

# **GLOBAL ELECTRIC POWER REFORM, PRIVATIZATION AND LIBERALIZATION OF THE ELECTRIC POWER INDUSTRY IN DEVELOPING COUNTRIES<sup>1</sup>**

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## **ABSTRACT**

This paper reviews the progress of the movement to privatize and liberalize the power sector in developing countries. It reviews the forces driving the movement and then describes the steps that should be taken to achieve success. Data on actual steps taken and preliminary information on the impact of reform are presented. Finally, lessons from this past experience are highlighted.

## **INTRODUCTION**

In the past decade, the pace of reform and change in the electricity sector has rapidly increased, and the nature of the reforms adopted have become steadily more sophisticated. Many countries—from the very large, such as China, to the very small, such as Bolivia—have enthusiastically adapted earlier reform models to their own needs and circumstances. Both developed and developing countries have embarked on a program of liberalizing and reforming their power sectors.

The principal driving forces behind this reform movement, described by a number of authors (1, 2, 3, 4), include the following: (a) the poor performance of the state-run electricity sector in terms of high costs, inadequate expansion of access to electricity service for the population, and/or unreliable supply; (b) the inability of the state sector to finance needed expenditures on new investment and/or maintenance; (c) the need to remove subsidies to the sector in order to release resources for other pressing public expenditure needs; and (d) the desire to raise immediate revenue for the government through the sale of assets from the sector.

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In many countries all these factors have been present at the same time, with the notable exceptions of countries in Eastern Europe and the former Soviet Union, where policies of encouraging heavy industrialization had left the power sector with short-term excess capacity, so that new capacity was a lower priority than in most other countries.

Although some traditional state-owned and -run enterprises have performed well, and indeed were often formed by nationalizing private-sector companies that were either too small to exploit economies of scale or too large to prevent monopolistic abuse, there was an increasing awareness during the 1980s that a lengthy period of state ownership, without the forces of competition or the incentives of the profit motive to improve performance, eventually resulted in excessive costs, low service quality, poor investment decisions, and lack of innovation in supplying customers.

Rapid changes in technology have occurred in both the generation of electricity and in the computing systems used to meter and dispatch power. These changes have made new industrial structures possible, which state enterprises have been too slow to adapt. The private sector offers many new solutions to providing power at lower cost, especially to consumers with low levels of demand, through innovations in customer service (service standards, billings, and collections) and cost recovery mechanisms. These solutions are important requirements for the sector.

The principal gains hypothesized as arising from sector reform come from three separate sources of improvement in economic performance. First, in terms of overall allocation of resources, making consumers pay at the margin what it costs to produce and supply them is expected to achieve a better economy-wide use of resources. Issues of income distribution and support for the poor are increasingly regarded as being supportable by targeted subsidies to needy groups, rather than by across-the-board subsidies, which have the effect of generally distorting patterns of the consumption of energy. The extraordinary levels of subsidies seen in some countries (5, 6) have been calculated to produce major welfare losses in terms of overall economic welfare. Second, the profit motive gives a stronger incentive for efficient use of inputs, in terms of lower cost combinations of inputs and actual reductions in inputs required to produce a given output, than any incentives offered by an enterprise controlled and managed by a bureaucracy (7). Third, competition, where it is possible, is the form of private participation most likely to reduce the costs of production and to pass benefits on to consumers. If the sector can be made to cover its costs and be profitable, then there will be an incentive for firms to invest, and they will also have an incentive to seek out new markets that can be profitable. New entrants, also attracted by profit opportunities, can seek out specialty market niches that may not appeal to mainstream firms.

Although many countries have expressed some dissatisfaction with the operation of their state-owned power sector, there has been a wide range of responses to the problems perceived. Some countries have felt it impossible or undesirable to embark on any reform strategy that entails opening electricity production or sales to private participants, whereas other countries, although willing to engage private participation, have chosen very different strategies for doing so. The variety of responses that have already emerged globally is one of the most striking features of the power sector in the past decade.

There has been considerable interest in the wider issues of why some countries chose to undergo economy-wide reforms in terms of reducing the role of the state, introducing the private sector into markets once exclusively reserved for previously state-owned enterprises, and generally liberalizing control (7, 8, 9, 10). Both a wide-ranging analysis (7) and discussion (11) of these issues for developing countries suggest that two essential conditions must be met before reform is attempted. (a) It should be generally perceived in the country that reform is desirable and (b) carrying out the reform agenda should be politically feasible.

The desirability of reform focuses on the consequences of the unsatisfactory performance of the economy or sector for those who have political influence. For example, the failure to provide rural electrification would be seen as undesirable by the large number of rural households in many developing countries, but usually this group is politically weak, a condition that in itself is not likely to persuade the government to change policies. At the energy-sector level the picture is more complex—poor macroeconomic performance may indeed persuade the government to undertake sector reform (especially if the government were running an unfinanceable deficit and could no longer subsidize loss-making public enterprises). However, for reform to be embraced, it is likely that the sector itself would need to be underperforming in some crucial way—both in terms of the delivery of energy to important groups of users and in terms of its financial claims on the central budget. A sector that was meeting all demands and was not a drain on central government expenditure is not likely to be seen as a high priority for reform, unless the motivation is solely to solve a short-term problem of public finances through the asset sale (as was partially the case in the United Kingdom). Because there are always interest groups likely to lose out as a result of sector reform—such as those employees of the former state-owned enterprise who will be made redundant, and those bureaucrats and politicians who will lose a sphere of patronage—any such groups with political power must see sufficient benefits to outweigh the costs in order to support the reform.

Even when it has become evident to the ruling party that an institutional change would be beneficial, the government must have the confidence that the reforms, several of which are likely to require legal and, in some cases, constitutional changes, are politically feasible. Here, the strength of the majority, the nearness of the next election, and the mandate of the previous election all impact on the willingness and ability of the government to institute the required changes. A crucial window of opportunity may be created by a change of government because the incoming group may have the mandate, strength, and time to carry out the program. In many countries, although the problem and possible solutions became evident early in the 1990s, action was not possible for several years, because of the political priorities facing the incumbent governments around that time.

Intertwined with these country-related conditions are the actions of the International Financial Institutions, which have been advocating and encouraging both macroeconomic and sector reform. Lending policies often have had a "carrot and stick" structure, in that lending for institutional reform, which is often bundled with lending for investments to upgrade supply facilities that are needed to support the reformed power market, will attach conditions related to achievement of targets for release of tranches of the loan (12, 13). The extent that failure to achieve the targets would jeopardize both disbursement of tranches under the present loan and subsequent approval of other possible future loans will also be a factor in determining the country's commitment to the reform process.

Sector problems in energy are most likely to be felt in terms of nondelivery of the product. Power blackouts and brownouts are the most dramatic instance of this, with their very high costs of alternative supply for those who have come to count on the public supply of electricity. Quality of service, which takes many forms, also can deteriorate and impact users adversely. The failure of supply may be partly associated with very low operating efficiency caused by lack of maintenance, theft, etc., and partly associated with lack of investment caused by financial restrictions. The inability of a state enterprise (and eventually government) to finance new and needed investment is often compounded by poor public-sector price or tariff setting, which does not allow the state owned enterprise to recoup all its costs, as well as by inefficiency in collecting all the revenue due it. Hence, a strong hypotheses is that reform is more likely where there are obvious problems of shortage of supply, such as blackouts, and less likely where there is excess capacity, making financing investment less important.

