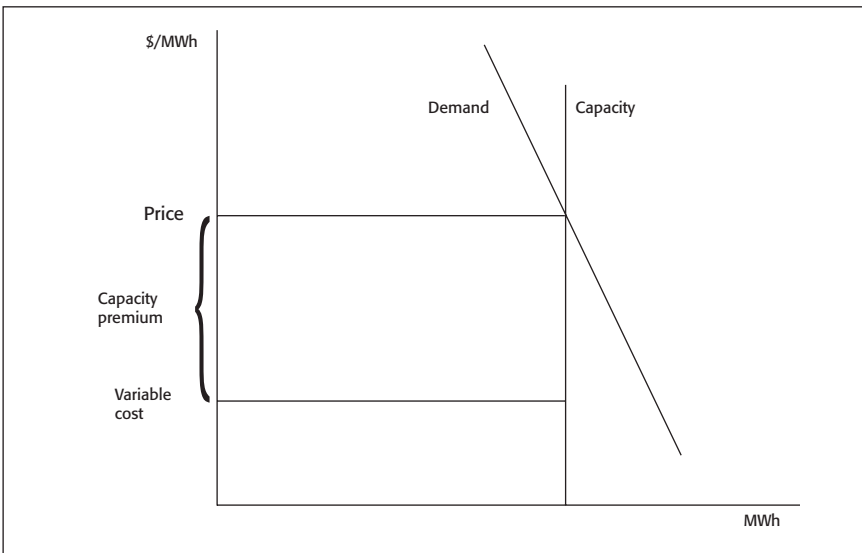
In other cases, rationing is done according to specific administrative criteria. For example, it may be based on a distinction between industrial and residential consumption or between consumers in different geographical areas. To the extent that such criteria reflect consumer groups' willingness to pay, the economic costs of rationing are correspondingly reduced.

Capacity

The gain from increasing supply capacity equals the expected savings from a reduced incidence of shortages. Consequently, the optimal investment criterion compares the gain from fewer shortages to the cost of expanding capacity, known as "long-run marginal cost."

In a perfect market in which, at any instant, price reflects underlying supply-and-demand conditions, the market price signals the value of capacity expansions (Figure 5.3). When demand is restricted by available capacity, price exceeds short-term (variable) costs of supply. Since price reflects marginal willingness to pay for output, the difference between market price and variable cost equals the net value of a marginal increase in output capacity, known as capacity premium or CP.

Figure 5.3. Capacity Premium



When rationing occurs, however, the value of lost load (VOLL) exceeds the market price of electricity. This is caused partly by inefficiencies in the rationing scheme and partly by the fixed-cost nature of rationing costs. Therefore, in general, the short-term or spot-market price for electricity underestimates the gain from a marginal increase in capacity.⁶

The CP varies over time, depending on both demand and supply conditions. It will be high during periods of peak demand. Conversely, during periods of excess supply, when price reflects variable costs and the

⁶ If a market for capacity or priority rights exists, however, the VOLL may be expressed in the price of such rights.

probability of a rationing event is zero, the CP will be nil. Ex ante (i.e., before the actual event), the expected CP may be divided into two elements: loss of load probability (LOLP) and value of lost load (VOLL). The LOLP is the probability that demand is constrained by available capacity, hence causing a rationing event, while the VOLL is the expected value of unserved demand in this event. The CP equals the product of these two elements:

$$CP = LOLP \times VOLL.$$

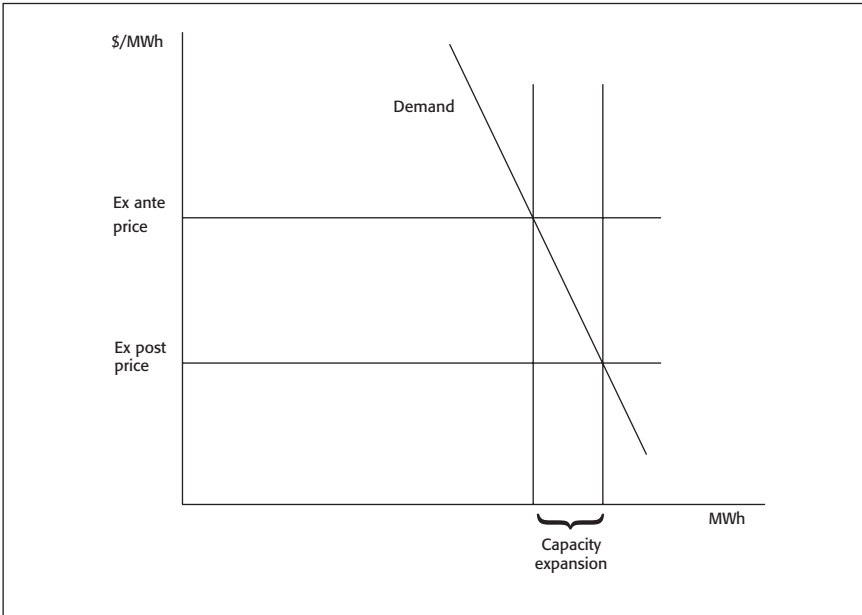
Since capacity is long-lived, the marginal gain from additional capacity is given by the average, or expected, CP over the lifetime of the capacity unit (properly discounted). Consequently, the investment criterion must be evaluated in a forward-looking manner. Given the lead-time of investment projects, the CP must be forecasted from the time at which the additional capacity enters operation. In a growing market, this means that investment should typically occur before the CP has reached the level of marginal capacity costs.

In many cases, it may be reasonable to view capacity additions as marginal. Capacity may be enhanced by upgrading existing facilities or by adding new generating units at existing plants. Unless the industry is extremely small, such additions will be small relative to overall market size. Occasionally, however, capacity is added in discrete amounts. Technological or input supply conditions, such as the efficient exploitation of a hydro facility or a natural gas resource, may make constructing a large generating plant economical. In such cases, expansion disturbs the market balance; in particular, it directly (and negatively) affects the premium that the new capacity can expect to receive.

Figure 5.4 illustrates the case where price always clears the market. To predict reduction in ex-post market price for such large projects, it is generally optimal to postpone the investment until ex-ante CP has reached a level beyond the unit capacity costs.

Technologies

Electricity industries are characterized by randomness of both demand and capacity availability. Since electricity cannot be economically stored,

Figure 5.4. Discrete Capacity Expansion

efficiency requires that an appropriate mix of technologies with different cost characteristics be installed to meet demand at minimum cost. A base-load plant typically has high capital costs and low operating costs, while a plant designed to meet peak demands has lower capital but higher operating costs. The marginal cost of operation, therefore, varies with demand, and peak-load pricing schemes reflect these changes in costs. Consequently, optimal capacity choices for various technologies depend on the pattern of short-term demand fluctuations and the probability of supply outages (Chao, 1983).

A system's ability to deliver electrical energy over any given period depends not only on installed capacity; it also involves operational skills, incidence of failures and outages, availability of inputs (including labor), and storage facilities. Particularly for hydro plants, availability of the essential input water is largely determined by nature, although access to input-storage facilities, in the form of reservoirs, may, to some extent, allow for disentangling water inflows and energy production. While this issue is qualitatively more important for hydro plants, it does not differ qualita-

tively from those that arise for other technologies; for any plant, access to inputs and storage facilities is essential to ensure optimal operation.

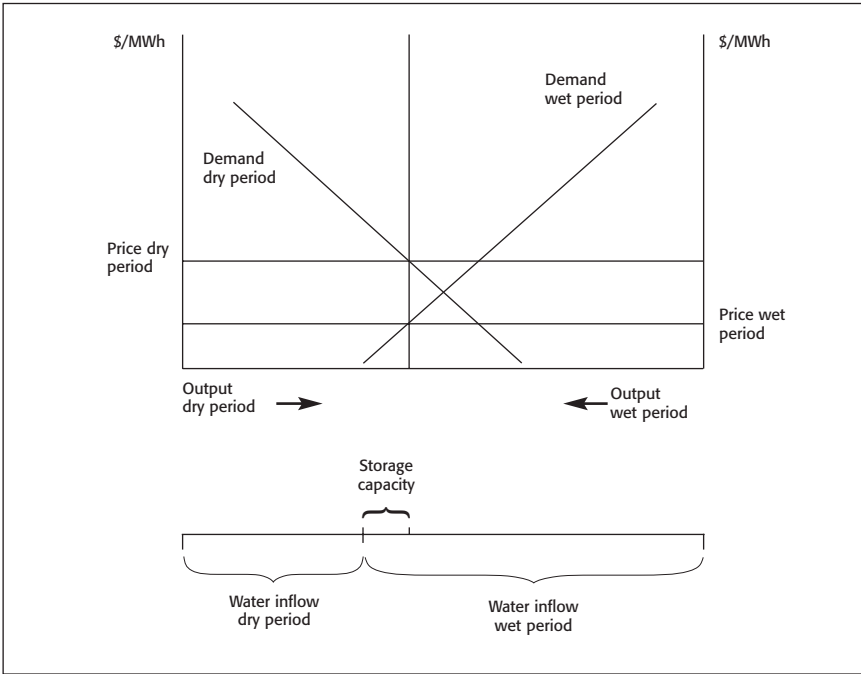
Nevertheless, in a hydro system, it becomes particularly important to distinguish between three capacity types:

1. *Power*—Determines the ability to produce output at any given time; it depends on the diameter of pipelines or water tunnels that bring water to the turbines, the vertical distance between water inflow levels and turbines, and size of turbines.
2. *Energy*—Determines the ability to produce output over any given period; it depends on the amount of water inflow from streams and rivers connected to the system.
3. *Storage*—Determines the ability to move output between periods; it depends on the size of dams.

The investment criterion for hydropower capacity is the same as that for any other technology: Investment should occur as long as the CP exceeds capacity costs. However, investment criteria differ for energy and storage capacity. The gain from expanding energy capacity (by connecting more streams and rivers to the system) is given by the willingness to pay for energy during periods when output is not constrained by other factors (particularly power capacity). The gain from expanding storage capacity is given by the benefit from moving energy from periods in which the willingness to pay is low to periods in which it is higher—the difference in willingness to pay between periods over which water can be stored.

Figure 5.5 illustrates a hydro system over two periods. The distance between the left and right vertical axes equals total water inflow over the two periods. The lower part of the figure indicates levels of inflow during the dry and wet periods, respectively. Because water may be stored, its availability during the dry period equals the sum of inflow in that period and storage (represented by the distance between the left vertical axis and the middle vertical line). The distance between the middle vertical line and the right vertical axis represents water availability during the wet period, which equals the difference between inflow during that period and what is carried forward to the dry period. Output during the dry period is measured left-to-right from the left axis, while output during the wet

5.5. Hydro Energy and Storage Capacity



period is measure right-to-left from the right axis; hence, the demand curve for the wet period falls from upper right to lower left.

Assuming that the market is cleared in both periods, prices are set so that demand equals supply (demand may be thought of as net of output produced by other technologies). Given the lesser availability of supply during the dry period, the price is correspondingly higher in this period. The resulting price difference reflects the limitation in storage capacity; had this capacity constraint not been binding, equilibrium prices would have been equal over the two periods. Consequently, the gain from expanding storage capacity is represented by the difference in the value of energy between the dry and wet periods, respectively.

Gain from expanding energy (inflow) capacity is given by the price of output during the period in which the additional energy is supplied. Given limited storage capacity, if inflows are increased during the wet period, the energy must be produced in that period; hence, its value will

be relatively low. If, on the other hand, inflow capacity can be increased during the dry period, the value of the additional output will be correspondingly higher (von der Fehr and Sandsbråten, 1997).

Hydro investments differ from thermal investments in many other respects. For example, while thermal plants allow for much flexibility with regard to scale, input choice, and other design issues, constructing a hydro facility is largely determined by the characteristics of the particular water resource in question. In some cases, necessary investments are huge and lead-time from the planning stage until the facility is produced can be long. If the entire system is dominated by hydro, energy availability can vary considerably over time, leading to considerable uncertainty about development of future output and market prices (obviously, this would also affect decisions about investing in thermal plants).

Transmission and Distribution

Consumption of electricity is constrained not only by available generation capacity but also by the ability to transport electricity from generation to consumption sites. This ability depends on geographical distances, line capacity, and the extent to which individual lines are interconnected.

Over any given line, the ability to transport electricity is given by the capacity (resistance) of the line and total load. In an interconnected network, however, transportation capacity depends not only on capacity of individual network parts and total load, but also on geographical configuration of both load and generation. The power flows over any given line in a network and the losses in that line are determined by generation and loads at all buses, not just those at either end of the line. The line flows are determined by the laws of physics and depend on the networks' interconnected structure, as well as physical parameters.

Consequently, satisfying demand economically requires the coordination of investment in both generation and transport capacities, including both transmission and distribution capacities.

Practical Solutions: Three Latin American Examples

In theory, establishing an electricity market should suffice in providing adequate signals to ensure an optimal level of supply security. Market

prices provide investment signals to ensure a response from rational generators to install new facilities until the optimal capacity level is reached. In practice, however, difficulties arise that may prevent the market from providing the necessary signals or preclude generators from acting rationally in response to these signals. These problems include:

- ◆ *Price cap*—Limits revenue;
- ◆ *Risk aversion*—Reduces willingness to base investment decisions on average or expected revenues (this could be particularly important for peaking units used infrequently);
- ◆ *Market power*—Distorts price signals; and
- ◆ *Consumer-price regulation*—Mutes price signals and undermines rational demand-side management.

The next sections discuss how the supply-security issue has been addressed in three countries: Colombia, Honduras, and Guatemala. Solutions among these countries vary markedly. While certain differences can be traced to country-specific traditions and conditions, others are more difficult to explain. Nevertheless, the three cases highlight many of the practical problems that any regulatory regime should address.

Colombia: Lessons from a Market-based Model

Of the three countries studied, the Colombian model is the more market based. However, regulatory interventions in the country's marketplace, although perhaps well meaning, are not necessarily well designed and may undermine the system's ability to provide a reasonable level of supply security.

In Colombia, all electricity is traded on a daily basis through a mandatory pool or spot market (*bolsa*). Generators submit offering prices at which they are willing to supply electricity. Although supposedly cost-reflective and subject to regulatory oversight, in practice, pricing is relatively free and prices may well exceed underlying costs. This became evident recently when, as a result of guerrilla attacks on the main transmission lines connecting northern coastal areas to the rest of the country, the Colombian market was effectively split in half. Exploiting their must-run positions, generators were able to push prices to unprecedented levels.

The resulting market disturbance came to an end only when the regulator, CREG, introduced new price caps.

In addition to payments for energy—obtained through the pool and possibly moderated by financial contracting outside it—generators are paid for capacity availability. The capacity charge (CPC) aims at recognizing the reliability that individual plants confer onto the system during the dry season. The charge is collected by generators through power sales and is distributed among them according to their Theoretical Remunerated Capacity (CRT); CREG computes the CRT using a model that considers plants' ability to generate power during critical hydrological conditions. The collection method creates a floor for generators' market offers (equivalent power cost, [CEE]), which, in theory, must provide sufficient revenue to remunerate plants and foster investment in reserves.

While dispatch of generating units is centralized, based on submitted offering prices, in practice, generators have considerable opportunity for affecting their likelihood of being dispatched. This is particularly true for hydro facilities, which base bids on assessments of water values. However, to ensure that hydro plants reserve generation capacity for the end of dry periods, thereby facilitating short-term reliability, specific measures have been introduced to regulate their operation. These operating minima (*mínimos operativos*) are calculated based on extreme hydrology conditions and form a set of criteria that can be used to manage the hydroelectric facilities during dry periods. Thermal plants are operative before the use of reservoirs with levels below operating minima. In such periods, hydro output is remunerated at regulated prices. These so-called “intervened prices” are generally set higher than private opportunity costs of water (to prevent water releases) and may be as high as estimated economical rationing costs.

