Infrastructure in East Asia and the Pacific – The Way Forward

Background Paper

Lessons from Experience of Power Sector Reform

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Executive Summary
1 Objective of paper

This paper addresses the theme “Lessons from experience on the appropriate roles of the public and private sectors in infrastructure planning, regulation, financing, risk bearing and operations”. It draws these lessons from experience of the recent challenges faced by power sectors undergoing reform in numerous countries around the world. The lessons focus on policies from the perspective of reform objectives. The paper does not examine in detail the numerous technical issues for power sector reform\(^1\), but it does provide references to documents that do so.

The lessons from experience are based on the presumption that power markets in developing countries should be organised to deliver modern energy services to promote poverty alleviation and economic growth, since these are the overriding priorities for these countries. Meeting these objectives requires the provision of reliable electric power services in sufficient quantity to meet affordable demand at the lowest cost, reflecting the resources and impacts involved in their production and transportation.

The paper uses empirical evidence from a variety of sources that include cross-country econometric analysis of power sector reform, efficiency and productivity analysis of power companies and sectors and single country case studies of power sector reform. It also uses published reviews of experience with electricity reform generally and of specific aspects of reform by international agencies and in technical journals (given in the references at the end of the paper).

The lessons of experience are presented according to the following outline.

- Section 2 sets the overall context for this review of experience with power sector reform. This context consists of the main drivers for reform, the reform models that have emerged, trends in sector investment, experience with independent power producers, emergence of complementary public/private approaches, and the outcomes of power sector reforms.

- Section 3 presents lessons and their contexts for sector governance and regulation. The lessons are organized into the following themes: ways to improve governance in the power sector, alternative arrangements for regulating the power market, the extent to which power markets should be liberalized and the scope for introducing competition into the power markets of developing countries, and power sector reform and the poor.

- Section 4 presents lessons and their contexts for sector planning, pricing and investment. The themes of these lessons are the appropriate investment planning and policy coordination functions of government, options available to regulate electricity prices and target subsidies efficiently, the conditions required to attract and sustain private investment in the power sector, and managing the transition to the reformed power market.

2 Experience with Power Sector Reform

Many lessons of experience can be drawn from empirical analysis of the outcomes of reform. Confidence in the findings of the empirical analysis to date about power sector reform, however, is

\(^1\) Reform issues that are highly technical include competitive power trading, price regulation for distribution and supply and for transmission services, and privatization strategy.
is constrained by concerns about the rigour of the methodology used and/or inadequacy of the data (both cross-country and longitudinally over time) available for analysis (Jamasb et al. 2004). Furthermore, even the theoretical literature shows differing views about fundamental issues such as the effectiveness of privatization and competition in network industries such as electric power, at least in OECD countries. In effect, more experience and analysis is needed to resolve concerns about the analysis of these issues.

In the case of developing countries, two opposing views could be held. One is that their poor starting conditions for reform provide more potential for reform gains than in OECD countries, because even minor changes can produce dramatic short run benefits. The other is that their limited amount of economic and institutional resources cannot support the complex and costly measures involved in reforming their power sectors sustainably. Some developing countries may have similar experience to OECD countries, but others may have the opposite experience. For example, the general direction of retail prices as efficiency improves during and following sector reform is downwards in OECD countries because prices already generally cover supply costs, whereas retail prices usually move upwards in developing countries under pressure to remove general subsidies and cross-subsidies. This review therefore both compares and contrasts experience from power sector reform between OECD and developing countries.

Until the mid-1990s, electricity supply in most OECD and developing countries was controlled by the state through ownership of monopolistic power utilities and their fuel suppliers. This structure emerged from a global wave of consolidation and nationalization during the 1940s and 1950s (except in the USA) of previously fragmented power sectors composed of privately and municipally owned local power monopolies.

This development was justified on the grounds that state financing was favoured by the large-scale investments in specific production and network technologies with high fixed costs that were needed to capture economies of scale. State financing was also favoured by the view that the substantial degree of natural monopoly in the sector should be kept under state stewardship to enhance consumer welfare from these services. Governments also considered the sector to be critical to national economic security as well as a means for pursuing economic and social distributional objectives. Under state financial support, the installed capacity to supply power increased hugely during the subsequent three decades from the initial small levels under centralized state-level financing to support economic development and bring electricity to the population.

Although some state-owned and -run enterprises performed well, 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 result in excessive costs, low service quality, poor investment decisions, and lack of innovation in supplying customers.