The political feasibility of sector reform is likely to be closely related to the political feasibility of macroeconomic reform, but one possible difference is that sector reform is most likely to eventually involve the privatization of existing assets, as well as private-sector involvement in new investment. In countries that have a relatively small, internal, formal financial structure (compared with the size of the sector) and possibly no stock market, privatization inevitably means foreign ownership in part or in total. This raises different issues from those normally associated with a macroeconomic stabilization. Ownership is seen as a long-term and irreversible change (although renationalization is not unknown—for example in the United Kingdom in the 1940s and in Latin America in the 1960s), and the control of key domestic sectors by foreign companies may be seen as qualitatively less desirable than the general, but temporary, austerity required by a stabilization package. Hence, governments willing and able to contemplate a strict monetary and fiscal control, for instance, with its attendant short-term recession may not be willing or able to contemplate privatization. In order for privatization to happen, the problem must be more obviously linked to the underperformance of the sector, and the government must be in a strong position, as expressed in terms of the support of those groups that are likely to determine its future.

The next section discusses the possible approaches to power-sector reform: the various steps that can be taken and the sequence in which they should be taken. The following section gives a global perspective of progress with reforms to date in developing countries. This section looks at results from steps already taken, as well as at patterns in the approach to sector reform. Because the reform movement effectively started around 1990 (with the notable exception of in Chile, where it started approximately 10 years earlier), there are now data relating to the impact the electricity sector reform had on the industry itself, on consumers, and on the economy as a whole, and this important topic is reviewed in the fourth section. The main lessons learned from designing and implementing these reforms are summarized in the final section.

## **ELEMENTS OF A SECTOR REFORM PROGRAM**

In many developing countries, and in particular those in Asia, the Middle East, and Africa, reform of the power sector starts from a market structure that is dominated by a state-owned national power utility with a legally endowed monopoly and a vertically integrated supply chain encompassing power generation, transmission, distribution, and customer services. The rationale for this structure is minimization of the costs of coordination between these functions and of financing the development of power systems. The pre-reform structure in other countries, notably in South America, places distribution and customer services with local companies, separate from national companies that provide power generation and transmission.

Power reforms are designed to introduce competition where feasible, which is in the upstream production and downstream supply functions of the industry structure, and to use economic regulation of the wholesale and retail power markets to promote competition and protect consumer interests. Regulation of the power market is essential, as shown by the experience of New Zealand, which tried an approach without the amount of regulation used elsewhere. Their approach was based on mandatory separation of generation, transmission, and distribution, using general competition laws to deal with both the terms of interconnection and conduct generally in unbundled power networks. Sector-specific regulation, especially of electricity prices, was rejected under this approach as being self-defeating, and competition was relied on to provide the required market discipline for participants. Experience, however, showed that competition was not sufficient to control pricing in the presence of the transmission and distribution natural monopolies, and hence, the New Zealand government subsequently imposed price controls on power suppliers (14).

A full-scale power reform program generally consists of the following main elements.

1. Obliging electricity enterprises to operate according to commercial principles. This obligation extends to state-owned entities that undertake one or more of the basic functions in the supply chain, namely generation, transmission, system control, distribution, and supply services to users of electricity. The supply services function encompasses the sale of electricity procured on the wholesale electricity market to electricity users and the associated customer services of billing, collection, and maintenance. These principles require that enterprises pay taxes and market-based interest rates, earn commercially competitive returns on equity capital, and have the autonomy to manage their own budgets, borrowing, procurement, and labor employment.
2. Introduction of competition in order to improve sector performance in terms of efficiency, customer responsiveness, innovation, and viability. Competition can be developed in the generation- and supply-service segments but in most cases is not feasible in the network segments (transmission, distribution, and system control) because these functions are natural monopolies. Supply services to large electricity users is an intrinsically competitive segment because the cost of competing for their business is small compared with the potential profits. Supply services to all but large electricity users, however, has usually been a monopoly in practice because the profits per customer are too small to stimulate competition. Hence, this element of supply service has generally been carried out by the entity that distributes electricity to these users because both these functions serve the same market. The threshold level of customer demand at which the supply to meet it becomes competitive has been coming down, however, and full competition in the retail market has been introduced in England and Wales, Norway, and some parts of the United States. A further consideration is that consumers must be able to switch between suppliers at low cost—any arrangement in which consumers have to remain with their original supplier gives market power back to the sellers even when the sellers have only modest market shares.
3. Restructuring of the electric power supply chain to enable the introduction of competition. This involves breaking up ("unbundling") the incumbent power utility into multiple generators and distributors of power that trade with each other in a competitive wholesale power market. To prevent the acquisition of anticompetitive amounts of vertical market power by any generators or distributors, transmission, and system control are placed with independent companies (or they may be combined) with restrictions on ownership or on control (through governance arrangements) of such companies by generators and distributors. Independent electricity suppliers should be allowed to compete with distributors for the custom of large users (this could be delayed in those countries where distribution and supply systems are so dilapidated at the time of privatization that new owners need a period of assured revenues to remedy the worst deficiencies before having to compete for the business of their largest customers), and supply licenses can be granted to generators as well as to firms that specialize in energy trading.
4. Privatization of the unbundled electricity generators and distributors under dispersed ownership, because competition is unlikely to develop properly between entities that are under common ownership—whether state or private. In developing countries, furthermore, private investors and operators are expected to bring in financial resources and technical and managerial expertise that will rectify the prevailing low standard of electricity supply by state-owned power utilities.
5. Development of economic regulation of the power market that is applied transparently by an agency that operates independently from influence by government, electricity

suppliers, or consumers. In the wholesale market, the focus of regulation is to prevent anticompetitive abuses of market power. In the retail market, the focus of regulation should be on balancing the interests of suppliers with the interests of their captive customers.

6. Focusing of government's role on policy formation and execution while giving up the roles of operator and investor with divestiture of state ownership in generation and distribution.

The process of a full reform program therefore consists of the following four main stages: (a) formation and approval of a power policy by government that provides the broad guidelines for the reform program and the heavy political commitment needed to sustain the reform process, followed by the enactment of legislation necessary for implementing this policy; (b) development of a transparent regulatory framework for the electricity market; (c) unbundling of the integrated structure of the power supply and establishing a market in which electricity is traded at arm's length; and (d) divestiture of the state's ownership at least in most of the electricity generation and distribution segments of the market.

Reform programs for electricity sectors must be built around these basic elements, but the detailed design of each program should reflect the particular circumstances of the country and its electricity sector. Hence, actual reform programs exhibit a variety of designs, particularly in terms of market structure, degree of private involvement, and sequencing of reform stages.