In addition to the CPC and operating minima, demand-preventive rationing may also be used to maintain system reliability. Depending on the seriousness of the situation (defined according to such criteria as spot prices, outages, technical limitations, and occurrence of natural catastrophes), a range of rationing measures may be put in place. All distribution circuits are classified as either “disconnectable” or “not disconnectable,” depending on the relative proportions of four types of consumer categories: residential, commercial, industrial, and official. Demand is rationed as a percentage of each circuit type.

While the CPC, operating minima, and rationing procedures are designed to overcome the supply-security problem, it is unclear whether these measures are adequate, or, if so, whether the goal is achieved efficiently.

Clearly, the CPC provides an incentive to build new capacity, although the importance of this incentive depends on the level at which the charge is set. If the model calls for a capacity payment either above or below long-term marginal cost (including appropriate profit), the result would be over- or under-recovery of capacity costs.

The calculation method has been the subject of considerable controversy (most recently, in the year 2000, when basic modeling parameters were changed). Criticism has focused on three fundamental problems. First, the volume to be compensated is difficult to justify using administrative criteria, even when based on sophisticated models. Second, distribution of rents between generators often depends highly on modeling assumptions (especially those related to hydro conditions). Third, since actual operations may differ from simulated ones, actual incentives for expanding capacity may deviate from the theoretical incentives in the simulation model. In short, it is unclear whether the administratively set, capacity remuneration scheme provides adequate incentives for either a reasonable level of supply security or an efficient technology mix.

Regulations of hydro operations further complicate the matter. First, it is not obvious that these regulations are warranted; that is, if hydro generators really have incentives to drive reservoirs down to sub-optimal levels. When energy shortages are expected, there are strong incentives to economize on reservoirs in order to benefit from higher prices in the future. Consequently, efficient operation of hydro resources is profitable both socially and privately. Second, the expectation of regulatory intervention may create perverse incentives. Expecting output rationing based on operating minima, hydro generators may be tempted to increase output. They reason that, during output rationing periods, when quantities are restricted and prices are regulated, it may be profitable to expand output before rationing is introduced. This is motivated, in part, by a desire to reap gains before output is restricted and, in part (if regulated prices are high), to trigger a rationing event. Such behavior would exacerbate the likelihood of energy shortages.

Other regulations also contribute to an increased likelihood of shortages. In particular, the way consumer prices are set creates perverse incentives in relation to underlying supply conditions. Consumer prices are determined as a 12-month moving average of wholesale (spot and contract) purchase prices. Consequently, consumer prices tend to signal previous, rather than current, supply conditions. As the industry is entering a period of shortages, with increasing spot market prices, consumer prices will react with a considerable lag, thereby muting the signal needed to curtail demand. Similarly, as the shortage period draws to an end and capacity availability improves again, consumers will, for a considerable period of time, face high-energy prices, which discourage using available capacity. Admittedly, a segment of the market is, at least in principle, subjected to spot prices; in particular, the terms under which the supply contracts for unregulated, large consumers are set sometimes include prices related to the spot market. However, the legal requirements imposed on large consumers who want access to the spot market have, to date, impeded development of more efficient energy transactions.

Lack of proper price signals is particularly important, given that volatility in the Colombian market is high, even for an electricity market. This results, in part, from singular events, such as the transmission problems caused by guerrilla attacks or the recession that started in 1998-99. However, recurring environmental events, such as ENSO (severe droughts recurring every fifth year, on average) and La Niña (substantial increase in randomly occurring rainfall), also contribute. Thus, depending on climatic conditions, use of thermal capacity can vary substantially. During dry years, thermal capacity may be fully dispatched at high spot prices. During wet years, however, it may not be run for long periods of time, and spot prices may be low. Low levels of capacity use for several consecutive years means that payments to (peaking) thermal generators can remain small for a long time, resulting in severe cash-flow problems and barriers to new investment.

Deficiencies of the current regime have prompted an interest in regulatory reforms. Proposals have been put forward that would introduce entirely new systems for capacity payments, hydro regulations, and rationing rules.

One proposal is to substitute a set of firm energy-option contracts for the CPC.⁷ The idea is to commit generators contractually to be available when needed because of supply scarcity. The contracts consist of a combination of a financial call option with a given strike price and an explicit penalty for non-delivery. When the spot price exceeds the contract strike price, a generator holding such a contract must compensate its contractual counterparts (consumers) for the difference between prices; hence, the option, in effect, fixes an upper limit on the electricity price. If the generator is unable to honor its contractual obligations with respect to output, it must pay an additional penalty. To compensate for the cost of refunding consumers and ensuring a sufficient level of supply security, the generator receives a premium.

As discussed in Chapter Two, contracts are to be traded in an auction process, whose goal is to create a reliability market that determines the price of the reliability product by means of market-based mechanisms. The regulator sets the basic parameters of the contract (strike price, total amount of contracts to be issued, penalty for non-delivery, and contract duration), and, at the auction, generators submit price-quantity bids for the total amount of capacity they wish to commit and the minimum acceptable contract premium. Winning bids are selected to minimize total premium costs (the highest accepted premium determines the price of contracts). This proposed approach reduces the need for administratively determining certain reliability criteria (e.g., individual market participants determine the amount of capacity generators have to offer and the cost of ensuring the required level of reliability); however, certain critical

⁷ The proposal was developed by a consultant team working for the Association of Colombian Generators (ACOLGEN) (see Vázquez, Rivier, and Pérez-Arriaga, 2001). An alternative proposal has been put forward by a team of consultants working for CREG and the MME (see TERA, 2001). While the two proposals share some fundamental characteristics, they differ in certain respects. In addition to the firm energy options, the proposal by Teknecon Energy Risk Advisors (TERA) calls for establishing a forward or futures market for managing fixed-price risk. Such instruments could be used to manage price-risk exposure assumed by the primary writers of the firm energy options (generators). Also, modifying procedures for introducing rationing or other actions taken outside the market is considered necessary. According to TERA (2001), a rationing event should be declared only if, based on public information and criteria that are reasonably knowable, reliability is impaired. The suggested rules are expected to affect the market less frequently and severely than existing rationing procedures and operating minima.

parameters (e.g., strike price, overall system-reliability criteria, non-delivery penalty, and contract duration) would still be set administratively.

As Chapter Two showed, the single contract type proposed implies a degree of arbitrariness with respect to choice of key contract characteristics and leaves market participants little flexibility. Moreover, it is unclear why price and quantity protection should be combined into a single contract. They could, at least in principle, be disentangled by introducing two types of contracts: one containing the firm-energy element and a penalty for non-delivery, and the other, a purely financial contract, containing a strike price and option premium. Having two types of contracts would enable the market to determine the insurance premiums for supply security and price protection separately, allowing both generators and consumers a more flexible choice.

Firm energy contracts, unlike the CPC, require creating an entirely new market, with the necessary institutions and regulations, including mechanisms to ensure that participants adhere to market rules. As the authors mention, if the penalty for non-delivery is set too low, generators may be tempted to over-contract in order to benefit from the payment of contract premiums. Moreover, in cases of demand and supply imbalances (with correspondingly high spot prices and difficulties of ensuring the required energy), agents may be tempted to default on their contractual obligations (in extreme cases, by declaring themselves bankrupt). Thus, it is necessary to select the rules carefully, continually oversee market performance, and impose sanctions on agents who do not abide by the rules.

Under this proposal, the regulator would still be responsible for supply security.⁸ A potential alternative would be to introduce demand-side bidding in the contract market, thereby allowing consumers (or suppliers on their behalf) to determine contract coverage. This would

⁸ The TERA (2001) proposal assumes that consumers (or suppliers on their behalf) would buy the firm energy contracts. However, contractual coverage is subject to oversight by the market operator so that, in effect, the market operator remains responsible for determining the minimum level of supply security. After an appropriate transition period, qualified consumers may be given the option to determine contractual coverage. TERA also envisages a second-hand market in which contractual positions may be revised (for example, when consumers switch suppliers).

eliminate the need for fixing a reliability criterion, and leave decisions about the required level of supply security to the market. Another option, following the example of Guatemala, would be to have consumers determine their level of supply security, while other (regulated) consumers are provided full security and their suppliers' obligation to ensure it.⁹

Honduras: Assessing the Trade-offs

In Honduras, decisions about capacity expansion are subject to administrative planning procedures. The system is operated by the *Empresa Nacional de Energía Eléctrica* (ENEE), a single, vertically integrated, state-owned utility. While some generation capacity is privately owned, most (including the large hydro facilities) is handled by ENEE. Based on demand forecasts, ENEE draws up plans for new capacity requirements. Recently, building new capacity has been based on competitive tender for power purchase agreements (PPAs). These contracts stipulate both fixed and variable payments. In principle, fixed payments cover capacity costs, while variable payments cover operational costs, including the cost of fuels.

System operation is based on variable-costs assessments. Thermal units are dispatched in increasing order of operational costs, taking into account start-up and adjustment costs (those figures agreed to in the PPAs). Hydro facilities are operated so as to minimize overall system costs, using storage facilities to reduce the need for running costly thermal facilities in peak-demand periods.

Privately-owned generators are paid their variable costs for all output supplied. Prices to consumers are calculated on an average cost-plus basis, taking into account payments to private generators (output and capacity costs), as well as the cost of ENEE-owned facilities. Consumer prices are adjusted annually.

An obvious strength of such an integrated structure is the opportunity for balanced and consistent system development. Having access to

⁹ Vázquez, Rivier, and Pérez-Arriaga (2001) do not recommend different rules for regulated and non-regulated consumers; rather, they argue that supply security is a public good and that non-regulated consumers would free ride on the supply security provided by regulated consumers. It is difficult to see that the public-good argument has much bearing on the supply-security issue, especially in the longer term.

information about the entire system and control of generation, transmission, and distribution facilities, ENEE is ideally positioned for comprehensive and integrated planning of capacity expansions and ensuring that such expansions occur according to plan.

A significant weakness of current practices, however, is that assessments of supply-security needs are not based on consumers' willingness to pay to cover such needs. Prices are cost-based and do not vary according to changes in underlying supply-and-demand conditions. Rationing is based purely on administrative criteria, and not on market-based measures. Consequently, there is little information about what consumers might be willing to pay for different levels of supply security. Thus, supply-security assessments are based more on technical criteria, such as capacity-reserve conditions and likelihood of a rationing event.

Relying solely on engineering criteria for capacity expansion, combined with cost-based pricing, may well lead to overexpanded capacity. Both external performance evaluation and internal success criteria are closely linked to ENEE's ability to avoid the occurrence of rationing events. Since ENEE can, at least in principle, pass along all costs associated with capacity expansion to consumers, it is tempting to ensure a level of system capacity that minimizes potential rationing. While such practices lead to a high level of supply security, they also result in costly overexpansion of the system.¹⁰

The tendency to overexpand may be counteracted by a weak governance structure, leading to excessively high capacity costs and delays caused by bureaucratic inertia in approving capacity additions. On the one hand, competitive tendering should result in supply prices that reflect actual costs. On the other hand, weak regulation provides ENEE little incentive for choosing cost-effective solutions and keeping costs down. Furthermore, corruption—and the cumbersome bureaucratic regulations introduced to avoid it—tends to drive up the costs of having a project approved and create regulatory delays and uncertainty that add to investor costs. Whether excessive capacity costs counteract the tendency to overex-

¹⁰ In Europe, Australia, and other regions, overcapacity was a consistent feature of monopolistic, vertically-integrated utilities and a major argument for introducing more market-based reforms.

pand cannot be determined on purely theoretical grounds; it may depend on availability of capital for financing new investment, including government funding. For example, funding availability in the late 1980s and early 1990s led to considerable overinvestment, while the tighter financial situation in more recent years is rapidly moving the system toward capacity deficiency. In any case, incentives for maximizing supply security and excessive capacity costs tend to increase overall system costs.

Finally, lack of price variability may drive up the need for costly capacity expansion. As explained above, by adjusting prices according to changes in underlying demand and supply conditions, it is possible to ensure a better balance between demand and available supply capacity. If such price adjustments are not undertaken—particularly during periods of small capacity reserves—rationing events are more likely. To avoid such events and, at the same time, maintain reasonable levels of supply security, capacity must expand. In short, unwillingness (or inability) to use the price instrument results in a greater need for capacity.

The example in Box 5.1, while simplistic, nevertheless captures certain characteristics of the Honduran electricity supply industry. Clearly, consumers—especially those with limited financial resources—would not welcome considerable price variability, even if caused by demonstrable variations in underlying supply conditions. However, the cost of insuring consumers against such price variations is considerable. Ultimately, the question is whether the insurance premium, in the form of costly expansions of generation capacity, is worth paying. The problem with the Honduran setup—providing, as it does, so little information about consumer willingness to pay—is that it is hard to tell.

Guatemala: Flexibility versus Risk

The Guatemalan model shares characteristics of the Honduran model, but differs in important ways. Being more decentralized and market-based, the Guatemalan model is potentially more flexible, but also prone to market-power abuse.

The system for generator dispatch is basically the same in both countries, although the Guatemalan system is formally organized as a spot market or pool. Dispatch results from model-based optimization of the

Box 5.1. Honduran Industry Tradeoffs: Price Variability versus Supply Security

To illustrate the tradeoff between price variability and supply security, consider an example. Assume that hydro output capacity varies 20 percent between normal and dry years. Capacity is 3,000 GWh in a normal year and 2,400 GWh in a dry year. Every fifth year is dry. Assume also that the average total cost of electricity (not counting transportation costs) is US\$ 0.10 and that demand equals 3,000 GWh at a price equal to this cost. Finally, assume that elasticity of demand (the percentage reduction in demand when price is increased by 1 percent) for annual price variations is 0.2.

First, consider the case in which price does not vary between years. Installed system capacity must be able to deliver an output level of 3,600 GWh in order to satisfy demand at all times. In normal years, capacity corresponding to 600 GWh of energy remains idle.

Next, consider the case in which price is allowed to vary between normal and dry years. In order to ensure, in a dry year, a demand reduction corresponding to the drop in hydro capacity, the price must be 100 percent higher than in normal years (a price increase of 100 percent reduces demand by $0.2 \times 100 \text{ percent} = 20 \text{ percent}$, or from 3,000 GWh to 2,400 GWh). This generates enough revenue to allow average prices (i.e., in both normal and dry years) to be reduced by about 20 percent (the 100 percent revenue increase in dry years spread over the five-year cycle). Since price is reduced at all times, demand will also increase; hence, additional capacity will be needed. (This explains why prices may also be reduced in dry years.)

Furthermore, since demand is reduced in dry years, there is no need to install additional capacity to substitute for hydro output in such years. Consequently, the real cost saving of capacity corresponds to 600 GWh of output. Assuming an average running time of eight hours per day (i.e., a plant factor of 33 percent), output of 600 GWh corresponds to an installed capacity of about 200 MW, at a cost that could easily amount to US\$200 million or more.

entire system, taking into account capacity availability, reservoir levels, fuel costs, and other technical characteristics. Generators must provide the market operator information about operational costs, as well as capacity and reservoir availability. Information reports are, at least in principle, subject to control by the market operator. There are also financial incentives to provide accurate information; for example, generators unable to deliver at reported capacity levels have their nominated capacity—and hence their scheduled output—reduced.