In most developing countries, power supply has been scaled up to the extent that the financing and management needs of the sector have generally outgrown the capacity of state institutions. Hence the electric power sector has undergone a substantial change in government policy, public attitude and the intellectual environment since the 1980s. The current movement towards breaking up these monopolies and reintroducing the private sector can be seen as partly returning an older structure, but with the important difference that it also encompasses arm’s length regulation and competition.
Since the early 1990s, the pace of reform and change in the electricity sector has spread and increased globally. Power sector reform for OECD countries, led by England and Wales, the Scandinavian countries, Australia and some regional groups in the USA, has conventionally been interpreted in terms of radical market liberalization with the introduction of competition in both the wholesale and the retail markets for electricity.

Many developing countries—from the very large, such as China, to the very small, such as Bolivia—are adapting reform models to their own needs and circumstances (APEC 2000, Bacon and Besant-Jones 2001, EBRD 2001, World Energy Council 2001b). In fact, during the 1980s Chile became the first country in the world to break up power monopolies, progressively withdraw the state from management - but not regulation - of the electricity supply industry, and divest state ownership in most of them to private investors.

The Chilean and British reforms showed that electricity could be supplied reliably when an integrated electricity supply chain is broken up. These reforms covered both vertical unbundling – generation, transmission and distribution – and horizontal unbundling with many competing generation companies and many distribution companies with local franchises. This experience countered widespread concern about the technical feasibility of decentralizing corporate control (but not control over power system operation) in power markets.

Experience to date indicates, however, that reforms of power markets in developing countries are generally tentative and are still work in progress (Bacon and Besant-Jones 2001). Given the difficulties generally facing these countries in implementing such reforms due to scarcity of economic and institutional endowments, this review considers reform to encompass changing business-as-usual in the sector by restructuring institutional and market frameworks, without prejudging the form, extent or pace of reform.

The extensive range of economic and institutional endowments found across developing countries rules out “cookbook” solutions for reforming power sectors. This lesson applies regardless of the choices made for roles of public and private sectors for power supply (World Bank 2004b). Reform strategies should be adapted to country conditions. But these choices must address a generic set of interrelated challenges: changing the manner in which new investments are financed, increasing the efficiency and development effectiveness of those investments, and increasing operational efficiency, while addressing equity concerns as the power market expands.

2.1 The main drivers for power sector reform

In principle, three separate sources of improvement in economic performance are postulated from sector reform.

- 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 (IEA 1999) 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 (World Bank 1995a).

Third, competition, where it is possible, provides the most likely means to reduce supply costs and 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.

Power sector reform is more likely where there are obvious problems of shortage of supply, such as blackouts, and less likely where there is excess capacity that reduces investment needs. Power sector problems are most likely to be felt in terms of non-delivery 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.

The drivers for reform have tended to reflect specific country circumstances, including the various forces that have driven changes in public policy towards power markets within a broader drive for economic reform.

- In Europe, the desire to bring about a single market in electricity - as well as other industries - has been a key driver of change. The countries of Eastern Europe have been motivated by the requirements of the European Union’s Electricity Directive of 1996 for accession to European Union.
- In much of the developing world, the driving forces have been fiscal pressure, disenchantment with the performance of publicly owned utilities, and the need for new investments and modernization.
- In Britain, privatisation was primarily driven by more political motives, to "roll back the frontiers of the State" and because "the business of government is not the government of business". Economists argued that competitive pressures were more likely to deliver cost improvements and hence politically attractive price reductions.

The British experience showed that the production and supply of electricity could be subject to competitive pressure, provided that transmission and distribution are regulated to support
competition in production and supply. The new guiding principle was to introduce competition by restructuring the electricity supply industry where possible, and to simulate as far as possible the effect of competition on the natural monopoly network through price-cap regulation. In 1990 with the restructuring of the Central Electricity Generating Board, for the first time privatisation was combined with restructuring to introduce competition, which resulted in rapid substantial reductions in wholesale electricity costs. Under regulatory pressure and bargaining by the government/competition authority with the electricity supply industry to introduce further competition, wholesale electricity prices collapsed by the end of the decade to finally deliver the benefits of competition. This showed the power of competition in first driving down electricity costs and then, where retail competition could become effective, in driving down electricity prices (Newbery 2004).

More than fifty developing countries have embarked on reform to their power sector, but only a few countries in Latin America have advanced far in terms of privatization and competition. Reform is unevenly spread among regions – being most widespread in Latin America and the Caribbean (Argentina, Bolivia, Brazil, Chile, Colombia, Peru) and in Europe and Central Asia (Georgia, Hungary, Kazakhstan, Moldova, Poland, Romania, Turkey, Ukraine). In Asia, Africa and the Middle East, progress to date is generally limited to long-term contracts by independent power producers to supply incumbent utilities (ESMAP 1999), although many countries are planning deeper reforms.