The variety of market structures can be categorized according to increasing degree of competition, as follows (15). Model 1 (monopoly) has no competition at all, only monopoly at all levels of the supply chain. A single monopolist produces and delivers electricity to the users. Model 2 (purchasing agency) allows a single buyer or purchasing agency to encourage competition between generators by choosing its sources of electricity from a number of different electricity producers. The agency on-sells electricity to distribution companies and large power users without competition from other suppliers. Model 3 (wholesale competition) allows distribution companies to purchase electricity directly from generators they choose, transmit this electricity under open access arrangements over the transmission system to their service area, and deliver it over their local grids to their customers, which brings competition into the wholesale supply market but not the retail power market. Model 4 (retail competition) allows all customers to choose their electricity supplier, which implies full retail competition, under open access for suppliers to the transmission and distribution systems.

Reform programs are designed to progress through these models, starting from model 1 and progressing through model 2 or 3 until eventually reaching model 4. This progression reflects the basic sequence for a reform program, whereby restructuring the supply industry and setting up the legal and regulatory framework precedes the transfer of ownership of power generation and distribution from the state to the private sector. Models 3 and 4 are important for countries contemplating reforming their power sectors because they offer plausible alternatives to the traditional European state-owned, integrated industry structure, and to the rate-of-return based, investor-owned utility model developed in the United States.

Many reform programs in developing countries focus on moving from model 1 to model 3. The key decision is whether to go for model 2 or model 3. Adoption of model 2 in some developing countries has been justified largely as a transition stage to model 3 that is needed to allow time for the generation and distribution sectors to develop sufficiently for the operation of a competitive wholesale electricity market. The main risk with this model is that government can still impose uncommercial practices on the market by manipulating the single buyer. An additional risk is that government's commitment to full reform may weaken to avoid politically controversial consequences of introducing more privatization and competition (16).

The design of the new market for trading electricity depends on the industry structure that is adopted and on the capability of the suppliers and purchasers in the market to handle trading mechanisms. The simplest design is a series of bilateral contracts between buyers and sellers, basically electricity distributors and generators, subject to the approval of contract terms by the market regulator. This form is appealing for countries with small power systems and weak institutional capacity. Such contracts provide for competition only at the time of bidding for the right to secure such contracts and do not allow competition to develop as trade takes place in the market. Moreover, a group of bilateral contracts will not match total supply precisely with the constantly changing total demand for electricity in the market, and hence, a means of balancing supply with demand at the margin needs to be included in this design. One solution is to establish a balancing pool in which suppliers and buyers trade at spot prices to balance their needs, whereas another is for one generator to undertake to act as the "swing producer." Beyond these designs lie power pools of ever-increasing complexity that allow progressively more competition in the market (17). The best examples of power pools outside Europe and North America are found in South America (Argentina, Brazil, Peru, and Bolivia).

Independent power producers (IPPs) are often the first private investors in a power market dominated by state-owned power utilities, and their entry can help to launch the reform process by showing the benefits of private investment and management. IPPs can enter the wholesale power market under any of the four models described above, but they need the benefit of long-term power purchase agreements (PPAs) backed by suitable guarantees for raising long-term financing under the first two models, and also in the third model where competition is still nascent, because of the regulatory risks faced by such investments. When the wholesale market is fully competitive, under model 3 or 4, IPPs can dispense with PPAs for a substantial portion of their output, which they can sell directly to the market. IPPs may earn the right to enter into PPAs under a competitive bidding process that gives transparency to the process and thus sustainability to the agreement (18).

Intermediate between models 1 and 2 is a model whereby the private sector is brought in under a long-term concession as operator, but not investor/owner, of the incumbent integrated utility. The anticipated benefit is to turn round a poorly performing utility in conditions that are unlikely to attract private investors because of their perceptions of high country and sector risk. In other words, concessions are viewed as an option when competition under models 3 and 4 is not considered feasible. Concessions of small utilities has been tried in francophone West African countries with limited success [as in Senegal (19, 20)].

## **PROGRESS WITH SECTOR REFORM**

Electricity-sector reform has been advocated by such international lending agencies as the World Bank (21), the European Bank for Reconstruction and Development, and the Inter-American Development Bank (22), as well as by such organizations as the World Energy Council. To assess what has been achieved by which countries, these bodies have carried out analyses of the steps taken by their member nations. At the same time, the private sector has a great interest in knowing what is happening on a comparative basis, so that investment decisions can be put into proper context, and a number of publications have addressed this need for information.

From a global perspective, the movement to reform power sectors appears to be sweeping across the developing world at a rate similar to that in the industrialized world. Many developing countries have already started their reforms, and some of them have substantially completed them. Moreover, many more, possibly most, are either planning or seriously considering similar reforms. This phenomenon can be explained by the presence of a strong demonstration effect. The pioneering reforms to power sectors in Chile, England and Wales, and Norway during the 1980s

(which fall under model 3) have motivated numerous industrialized and developing countries to follow them during the 1990s. A mixture of these two variants of model 3 (the power pool design of the Chilean model, the independent transmission and system operator of the England and Wales model) has been widely adopted in South America (Argentina, Brazil, Bolivia, Colombia, and Peru). Other countries have implemented variations on this model, particularly for the use of bilateral contracts between producers and suppliers (Georgia, Hungary, and Moldova). Many other countries are in the process of reforming their power sectors based on similar approaches, some of whom (Ecuador, Armenia, Bulgaria, and Romania) have completed the initial restructuring and regulatory steps but have yet to privatize most of their generation and distribution entities.

Also in the 1990s, the model of IPPs selling to a state-owned power utility (model 2) spread across Asia (China, India, Indonesia, Malaysia, Nepal, Pakistan, Philippines, Thailand, Vietnam, and Jordan) and Central America and the Caribbean (Guatemala, Honduras, Belize, Jamaica, Panama, and the Dominican Republic). Model 4 has been adopted in England and Wales (where model 3 was transitional) and in Norway, but not yet in any developing countries. Hence, models 2 and 3 have emerged as the main options for the developing countries that have yet to select one.

In Eastern Europe and the countries of the former Soviet Union, power-sector reform has progressed slowly, although a wide range of reform approaches is present in the region, including (a) reform limited to IPPs (Croatia, Slovakia), (b) third-party access to the dominant utility's network for private producers (Czech Republic), (c) restructuring with the intention of major divestiture of state ownership (Poland, Russian Federation, and Ukraine), and (d) opening up the power market to new entry through concessions, including IPPs, restructuring, and divestiture (Hungary, Kazakhstan, Georgia, and Moldova). This diversity of approaches indicates that it is too early to conclude definitively that the region is adopting a common reform model. However, because other countries in the region (Bulgaria, Estonia, Latvia, and Romania) are also considering or have started on reforms that match model 3, a general preference for the South American approach may be emerging in this region (23).

Africa and the Middle East have lagged behind other regions in implementing reforms to power sectors, except for the concessioning of utility management of private operators (usually a foreign power utility) in some francophone countries. Algeria, Côte d'Ivoire, Egypt, Ghana, Kenya, Morocco, Senegal, and Tanzania have attracted one or more IPPs (model 2); Zambia has privatized a generation station and its local transmission grid in the copper-belt area, whereas Togo has privatized its small power utility without restructuring under a 20-year concession. Africa appears to be catching up to other regions, however, because many more African countries are considering reforms to their power sectors, mainly along the lines of model 3. This approach would be supported by the ongoing developments to form regional power pools in the southern, eastern, and western areas of the continent, which would help compensate for the small size of the national power markets. Other African countries are in the process of negotiating with IPPs and/or putting out some or all of their distribution markets to long-term concessions.