A short-term operational difference between the Guatemalan and Honduran systems is that, while Honduran generators are paid at their individual variable cost, Guatemalan generators are remunerated at the same systemwide price (the variable cost of the marginal or most expensive generating unit in operation). This is also the price of energy that consumers pay.¹¹

By remunerating all generating units at the same price, infra-marginal units earn a premium in the spot market, over and above their variable operating costs. This premium contributes toward generators' fixed capacity costs. Since the premium is larger the smaller the variable cost, base-load technologies recover a larger part of their capacity costs in the spot market. Thus, the spot market provides an incentive for investment in technologies with low variable and high fixed costs.

The method for determining energy prices must be viewed in relation to the system for capacity contracting. This is done outside the spot market or pool in a market for bilateral capacity contracts. Non-regulated consumers (consumers with a maximum demand exceeding 100kW) without a capacity contract may be subject to load shedding whenever total available capacity is insufficient to cover demand. Consequently, capacity contracts may be viewed as a measure to ensure delivery of all or part of energy demand. For regulated consumers, suppliers are required to enter into capacity contracts sufficient to cover the maximum demand of all customers.

In the Guatemalan system, consumers' supply-security rights are clearly defined, albeit weakly; unless consumers (or the supplier on their

¹¹ In practice, payments are moderated by long-term contracts between market participants.

behalf) hold a capacity contract, they have no guaranteed right to take power from the system. If not all of the available capacity is contracted, consumers without capacity contracts may obtain power in events where all consumers with contracts demand up to the capacity they contracted for. In cases where all existing capacity is contracted, consumers without such a contract may consume energy only when other consumers are not demanding up to the capacity they contracted for. In a balanced market, one would expect investment to occur only if new capacity can be sold. Hence, holding a capacity contract is needed to ensure complete supply security.¹²

The capacity market provides investors incentives to build new capacity only when there is an expressed willingness to pay for it. At the same time, given the way that energy is priced in the spot market (and given that the wholesale market price is fed through to consumers, which, admittedly, is done only partially), consumers are provided signals about the cost of energy. This, in turn, creates incentives to save on available capacity. Thus, flexibility of the Guatemalan model reduces the need for costly capacity expansion and allows for a better balance between willingness to pay and cost of new investment.

Despite such strengths, the model also has its weaknesses. First, the market's size risks large players' exercise of market power. Given the high cost of entering the market—resulting from imperfect capital markets and the risk associated with investing in Guatemala—existing players may be protected from entry of new competitors. Consequently, there is a potential for exercising market power, particularly by holding back new investment.

The market-power problem is exacerbated when generators are vertically integrated into the supply, distribution, or transmission businesses. Such players may create further entry barriers toward new competitors and ensure additional monopoly profits.

Problems with Guatemala's setup also stem from regulated elements of the model. In order to enter the capacity market, a generator must

¹² Clearly, even when all consumers are holding capacity contracts, available capacity may not suffice to cover demand. Reasons may be extreme peak in demand, plant outages, or failures in the transmission system. This risk is controlled by holding reserve margins and constructing extra transmission lines.

subject the determination of its capacity to the market operator. For thermal technologies, capacity is determined according to engineering criteria. For hydro technologies, it is determined partly with respect to characteristics of the particular facility and partly by system characteristics; capacity is given as projected available power during the period of maximum expected demand on the system and assuming optimal operation of the rest of the industry. A generator can enter into capacity contracts as determined by the market operator only.

While determining engineering-plant capacity limits in a hydro-thermal system is complicated, requiring sound judgment, the chosen rules for capacity determination may appear somewhat conservative, particularly for hydro facilities. If so, the consequences are partly an overall disincentive for new investment and partly a bias against investment in hydro facilities. These effects are further enhanced by what appears to be excessive reserve margins, also determined according to engineering criteria. A combination of low capacity measurements and high capacity margins result in excessive capacity costs. As these costs must inevitably be borne by consumers, the overall cost of energy is driven up.

Moreover, it is not obvious whether efficient operation of the capacity contract market needs to introduce measurement of installed capacity in the first place. If capacity contracts are linked not to installed capacity but to output at the time capacity is needed, then the measurement problem is considerably reduced. Of course, these types of contracts must include penalties for suppliers who are unable to meet contractual output levels. They therefore require a system whereby holders of capacity contracts can ensure indemnity from counterparts who are unwilling or unable to adhere to contractual obligations.¹³ The gain is that such a system provides for a more decentralized—and hence more realistic—evaluation of available capacity.

One may question the advisability of requiring consumers to contract for capacity. An alternative would be to provide consumers full supply-security rights at the outset and offer instead the opportunity for entering

¹³ Regulations for handling this problem should include considerations for the liquidity and solvency of parties failing their contractual obligations, as well as allocation of proceeds from indemnity payments.

into contracts for interruptible power. Given that most consumers would likely want 100 percent supply security, this alternative could potentially reduce the need for costly transactions. However, such a reform would require changes to the way energy is priced in the wholesale market, whereby generators could recoup capacity costs. For example, during demand-rationing events, the wholesale price could be set at the energy price at which consumers are willing to have their supplies interrupted.¹⁴

Implementation Issues

In practice, solving the supply-security problem involves designing an institutional framework within which participants—consumers, generators, market organizers, and government agencies—make decisions. Choosing an optimal institutional design from among the wide variety available should be guided by the market conditions in question, including both constraints (technical, economic, social, and political) and regulatory capacity. Most important, institutions are shaped by or derived from the implied allocation of rights and responsibilities between the parties involved. Indeed, institutional design primarily concerns the allocation of property rights and facilitation of their transfer between parties.

Thus, the following sections analyze three questions central to implementation:

1. What are, or should be, the rights and responsibilities of the parties involved?
2. What types of transactions do the parties want or need to undertake?
3. To what extent should regulation facilitate these transactions?

Rights and Responsibilities

Any practical solution to the supply-security problem starts with assumptions, either explicit or implicit, about the rights and responsibilities of the parties involved. The first question is whether consumers have a right

¹⁴ Resulting price increases would affect consumers only to the extent that they are not fully hedged; for fully hedged consumers (including those on regulated tariffs), average payments (including both energy and capacity) would not change.

to uninterrupted supply. In Norway, for example, it is explicitly acknowledged that consumers have such a right, and the system operator must enter into interruptible power contracts with consumers to ensure that a sufficiently large proportion of demand can be shed when required. In Guatemala, on the other hand, consumers have no such right; unless consumers are covered by a capacity contract with a generator, they may be subject to rationing whenever total demand exceeds total supply.¹⁵ In many countries, the right to supply security is implicit in the rationing rules. For example, in Colombia, each circuit is classified as either “disconnectable” or “not disconnectable,” depending on (among other things) the composition of consumer types on the circuit.

When consumers have a right to uninterruptible supply, someone must be given the responsibility for ensuring that this right is honored. Two options are available: the system operator or the electricity suppliers. In Norway, the system operator has this responsibility and must ensure—by making arrangements for capacity reserves and interruptible demand—that rationing is avoided. In Guatemala, on the other hand, suppliers of non-regulated consumers are required to have contracted for a capacity sufficient to cover the demand of their customers.

Responsibility for ensuring an adequate amount of capacity may be decentralized. However, responsibility for the short-term, physical balancing of the system requires another solution. Given the inherent coordination problem, it would be extremely difficult to decentralize such a decision to the individual participants. Thus, in practice, balancing decisions must be centralized—a task most countries designate to their system operator. Clearly, this responsibility must be accompanied by a set of rights that allows the system operator to perform the task efficiently. However, this does not mean that the system operator must be provided with broad powers to overrule operational decisions of other market participants; system balancing may be done on the basis of voluntary agreements. Nevertheless, rights and responsibilities of the system operator must be aligned with those of other market participants.

¹⁵ This scheme applies only to non-regulated consumers. For regulated consumers (including households), distribution companies must ensure capacity coverage on their behalf.

Another question is whether consumers should be provided the right to protect against price risks. Traditionally, they have obtained electricity at infrequently adjusted, regulated prices. Where the electricity industry has been deregulated, however, consumers have tended to lose their right to take power at guaranteed prices. Gradually, starting with larger groups, ever-increasing numbers of consumers have had to accept market terms, as they have for other goods and services. To the extent that these consumers want protection against price risks, they must enter into long-term contractual arrangements with other market participants and pay for it.

Similar to consumers' eventual right to uninterrupted supply is generators' right to self-dispatch or self-declare availability. In some cases, such as the Nordic market, generators are free to adjust their output levels.¹⁶ In other cases, such as Colombia, generators are bound by their operational plans, but may decide on them as they see fit. In still other cases, such as Guatemala and Honduras, generators must make all capacity available at all times.

Finally, decisions about capacity expansion must be considered. Can anyone build new capacity or is participation limited or subject to specific regulations? Are investors free to decide which technology they want to use or are capacity-expansion plans subject to an approval process? Is investment decentralized or is someone given responsibility to ensure that investment occurs? Answers to these questions are central to the design of specific regulatory and market institutions.

Transaction Costs

According to the well-known Coase Theorem in economics, it does not much matter how rights and responsibilities are allocated. Participants have a mutual interest in making the most valuable use of available resources and, as long as they can transact, aim to reach agreements that realize all potential gains. Consequently, irrespective of where resources initially belong, the market process ensures that they are transferred to where they can be used most profitably, thereby achieving maximum efficiency.

¹⁶ In practice, this right is limited to avoid unforeseen shocks to the system. Generators must declare their operational plans in advance, and large deviations are generally not accepted. Discrepancies between contractual obligations and output are settled in a so-called "regulation market."

There are, of course, caveats to this argument. First, even under such ideal conditions, allocation of gains clearly depends on allocation of rights. For example, consumers are better off with, rather than without, a right to uninterruptible supply. With such a right, the consumer may decide to sell it—by entering into an interruptible power contract—but only for a price. Conversely, if consumers have no right to supply security initially, they must obtain it in the marketplace, at a cost.

More important, agents may not always be able to achieve potential gains from bilateral (or multilateral) transactions. Associated transaction costs (e.g., searching for trading partners or writing and enforcing contracts) may preclude mutually beneficial transactions. In such cases, the initial allocation of property rights determines the extent to which efficiency is achieved.

It follows that the choice of institutional framework—particularly the allocation of property rights—should consider associated transaction costs. For example, if consumers generally want a high level of supply security, providing them a right to uninterrupted supply reduces the need for private supply-security arrangements in the market. Similarly, giving the system operator responsibility for physical balancing reduces the need for market participants to reach private agreements on such arrangements. Therefore, by carefully designing the allocation of rights and responsibilities, one may reduce the need for private transactions and hence transaction costs. Furthermore, to the extent that transfer of rights is costly, and thus limited, allocation of rights and responsibilities determines in whose interest economic decisions are made and how resources are used.

Considerations involving equity on the one hand and efficiency on the other may sometimes be at odds. For example, while there may be good reasons to provide households protection against price and supply risks, greater capacity is required to meet demand in all contingencies; accepting that households are exposed to price fluctuations reduces the need for costly investments.

Institutional Facilitation: Contractual Arrangements

Successful allocation of property rights requires certain market transactions—there will always be gains from trade, adjusting levels of supply

security, enlisting the participation of private agents in system balancing, and new investment. Institutions should be developed to allow for such transactions at minimum cost. This could be achieved by creating markets, standardizing contracts, and ensuring that private parties abide by their contractual obligations.

From the above discussion, it should be clear why solutions to the supply-security problem can or should differ: because equity concerns and levels of transaction costs differ.

The importance of transaction costs and the opportunities for reducing them differ by country, depending on economic, social, and political conditions. For example, in countries with sophisticated market institutions, development of the electricity market may be left to private initiative, while, in countries with less developed market economies, it may make sense to require agents to operate with standardized contracts in regulated markets. Similarly, in countries where investment risk is high and financial markets are weak, capacity expansion may need to be subjected to administrative planning and approval procedures.

Nevertheless, restricting agents' opportunities for entering into private arrangements—or limiting use of the market mechanism—involves obvious dangers. In cases where administrative solutions prove costly or inefficient, agents have no opportunity to make alternative arrangements to ease the cost of inefficiencies. Indeed, with few or tightly regulated markets, little information is generated—by way of price signals or “voting with one's feet”—to reveal the failure of the chosen solutions.

To take just one example: Rationing involves both fixed and variable costs that may vary considerably between consumers. When a rationing event occurs, consumers experience fixed costs associated with turning electrical appliances off and on, switching to alternative fuel supplies, and potential damage to appliances. Variable costs are associated with coping without electrical supplies (foregone consumer surplus). The existence of fixed costs means that it will be more costly to ration many consumers over a short period of time than fewer consumers over a longer period. It may also mean that partial rationing is less costly than full rationing because partial rationing does not involve full stoppage and start-up costs. Finally, because costs to consumers differ, total costs

can be reduced by directing rationing at those consumers who suffer least. In a system where rationing is based on purely administrative criteria, any efficiencies arising from choice of the rationing scheme are borne by individual agents and are thus “invisible.” In a market-based system, however, market prices provide signals of the cost of rationing and, hence, the information needed to improve institutional design.

Conclusions

There is no universal model for organizing the electricity supply industry. On the contrary, reforms must be carefully designed, taking into account the current state and history of the industry, as well as social, economic, political, and regulatory conditions. The importance of taking such care should be evident from the three country studies presented in this book (Columbia, Honduras and Guatemala). While these countries may all benefit from moving toward more market-based reforms, their starting points differ so much that it would be senseless to drive them toward the same final destination.

While no universal model exists, the following features are common to all sound ones:

- ◆ The problem must be clearly understood in order to find an appropriate solution.
- ◆ Whatever the institutional setup selected, it must be internally consistent.
- ◆ Institutional design must satisfy regulatory and other constraints.

Design of efficient institutions must consider levels of transaction costs. In particular, transaction costs may limit opportunities for relying on markets. For example, determining levels of supply security may be decentralized and left to the market in the form of contractual arrangements that establish penalties for non-delivery. However, the efficient working of such a market requires a set of institutions to ensure that participants abide by their contractual commitments. If such institutions cannot be established or made to work properly, it may be just as well to determine supply-security levels by administrative means, which, though crude, are easier to enforce.

However, it may be more important to clarify the rights and responsibilities of the parties involved than to devote scarce administrative resources to institutional design. Both the theoretical literature and the public debate have centered on institutional design, including contractual and trading arrangements; however, the importance of fine-tuning institutions is not always clear. First, allocating property rights by determining the need for costly transactions affects the overall level of transaction costs. Second, market participants have incentives to establish efficient contractual and trading arrangements. Consequently, by clarifying and carefully allocating property rights, one may, to a certain extent, be able to rely on private initiative to create the necessary institutions to handle transactions.

In the past, discussion of the supply-security issue has focused on the supply side. Indeed, one author recently defined the problem as ensuring the “existence of enough installed and expected available capacity to meet demand” on the one hand and the “readiness of existing capacity to respond when it is needed in operation to meet actual load” on the other (Pérez-Arriaga, 2001). Clearly, it is important to build enough capacity and ensure sufficient reserve margins. However, the supply-security issue concerns the balance between demand and supply, and maintaining such a balance requires an awareness of both sides of the market.

It would be extremely costly (and indeed impossible) to build sufficient capacity to avoid shortages at all times. In any electricity industry, there is a probability that actual load will exceed available capacity because of a market shock on the demand or supply side. In such events, demand must be curtailed. Then, it is not a question of the “readiness of existing capacity to respond when it is needed;” rather, it is the readiness of demand to respond when it cannot be met. Whether such a demand response should be brought about by administrative rationing or some other market-based instrument is a practical matter that requires weighing the costs of inefficient rationing against transaction costs. The critical point, however, is that a response can sometimes be obtained on the demand side only.