Many Latin American countries reformed and liberalized their electric power sectors during the 1990s, learning from the experience of earlier reforming countries, and in particular from the Chilean experience that started in the late 1970s. The evolution of reforms under this process has led to less regulation of segments that are or can be made competitive (generation and energy supply services) and more regulation of the non-competitive sectors (transmission and distribution network services) combined with the vertical unbundling of competitive and non-competitive segments of the industry (Box 1). Some open questions remain, for example, how to solve the problem of the expansion of the transmission system, and how to strike a balance between a regulator that has some freedom of action to react to unforeseen events and the corresponding fear of regulatory takings.

New regulatory reforms are developing as new challenges appear in Latin America (Basanes and Willig 2002, Basanes, Saavedra and Soto 1999). First, the countries that privatized earlier will have to modernize their regulations, which are becoming obsolete as new reforms in developing and developed countries signal the way to freer, more efficiently regulated markets. Moreover, increases in cross-border electricity transactions will promote regulatory convergence in the region, as it will be difficult to coordinate operations when partner countries have different regulatory frameworks. Second, the appearance of multi-utilities and environmental restrictions will require changes in current regulations. Third, the transmission and distribution monopoly may be weakened as technology lowers the minimum size of an efficient generation plant.
Box 1. Evolution of Power Sector Reform in Latin America

Power sector reform in Latin America proceeded in three distinct rounds. The first round started in Chile in the late 1970s with the development of a new legislation that was introduced in 1982, and ended with the privatization of the major electricity firms between 1986 and 1989. Chile's neighbors carried out the second round of reforms in the first half of the 1990s, an example of the demonstration effect of reform. The third round took place during the second half of the 1990s, and it included most of the remaining Latin American countries. Reform designers attempted to extend the scope and depth of competition in each round. Moreover, reforms were accomplished faster. The changes made in Argentina from 1990 to 1992 took a whole decade to achieve in Chile.

The Chilean reform contained three major innovations. First, competition was introduced to the wholesale market, in which power generation companies and large customers and distribution companies established long-term supply contracts, and transmission services were provided by a separate entity to introduce open access to the transmission network. Second, investment in generation capacity was left to market forces, specifically the profitability of developing new capacity as rising demand leads to higher wholesale power prices. Third, incentive regulation was used to compute the value added of network services provided by the distributor.

The second round of reform introduced more pro-competition regulation and restructuring of the sector. Vertical integration of generation and distribution was either prohibited outright or limited. Horizontal unbundling of the generation segment helped promote competition in wholesale power pools. Transmission fees, as well as the charge for local distribution services provided to large customers, were set by either the regulator or the power market operator. The minimum demand threshold for eligibility by large customers to buy power from the wholesale market was reduced. Governance of the power market was strengthened by allowing distributors, some eligible customers and the transmission company to join generators as members of the wholesale market operator. Moreover, instead of regulating the price at which distributors purchased electricity, some countries obliged distributors to tender their energy requirements among all generators. Some countries employed yardstick competition to regulate their unbundled distribution segment.

Regulations became more flexible, bestowing more discretion on regulators. Regulations also began to incorporate quality issues and increase fines for bad service. The process of setting regulated prices became more transparent. In Chile regulators were not allowed to publish the information used in rate-setting except to the regulated firms, which prevents the demand side of the market from countering the lobbying pressure of regulated suppliers. In Argentina, in contrast, public hearings became an important tool of the regulatory process. These changes made the power market in Argentina considerably more competitive than the one in Chile.

The third round of reform, which is still underway, has further deregulated the competitive or potentially competitive segments of the electricity sector. Two major changes characterize this stage: the introduction of retail competition, and liberalization of the wholesale energy market. Retail competition enables small customers to buy electricity from competing brokers. The brokers, in turn, purchase electricity in the wholesale market and pay a regulated fee to transmission company and distributors for the use of their infrastructure. Distributors were excluded or restricted from competing with brokers. Retail competition is too recent to evaluate its impact on these power markets. Liberalization of the wholesale energy market allows generators to submit price and quantity bids into a power pool, which the pool operator uses to build a system wide supply curve for energy. This curve is used to determine the order of dispatch of generating plants, replacing the merit-order system based on operating costs used by earlier reform countries. A major concern in bid markets with few participants is manipulation of prices and dispatch by power generators.

Source: Fischer and Serra 2000
The reforms undertaken in Eastern Europe and Central Asia are summarized in Box 2.