The two global studies on the extent of electricity-sector reform refer to the sector as it was in 1998, so that the findings reported below do not fully reflect the current state of affairs. A study by the World Energy Council (24) gave an assessment for all its member countries (both developed and developing) of the state of the energy industries. The basic headings (with some variation between fuels) were ownership and control, privatization extent, entry barriers, pricing basis and regulation, international trade restrictions, and fiscal framework. These indicators were combined into an overall indicator to give an assessment of the degree of sector liberalization. Table 1 shows the number of countries (developed and developing) judged to have made

substantial progress to sector liberalization, to be underway to sector reform, or to have made no steps toward sector reform.

**Table 1 Number of countries achieving substantial power-sector liberalization by 1998<sup>a</sup>**

Region	Substantial liberalization	Liberalization planned/under way	No liberalization
Western Europe	5	12	2
Central & Eastern Europe/CIS <sup>b</sup>	4	8	15
Africa/Middle East	0	17	46
Asia/Australia	2	12	13
South America	4	3	5
North America	0	3	0
Total	15	55	81

<sup>a</sup>World Energy Council criteria. Excluding Central America and the Caribbean, for which full details were not given.

<sup>b</sup>CIS, Commonwealth of Independent States.

As shown in Table 1, only 15 countries actually carried out substantial reforms of previously state-owned energy industries. Furthermore, analysis of the individual country data reveals that about half of these were high-income, industrialized countries. Some 55 countries had liberalization under way or planned, and of these about one third were in the high-income, industrialized group. Finally, some 81 countries had made no move toward sector liberalization—many of these were less-developed countries.

An Energy Sector Management Assistance Program (ESMAP) publication (25) focused entirely on the non-industrialized countries. The questionnaire asked the following questions, which were to be answered "yes" or "no."

- "Has the utility been commercialized and corporatized?"
- "Has an 'Energy Law' been completely passed by Parliament [a law which would permit the creation of a sector that could be unbundled and/or privatized in part or in whole]?"
- "Has a regulatory body started work [a body that is separate from the utility and from the Ministry]?"
- "Is there any private sector investment on greenfield sites in operation, or under construction?"
- "Has the core state owned utility been restructured/separated?"
- "Has any of the existing state owned enterprise been privatized [including outright sale, voucher privatization or joint ventures]?"

For each of the 115 countries analyzed, the maximum reform score was six (all steps taken) and the minimum was zero (no steps taken). Table 2 shows the number of countries that had taken key reform steps. The privatization of assets was least common, with approximately 20% of countries having undertaken some action in that direction; the most common was

corporatization and commercialization of the state utility, with over 40% of countries having taken this step.

**Table 2 Number of countries taking key reform steps in the power sector as of 1998<sup>a</sup>**

					Generation privatization	Distribution privatization	Reform indicator
Corporate	Law	Regulator	IPPs	Restructure			
51 (44%)	38 (33%)	33 (29%)	46 (40%)	40 (35%)	24 (21%)	21 (18%)	2.06 (34%)

<sup>a</sup>Energy Sector Management Assistance Program data. IPP, Independent power producers

The overall indicator shows that for the developing countries surveyed, on the average one third of these reform steps had been undertaken. The method of scoring tended to exaggerate the extent of reform because any action toward privatization (however small a share of all assets had been sold) counted as a "success." The study also allowed investigation of whether there were important differences between countries, and whether any such differences were systematically related to features of the countries involved. The data on the overall reform indicators were first analyzed by grouping countries into the World Bank's regions. The results are shown in Table 3.

Table 3 shows the great unevenness in reform effort between regions. In the Latin America/Caribbean region, almost three quarters of the reform steps had been taken, whereas in the Africa/Middle East/North Africa region, only one sixth of the steps had been taken. The actual privatization of assets and the introduction of independent power producers were similarly unevenly spread, so that the key element of the reform program, which was the introduction of the private sector with its finance, know-how, and management skills, had hardly started in a large number of developing countries. This inequality between countries is shown clearly by the following statistics: Out of the 115 countries surveyed, 42 had taken no reform steps and 15 had taken only one step. Only 10 countries had taken five steps and only 12 had taken all six steps, so that the Gini coefficient of reform inequality was as high as 55%.

**Table 3 Number of countries having taken key reform steps by region as of 1998<sup>a</sup>**

Key step	Region (no. countries)					
	AFR (48)	EAP (9)	ECA (27)	LCC (18)	MNA (8)	SAR (5)
Corporate	15 (31%)	4 (44%)	17 (63%)	11 (61%)	2 (25%)	2 (40%)
Law	7 (15%)	3 (33%)	11 (41%)	14 (78%)	1 (13%)	2 (40%)
Regulator	4 (8%)	1 (11%)	11 (41%)	15 (83%)	0 (0%)	2 (40%)
IPPs	9 (19%)	7 (78%)	9 (33%)	15 (83%)	1 (13%)	5 (100%)
Restructuring	4 (8%)	4 (44%)	14 (52%)	13 (72%)	3 (38%)	2 (40%)
Generation privatization	2 (4%)	2 (22%)	10 (37%)	7 (39%)	1 (13%)	2 (40%)
Distribution privatization	2 (4%)	1 (11%)	8 (30%)	8 (44%)	1 (13%)	1 (20%)
Reform indicator	0.88 (15%)	2.44 (41%)	2.70 (45%)	4.28 (71%)	1.00 (17%)	3.00 (50%)

<sup>a</sup>Energy Sector Management Assistance Program data. AFR, Africa; EAP, East Asia and Pacific; ECA, Europe and Central Asia; LCC, Latin America and the Caribbean; MNA, Middle East and North Africa; SAR, South Asia; IPP, independent power producers.

In the summer of 2000, the World Bank carried out a further analysis of power-sector reform for 116 developing countries. In 17, industrial enterprises did have a choice of power supplier; in 37, there was a regulator who was judged to be operating in an objective, transparent, and nondiscriminatory manner in order to promote competition; and in 27, private ownership and financing was judged to play a dominant role in the power sector. These figures suggest that there had been some progress in the entry of the private sector, but that true competition had not been widely established. These findings have been confirmed also for the Mediterranean region (26), including countries not covered by the ESMAP study.

The European Bank for Reconstruction and Development (27) defined the levels of sector transition according to more complex criteria, which were as follows:

1. Level 1: Power sector operated as a government department; political interference in running the industry; few commercial freedoms or pressures; average prices below costs, with external and implicit subsidy and cross subsidy; very little institutional reform, with monolithic structure with no separation of different parts of the business.
2. Level 2: Power company distanced from government, for example a joint-stock company, although still political interference; some attempts to harden budget constraint but management incentives for efficient performance weak; some degree of subsidy and cross subsidy; little institutional reform; monolithic structure with no separation of different parts of the business; minimal, if any, private-sector investment.
3. Level 3: Law passed accounting for full-scale restructuring of the industry, including vertical unbundling through accounting separation, setting up a regulator; some tariff reform and improvements in revenue collection; some private involvement.
4. Level 4: Law for industry restructuring passed with separation of the industry into generation, transmission, and distribution, and setting up of a regulator with rules for cost-effective tariff-setting formulated and implemented; arrangements for network access (negotiated access, single-buyer model) developed; substantial private-sector involvement in distribution and/or generation.
5. Level 4+: Business separated vertically into generation, transmission, and distribution; an independent regulator with full power to set cost-reflective effective tariffs; large-scale private-sector involvement; institutional development covering arrangements for network access and full competition in generation.