Furthermore, the degree of demand-side flexibility strongly affects the need for building costly capacity. If consumer prices are fixed or vary little in response to changes in underlying market conditions, the likeli-

hood of demand exceeding any given level of capacity is larger than if consumers are exposed to varying prices. Also, if rationing is based on administrative criteria, rationing events tend to be more costly than if the demand response is obtained by contracts that reflect opportunity costs. Consequently, more capacity is needed to reduce the likelihood of a costly scarcity event. The practical solution to the supply-security problem, therefore, depends on the extent to which one is willing to accept price variability. To sum up, the solution to the supply-security problem lies on the demand side, not the supply side.

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CHAPTER SIX

Power Sector Reform: Lessons Learned

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As shown in the case studies in this book, power sector reform in Colombia, Honduras, and Guatemala differs markedly. Of the three countries, Colombia was quickest off the mark and has consequently a fairly long experience with a reformed power sector. Although reform succeeded in Colombia during the first few years, the model has come under increasing stress. Privatization has come to a halt, and many government-owned companies are in severe financial difficulty. These financial problems have been exacerbated by the country's economic setback, and, as a result, the survival of the entire reform process is at stake. In Honduras, regulatory reform never really got off the ground, and the country's power sector remains largely a vertically integrated, state-owned monopoly. While some improvements were made during the reform process, the sector is still plagued by low efficiency, cross subsidies, insufficient tariffs to cover costs, and poor prospects for new investment. In Guatemala, the reform process started somewhat later than in Colombia. While the reform models were similar in many respects, there are also important differences. In Guatemala, establishing an independent regulator was even more difficult than in Colombia. While, after years of implementation, many problems were solved, new problems associated with structural and regulatory incoherencies have emerged, which may threaten the survival of reform.

Overview

Drawing general lessons from three such diverse country experiences may appear daunting. Nevertheless, the countries' underlying problems are similar and their divergent developments share common features. These include difficulties in introducing market-based solutions, establishing new regulatory institutions, and avoiding haphazard and incoherent political interference in industry development.

The starting points and objectives of sector reform in these three countries differed from those of pioneering Organisation for Economic Cooperation and Development (OECD) nations, but the reforms per se were copied more or less directly from them.¹ It appears that particular country contexts—motivations for and experiences with reform—were largely overlooked. A more cautious approach might have recognized that no universal model exists and that success depends on the institutional setting and timing of associated reforms of the economy at large. Unless these elements are replicated or replaced by local versions, and unless reforms are introduced coherently across the economy, transferring a model out of context is likely to fail. Indeed, while blueprints, best practices, international standards, and harmonization may prove useful for narrower technical issues, large-scale institutional development requires a process of discovering local needs and capabilities (Rodrik, 2000).

The lack of fit between the regulatory models adopted and a country's institutional and resource capacities may undermine reform sustainability. Although many—and sometimes impressive—results have been obtained, regulatory reforms have not been as successful as was perhaps expected at the time they were conceived. One could argue that this was caused by reformers' unrealistic expectations and that a more realistic evaluation would have shown that the results were as good as could be reasonably expected. However, the evidence indicates that this is not the whole story. Regulatory reform faces serious problems that need to be tackled to improve industry performance.

¹ Although it could be argued that Chile, whose reforms preceded those of OECD countries, set the initial example.

The more fundamental question is this: Were the reforms unfortunately chosen or did weak institutional and resource capacities cause the problems, regardless of the regulatory model in place? If the latter is true, then these countries face underlying problems that regulatory reforms simply cannot solve, or—even worse—non-sustainability is an inherent feature of power sector regulation in countries of Latin America and the Caribbean. If that is true, then attempting to improve on regulations is, at best, a futile exercise and, at worst, damaging to sector performance.

Certainly, power sector reform can only do so much; significant problems will remain no matter how well designed a regulatory framework is. Nevertheless, by carefully studying the circumstances of each country—economic, social, political, and institutional—and by adapting not only the design of the reform, but also the way in which it is implemented, the authors remain convinced that reform sustainability can be improved.

Reform by Necessity rather than Choice

It is almost a rule that regulatory reform is triggered by crisis, and reform of the power sector is no exception. In fact, power sector reform typically has resulted from developing problems within the sector that eventually became unbearable due to events external to the sector. Notably, the political and macroeconomic conditions of the 1980s induced governments to keep tariffs low in an effort to keep inflation under control. Poor performance of state-owned enterprises added to the financial burden of governments, and large transfers from central budgets to utilities contributed to the more general financial crisis. As a result, privatization of the power sector was viewed not only as a means of stopping the sector's drain on government resources, but as a way to fill empty treasury coffers and improve government finances overall. Moreover, government access to external financing dried up because of the 1980s crisis and multilateral institutions' reluctance to continue financing companies with poor performance, huge losses, and low tariffs.

Crisis as Opportunity

From this perspective, crisis not only forced the need for reform; it also provided an opportunity for change that might otherwise have been diffi-

cult to achieve. The fundamental economic problems created a common understanding that something had to be done. While full agreement about the exact nature of the problems and their solutions may not have developed, it was nevertheless clear to most participants that the old state of affairs was no longer sustainable and that change was needed. The common understanding was not limited to the necessity of reform, but extended to the urgency for making changes. In short, the crisis provided a window of opportunity for reformers.

Colombia's experience is particularly interesting in this respect. At the time of reform, the country was an exception in macroeconomic terms, with healthy growth and moderate inflation; however, its power sector was in shambles, and the government was pushing hard for urgent reform. Fortunately, the rationing event of 1992 provided the government a unique opportunity for taking action. This event strengthened consensus, both within the sector and among multilateral institutions, that the old regulatory model was no longer viable. This awareness coincided with the deteriorating State model, acceptance of a new international development paradigm, and adoption of the 1991 Constitution, which welcomed the new paradigm. In short, the time was ripe for power sector reform, and the government could pursue it with little opposition as part of a more general package aimed at modernizing the State and implementing the principles of the new constitution.

However, this happy coincidence of diverse factors that created a window of opportunity is insufficient for reform to become a reality. In addition, reform requires political leadership willing to measure the consequences of the status quo and take the implicit risks. As Chapter Two clearly showed, while the lack of an immediate financial crisis in Cali, Colombia may have weighed heavily in its decision to revert reform, the solution to the crisis in Bogotá would not have been possible but for the leadership shown by the mayor.

Crisis as Risk

While specific economic and political circumstances provided an opportunity for much needed reforms, the urgency with which they were undertaken created considerable risk that they might include ill-advised changes that

would prove unsustainable over the longer term. This risk was all the more serious, given that the reforms were patterned after those of countries with considerably different economic and institutional conditions. Moreover, the reforms were implemented with the help of foreign advisors who had little or no regard for the countries' unique conditions. In fact, the underlying philosophy of the reforms appears to have been largely "institution free"—that is, optimal solutions did not depend on institutional conditions. The striking similarity of philosophy, as well as many key practical aspects, among all of the countries that attempted reform raises the question: Was sufficient thought given to designing reforms appropriate to particular country conditions? That reforms tended to be radical and took a long time being put in place points toward the same question.

Lack of Ownership: Causes and Consequences

As mentioned earlier, Latin America's reforms undertaken in the early 1990s, including power sector reform, were part of its adoption of a new paradigm intended to end economic stagnation. In the infrastructure sectors, reforms favored private service providers, limiting the State's role to policy definition and regulation. Argentina's power-sector reform model, as well as the Chilean and UK examples upon which it drew, were particularly important in shaping design. International advisors (who, as government consultants, were often directly responsible for drawing up the exact reform design), donors, and multilateral institutions advocated these models, even though they did not always enjoy strong local ownership or popular support. Colombia's government appeared committed to the reform initiative overall. This was not the case in Guatemala, despite strong proponents. In Honduras, however, proposals received little or no enthusiasm, and, to some extent, were actively opposed. The point is not merely that the reforms were, to varying degrees, imposed from abroad; when difficulties were encountered, absence of domestic support made sustainability considerably less certain.

Lack of Understanding and Legitimacy

When reforms are based on foreign ideals and are perhaps drafted by outsiders, they are not necessarily well understood. While the general princi-

ples may be acknowledged, lack of experience with the particular type of reform may create serious obstacles to its practical implementation. Furthermore, with limited local ownership, the reform initiative may lack the necessary legitimacy that allows reformers to overcome inevitable resistance, particularly from those who will be adversely affected by changes. In addition, if the reforms do not conform with local conditions, failing to include key institutional and human resources may hinder their implementation. As a result, technical and institutional limitations, as well as compensations and concessions granted during the approval process, may complicate implementation and give groups that have benefited from the transition period strong incentive for developing new interests that will prolong it. Thus, achieving the original objectives of reform requires that its various aspects be compatible with local institutions. It also requires an increase in the number and influence of advocates, making reform less vulnerable to external shocks.

Radical versus Gradual Reforms

While crisis within or outside the power sector can provide an opportunity for reform, it does not guarantee enough momentum to push reforms through. In both Honduras and Guatemala, the large scale of proposed reforms and the speed of attempted change may have been excessive, accounting for the opposition encountered. Indeed, the grand size of proposed reforms may have been a fundamental reason why the Honduran reform process never got off the ground. These problems were exacerbated by incoherencies in the overall reform program and a lack of willingness to follow up with reforms in other areas.

This is not to say that the reforms would necessarily have been more successful if the process had been more gradual, although this seems likely, at least in the case of Honduras. Gradual reform runs the risk that vested interests succeed in slowing the process so that it never picks up sufficient momentum. On the other hand, radical reform efforts, once initial enthusiasm cools down, do not ensure that the process will not be stalled or even reversed. Provided that it does not forego options for future development,² gradual reform reduces the likelihood of outright

² For example, Guatemala's difficulty in handling the stranded cost resulting from earlier PPAs.

mistakes and allows for opportunities to change course based on learning and experience.

Even if the speed of reform has been excessive, it does not follow that the direction of change has been wrong. For all three countries studied, while certain aspects of reform were unsuited to local conditions, the fundamental idea of introducing more market-based reforms was sound.

Lesson

If the direction of reform is fundamentally sound, the process of implementation should be gradual enough to reduce local opposition, learn from mistakes, and enable mid-course corrections.

Model Choice

Around the world, regulatory reforms have taken many directions with respect to market architecture, market design, and regulatory framework. For example, in some countries, strict regulation of the vertical and horizontal industry structure has been an integral part of reform efforts; in other countries, governments have taken a more relaxed view with regard to industry structure. In some cases, mandatory spot markets or pools have been established; in others, agents have been free to design their own trading institutions. Many countries have established independent institutions responsible for regulatory oversight; in others, power sector regulation has rested with competition authorities or other government agencies with broader responsibilities. In short, governments have shaped models according to the particular circumstances of their respective countries.

Given the different circumstances of Colombia, Honduras, and Guatemala, it is surprising that design of their power sector models were so similar, particularly with respect to vertical and horizontal disaggregation, introduction of competitive wholesale markets, and establishment of OECD-style regulatory agencies. For example, Colombia has a comparatively large power sector, while the Honduran and Guatemalan sectors are fairly small. Moreover, Colombia began with a rather fragmented industry structure, with a mix of local and central government ownership, while

Guatemala was dominated by two vertically integrated, state-owned monopolies and Honduras by one.

Nevertheless, these differences, as well as other social, economic, and political conditions, apparently played a minor role in shaping plans for reform.

Common Features of Sound Models

While the authors would argue that there is plenty of scope for varying the design of power sector reform, it nevertheless remains true that all sound models share certain features. Separation between competitive and non-competitive activities is important to avoid cross subsidies that lead to unfair and ineffective competition. For example, if competition is introduced in retail or supply, measures should be taken to ensure that these activities are separated from distribution; otherwise, integrated companies engaged in both retail and distribution may be able to monopolize the market by biasing distribution tariffs. It is generally acknowledged that effective separation can be achieved only by requiring full ownership separation (as opposed to separation of accounts). However, exactly where such separation is required depends on where the line is drawn between competitive and non-competitive activities.

A second feature of sound regulatory models is strict regulation of non-competitive activities. This is necessary to avoid inflating prices and costs. Key parts of the power sector cannot be subjected to market-based competition because of their natural monopoly character. Furthermore, for various reasons, certain activities that could, at least in principle, be subjected to competition are not. Consequently, competitive forces will not discipline substantial parts of the sector, making more direct measures necessary to ensure adequate performance. Regulation is inherently difficult—because of the informational handicap of regulators, for example, when assessing reasonable cost levels for regulated activities—but unavoidable. Thus, sufficient attention must be paid to how regulation is done.

A third feature of sound regulatory models is clear rights and responsibilities of the parties involved, particularly those of government-level policymakers and regulators, to ensure consistent governance across the

sector. Uncertainty about rules and regulations, haphazard sector intervention, and arbitrary regulatory decisions can undermine the confidence of industry participants and affect their decisions, especially with regard to long-term investment commitments. Such effects may also result from lack of clarity about the rights and responsibilities of market participants. To what extent are agents free to pursue profit-maximizing strategies by setting prices freely? What are their public-service obligations? What happens if agents default on their financial obligations (say, to the pool)? Are there limits on contractual freedom? Who is responsible for supply security? In short, market rules must be clarified to minimize opportunistic behavior and costly conflict resolution.

Whatever regulatory model is chosen, coherence is paramount. Examples of model incoherencies abound in the three countries studied. In Guatemala, attempts have been made to introduce retail competition, with important elements of vertical integration remaining between retail and distribution activities (there are few or no restrictions to hinder further re-integration). In Colombia, sharing of regulatory responsibilities between government agencies has led to considerable confusion and indecision because of lack of clearly defined responsibilities. It is of little help that individual reform elements are sound and well-designed if they do not fit together well.

Lesson

If the overall reform model is coherent, weaknesses in individual parts may not only be more limited, but may also be corrected more easily.

Respect for Local Conditions

Over time, regulatory models around the world may well converge. As diverse models are tried out and experiences are gathered, important lessons continue to emerge. The lessons learned thus far indicate that certain models can be ruled out as unsatisfactory. For example, it seems clear that vertical integration cannot be combined with effective competition and that concentrated markets cannot be made competitive. It may be that, over time, a particular model may emerge as superior to others.

However, this is probably a long way off, given the relatively short history of market-based regulatory reform in the power sector.

Even if such a model should appear, choice of the regulatory model should still be customized to the country in question. Unless one believes that the ultimate solution has been identified and that it can be reached in one great leap, regulatory reform must respect the starting position of the sector, as well as the country overall. For example, in Honduras, where a tiny industry is completely dominated by a state-owned, vertically-integrated utility and weak regulatory institutions, it would be impossible to create a full-fledged power market. In Colombia, with its large power sector, fragmented industry structure, and more developed set of regulatory institutions, conditions for market-based solutions are more favorable.

Lack of respect for local conditions appears to have been especially strong in the case of Honduras. The country's original plan called for complete privatization of the industry, vertical and horizontal disintegration, introduction of a spot market, and decentralization of decisions for operation and investment. Clearly, achieving an efficient market solution in a power sector of the size and composition of Honduras is a great challenge. It would mean establishing a completely new regulatory framework with which the country would have had little or no experience. Moreover, the proposal was clearly not attuned to political sentiments in the country. While there appears to be a willingness to consider privatization of distribution and possibly other parts of the industry, the idea of privatizing hydro facilities has been strongly opposed. In sum, the discrepancy between the reform proposal and technological, institutional, and ideological constraints has brought the entire reform process to a halt.

Lesson

Regulatory reform should aim at developing a country's power sector from its current position, building on strengths of the existing model while amending its weaknesses. While such development may gradually lead to a model convergence, this results from evolution and not from being imposed at the outset.