**Box 2. Reforms undertaken in Eastern Europe and Central Asia**

- Kazakhstan privatized quickly most of its generation and some of its distribution at “throwaway” prices, and now it operates a bilateral contract driven wholesale market. Some of the investors have disinvested and walked out.

- Tajikistan and Kyrgyz Republic have either unbundled or are considering unbundling their sector and have not undertaken any privatization yet. The planned concession for Pamir Power Company to operate as a vertically integrated utility in Tajikistan would be the first case of private investment.

- Turkey and Lithuania have substantially commercialized and unbundled the sector and are poised to introduce competitive wholesale markets.

- Poland and Hungary have unbundled the sector, introduced a single buyer model wholesale market and have substantially privatized generation and distribution. Poland and Hungary have completed privatization substantially.

- Ukraine has unbundled and adopted a sophisticated competitive pool (which could not work as envisaged on account of extensive non-payment problem) and has privatized more than 50% of its distribution. It is still searching for a workable model.

- Georgia has unbundled and privatized distribution in its capital region and some generation. It has given management contracts to manag e non-privatized generation, transmission, and the Wholesale Market Operation and operates a single buyer model pool.

- Moldova, the smallest among the countries reviewed, has unbundled its sector, has privatized three of its five distribution companies, and operates a wholesale market based on bilateral contracts between distributors and domestic and foreign generators.

- Hungary, Poland and Turkey started with BOT/BOO/TOOR type of private sector involvement and are devising methods to accommodate them in a competitive structure and to manage the resulting stranded costs/contracts.

- Romania and Bulgaria have unbundled their sectors and are in the process of their first privatisations.

Source: Krishnaswamy and Studdings 2003

The principal driving forces behind this reform movement in developing countries are:

(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. Operating performance is well below commercial standards, much of the population remains unconnected to the public power system, and those who are connected often receive unreliable service.

(b) *The inability of the state sector to finance needed expenditures on new investment and/or maintenance*. Many power utilities are financially distressed because of their poor governance environment comprising endemic corruption, rampant theft of power, political interference and an inability by stakeholders to work towards long term solutions.
(c) The need to remove subsidies to the sector in order to release state financial resources for other pressing public expenditure needs. Electricity tariffs are seriously distorted, and on average do not come close to covering the current costs of service provision, but low tariffs do not benefit most of the poor, who largely lack access.

(d) The desire to raise immediate revenue for the government through the sale of assets from the sector.

In many countries all these factors have been present at the same time, with the notable exception 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.

2.2 Models for power sector reform

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.

A wide range of responses to dissatisfaction with the operation of state-owned power sectors has emerged globally, particularly in terms of market structure and degree of private involvement, which reflects the variety of starting conditions for reform among countries. 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 market structures emerging from reforms to power sectors can be categorized according to increasing degree of competition, as follows (Hunt and Shuttleworth 1996).

- **Model 1 (monopoly)** has no competition at all, only a vertically integrated monopoly at all levels of the supply chain within a country (typically) or a region in parallel to other vertically integrated regional monopolies (as in Japan generally and in parts of the U.S.A. and Canada).

- **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 can be designed to progress through these models, starting from model 1 and progressing to model 2 or 3 (Figure 1), and possibly proceeding eventually to model 4. This progression reflects the basic sequence or 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. Model 1 is almost universally under state ownership (for reasons given at the start of section 2). Models 3 and 4 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.

**Figure 1. Range of Power Supply Structures**

![Diagram of power supply structures](image)

The key decision for many developing countries is whether to choose model 2 or model 3. Adoption of a single buyer structure under model 2 in some developing countries has been justified largely as a transition stage to model 3 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 the single buyer model is that government can still impose noncommercial 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 (Lovei 2000).

In the developing world, few countries – mainly in South America – have advanced power sector reforms far beyond the single buyer model. 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 adopted in South America (Argentina, Brazil, Bolivia, Colombia, and Peru). East European countries have also implemented variations on this model, particularly for the use of bilateral contracts between producers and suppliers (Georgia, Hungary, Moldova, Poland and Ukraine). Countries in East Asia and South Asia have to date strongly opted for model 2, although some plan to move to some market liberalization under model 3.
Countries in the Middle East and Africa have generally not restructured their power sector institutions and markets.

The tendency for countries of similar economic, legal and political backgrounds to adopt similar approaches to power sector reform indicates the importance of these basic characteristics for designing sector reforms. This tendency is shown in Table 1. It shows clear regional groupings, with Latin America the most advanced in restructuring, Asia and Africa the least advanced, and Eastern Europe between them.