Using these criteria, by the year 2000, of the 26 countries in the survey, one scored a 4, eight scored 3, thirteen scored 2, and four scored 1. None had reached the 4+ level. Thus, similar pictures emerge from the World Bank and the World Energy Council studies, i.e., that in many countries of Eastern Europe and Central Asia, there is much to be done before the sector can be considered to be reformed extensively.

For developed countries, the most elaborate scorecard for measuring power-sector reform is the RED (Retail Energy Deregulation) index (28), which gives an overall reform score in the year 2000 for each of 51 states/jurisdictions within the United States based on 18 attributes. On a scale of 0–100 (maximum reform), the most advanced state scored 65, and six states scored 0, showing no reform. This also confirms the great variability, even within the United States, of the present state of sector reform.

The great variability between countries leads naturally to considerations of whether there are patterns in the extent of reform. Individual country reform scores from the ESMAP study (25) were correlated with economic variables that might be expected to show a relationship with the degree of reform achieved by 1998. Data were collected on several economic variables: gross

domestic product (GDP) per capita in 1997 US dollars; a country policy and institutional assessment for 1998; country risk for 1998; aid/GDP in 1997; commercial energy use per capita in kilograms of oil equivalent for 1996; and annual growth rate of commercial energy use per capita between 1980 and 1996.

The country policy and institutional assessment is based on 20 indicators, which focus on macroeconomic management and sustainability of reforms, policies for sustainable and equitable growth, policies for reducing inequalities, and public-sector management. The hypothesis would be that this indicator should be positively correlated with the reform score because all components are conducive to more active reform.

The risk indicator is based on a weighted average of nine indices, of which political risk and economic performance each account for 25% of the weighting. Reform is hypothesized to be positively correlated with this indicator, i.e., less reform occurs in countries that are assessed as more risky (low-risk indicator score).

The GDP per-capita variable measures the general level of economic development, and it is hypothesized that this would be positively correlated with the reform indicator.

The ratio of aid to GDP gives a measure of the dependence of the economy on foreign aid. It is hypothesized that the higher the dependency ratio, the less the country will have reformed.

The energy use per capita is an attempt to measure the extent to which the economy has become energy using—the higher the value, the more likely it would be to reform. The growth in energy use measures the pressure on the energy sector. Rapid growth of demand should require more efficient supply and hence reform, whereas a decline in use (as happened in many countries) might indicate excess supply and less need for finance to expand the sector: With less pressure for growth, there would be less pressure for reform.

In addition, six "dummy" variables are constructed. Each region has a dummy variable that (a) takes a value of unity if the country in question is in that region and (b) takes a value of zero otherwise. The dummy variables measure any common tendency for countries in a given region to have a higher (or lower) reform score than the average of countries from all other regions.

The cross-section regression in Table 4 shows that the risk indicator is significantly correlated with the level of reform—the less-risky countries have higher reform scores. The World Bank's policy assessment indicator also is significant—the better the policy assessment, the more reform steps are likely to have been taken. In addition to these effects, there are effects for three regions relative to the other three that show no significant differences between themselves once the level of risk and policy have been considered. Countries in the Latin America/Caribbean region have taken about one more reform step for the same risk and policy assessment, whereas countries in Africa have taken one step less, and countries in the Middle East/North Africa region have taken two steps less than the group of other countries. The aid dependency variable does not show a significant effect independent of the other variables, which may reflect the fact that it is directly or indirectly incorporated into the other variables. The lack of a significant incremental effect of GDP per capita is striking. A plot of the data tends to suggest that countries that have taken a large number of steps include both high- and low-income levels [e.g., Argentina at \$8950 (US) versus Bolivia at \$970 (US)], so that there is no strong pattern ranked by income level even among the most reforming countries.

**Table 4 Multiple regression for power-sector reform indicator<sup>a</sup>**

Variable	Coefficient	Standard error	t-Statistic	Probability
Constant	-0.476	0.815	-0.583	0.560
Risk	0.035	0.019	1.859	0.065
Policy	0.630	0.309	2.034	0.044
LCC	1.019	0.479	2.126	0.035
MNA	-2.140	0.658	-3.252	0.001
AFRICA	-1.146	0.374	-3.063	0.002
R-squared	0.473	Mean dependent variable		2.110

<sup>a</sup>World Bank calculations based on Energy Sector Management Assistance Program reform scores. LCC, Latin America and the Caribbean; MNA, Middle East and North Africa.

In addition to the total number of steps taken, the design of reform can be assessed in terms of the combinations of steps taken or by the sequence in which the steps were taken. Both approaches assign an ideal order to the steps. Each step actually taken can be seen as less effective if the earlier steps in this ideal sequence have not been taken.

The ESMAP study (22) had used the following reference sequence for its six steps: corporatization, restructuring, law, regulator, IPP entry, and divestiture. Hence, for example, a country that by 1998 had corporatized and restructured would have taken two steps in an ideal combination, whereas a country that had corporatized and had some IPPs would not have the ideal combination because it did not possess a law or a regulator, nor had it unbundled—it would have just one step of the reference. Using this criteria for the reference combinations, the survey showed that 63 countries had taken no steps in the reference combination, 18 had taken one step; 9, two steps; 5, three steps; 5, four steps; 2, five steps; and 12, all six steps (necessarily the optimal combination). This simple calculation, which is dependent on the definition of the reference combination, nevertheless does suggest that the amount of well-structured reform is even less than the basic statistics for reform steps taken would indicate. In fact, further experience with reform suggested that an alternative sequence to the reference sequence would be better, as discussed below.

In a later study, for a subset of countries, the World Bank collected data on the dates at which various steps were taken in order to calculate the duration of the reform process and the extent to which the temporal sequence of steps taken was optimal. In this study, the optimal temporal sequence was (a) launch a privatization/liberalization program, (b) enact an electricity law permitting unbundling and divestiture, (c) establish an independent regulatory authority, (d) approve a new power market structure, (e) unbundle the power utility, (f) privatize or close on a concession for some private distribution, and (g) privatize some generation. The entry of IPPs (under terms that did not hinder other necessary reform steps) was seen as a step that might happen at any time in the sequence without being flawed if other steps had not been taken. A subset of countries surveyed had by the year 2000 taken all these steps. The span of time required to go from the initial formal launching of a program for reform of the sector to carrying out all these steps varied markedly between countries, as the following dates show: Argentina, 1989–

1992; Bolivia, 1993–1995; Brazil, 1990–1999; Georgia, 1994–1999; Ghana, 1994–1999; Hungary, 1994–1995; Kazakhstan, 1995–1999; and Panama, 1995–1999.