Respect for Clear Priorities

Another reason why regulatory models should be customized to country conditions is that priorities may differ among countries. Choice of reforms may largely depend on whether priority is given to security of supply, efficient use of existing facilities, proceeds from privatization, or attracting private foreign investment. If the first priority is to attract new investment, securing a stable industry environment and sound profit margins that allow ample opportunity for recouping investment costs will be of major importance. On the other hand, if the top priority is cost efficiency and keeping prices down, vigorous competition must be ensured and strict regulation enforced. Clearly, a conflict may arise between these two goals, as effective competition and strict regulation tend to minimize profit margins and hence reduce the attractiveness of new investment. Similarly, a high degree of supply security, which requires large capacity margins, can only be bought at a cost and so will result in higher prices. Therefore, the choice of regulatory regime depends heavily on priorities.

The three country studies suggest that priorities have not always been entirely clear. Reducing a government's financial burden seems to have been a main motivator. However, the Colombian government's inability to simplify its intricate and costly subsidy system, and introduction of the social rate in Guatemala, suggest that this is, at least, not an overriding priority. Similarly, while privatization of utilities has been high on the list of priorities, lack of willingness in Guatemala and Honduras to depart with hydro facilities has severely limited opportunities for their governments to profit from such sell-offs. Attracting new investment is an often stated priority, but pursuit of effective competition—especially, in Colombia, where the recent intervention of the Energy and Gas Regulatory Commission (*Comisión de Regulación de Energía y Gas - CREG*) to limit opportunities for exploiting market power led to vociferous protests and threats to retire plants from the market—illustrates the difficult trade-off between ensuring efficient market operation and providing investment incentives. In addition, the attempt to renegotiate the terms of power purchase agreements (PPAs) (which have become rather onerous) does not provide a particularly good signal for attracting private foreign investment.

The authors do not wish to suggest that regulatory reform should be guided by a single priority. In practice, governments have a complex agenda with many goals. It has been stressed repeatedly that, in order for reforms to be sustainable, the range of various stakeholder interests must be taken into account. Nevertheless, it is important to clarify goals and assess their level of priority. Given the inherent conflict between goals, it must be made clear which ones should take priority. Furthermore, ambiguity about priorities may lead to confusion, indecision, and risk of reversals. Therefore, sustainability of reforms requires that priorities be stated as clearly as possible.

Lesson

In Colombia, Honduras, and Guatemala, reform models were adopted somewhat indiscriminately, and insufficient attention was paid to the unique characteristics of each country. The three countries had different starting points and, to some extent, different goals. Clearly, these differences were not reflected in the regulatory models chosen, at least not as they were envisioned initially.

Regulating Consumer Tariffs

While reform efforts have affected consumer prices with respect to the principles upon which prices are set and their actual levels (this is especially true for larger consumers in Colombia and Guatemala, who can freely choose their suppliers), there is still a long way to go before prices truly reflect underlying costs. From an efficiency point of view, this is a deficiency in that consumer prices provide poor signals for efficient use of scarce resources and revenues do not cover costs. The structure and level of consumer prices seem to result from deliberate political choice, although it is unclear whether the economic implications of pricing policies have always been fully appreciated, including the direct effects of price adjustments (targeting of subsidies) and indirect effects on resource use (cost efficiency and investment incentives).

It is easy to understand why governments often steer away from the politically sensitive issue of consumer tariff reform. A government may risk losing its grip on power—if not causing an outright uproar—if it

were to raise electricity tariffs substantially. Moreover, there are two major reasons for regulating consumer tariffs. First, most consumers tend to be risk averse, particularly when it involves large swings in the price of an important commodity. Second, the economic effect of rising prices may be high, especially on poorer household segments.

Regulating consumer tariffs involves three issues: cross subsidies between consumer groups, overall cost coverage, and price flexibility.

Need to Optimize Cross Subsidies

In all three countries studied, cross subsidies between consumer groups occur on a considerable scale. Guatemala's parliament has instituted a social rate for transferring the economic surplus from hydro resources (i.e., the difference between average spot-market prices and out-of-pocket costs when plants are dispatched according to optimal use of water) to low-income households. In practice, the consumption threshold is set high (300 kWh per month) in order to allow a large percentage (92 percent) of all households to be eligible for the social rate. Combined with the fact that the number of households on the social rate is growing while those paying the full tariff is falling, this means that the subsidy is quickly eroding its financial basis and will soon represent a direct burden on government budgets (i.e., unless the subsidy policy is reconsidered). Furthermore, concentrating payment of the stranded cost from the pre-reform PPAs on a narrow and decreasing segment of consumers is a serious threat to reform sustainability. Honduras also has a high threshold for residential subsidies. In Colombia, subsidies are allocated according to an elaborate scheme based on location, whereby the tariff rate for a particular household is set according to the social stratum defined in terms of the condition of dwellings and other characteristics.

Economists would argue that, as a general rule, cross subsidization is not the most efficient way to achieve income redistribution. Typically, there are better ways for selected groups to be targeted more directly (e.g., the tax system or transfers). This does not mean that subsidies should be avoided in all circumstances. Choice of policy instrument must always be judged against available alternatives; especially in countries that have difficulty raising taxes and poor institutional capacity, subsidies may become the preferred, if not the only, alternative.

If subsidies are preferred, they should not be tied blindly to electricity consumption, which is not always closely related to the fundamental economic conditions of a household, particularly non-electrified ones, which tend to be among the poorest, receiving no such subsidy. Even if electricity subsidies were the chosen instrument, the subsidy program would have to be carefully designed to achieve its goal. For example, Guatemala's "leakage" problem—giving subsidies to those who do not deserve them—could be significantly reduced without increasing the "exclusion" problem—not giving subsidies to those who do deserve them—if the threshold were reduced (Foster and Araujo, 2002).

In any case, cross subsidies involve costs. First, there are costs of administering the subsidy program, which may be considerable, especially with a system as involved as that of Colombia. Second, the subsidy program may have indirect effects (e.g., when transfer of payment is delayed, as has typically been the case in Colombia). Third, there are costs associated with muting price signals and the resulting inefficient use of resources. Consumers faced with lower prices tend to consume more; the converse is also true. Consequently, cross subsidies not only transfer gains between consumer groups; they also affect consumption patterns. As a result, electricity is not necessarily consumed by those who value it most, and the overall value added of the industry is correspondingly reduced (notwithstanding the fact that increasing electricity consumption may be a goal in itself, for example, by increasing overall coverage, to which an electricity subsidy is directly targeted).

It is unclear whether the costs of cross subsidization (or subsidies more generally) have always been adequately accounted for. Reducing tariffs has been a seemingly popular policy, designed to win votes, and the associated costs appear to have received little or no attention. Clearly, income redistribution will be an important goal of any government; admittedly, one can conceive of circumstances in which electricity tariffs will be an effective instrument for achieving this goal. Doubtless, the particular forms that subsidy programs have taken in the three countries studied, regardless of their political popularity, do not constitute cost-efficient means of redistributing income. The evidence points clearly to the need for reducing the extent of electricity-tariff cross subsidies, as well as changing their structure. The most direct measure to achieve this would be to drastically reduce consumer threshold levels, in combination with simplifying system administration.

This may be combined with concentrating resources on providing access and reducing connection fees, thereby allowing for more extended coverage, while, at the same time, maintaining incentives for energy conservation.

During the recent supply crisis in Brazil, the government concentrated proceeds from the energy efficiency levy on providing the poor free, efficient lighting, thereby contributing simultaneously to reducing their bill and ameliorating the crisis. Facilitating access by rural populations and normalizing service to peri-urban residents may also have an important equity and efficiency impact, if done properly.

Importance of Raising Tariffs

Perhaps most surprising of all is that the reform effort has achieved so little with respect to cost coverage. This is all the more surprising since, as discussed above, the original impetus for reform was the dire financial situation of the power sector. Not only had the financial burden associated with a long history of heavy subsidization increased further, as the result of rising costs, but the governments' ability to shoulder this burden was substantially reduced because of difficult overall economic conditions, as well as less willingness of donors and multilaterals to bail them out. As a result, power sector reforms were viewed, first and foremost, as a way to solve the government's financial difficulty by 1) relieving it of financial responsibility for the sector, and 2) generating revenues from the sale of government assets to improve the financial situation generally.

Given the inherent difficulties associated with cutting energy losses and increasing efficiency (which were and should be a top priority), the most obvious and direct measure to solve the financial problem would have been to increase tariffs. This, however, was not the route taken. Instead, the preferred action was to privatize the sector, thereby raising revenues and transferring financial responsibility to the private sector. At the same time—although of seemingly lesser importance, at least in Guatemala and Honduras—private entrepreneurs and state-owned companies would respond to incentives provided by regulatory reform and would increase the efficiency of the sector, thereby reducing costs and deficits.

While privatization could provide temporary relief for the government, it could not reduce the problem of sector deficits. Efficiency improvements

would certainly help, but, unfortunately, these are difficult to implement. No doubt, important progress has been made in this respect, as evidenced by reduced loss factors and labor costs; however, costs have not been brought in line with revenues. Furthermore, since tariffs have not been allowed to rise along with costs, due to various forms of tariff regulation, the gap between revenues and costs is likely to increase even further. In principle, in a fully privatized sector, individual companies (and their lenders) would have to bear the consequences of financial deficits. However, since privatization is achieved piecemeal, the government still owns large shares of the industry and so is directly affected by loss-making utilities. Moreover, a government is made directly or indirectly responsible for ensuring that the industry does not collapse financially. Rather than disappear, the problem will re-emerge as even more serious as time passes.

In Colombia, the financial difficulties of the distribution companies are already threatening the entire industry. Most Colombian utilities are trapped in the same vicious circle, fueled by lack of resources for investment, extremely high energy losses, operational deficiencies, stranded costs associated with special contracts, and regulatory problems that have made them financially insolvent, illiquid, and unable to service their debts or collect accounts receivable, with mounting deficits. In Guatemala as well, there are reasons to believe that problems are rapidly increasing. Thus, immediate action is called for.

Allowing for More Price Flexibility

The need to economize on scarce resources requires consumption to vary with supply conditions. This is especially important in hydro-dominated systems, in which energy availability may vary considerably over a season and between years. Electricity supply in Colombia, Honduras, and Guatemala depends heavily on hydro. The ability of these facilities to generate electricity fluctuates greatly, depending on hydrological conditions. Especially critical are recurring events associated with prolonged droughts that may reduce energy availability by a large percentage.

The only way to avoid reducing demand as a consequence of reduced supply capacity is having installed sufficient capacity initially. In practice, it will be impossible to install sufficient capacity to avoid demand reductions

in all events (thermal plants may also fail), but it is possible to reduce the occurrence of events in which demand must be curtailed. However, given the expense of capacity expansion, the cost of this additional investment should be weighed against the alternative of temporary demand reductions.

There are two major ways to reduce demand. One is to introduce rationing measures, whereby consumers are forced to scale down their power intake (e.g., Brazil's recent experience). A second way is to raise prices. The advantage of using the pricing system is that it simplifies the administration of demand reductions, by allowing individual consumers to choose how much they want to reduce their consumption, thereby leading to a more efficient allocation of available resources. However, the pricing instrument has the obvious disadvantage of exposing consumers to variable, and at times, high prices.

Given the financial and other difficulties associated with expanding capacity, it would be beneficial to introduce more pricing flexibility into the power sector. This would not necessarily mean that prices would vary continuously; what is important is price variation between normal and extreme supply conditions. In addition, it would not be necessary to expose all consumers to varying prices. It would be possible, for example, to shield certain groups from price spikes. Obviously, this would mean that other consumers would have to reduce their consumption by even more or that additional supply capacity would be needed.

Lesson

Introducing more realistic price signals is a difficult but key challenge for the power sectors of the three countries studied. Without such signals, new investment cannot be financed, supply capacity will be exhausted, and the power sector will continue to drain government finances. Political support must be mustered to allow for price adjustments. A starting point may be to eliminate certain cross subsidies, especially those that reach middle- or higher-income groups. Measures to increase price flexibility should be targeted primarily at larger consumers, such as those in Guatemala, who will probably be willing and able to negotiate prices on reasonable terms. Eventually, greater use of the pricing instrument should be allowed across all market segments.

Supply Security

A primary goal of any electricity supply industry is the ability to service demand at all times. As explained above, energy availability varies, but consumer response does not—at least if prices are not allowed to vary sufficiently—and rationing is generally not an option. Sufficient capacity must therefore be installed to meet demand. Since the supply-security issue is dealt with at great length in Chapter Five, the authors limit their discussion to the following observations.

It is clear that capacity availability may be secured in a variety of ways. One possibility is to provide financial incentives, as has been done in Colombia; here, capacity made available to the spot market is paid a capacity charge, thereby providing an additional financial stimulus to build new capacity. Another way is to establish a capacity market, as Guatemala has done; here, consumers (or distributors on their behalf) are required to contract for capacity directly, thereby creating a business incentive for introducing new capacity on the market. A third alternative is to regulate capacity expansion directly, as Honduras has done; here, the state-owned, vertically integrated National Electricity Company (*Empresa Nacional de Energía Eléctrica - ENEE*) effectively acts as a single buyer for capacity, contracting with private generators for new investment according to plans sanctioned by the government.

There are various models to choose from, as already discussed. Moreover, each model has numerous variations involving design of contractual conditions, market institutions, and other key elements. More important than choice of model, however, may be the general macroeconomic environment that potential investors face. Clearly, what is commonly called “country risk,” which encompasses political, social, and economic instability, tends to drive up the rate of return required by investors. It is desirable to reduce such risk to the extent possible. In any case, one should be careful in not taking actions related to regulation of the power sector itself or creating the impression that such actions may be taken, which adds to this risk. While reform sustainability may well be a goal in its own right, it will also improve the prospects that new investment will be forthcoming, at reasonable costs, when required.

Colombia’s recent experience amply demonstrates the importance of

the investment climate. Discussions about capacity charge have led to a search for alternative mechanisms to remunerate capacity investments, but thus far, without consensus as to what might prove a better and more viable solution. As a result of the fierce debate among market participants and between market participants and the regulator, uncertainty has been created about the future treatment of new investment. These problems have been exacerbated by the controversial intervention in the market during the difficult supply conditions of 2001 (resulting from guerrilla attacks on power installations), which has generally discredited the regulator and demonstrated, in the eyes of generators, a tendency to opportunism on behalf of the government. The financial difficulties of distribution companies, which threaten the financial solvency of the entire sector, and increasing political opposition to neo-liberal reforms in general and power-sector reforms in particular, have fueled suspicions that the current regulatory regime is unsustainable. On top of problems within the sector, difficult overall economic conditions, particularly concerning security, severely diminish the interest of foreign investors.

Lesson

Experiences in Colombia and Guatemala—as well as those in many other countries around the world—show that it is possible to decentralize capacity decisions. Exactly how this should be done depends on the particular circumstances of the market in question. Colombia and Guatemala chose different solutions. However, more important than choosing a particular contractual or institutional design may be ensuring that the rights and responsibilities of those involved in this market—investors, generators, network operators, and consumers—are clearly stated.

Market Architecture and Competition

A fundamental problem of regulatory reform is determining the extent to which one should aim at decentralizing decision-making to individual market participants. In principle, it is possible to envisage decentralizing almost any decision, although, in practice, various constraints—techno-

logical, economic, and institutional—limit both the potential for and desirability of doing so. Most importantly, decentralized decision-making generally requires a competitive environment to produce efficient outcomes. Below, the authors discuss this problem in relation to two important generation issues: short-term decisions concerning operation of existing facilities and long-term decisions concerning investment and expansion of capacity.