Using the same data, an index of the optimal sequencing of reforms carried out was calculated. For the given number of reform steps taken, a perfect score of 0 would be achieved if they were taken in the optimal sequence, whereas the maximum score of 100% would occur if the steps were those of the optimal sequence taken in reverse order—for example, if only two steps were taken, then taking step *g* above first, followed by step *f*, would be the worst possible sequence and would score 100%. Table 5 gives sequencing scores for a group of countries. It shows that although many countries took the steps in a sequence closely matching the "optimal" sequence, there were several whose sequence was far from optimal.

**Table 5 Index of optimal sequencing of power-sector reforms taken to date<sup>a</sup>**

Country	Index of sequencing (% worst possible)	No. steps taken
Albania	3	4
Argentina	5	7
Bolivia	0	7
Brazil	46	7
Colombia	48	5
Cote d'Ivoire	55	6
Georgia	61	7
Hungary	2	7
India (Orissa)	2	6
Kazakhstan	75	7
Mali	30	5
Panama	9	7
Thailand	39	3
Turkey	34	6
Ukraine	34	5

<sup>a</sup>From R. W. Bacon & J. Besant-Jones, unpublished data.

The outcome of the reform process can also be measured by looking in finer detail at the steps taken. Several countries have unbundled and privatized generation. Here, one issue is whether this was done in such a way as to avoid abuse of market power from the creation of just one or two dominant firms (29, 30), which was a problem with the original breakup of the sector in England and Wales (31, 32, 33, 34, 35) and in Chile (36). A simple measure of the degree of potential

market power is given by the Herfindahl-Hirschman Index (HHI).<sup>2</sup> This has been calculated for a series of countries (regions) that have undertaken extensive restructuring and privatization.

**Table 6 Index of market concentration for power-sector generation<sup>a</sup>**

Country/region	No. firms	Share of largest firm (%)	HHI	Equivalent no. equal-size firms
Argentina	38	14	0.06	16.7
California	40	23	0.11	9.1
Australian NEW	11	18	0.12	8.3
Colombia	26	24	0.14	7.1
Brazil	14	25	0.15	6.7
England and Wales	32	28	0.16	6.3
New England	16	32	0.18	5.6
Bolivia	6	26	0.19	5.2
Hungary	10	27	0.19	5.3
Peru (SICN)	8	35	0.23	4.3
Sweden	8	52	0.32	3.1
Chile (SING)	4	43	0.33	3.0
N. Ireland	4	48	0.33	3.0
Spain	8	46	0.34	2.9
Alberta	12	55	0.38	2.6
Chile (SIC)	4	60	0.43	2.3
New Zealand	6	68	0.53	1.9
Czech Rep.	6	75	0.60	1.7
Queensland	2	76	0.64	1.6
Portugal	3	93	0.86	1.2

<sup>a</sup>From R. Lamech, unpublished data. HHI, Herfindahl-Hirschman Index; SICN, Central Northern System; SING, Northern Interconnected System; SIC, Central Interconnected System.

Table 6 shows that even in some large, high-income industrialized countries, where it would have been possible to create several approximately equal-size private generators, the structure chosen has created considerable market power. For example, in Spain, although there are

<sup>2</sup> The HHI is defined as  $\sum Si^2$ , where  $Si$  is the share of the  $i$ 'th firm's capacity in the market. The index varies between unity for a monopoly and 0 for perfect competition (a very large number of equal-size firms). Two relationships are of importance for interpreting the HHI. First, the value given by its reciprocal is equal to the number of identical-size firms that would have the same concentration ratio. Second, the weighted average price over cost margin (Lerner index) given by  $\sum Si(p - ci)/p$  under conditions of Cournot competition (competition by quantity) is equal to the HHI divided by the price elasticity of demand in that market. Hence, the HHI can be taken as an indicator of how much the price could be raised above the marginal costs of production where there is no regulation to control prices.

eight firms, the largest controls 46% of the total generating capacity, so that the structure has the same market power (and ability to raise prices above costs) as if there had been three equal-size firms. Argentina, which deliberately designed the reform so that no firm could have more than 15% of the market, has the lowest HHI, and Colombia and Brazil also have low values. The Czech Republic and Chile (where one firm has 60% of its market) have very high values of the HHI. Two interesting cases are Bolivia and Peru—small countries, with relatively few generating plants to be privatized—where both managed to avoid creating the very high levels of market power found elsewhere.

Because one major reason for the reform movement has been to attract private finance into the sector (either for greenfield investment or for the purchase of existing state-owned assets), an important measure of progress of reform is the amount of private finance that has entered the sector. A useful summary for developing countries is provided by the World Bank's Private Participation in Infrastructure database.

Table 7 gives data on power projects in developing countries with private sector participation that came to closure in the years between 1990 and 1999. The total private-sector involvement in the power sector over these 9 years was approximately \$150 billion (US)—showing that very large sums could be attracted to the sector. More was invested in greenfield projects than in divestiture, but the amount per project was almost identical. The pattern over time showed a rapid increase in the number of private-sector projects until 1993, after which it kept roughly constant until 1998, when there was a major collapse. Regionally there were enormous differences. Of all this investment, 40% went to the Latin America/Caribbean region (both greenfield and divestiture) and 36% went to the East Asia/Pacific region (mainly greenfield). Less than 2% went to Africa, and less than 4% went to the Middle East/North Africa region.

**Table 7 Electricity projects with private participation in developing countries that reached financial closure 1990–1999**

<b>Closure date</b>	<b>Number</b>	<b>Divestiture expenditure</b>	<b>Greenfield project expenditure</b>
1990	7	803	409
1991	3	147	863
1992	25	3468	2987
1993	105	2747	5955
1994	72	3936	9588
1995	94	5190	13069
1996	109	11096	17541
1997	117	21428	16349
1998	57	11103	8478
1999	56	4904	7421
<b>Total</b>	<b>645</b>	<b>64822</b>	<b>82660</b>

<sup>a</sup>In millions of dollars (US). From World Bank PPI database, 2000.

In addition to these comparative studies of the steps taken to reform power sectors in various countries, there have been a number of studies describing in more detail what happened in each case. An early review of the state of reform was given in Moscote et al. (37) for all the Latin American countries. Several African countries are covered in Chiwaya et al. (38), Argentina in Bastos & Abdala (39), Israel in Czamanski (40), European Union countries in Lauriol (41), and Latin America and the Caribbean in Suding (42). Power sector regulation in several countries, both developing and developed, has been analyzed by a series of authors (43).

## RESULTS TO DATE OF SECTOR REFORM

The previous section emphasized that many paths to reforming power sectors have been taken by developing countries, both in the number of steps taken and in the sequence of steps. Some countries have embraced a program of majority privatization of the sector to introduce competitive elements wherever possible. Others have made tentative progress along the IPP route. Many others have done little or nothing. Nevertheless, patterns in country choices can be identified that help explain the momentum developed for reform throughout the developing world. Moreover, a track record is beginning to show for the main approaches to reform that provides an interesting comparison of their relative performance and some lessons for countries that have yet to carry out or complete their reforms.

The improvement in efficiency after privatization of four South American distribution companies is summarized in Table 8. These improvements are measured in terms of the change in performance between the date of privatization and 1998. The following range of performance indicators were selected for this purpose: (a) energy sales (gigawatt hours/year)—positive if amount increased; (b) energy losses (percentage)—positive if level declined; (c) employees—positive if amount declined; (d) customers per employee—positive if number increased; (e) net receivables (days)—positive if level declined; and (f) provisions for bad debts (percentage of sales)—positive if level declined.

**Table 8 Improvement in performance of four South American electricity distribution companies from the time of privatization until 1998<sup>a</sup>**

Determinant	Peru <sup>b</sup>	Argentina <sup>c</sup>	Argentina	Chile
			Edenor	Chilectra
Year privatized	1994	1992	1992	1987
Energy sales (GWh/year)	+19%	+79%	+82%	+26%
Energy losses (%)	-50%	-68%	-63%	-70%
No. employees	-43%	-60%	-63%	-9%
Customers/employee	+135%	+180%	+215%	+37%
Net receivables (days)	-27%	-38%	n.a.	-68%
Provisions for bad debts (% sales)	-65%	-35%	n.a.	-88%

<sup>a</sup>Change in 1998 measured in terms of performance relative to the year of privatization. From company annual reports and websites.

<sup>b</sup>Luz Del Sur, distribution company.

<sup>c</sup>Edesur, distribution company.

The four companies showed substantial improvements in performance according to all these indicators. These improvements show the benefit of having private management focus on commercial performance, which has been a major weakness of state-owned utilities.

Some countries have obtained substantial proceeds from the privatization of their distribution entities, notably Brazil [more than \$20 billion (US)]. A comparison of these proceeds for 12 developing countries is given in Table 9, based on the values of the winning bids for the distribution entities. To control for differences in scale and timing of the transactions, the comparison is made on the basis of enterprise value per customer served on a countrywide basis, where enterprise value is calculated as the total market value of the enterprise (debt plus equity) based on the value of the winning bid for a defined proportion of shares in the enterprise, and where the countrywide value is the sum of the current values of these enterprise values. The results show a wide range of values, from over \$1300 (US) in Colombia, Brazil and Panama, to around \$300 (US) or less in India, Georgia, and Bolivia (M. Hoskote, A. Marghub & S. Ostrover, unpublished data). This range reflects differences in investors' perceptions of the rewards and risks under the business environment in each country, notably in the stability and transparency of the regulatory process, the administration of the process for selling the shares in the distribution enterprises, stability of macroeconomic conditions, and potential for fitting the target enterprise into a broader business development strategy.

**Table 9 Privatization proceeds from sale of electricity distribution entities<sup>a</sup>**

<b>Country</b>	<b>Enterprise value per customer</b>
Colombia	\$1,681
Brazil	\$1,369
Panama	\$1,334
El Salvador	\$872
Dominican Republic	\$860
Guatemala	\$773
Argentina	\$763
Peru	\$637
Hungary	\$527
Bolivia	\$364
Georgia	\$304
India (Orissa)	\$168

<sup>a</sup>From M. Hoskote, A. Marghub & S. Ostrover, unpublished data.

In the case of long-term power purchase agreements signed with IPPs by the incumbent power utility in a developing country, the first PPAs usually carry substantial government guarantees for the performance of the utility in keeping to its obligations. These PPAs usually run for around 25 years in order to support the financing of the heavy investment in fixed assets by the IPPs while keeping the power sales price at an affordable level for the purchaser during the initial period of the power purchase agreement, which because of its need to cover repayment of the project debt is when the price is highest.

The cumulative obligations of a utility to purchase power under many of these agreements may expose it to serious financial risks, as occurred in many Asian countries as a result of the 1998 financial crisis, when their currencies devalued but retail power tariffs were not allowed to rise (44). The greater these risks, the greater the obstacles they pose to restructuring the power utility as part of more radical liberalization of the power market, because the prices that emerge from a liberalized wholesale power market undercut the sales prices under these off-take contracts. When this happens, the high-priced (in local currency terms) power purchase agreements become stranded costs that have to be absorbed under the restructuring of power supply, which can create a major obstacle to this reform.

The risk exposure of utilities that are off-takers for many contracts with IPPs depends on how these risks are structured. In some cases, the utilities have taken on substantial risks, whereas in other cases the utilities are much less exposed to risks beyond their control. This difference is illustrated in Table 10 for four Asian countries (Indonesia, Malaysia, Philippines, and Thailand) that have followed the IPP route to reform. The following five types of exposure are assessed: (a) exchange rate exposure through origin of fuel supply—high if the fuel is imported; (b) exposure to exchange rate through currency of wholesale tariff—high if the currency is denominated in US dollars or another hard currency; (c) exposure to exchange rate through foreign debt for project financing—high if the foreign debt made up more than 50% of project financing; (d) exposure to market risk through proportion of domestic power needs supplied by IPPs—high if this proportion is over 50%; and (e) exposure to off-taker payment problems through margin of retail tariffs over wholesale prices—high if this margin is less than 3 cents (US) per kilowatt hour for covering the costs of transmission, distribution, customer services, technical losses in the power system, and nontechnical losses caused by theft of power and late or nonpayment of bills by customers.

**Table 10 Risk exposure to the impact of IPP costs in four Asian countries<sup>a</sup>**

Determinant	Indonesia	Malaysia	Philippines	Thailand
IPP capacity in operation in mid-2000 (MW) <sup>b</sup>	2329	7121	3676	2419
Exchange rate exposure through origin of fuel supply	Low	Low	High	High
Exposure to exchange rate through currency of wholesale tariff	High	Low	High	Low
Exposure to exchange rate through foreign debt for project financing	High	Low	High	Low
Exposure to market risk through proportion of domestic power needs supplied by IPPs	High	High	High	Low
Exposure to off-taker payment problems through margin of retail tariffs over wholesale prices	High	Low	High	Low

<sup>a</sup>Risk exposure assessments adapted from Gray & Schuster (45). IPP, independent power producers.

<sup>b</sup>From Reference (55)

The results show a wide difference in risk exposure just among these four countries. Philippines has the greatest overall exposure, with a high rating for all five exposure indicators, which is creating enormous problems (45). Indonesia also has a high overall exposure, with a high rating for four indicators, whereas Thailand has a moderately low overall exposure, with a high rating for two indicators, and Malaysia has a low overall exposure, with a high rating for only one indicator.

Poland, the Dominican Republic, and Pakistan have problems, similar to that of the Philippines, with a single-buyer approach to contracting with IPPs. In Poland, the transmission company took on long-term PPAs with all the generating companies formed from restructuring the sector but at prices that were later undercut by prices realized in the new competitive wholesale power market (46). In the Dominican Republic (47) and Pakistan (48), the problem stemmed from arrears in payments by the state-owned utility to the IPPs caused by low retail tariffs and low collection of payments from power users. To keep the utility's risk exposure within manageable proportions, only a few such PPAs should be signed before the power market is reformed. Where the pressure to sign PPAs is caused by the need to reduce or eliminate a costly shortage of power-supply capacity to meet demand, an alternative to a long-term PPA is a short-to-medium-term PPA with an IPP to supply power from barge-mounted or skid-mounted generating units that can be installed in fewer than 6 months from closure, and that require far less investment than needed for a plant installed under long-term PPAs. Of course, the price of power under this alternative tends to be higher than under a long-term PPA because of higher fuel consumption by the units and shorter term for amortization of capital expenditures, but the benefit of quick additions to supply can be an advantageous trade-off for the host country. This approach has been taken in Bangladesh (49), Nigeria, the Philippines, Jamaica, the Dominican Republic, and Guatemala.