Three Solutions

Colombia, Honduras, and Guatemala have chosen different ways to organize decision-making around these two generation issues. In Honduras, although reform proposals have called for a decentralized approach, to date, both operation and investment decisions are completely centralized. On the basis of technological information (or, in the case of private-generation assets under PPAs, contractual cost figures) and computerized optimization models of the entire system, the system operator (in this case, the state-owned, vertically integrated ENEE) makes all operation decisions, dispatching plants to minimize overall costs, taking into account current and future availability of hydro resources. Decisions about new capacity are, at least in principle, similarly made, based on predicted demand growth and hydrological conditions and runs of the optimization model. Capacity is usually solicited at public auction.

Like Honduras, Guatemala's operational decisions are also centralized and similarly made. Generators are required to make all of their installed capacity available, and dispatch is made in a least-cost manner, based on information about technical efficiency, fuel costs, and hydrological conditions.³ However, generation-investment decisions have been virtually decentralized. Subject to various licensing conditions, anyone is free to invest in new capacity, have it connected to the main grid, and dispatched

³ Unlike in Honduras, hydro-electricity units are dispatched on the basis of variable cost assessments, with generators allowed to determine these costs; that is, the opportunity cost of water (in practice, most hydro facilities are owned and operated by the state-owned INDE). Capacity under contracts predating the new electricity law and containing take-or-pay clauses are dispatched out of merit, independent of whether they represent the lowest cost energy.

according to the rules of the wholesale market. Importantly, demand is required to obtain capacity reservations (or risk being rationed, in case of insufficient capacity availability), so a market for capacity rights has been established. As a result, the investors receive revenues from two sources: 1) output produced and delivered to the wholesale market (remunerated at the wholesale-market price or according to voluntary, bilateral contracts), and 2) capacity contracts. Consequently, investment decisions are based on standard business motives.

In Colombia, both operation and investment decisions are decentralized. Although subject to regulatory oversight in principle, in practice, generators are free to set the prices at which they are willing to supply electricity to the wholesale market.⁴ Investment decisions are also completely decentralized and subject to private business motives. There is an element of direct stimulus to encourage investment, in the form of the capacity charge paid to available capacity, but the main form of remuneration to capacity is via wholesale energy prices. In particular, since energy prices are allowed to be set above actual (marginal) cost, capacity scarcity will result in high profit margins and hence induce new investment.

Competitive Conditions

The different routes taken by these three countries are, to some extent, explained by their diverse technological, economic, and institutional conditions. Centralized decision-making typically suffers from a lack of accurate information. For example, the optimization techniques used for centralized dispatch in Guatemala and Honduras require, as input, data on capacity, technical efficiency, and fuel costs for each individual plant. Since generators have an incentive to distort such information in order to increase monetary remuneration for output produced, inefficiencies may arise. The great advantage of decentralizing economic decisions is that it allows individual agents to use their information efficiently. However, agents may also have incentives to distort decisions. In particular, they

⁴ During the 2001 supply crisis resulting from guerrilla sabotage of transmission lines, in which prices increased rapidly, the regulator intervened and, in effect, capped generation prices. Also, when reservoir levels are sufficiently low, operation of hydro facilities may be subjected to direct regulation.

have incentives to increase prices by raising their bids or price offers. Consequently, decentralized decision-making will produce efficient outcomes only if such incentives are corrected, for example, by competitive conditions that force agents to price at cost.

Effective competition requires a sufficient number of independent, efficient players. The number of players is determined by the size of the industry, as well as by the minimum efficient size of an efficient player, taking into account not only productive efficiency, but also efficiency at the operational and managerial level. As evident from California's experience, tightness of the market is crucial in determining competitive conditions. When the industry is close to capacity limits, each generator has ample opportunity to raise prices without running the risk of losing market share to competitors. Consequently, in a tight market, prices tend to rise above cost. The problem is further exacerbated by transmission constraints, as was evident in the 2001 supply crisis in Colombia, when the market was effectively split into two or more sub-markets and generators could benefit from higher prices. The presence of hydro plants, which typically have large capacities and opportunities for storing water, tends to reduce the problem of market tightness during periods of favorable hydrological conditions; in more difficult periods, however, the market power problem becomes more serious.

Many Latin American markets are too small to allow for a sufficient number of generators of minimum efficient size. The Honduran industry is probably well below the critical threshold, and the same may be true for Guatemala. In Colombia, however, with an installed capacity of approximately 12,500 MW, the market is sufficiently large for efficient competition, at least under normal conditions. Market integration across borders may eventually allow for effective competition in Central America (as well as in other regions where competition does not currently prevail). Even though there are concrete plans for making the investment and institutional changes required to implement such a scheme, this solution lies in the future.

Smallness of a market may preclude ex-post competition within the market, but not necessarily ex-ante competition for the market. With few established players, it is difficult to induce a competitive situation and hence achieve effective spot-energy markets. However, while the number of established players may be small, the number of potential players, in the

form of new entrants or investors, may be much larger; thus, it may still be possible to establish effective competition in the market for new capacity. This may be done within a single-buyer model, as has been the tradition in many Latin American countries and as is still practiced in Honduras. However, it may also be achieved in a more decentralized way, as is currently done in Guatemala.

Any solution must ensure consistency with the institutional framework. The proper regulatory and legal frameworks are required to procure long-term contracts, either by a single buyer or multiple distribution companies. The Honduras example is a painful reminder of this problem.

Lesson

Competition is a potent regulatory instrument, and there is further scope for market-based solutions in all three countries. However, great care must be taken when opening up new markets. First, one must be aware of whether technological, economic, and institutional conditions are conducive to a competitive outcome. Second, one needs to establish a suitable market architecture; that is, a balanced market structure with a sufficient number of efficient players. Finally, markets must be designed to allow for efficient trading and contractual arrangements.

Appropriate Regulation

One of the most difficult problems of the regulatory reform process has been establishing suitable regulatory institutions. It is generally recognized that, regardless of the regulatory regime chosen, the power sector can perform well only if regulatory institutions are in place to enforce rules and regulations consistently. This is self-evident for those activities subject to direct regulation, but is equally important for market-based activities. While well-functioning markets may relieve a government of some degree of regulatory burden, markets can only function well if regulatory institutions exist that ensure participants adhere to market rules, which are adjusted when necessary.

Establishing suitable regulatory institutions is demanding in many respects. The regulator must be equipped with sufficient human and other

resources to be able to undertake tasks in an expedient, professional manner. Furthermore, the regulatory and institutional frameworks must allow the regulator to perform his or her duties in a clear and consistent manner to ensure market participants an environment conducive to sound economic decision-making.

As a result, much of the debate has focused on two issues: 1) providing regulators sufficient human and other resources and 2) ensuring regulatory independence. Although progress has been made on both issues, much work remains. This is all the more serious given that well-functioning regulatory institutions are a prerequisite for sustainability of regulatory reforms. However, it may be that some of the problems experienced result from attempts to establish regulatory institutions that do not conform well with the political and institutional conditions of these countries. In particular, conditions taken for granted in other countries—rule of law, clear and accepted property rights, an independent and competent judiciary, mechanisms for peaceful conflict resolution, contract enforceability, quality of public bureaucracies, and competition agencies—are either missing or incipient. Moreover, there is a long history of highly politicized decision procedures, with respect to both sector planning and day-to-day regulatory oversight, from which it is difficult to break away.

Regulatory Difficulties

In Honduras, sector policy is the responsibility of the Environment and Natural Resources Secretariat (*Secretaría de Recursos Naturales - SERNA*), which has an Energy Directorate and is charged with ensuring sufficient supply of capacity and power. However, SERNA's sectoral leadership is weak, and the Secretariat's principal concern regarding electricity appears to be promoting renewable energy sources. In practice, sectoral planning is still done largely within ENEE, the vertically integrated, state-owned monopoly. Regulatory responsibilities lay with the National Energy Commission (*Comisión Nacional de Energía - CNE*), a "de-concentrated" entity of SERNA (meaning that it forms part of the Secretariat but has a high level of operational independence). However, CNE is generally considered weak. The executive branch controls it; the president directly nominates all commissioners for the four-year administrative term.

CNE also lacks fiscal independence (its budget is controlled by SERNA) and is technically weak, depending heavily on ENEE for information and analysis. Users have no effective rights regarding access to or quality of services. De facto, ENEE remains the direct policy instrument of the executive branch. The legal and administrative setting for regulation is also deficient. Honduras has no general antitrust legislation, and the judiciary has historically been highly politicized and incompetent. Consequently, the decision-making process is characterized by obscurity, delays, abrupt changes of direction, and an inability to face up to fundamental sector problems. This has been evident in the slow, cumbersome process of contracting PPAs, which has, in many cases, led to high costs and undermining of public credibility of the process.

The complex State procurement rules contained numerous ambiguities. As interpreted by ENEE, the rules often did not guarantee effective competition because they discouraged possible bidders from entering the process. Taking advantage of these ambiguities, ENEE directors sometimes got involved in assignment of contracts, pressing technical committees to prefer offers that had not initially been placed first. Several key companies involved in these processes have links to politicians with seats on the ENEE board. Ambiguities in the rules led to frequent legal disputes over outcomes. As a result, on various occasions, ENEE made emergency procurements under the shadow of impending power outages, which allowed formal rules to be waived.

In Guatemala, the National Electricity Commission (*Comisión Nacional de Energía Eléctrica - CNEE*) was created as part of regulatory reform. CNEE consists of three regulators, appointed for five-year periods. Since each regulator has the same term, there is little overlap of experience at higher organizational levels. Various measures have been introduced to limit opportunities for political interference in the appointment of new regulators, although some commentators claim that ample opportunities still exist for the government to pick its political cronies. More importantly, the regulators' ability to enforce rules and regulations is severely limited. This is partly because of the limited resources provided to CNEE, but mostly because of the opportunity for agents to appeal decisions of the regulator to the Ministry of Energy and Mines, upon which CNEE directly depends, and through mechanisms of

the Public Administration Law, thereby preventing regulatory rulings from taking effect. In addition, political authorities, including Congress, continually threaten to interfere in decisions of the regulators, for example, by passing new laws. Interestingly, however, Guatemala seems to have had some success in establishing a form of self-governing regulation of the wholesale market. In particular, the Wholesale Market Administrator (*Administrador del Mercado Mayorista - AMM*), whose board has representatives from all key parties in the wholesale market, has been able to reach compromises on crucial regulatory issues that have allowed improvement of market rules. This apparent success does not come cheaply, however, since many observers claim that several rules, particularly those referring to transmission expansion and tariffs, are biased toward incumbents and discriminate against the state-owned transmission company. Moreover, there is limited regulatory oversight of AMM.

Colombia also established a new regulator, CREG, as part of its reform package. The commission is ruled by an eight-member board; five members are chosen as independent experts, while the other three are the respective ministers of energy, planning, and finance. The fact that the government of Colombia is directly represented on the board has drawn criticism, with claims that the regulator is not truly independent. Advocates of this arrangement, however, claim that political control is not only warranted, but allows the regulator to make more informed decisions. A potentially more problematic feature of the Colombian institutional structure, however, is the fact that CREG is responsible for the design and implementation of rules and regulations only, and that regulatory oversight and control rests with the Superintendence of Residential Public Utilities (*Superintendencia de Servicios Públicos Domiciliarios - SSPD*), another executive branch. SSPD lacks the necessary economic and technical competence to manage its tasks and has, moreover, been plagued by scandals involving its senior officers. As a result, SSPD has been unable to perform its duties, a major reason for the many problems currently experienced by the sector, including those associated with continuity of supply, privatization of distribution utilities, liquidity and solvency of utilities in general, supervision of tariff formulas and pool prices under emergency conditions, attention to service providers and users, and regional political interests attempting to capture regulators.

Clearly, in all three countries, utility regulators are neither independent nor financially autonomous. Regulatory agencies are either tightly integrated within the executive branch (as in Honduras and Colombia) or directly controlled by it (as in Guatemala). In both Guatemala and Colombia, efforts have been made to de-politicize the appointment of regulators, but these attempts have succeeded only partially. In Colombia, SSPD depends directly on government funding, but CREG has some financial independence, given that its activities are financed by a levy on the sector (however, CREG's budget must be approved by the government, and CREG has not been allowed to use all revenue raised by the levy). In Guatemala and Honduras, agencies are financed directly from their governments' budgets. Problems associated with lack of financial resources are underscored by a scarcity of human resources.

New Challenges

Deficient technical capacity of regulatory institutions is not unique to these three countries, but has been experienced in nearly all countries that have reformed their power sectors. Introducing market-based mechanisms creates new regulatory challenges, and it will necessarily take time until the required expertise has been acquired. Nevertheless, the problem is particularly acute in these three countries, owing to lack of experience with market-based regulation in other sectors of their economies and lack of human resources. It is unclear whether these difficulties and the specific measures needed to recruit and train new staff were perceived from the outset. In fact, rules on recruitment and remuneration arrangements (typically dictated by civil-service traditions and judiciary norms) have often been inadequate. In Colombia, for example, regulators have had difficulty maintaining qualified experts, leading to high turnover of personnel, with the obvious results of inconsistencies and volatility in regulatory decision-making. Similarly, funding has been lacking for necessary training and technical-assistance programs. Clearly, unless these problems are addressed, performing regulatory duties will continue to be difficult.

While the resource problem is clearly important, problems involving the lack of independence and credibility of the regulatory bodies appear even more serious. These problems are associated with the organization of

regulatory institutions and their placement within the organizational structure of government, as well as the selection system, definition of terms of office, and rules on rotation and overlapping of terms. But problems also derive from the legal setting, including the regulator's degree of autonomy and the judiciary's reliability and transparency.

Regulation to establish markets and competition, control market power, and balance utility and consumer interests is a practice alien to an environment ruled by politicized monopolies. It derives from a system of protection of property and market access based on common law, rather than statutory law, with legal roots in systems of division of powers and administrative law. Furthermore, around the world, regulatory regimes adequate to market-based power sectors are still in their early stages. Thus, since goals conflict with established powers, regulation to structure competitive markets faces obstacles that require gradual accommodation and adaptation with respect to how regulatory institutions are set up. Moreover, there may be a need to educate all participating agents, not only regulators. This may be done by sponsoring research programs and think tanks; training officials in government and the judiciary; and launching information campaigns aimed at political parties, journalists, business people, social leaders, and the general public. In short, a regulatory culture needs to be established in countries unfamiliar with it.

Conflict between a government's role as policymaker and regulator is particularly clear in cases where the State is involved as owner and/or manager of significant proportions of the sector in competition with private companies. The risk is that sector policy and regulation favor State companies or arbitrate their value when they are in the process of being privatized. This risk is particularly acute when, as in Colombia, the minister (or his or her representatives) sits on company boards and, at the same time, strongly influences the regulator (in Colombia, the Minister of Mines and Energy, together with his colleagues in Finance and Planning, have veto power in CREG). Few mechanisms or controls ensure neutrality in policies, or even in regulation, when the management line falls directly under the executive branch.

Coherence and Consistency

However desirable, regulatory independence may be hard to achieve. Colombia's Constitutional Court has established the doctrine that, even if certain measures pertaining to managerial and financial autonomy, as well as appointment of nongovernmental members, could convey the impression that independence is real, commissions such as CREG are subject to the administrative branch, and their function is to lay out the details of policies determined by the government. Even if this is taken as a given, measures clearly exist for achieving greater regulatory autonomy without jeopardizing subordination of regulatory institutions. One such measure involves removing the direct presence of political representatives from the regulatory agency, while simultaneously introducing rules that subject regulatory decisions to control (e.g., by rights of appeal and proper accountability). Although the Guatemalan experience suggests that such measures are no panacea, a well-designed and balanced system of discretion and control can potentially improve the decision-making process.