## **LESSONS FROM SECTOR REFORMS**

Experience with designing and implementing reforms to power sectors yields several lessons for power-sector reform (50).

Radical restructuring of an integrated power supply chain of functions is feasible—generation, transmission, and distribution can be separated from one another even in power sectors that did not adopt this structure from an early stage of their development. There is sufficient track record to provide assurance that restructuring is possible while still ensuring proper coordination among these power-supply functions and maintaining security of supply to power users.

Private financing of power investments is feasible in a sound business environment, and commercial lenders are willing to provide medium-term financing (10–15 years) for investments in well-functioning reformed power sectors that are establishing a good track record of adhering to sound regulatory principles (except during a global or regional macroeconomic crisis). Conversely, in countries with little record of sound regulation and fair dealing for businesses, commercial lenders are conspicuous by their absence or by their willingness to lend only on short maturities (under 3 years). The governments of these countries have to carry an unduly high proportion of investment risks through performance and payment guarantees, aided by the presence of multilateral financial participation, in order to attract large investments to their power sectors from the private sector.

The competition to developing countries from investment opportunities in industrialized countries has been stiffening during the past few years and magnifies the task of mobilizing the billions of dollars needed every year to finance new power-supply capacity in developing countries. This issue is as relevant to a country whose power sector is under private ownership as

to one that is under state ownership. Hence, governments must sustain an attractive business environment and sound sector regulation to attract the required amount of investment in power capacity on competitive terms.

Domestic capital markets are too undeveloped to replace foreign finance or to provide a market assessment of performance by power suppliers and regulators. Hence, developing countries should avoid giving perceptions of excessive risk in their power sectors to foreign investors in the global competition for finance. For example, protection against major uncertainty in the regulation of tariffs and licensing is needed to attract private investors during the period following reforms until a good record has been established by the government and the new regulator. This requires that regulatory powers over electricity prices, for example, be limited to applying rules and regulations laid down in secondary legislation for a specific period following privatization of distribution and supply. This approach can be implemented without undermining the long-term regulatory framework by granting vesting contracts to the new distribution companies for a limited period (approximately 5 years), during which certain regulated variables are specified.

A bid-based competitive power pool based on spot pricing is too complex to operate and too difficult to monitor for abuse of market power for all but the most advanced developing countries—even California is having well-publicized problems with this approach (51). Moreover, the small size of the power market in many developing countries (about 100 countries have power markets of under 1000 MW) would limit the number of viable participants that can be formed from unbundling a utility to fewer than is needed to sustain competition in the market (52). There are simpler approaches to managing the wholesale power market in these countries, based on a well-designed set of market rules according to production costs (for example, the cost-based bidding approach used by South American countries). By allowing competition for market share, these approaches can give incentives to producers to reduce costs (Argentina, Bolivia, Chile, Peru, and Poland).

For developing countries with fast-growing power demands that exceed the available supply capacity for the foreseeable future, the persistence of large supply shortages also rules out the possibility of competitive power pools because the development of competition requires adequate supply capacity to meet all segments (base, peak, and shoulder) of the load on the power system.

Competition for the right to enter the power market on contractual or regulated terms plays an important role in developing countries, notwithstanding the limited scope for sustaining competitive power pools. For example, provided that sufficient interest can be attracted from bidders, governments, and utilities can obtain better terms for the host country under competitive bidding for proposals from IPPs than under noncompetitive negotiated deals. Likewise, a transparent and soundly structured process for the sale of stakes in power entities will yield the best terms for the long-term efficiency of the power sector.

The sequencing of reforms is crucial to their long-term sustainability. First, the legal and regulatory framework should be in place before privatization of the restructured power supplier. Second, major restructuring should precede the creation of private ownership rights to avoid problems with stranded assets. Third, the scope for introducing competition to the wholesale power market should be incorporated into the initial structural reforms to the power market, rather than relying only on later regulatory interventions to reduce the market power of the largest generating companies. Fourth, the incumbent utility should not sign many long-term power off-take agreements with IPPs before it is restructured and the regulatory framework for a liberalized power market is in place. Fifth, where cash collections fall far short of the revenues that should be collected by the incumbent power utility from power consumers—regrettably, a situation that

exists in many developing countries—the priority for the privatization strategy should be to improve this performance by privatizing the distribution and supply functions first. This would help attract potential bidders for the upstream generation facilities by signaling that the distributors and suppliers will become creditworthy buyers of power from the generators.

The timing of reform is also critical, particularly relative to the electoral cycle, for the privatization of electricity generators and distributors, and for an unpopular increase in electricity tariffs needed to remove major subsidies. The success of a privatization program often depends on divesting most of the state's ownership before the government faces the next election, and this can force a compromise with long-term efficiency objectives for the sector (as happened in England and Wales).

Power-sector reform can yield huge productivity gains, particularly through dynamic efficiency gains under competitive pressures. However, regulators have difficulty in making power suppliers pass on some of their productivity gains through lower retail power prices to franchised electricity consumers in noncompetitive retail market segments (in Argentina and Chile, for example). This is because regulators also have to avoid creating or adding to substantial uncertainty about future revenues for private investors in power-supply facilities.

Governments and regulators must expect to face unanticipated challenges when radical reforms are proposed or introduced into their power sectors. Such challenges may come for groups that lose from the reforms, such as workers laid off under productivity improvements, power users and fuel suppliers that have benefited from subsidies, and local manufacturers of plant and equipment preferred by the power utility before the reforms but not competitive with other technologies preferred by the new private owners. Private owners may even pull out of a power market if they cannot earn competitive returns, as in Kazakhstan (53).

Completion of a reform program is not the end of the process of change in a liberalized power market. For example, once most of the power-supply industry has been passed into private ownership and is exposed to competitive forces, the private owners may carry out further restructuring with moves to recombine some generation capacity with some distribution capacity to reduce market risks (England and Wales), or they may sell their stakes to other private parties under realignment of their investment strategies, as in Brazil (54). These tendencies require careful antimonopoly regulation to maintain competitive pressures on power suppliers. Another example is when unexpectedly large profits by the new private producers and suppliers arouse public hostility to the reforms and provoke the regulator into making unscheduled price reviews or the government into considering a windfall tax on these profits (as happened in England and Wales). A third example is the unbearable upward pressure of retail tariffs caused by unanticipated large currency devaluations that can lead to demands from the utility for reductions in the off-take prices under PPAs with IPPs, as described in the previous section in the case of some Asian countries following their financial crisis in 1998. However, even though such occurrences have been unpopular, there has been no move to reverse or undo the main steps of any country's liberalization program.

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