Perhaps regulatory independence should not be viewed as a goal in itself. The fundamental challenge is to achieve coherent and consistent regulatory decisions that ensure industry participants that the government will not act opportunistically. Clearly, this requires a certain degree of regulatory autonomy. The regulatory decision process should not be open to arbitrary interference from political or other interests, but should be based on informed deliberations within the rules of the law. In principle, at least, this may be achieved without formal independence of the regulator. However, credibility demands that the decision-making process be open and transparent. This requires the regulator to spell out clearly the basis upon which decisions are made and the opportunities for appeal. The need for openness and transparency is typically viewed as an indispensable condition for guaranteeing regulatory consistency (Smith, 1997). Every piece of evidence and message to the regulator (including those from superior authorities) must be made public; in addition, it must be demonstrated that decisions are based exclusively on public information. Openness and transparency are also needed to make regulators accountable for their decisions, by allowing them to be challenged and by providing the basis for rewarding success and, when needed, penalizing failure.

Transparency and credibility may be achieved by soliciting advice from independent sources. In many places around the world (e.g., California, the Netherlands, and Norway), market surveillance committees or resource groups consisting of independent experts have been established to oversee sector performance and advise on regulatory issues. Without limiting regulatory discretion, such committees provide the regulator a professional basis for decision-making.

While it is impossible to avoid all inefficiencies of a regulatory framework, a regulatory regime consistent with regulatory institutions, along with an adequate and transparent incentive structure and sufficient resources, can at least reduce the extent of such inefficiencies. On the other hand, a country with weak judicial institutions and a tradition of political intervention in judiciary decisions faces a considerable challenge when trying to overcome regulatory deficiencies, whatever the regulatory framework.

Lesson

While advances may be made to secure an adequate and well-functioning regulatory framework, the problem is unlikely to be solved completely, at least in the foreseeable future. Therefore, one needs to consider how to simplify the regulatory task in order to economize on scarce resources. This argues for market architecture and design that pose simple regulatory problems that can be dealt with by clear rules, as opposed to architecture and design that pose complex regulatory problems requiring a large scope for regulatory discretion.

Conclusions

For all three countries studied—Colombia, Guatemala and Honduras—there was no alternative to reform. Government resources were insufficient to finance subsidized prices and new investment, and the economic inefficiency of the sector was unacceptable. For these three countries, the fundamental goals of reform were the same, as were the solutions: getting the prices right, relieving the government of the role of entrepreneurship, improving efficiency, ensuring that new investment would be forthcoming, and increasing service coverage.

Towards a Reform Strategy

These studies show that reform is a process, not a once-and-for-all decision. Changes must be made along the way, as new experience is gathered and lessons are learned. In most cases, gradual reform is desirable. However, this does not mean that one should concentrate solely on those issues that are currently pressing, and leave the future to itself. On the contrary, decisions must be made with a view to how they will conform with further development of the sector. In fact, what is needed is an overall reform strategy to guide individual developments and policy decisions.

The authors have argued—and the results of the three country studies support this argument—that sustainability of reforms should be at the forefront of reformers' attention. Sustainability requires, first and foremost, the removal of incoherencies. Analysis of the regulatory reform efforts of Colombia, Guatemala, and Honduras reveals a series of such incoherencies: between policy goals, policy instruments, attempted changes, and existing conditions. These clearly threaten the future of the reform process. It is critical to ensure avoidance of outright disasters, such as financial collapse, unexpected price rises, or rationing events. But this is not enough. It is also necessary to scrutinize the entire regulatory and industry setup with the aim of removing internal inconsistencies and ensuring the overall coherence of whatever model is chosen.

Facing Obstacles to Sustainability

It cannot be denied that the difficulties of reform and its implementation will continue. Today's incoherencies create conflicts that may not always be easy to resolve. The successful reformer must be aware of the trade-offs and ensure that goals are realistic. This is particularly important in view of the vested interests and opposing forces that will seek rents and look for new opportunities to further their own interests, often at the expense of the fundamental purposes of reform.

The State's continued entrepreneurial involvement, its allocation of subsidies for political reasons, and the indefinite prolonging of transition are at the core of counter-reform proposals. They provide electoral dividends at the expense of a sustainable sector and block the extension of benefits to other groups—including those without service coverage—who could

support the reform. Restricting opportunities for such opportunism is the greatest chance for consolidating power sector reform. This can be achieved through fiscal discipline that encourages privatization, dedicates surplus resources to the poor, and extends service to areas currently excluded. Combined with a credible commitment to avoiding direct government involvement in costly public projects, which could discourage private participation, this can help broaden the coalition favorable to reform.

In one important respect, reform efforts have not succeeded in tackling the underlying reason for having initiated them. In all three countries, the fundamental problem was a discrepancy between power sector revenues and costs. The sector's inability to cover its own costs imposed a heavy financial burden that eventually became unbearable. While privatization and new injections of capital have temporarily relieved financial problems, the fundamental revenue-cost problem has not been solved. Indeed, there are reasons to believe that this problem is almost as important today, or will be in the near future, as it was during the difficult times of the 1980s and early 1990s. In Colombia, the problem has already raised its ugly head in the form of insolvent distribution companies threatening the financial stability of the entire sector. In Guatemala and Honduras, the problem is partially masked by drawing on financial resources within the sector—particularly surpluses in State-owned hydro businesses—to cover deficits. However, it is probably just a matter of time until the problem re-emerges with full force.

Final Thoughts

One might have hoped that improved performance and efficiency gains would have reduced costs sufficiently to re-establish the balance between costs and revenues. However, this is more easily said than done. Even though the scope for productivity gains is probably considerable, they cannot be counted on. In short, there is no easy way out and, hence, no alternative to raising tariffs. It is not difficult to see the reasons—political and otherwise—why this has not been done. However, there is no other way if the fundamental problem of ensuring adequate resources to finance sector activities is to be solved.

In one fundamental sense, then, one may argue that reforms have failed. While privatization and regulatory reform may have dealt with many prob-

lems, one underlying cause has not been tackled. Until financial solvency of the sector is established, the other problems—including those associated with supply security and cost efficiency—will be difficult to resolve.

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Epilogue: A Reviewer's Insights

Ashley Brown

This book represents an initial step in the fundamentally needed process of assessing the extent to which power sector reforms have succeeded and whether the new regimes are sustainable. As an initial analysis, the study makes two critical contributions. First, it establishes a baseline and identifies areas for further exploration, analysis, and inquiry. Second, it sets the stage for the next generation of reform or mid-course corrections, which are necessary to enhance the sustainability of the changes already made.

The study consists of an analytic framework, three country studies—Colombia, Honduras, and Guatemala—a section on supply security, and a final section on lessons learned. While one can debate how representative the experiences of these three countries are of the entire region, each case is worthy of study, and, as a group, they are diverse. Colombia, with 12,500 MW of installed capacity, opted for a decentralized competitive market. Following initial success, it has been rocked by controversy; financially impaired distribution companies; and political, institutional, and regulatory turmoil. Guatemala, with a comparatively smaller power sector, opted for a competitive, centrally dispatched pool. While it also has enjoyed some success, particularly in expanding the availability of electricity, it has been troubled by institutional shortcomings, insufficient regulatory resources, transition difficulties in renegotiating pre-reform power purchase agreements (PPAs), and uncertainties regarding the emergence of a regional market. Honduras, an electricity micro market,

changed the law to enable the emergence of competition, but then failed to implement it.¹

The analytical framework paints the “big picture” of power sector reform. It provides an outline and imposes a discipline on the individual country studies and lays out key themes. These include analysis of the old regime; examination of the drivers of and influences (particularly interest groups) on reform; discussion of institutional, social, political, and economic constraints; and opportunities for sustaining the reforms that have been put in place.

Reflections on the Past Decade

The record of the old regime in Latin American power sectors, mainly state-owned monopolies, may be slightly more mixed than the analytical framework suggests. Indeed, the Colombia study suggests so in its discussion of the diversity of old-regime experiences. While service quality, efficiency of operations, tariff formulations, and other aspects of the industry may well have been severely lacking in many parts of the country, this does not appear to have been the case in all places. Medellín, for example, appears to have been well served. Similarly, such other state-owned companies as *Instituto Costarricense de Electricidad* (ICE) in Costa Rica and the *Companhia Energética de Minas Gerais* (CEMIG) and the *Companhia Paranaense de Energia* (COPEL) in Brazil enjoy considerable respect for the effectiveness of their performance. Nonetheless, the history of power sectors in Latin America underscores the importance of the sustainability question. In many cases, electricity service has not always been provided by state-run monopolies. In fact, for various political, economic, and social reasons, power sector ownership, like a pendulum, has swung from private to public ownership and then back to private.

¹ One could wish that the endeavor had been endowed with sufficient resources to look with equal intensity at other Latin American and Caribbean countries where the strain of reforms has been considerably acute. Brazil and Chile come to mind for a number of reasons, not the least of which being that these countries have experienced crises in supply and service quality, as pointed out in the Introduction. Argentina, whose wholesale market model is generally regarded as one of the region's most sophisticated, but which has had to endure severe macroeconomic crisis, also merits closer examination. Bolivia and Peru, for reasons also mentioned by the editors, deserve careful study.

These pendulum swings and models of limited duration are vital to analyzing the sustainability of reforms implemented in recent years and make the sustainability question all the more compelling.

Power sector reforms of the past decade have been, as noted in all three country studies, driven by factors both internal and external to the sector. In all three cases, internal factors have been derived from the inability to 1) fully commercialize the sector and 2) raise sufficient capital internally to finance growth and expansion (or, in some cases, to provide acceptable quality of service). The inability to fully commercialize the sector was derived from various well-known problems: political interference, disinvestments and diversion of funds, tariffs that failed to recognize all costs, and undue—sometimes perverse—influence of interest groups. That familiar litany of problems, however, does not appear to have been universal or systemic, as noted by the experience of Medellín, Colombia.² Thus, the problems that caused the downfall of the old model may not have been inherent, but derived from difficulties in execution. This would strongly suggest that the appropriate approach to developing power sector models is pragmatism rather than ideology.

The editors similarly note that wholesale importation of a model from one country to another is not helpful. They state clearly and categorically that there is no universal model and that transference of a model out of context is unlikely to succeed. The Colombia case makes it clear that a model that serves England and Wales well is not automatically transferable to Colombia. Similarly, the Honduran study points out the difficulties of conducting competitive solicitations that are inconsistent with local financial and banking practices. While this observation may seem obvious, experience suggests that sponsors of reform in developing countries have not always comprehended it.

The inability to generate sufficient capital internally to finance growth is, in part, a feature of insufficient tariffs. While political and other pressures contributed to keeping tariffs at low levels, macroeconomic influences were not insignificant. As the country studies note, macroeconomic policymakers' general concern about inflation were often reflected in

² To understand the sustainability of sector models more fully, it would be useful to examine carefully why the old model of state monopoly was reasonably successful in some cases while it failed in so many others.

efforts to keep the prices of such basic services as electricity lower than the costs might otherwise justify. Simply stated, the power sector does not exist in a vacuum. It must function in a larger world and be responsible to often-conflicting forces. Those pressures made sector policy decisions in the old regimes extraordinarily difficult. Indeed, the editors point out that the main motivators of reform were to relieve the State of financial responsibility for the sector and to grab substantial revenues for the treasury by selling power sector assets. Not only were there the usual political imperatives to keep tariffs low, but they were—as was generally the case in Colombia, Honduras, and Guatemala—often compounded by fears of inflation. On the other hand, the costs of doing business in the sector did not disappear because prices were maintained at less than sustainable levels. The result was that governments were compelled to provide subsidies that made fiscal discipline extremely difficult to impose. As pressures mounted for governments to put their fiscal houses in order, it was not only the power sector that was unable to raise capital, but the State itself. Subsidies and consistent supply of investment capital were simply no longer available. As a result, commercialization of the sector became an unavoidable imperative. Interestingly, privatization has not cured all of the ills that drove reform. As the editors note, privatization and regulatory reform have also failed to produce fully compensatory tariffs.

Macroeconomic considerations were accompanied by a political circumstance that is well illustrated in all three country studies. Critical pillars of support for market-oriented power sector reforms were located outside of the countries where they were being carried out. Although Colombia—and Honduras and Guatemala to a lesser degree—had domestic supporters of reform, they were largely absent. The greatest enthusiasm for reform was found among multilateral lenders, bilateral aid donors, and in distant capital markets. Thus, the political reality in all three countries was, at best, a limited domestic constituency supportive of changes. Not only were the reforms, to varying degrees, imposed from abroad; when difficulties were encountered, the absence of domestic support rendered sustainability less certain—a most significant reality.³

³ It would be useful to look more closely at the sustainability implications of foreign lenders' heavy influence on initiating, if not compelling, reforms.

Legacy of Mixed Results

The vulnerability resulting from limited domestic support makes it imperative that reforms have within them the potential for remedying this deficiency. Such remedies would almost certainly include a high degree of transparency in both the new markets and regulation, ample opportunities for meaningful public input and participation, major efforts at public education and dissemination of information, sensitivity to consumer demands for acceptable levels of service, and meeting the ongoing demands of social objectives (e.g., universal service and environmental quality). In addition, improved levels of efficiency and productivity must not only be attained, but also publicized. In short, the reform process must be conducted and new institutional arrangements must function with a view toward establishing credibility. Given the realities of political economy and the starting point for the new institutions, the task is Herculean, as the analytical framework and country studies illustrate.

Vulnerability of reforms is often compounded by expectations created by the reforms' proponents. To move reforms ahead politically, they often make assertions regarding improvements in service quality, increased investment, better prices, and efficiency gains. Thus, unrealistic public expectations frequently accompany reforms. As the editors point out, it is not difficult to deflate expectations. Service outages, investment shortfalls, higher than expected prices, market manipulations, failure to fulfill social expectations, and other shortcomings can seriously harm public support for reform. Thus, to the extent that political promises created false expectations, the seeds of undoing reforms were planted. Inevitably, not all expectations were met. To some extent, the inability to fulfill promises was made more perverse by the rapidity and scope of the changes, a process the editors describe as the "big bang." A more gradual approach, they point out, might have afforded opportunity to make mid-course corrections and garnered more patience from the public.

Both the analytical framework and the country studies point to mixed results. The editors point out that there have been relatively few private investors, most of which have been foreign.

They further state that, apart from the largest consumers, few competitive opportunities have materialized. Indeed, examples from all

three case studies illustrate the exercise of market power, insufficient scale to allow for effective competition (the example of El Salvador is noted), stranded assets, and other impediments to attaining high levels of competition. On the other hand, they also demonstrate that supply has—with the notable exceptions of Brazil and Chile—been made more secure; in general, prices have remained at reasonable levels, availability of electricity service has expanded, and special tariffs have been established to assist low-income customers in maintaining service. Funds from privatization have enabled some of the promised social benefits to materialize. This mixed record, of course, leaves open the question of sustainability.

The Honduras case study raises a critical question that lies at the heart of the sustainability issue: In small countries like Honduras, do the costs of privatization exceed the benefits to be derived? Small countries have little or no clout in capital markets. In Honduras, the wealth and power of potential private investors are almost certain to eclipse state resources. The Honduran government's ability to effectively regulate investors of that scale, or to create countervailing market or other forces capable of reducing their market power, is open to question. Investors perceive considerable risks in countries like Honduras, which depend on few resources, suffer from considerable poverty, and are tragically subject to vicious cycles of economic swings, natural disasters, and even wars. The premiums investors are likely to seek under such risky circumstances are almost certain to be high. Can small, poverty stricken countries afford to pay them? At what point does the sheer cost of reform render reform unsustainable? Similarly situated countries in Latin America, as well as in Africa and Asia, have raised similar questions, which clearly are deserving of more careful study.

Sequencing and Transition

The book also alludes to the problem of sequencing of and transitioning to reforms. For example, in Guatemala, PPAs were used to attract initial private investment to the power sector. Subsequently, those contracts became obstacles to further reforms because the prices, not surprisingly (given the leverage suppliers had at the time they were entered into), soon became above market—that is, stranded assets, in the context of further reform. While the Guatemalan contracts were renegotiated in 2001, they

still illustrate the problem of sequencing reforms. Given the old regime's supply security problems, Guatemalans had little choice but to enter into the PPAs to meet short-term demand. The fact remains that initial steps toward reform tended to retard subsequent, more substantial reform.

In Honduras, as the country study points out, adopting national reforms before the regional market had evolved led to considerable controversy when AES Corporation, the U.S. generating company, proposed a 750-MW station in Puerto Cortés. Although the plant may well have constituted a considerable asset for the region, its size and scale would have eclipsed all other generators in the tiny Honduran market. As such, its presence was barred by rules limiting concentration of power in the national market. Given the little control Hondurans possessed over all relevant circumstances, it would be unfair to blame them for the sequencing problems; the fact is that improper sequencing led to adverse consequences. Had the regional market been in place before the country adopted reforms, the situation may have concluded more favorably.

Although not entirely characteristic of the three countries studied, the more common sequencing problems relate to privatizing before establishing regulation or market rules. This is a common yet always disastrous course, as evidenced in Brazil, India, Pakistan, and Indonesia. Another common problem (though not a sequencing problem per se) is to structure the terms of privatization to attract the highest price. This is the temptation to which governments selling state assets often succumb. While this approach may yield positive short-term results for the treasury, it nearly always augurs poorly for the future of the reformed sector. As this book points out, both transition and sequencing matter. Failing to get matters right in the beginning makes subsequent evolution more difficult. The consequences of such difficulties, in terms of sustainability, can be severe, particularly when domestic support is scarce.

Reality of Sector Politics

One element of the sequencing problem critical to the sustainability question is the creation of powerful interest groups that acquire significant clout in shaping the evolution of public policy, market formation, and regulation. One myth of power sector reform is that privatization,

commercialization, and unleashing of market forces will somehow remove the power sector from politics. That argument, given the stakes for private investors and the centrality of electricity to the economic and physical well-being of the public, has always seemed odd. The book's editors puncture the myth of post-reform de-politicization, pointing out that the new actors, in defending their perceived self-interest, can easily become the obstacles to reform.

The Honduras case study even goes so far as to raise the specter of state capture by private interests. Certainly, AES' lobbying for its proposed Puerto Cortés project is illustrative of this potential. The Colombia and Guatemala studies also illustrate that, while sector politics may well be altered by privatization and market reform, reform in no way reduces the intensity of sector politics. In fact, the Guatemala study raises the issue that the public interest may be more threatened by the new regime because the political clout of certain market participants is not subject to any countervailing forces, and there is little organized activity on behalf of small consumers. It is unrealistic to expect that investors would put their capital at risk and then unilaterally disarm themselves politically. The study notes that the formation of powerful interest groups during the reform process can potentially destabilize the very reforms that created them.

The Guatemala study points out yet another irony of reform: many problems that served to destabilize the old regime are being visited upon the new, post-reform regime. The study identifies five threats to sustainability: poorly formulated electricity tariffs, rates, and related subsidies; vertical re-integration and monopolist behavior; poor governance; weak sector institutions (particularly with regard to planning and policy); and external threats (particularly regulatory uncertainty that could discourage investment). The Honduras and Colombia studies also identified some of these threats as present in these countries' post-reform regimes.

One must therefore ask whether such issues are inherent in the power sector itself. Given all of the work that has gone into restructuring, that would be an extraordinary circumstance. Commonality of threats across regimes is a somewhat facile observation. While the issues appear similar, they are played out in a different market environment within a different set of institutional arrangements.

Keys to Facing Threats

All three country studies focus on two areas that are key to controlling and containing threats to sustainability: 1) successful market design and operation and 2) effective governance (particularly with regard to policy, planning, and, most importantly, regulation). Regarding the first key area, it is no trivial task to design and operate a viable, competitive market in a sophisticated environment, as the California experience demonstrates; the task becomes considerably more difficult in a developing-country setting. The second key area, effective governance, depends heavily on a series of institutional foundations and arrangements that, all too often, are missing.

The characteristic that distinguishes the recent swing to private investment in the power sector is that change of ownership is accompanied by the introduction of market forces and competition. While all three countries opened their power sectors to private investment and, to varying degrees, relied on competitive solicitation of capacity, they took different approaches to developing a fully competitive energy market. Contrasts in the introduction of market forces range from Honduras' tepid, if not nominal, steps to Guatemala's partial embrace of the market, to Colombia's more decisive tilt toward a competitive wholesale market. In the case of the two Central American countries, the planned development of a regionwide electricity market tended to discourage domestic market reforms that might ultimately be undermined by subsequent regional development.

Pragmatism: A Collective Lesson

The country studies indicate that the choices made were, not surprisingly, driven largely by what was possible. For example, while Honduras took tentative steps in opening up its market, the country concluded that it was entirely too small and too hydro dependent for full competition. As the authors of the study point out, the prevailing view in Honduras was that the competitive model was simply not compatible with available resources. Perhaps it was also heavily influenced by the problems that its neighbor, El Salvador, was having in establishing a viably competitive regime. By contrast, Colombia—a much larger country not facing the imminent likelihood of a regional electricity market and with a somewhat

decentralized and diversified power sector—found it more logical to commit itself fully to competition. Guatemala fell somewhere between these two poles. In all three cases, however, the focus was on competition at the wholesale, rather than retail, level.

Descriptions of market evolution in the three countries share a common denominator: complete reliance on market forces is simply not feasible. Chapter Five describes in some detail the special provisions that have been made in each country to ensure security of supply. While those provisions are not necessarily inconsistent with the operations of a market, their mere existence suggests that complete market reliance may not be entirely prudent. The clear lesson from the three countries' collective experience is that, while markets can enhance efficiency and produce consumer value, they cannot be relied upon exclusively. This experience reinforces the message that pragmatism, not ideology, should govern the approach to restructuring the power sector. As in so many other countries, market design has proven to be a difficult and iterative process. None of the three countries have gotten the market right in initial design and implementation. That is hardly surprising and is by no means a criticism. Such experience has been universal. Market design in the power sector is simply incapable of being a static instrument. Designs require constant tweaking, based on evolving circumstances. Similarly, the rules governing market operation, contingencies (e.g., Colombian guerrillas blowing up transmissions lines, making isolated load pockets subject to the exercise of market power), and behavioral patterns must be dynamic and subject to change. In Guatemala and Honduras, in fact, with the prospect of being part of a much larger regional market, rules concerning electricity markets within their respective national boundaries, by definition, must be provisional. Thus, electricity markets will continue to depend upon institutions being in place to intervene when circumstances so require. Indeed, it is only in Honduras, the country that has made the fewest market reforms, where substantial market changes are recommended (e.g., vertical disaggregation/unbundling, limits on horizontal market power, PPAs with both capacity and energy components, delayed spot-market implementation until the regional market is functional, single buyer, economic merit dispatch, central pool with all capacity offered, time of day pricing and metering, and fully allocated tariffs). Otherwise, the specific suggestions in the country studies for sustainability strategies are

related to institutional improvement. In short, while market design and implementation are of great importance, the sustainability of reforms ultimately lies with the institutions created for policymaking, governance, planning, and regulation.

Institutional Underpinnings

As the editors point out, success of reform depends on the institutional setting. Analysis of the chapters demonstrates the interrelationship between power sector reform and the existence or establishment of an institutional framework within which reforms can be made to work. The analytical framework begins the discussion with the minimal institutional foundation for reforms: rule of law, protection of property rights, functional judiciary, respect for contracts, appropriate regulatory capacity, and effective antitrust laws and enforcement. Many of these themes are reiterated and reinforced in the three country studies.⁴ For example, the Colombia study, in its discussion of a court decision, raises serious questions as to whether a civil law system can accommodate independent regulatory institutions. Institutionally speaking, such judicial findings strike at the very heart of the recent reforms.

With regard to institutional arrangements specific to the sector reform, the issues fall into three broad categories: governance, regulation (including antitrust), and enhancing public awareness and participation.

Governance: Roles and Responsibilities

Governance issues relate largely to clarifying the roles of market players and how their responsibilities are carried out. As noted in the country studies, the history of power sector regulation is replete with battles over who makes policy decisions. Jurisdictional disputes are best resolved by clearly defining the respective spheres of influence of the various institutions. What is the role of the ministry? What is the role of the regulator? Who makes which sets of decisions? These basic questions must be sorted out.

⁴ Such key institutional requirements are fundamental societal questions that go well beyond the needs of power sector reform, and therefore receive perhaps less attention from the authors than they might otherwise deserve. The relationship between those elements, particularly a functional judiciary, and power sector reform deserves further study and analysis.

In Colombia, disputes grew so intense that the directors of its Energy and Gas Regulatory Commission (CREG) were removed from office. That dispute questioned whether the regulator should make policy, with the ministry contending that it, not the regulator, was the formulator of policy and that CREG's mission was largely to implement and enforce it. That formulation was not terribly helpful, because, in fact, few regulatory decisions are devoid of policy implications. Colombia's situation was made even more complex by the existence of another agency, the Superintendence of Residential Public Utilities (SSPD), whose sector functions were closely related to regulation.

In Honduras, absence of a separate energy ministry has led, in the view of the study's authors, to lack of effective leadership on sector matters. A single agency, the Environment and Natural Resources Secretariat (SERNA), is responsible for planning system expansion of the power sector, while also serving as the environmental regulator. The authors quite correctly note the conflict of interest inherent in SERNA's portfolio.

Guatemala's Ministry of Energy and Mines (MEM), the country study's authors note, is hindered by a weak policymaking and planning apparatus. No one is entrusted with formulating a sector vision. Similarly, they point to the Wholesale Market Administrator's inability to resolve disputes between market participants.

Experiences in each of the three countries studied suggest that, as the new model was put in place, insufficient thought was given to what actions were needed to establish a sustainable, non-conflicted, policy-making and planning function. In the old regime, state ownership and management of sector assets and operations made clearly defined roles less of a necessity. In the new world of private commercial entities doing business in a regulated market under policy and planning guidance from the government, responsibilities must be clearly defined, and relevant governmental institutions must have the capacity to carry out their responsibilities effectively.

Regulatory Issues

In addition to good governance, a well-performing power sector requires that regulatory institutions be in place to consistently enforce rules and

regulations. The editors note that even a competitive market can operate effectively only when appropriate technological, economic, and institutional conditions are in place. All three studies point to regulatory agencies lacking sufficient resources to do their job. In Colombia, low salary levels have contributed to high turnover at CREG, and regulators are limited in their ability to retain consultant experts. In Guatemala, directors' salaries at the National Electricity Energy Commission (CNEE) consume a disproportionate portion of budget resources. In all three countries, privatization has resulted in an exodus of critical expertise and experience to the private sector.

The studies are replete with examples of lack of adequate regulatory independence. In Colombia, three ministers sit on the CREG board and, collectively, can veto agency decisions. In all three countries, regulators' independence is institutionally impaired by terms of office that are commensurate with those of the president rather than staggered, ministerial involvement in appointment of commissioners, and ministerial sub-agency, rather than free-standing, status.

Finally, all of the studies point to deficient antitrust laws and enforcement. The notion of antitrust laws is new to many countries, and current regulators have little history of enactment and enforcement to guide them. Moreover, the tools available to them are clumsy and ineffective. In Honduras, for example, there is a flat prohibition on any actor owning more than 25 percent of the nation's generating capacity. That type of instrument in a market as dynamic as that found in the power sector, and which may be quickly rendered obsolete by the emergence of a regional market, is virtually useless in controlling the exercise of market power.

All of the impairments so well identified in the country studies show that insufficient thought was given to what is necessary for the creation of truly independent, credible regulatory agencies. As a result, the agencies are substantially impaired and vulnerable to political interference. Thus, it is hardly surprising that, as the Colombia study points out, regulatory decisions are not as predictable or qualitative as they should be.

Recommendations from the three country studies demonstrate that the reforms are not sustainable without rectifying the structural defects in the regulatory regime. Taken collectively, the studies make a compelling case for giving regulatory agencies sufficient resources, independence, and

defined responsibilities to perform effectively and credibly. Given the centrality of regulation to the sustainability of the new sector regime, the case simply cannot be refuted. Indeed, this is an area where multilateral and bilateral lenders, as well as governments, need to devote considerable attention in the coming years.

Enhancing Public Awareness

Finally, the public must be made more aware of its role in the newly designed power sector and provided more and better opportunities to participate in fully transparent regulatory and policymaking proceedings. Each case study calls for more transparency and opportunity for public education and participation.⁵ Clearly, regulatory agencies have operated without having first established an adequate base for full transparency and public participation.

A Recommendation: International Standards

One obvious question is why are there no international standards or guidelines that could be adapted to fit the circumstances of countries contemplating or undergoing power sector reform. Creating such standards would be useful from at least two points of view. The first, and most obvious, is that it would provide guidance on aspects of regulatory regimes that would be acceptable to investors and multilaterals, among others. The book points to numerous areas where establishing minimally acceptable international standards might be helpful. These include regulatory independence, legal standards applied to regulatory decisions, clarification between ministerial/executive and regulatory functions, and principles of transparency.

The second area where such standards would be of value is in assessing regulatory decisions. As the Honduras study points out, it is difficult for an international investor to visualize effective regulation by a country as small and poor as Honduras. If the regulator in such a country

⁵ Perhaps the Guatemala study best exemplifies such problems when it relates the story of an attorney for the regulatory agency who was attacked with a machete at a putative local public hearing. While the agency was trying to do the right thing, the public understanding of the process was obviously less than complete.

were to make a decision that the investor viewed as unfavorable, the country's reputation in world capital markets would likely be in tatters. The only effective defense for investors is to have a benchmark against which their decisions could be evaluated. Minimal, international regulatory standards could well provide such a benchmark. Within the context of global capital markets, having a reputable institution set such standards would seem sensible.

To sum up, this book makes the compelling case that the reforms may not prove sustainable unless further study and work are undertaken in the short term to build a stronger institutional platform to support them. As the editors note, reform is an ongoing process, not a one-time decision. Many reforms undertaken over the past decade were unavoidable, and there is little room for turning back; thus, sustainability should be viewed as a paramount concern. This puts the sustainability question front and center. For the supporters of the reforms already undertaken, the message is simple: much work remains if the reforms are to be sustainable.

INFRASTRUCTURE

Power sector reforms across Latin America in the 1990s based on privatization, liberalization and market forces were largely unavoidable. This book argues that while there is no turning back from this process, many reforms may not prove sustainable without further efforts to build a stronger institutional platform to support them.

The analytical framework presented in *Keeping the Lights On: Power Sector Reform in Latin America* establishes a baseline for the sustainability of reforms and identifies additional areas for exploration, analysis and inquiry. This baseline is critical to setting the stage for the next generation of reforms—or mid-course corrections—that will be necessary to enhance the sustainability of changes in progress. The book includes case studies of power sector reforms in Colombia, Honduras and Guatemala, as well as a timely section on the security of supply.

Ashley Brown, Executive Director of the Harvard Electricity Policy Group, writes: “This book represents an initial step in the fundamentally needed process of assessing the extent to which the reforms have succeeded and whether the new power sector regimes are sustainable...As the authors note, reform is an ongoing process, not a one-time decision.”



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