Table 1. Distribution of Developing and Transition Countries by Structure of Power Supply (mid-2004)

<table>
<thead>
<tr>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>A national utility and/or regional vertically integrated utilities</td>
<td>Regional discos, a national or regional genco/ transco</td>
<td>Regional discos, many gencos, a national transco</td>
<td>A wholesale power market, many gencos and discos, national/ regional transco(s)</td>
</tr>
<tr>
<td>Albania</td>
<td>Armenia</td>
<td>Bulgaria</td>
<td>Argentina</td>
</tr>
<tr>
<td>Algeria</td>
<td>Malaysia</td>
<td>Czech Rep.</td>
<td>Bolivia</td>
</tr>
<tr>
<td>Azerbaijian</td>
<td>Mexico</td>
<td>Estonia</td>
<td>Brazil</td>
</tr>
<tr>
<td>Belarus</td>
<td>Nepal</td>
<td>Georgia</td>
<td>Chile</td>
</tr>
<tr>
<td>China</td>
<td>Paraguay</td>
<td>India</td>
<td>Colombia</td>
</tr>
<tr>
<td>Croatia</td>
<td>Serbia</td>
<td>Kenya</td>
<td>Panama</td>
</tr>
<tr>
<td>Egypt</td>
<td>South Africa</td>
<td>Lithuania</td>
<td>Peru</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>Sri Lanka</td>
<td>Kazakhstan</td>
<td>Spain</td>
</tr>
<tr>
<td>India</td>
<td>Tanzania</td>
<td>Moldova</td>
<td>Turkey</td>
</tr>
<tr>
<td>Indonesia</td>
<td>Turkmenistan</td>
<td>Pakistan</td>
<td></td>
</tr>
<tr>
<td>Jordan</td>
<td>Uruguay</td>
<td>Slovakia</td>
<td></td>
</tr>
<tr>
<td>Tanzania</td>
<td>Uzbekistan</td>
<td>Thailand</td>
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<tr>
<td>Laos</td>
<td>Zambia</td>
<td>Uganda</td>
<td></td>
</tr>
<tr>
<td>Montenegro</td>
<td>Zimbabwe</td>
<td>Venezuela</td>
<td></td>
</tr>
</tbody>
</table>

Sources: Various including APEC 2000; World Energy Council 2001b.

1. Many states

2.3 Trends in power sector investment

A direct result of the global movement to reform power sectors described in the previous section was the entry of private investors to the power markets of many developing countries. This movement occurred under a corresponding withdrawal of public investment, including donor financing for such investments, in the expectation that private investment would be an adequate replacement. For example, annual financing for power sector investments from multilaterals fell from around $8 billion during 1980s to around $3 billion from 1998 to the present (World Bank 2004a).

Private investments in the power sectors of developing countries thus grew rapidly from the early 1990s up to US$43 billion in 1997. But after the Asian financial crisis of 1997, the rate of these investments dropped sharply and continuously to under US$7 billion in 2002, as shown in Figure 2. The decline in East Asia was proportionately greater than the decline for all regions, since
East Asia attracted 39 percent of total investment from 1990 to 1997 inclusive, but only 16 percent from 1998 to 2002 (World Bank 2003a).  

Most private investment went to a relatively few countries. Two regions – East Asia and Latin America and the Caribbean - received 75% of this investment, whilst about 50% went to only five countries – Brazil, Argentina, China, Philippines and India (Figure 3). About 70% of this investment went into the power generation segment, and the rest was mainly in the distribution segment. Little went into transmission (Figure 4). The investment in the power generation segment went in roughly equal shares to financing greenfield projects developed by independent power producers and to financing divestitures of ownership to the private sector (Figure 5).

**Figure 2. Trends in Private Investment in Electricity in Developing Countries 1990-2002 (US$ billions)**

<table>
<thead>
<tr>
<th>Year</th>
<th>All developing countries</th>
<th>East Asia &amp; Pacific</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>0.93</td>
<td>0.04</td>
</tr>
<tr>
<td>1991</td>
<td>0.99</td>
<td>0.38</td>
</tr>
<tr>
<td>1992</td>
<td>7.1</td>
<td>4.0</td>
</tr>
<tr>
<td>1993</td>
<td>9.0</td>
<td>5.0</td>
</tr>
<tr>
<td>1994</td>
<td>12.7</td>
<td>6.6</td>
</tr>
<tr>
<td>1995</td>
<td>27.2</td>
<td>6.8</td>
</tr>
<tr>
<td>1996</td>
<td>21.7</td>
<td>5.2</td>
</tr>
<tr>
<td>1997</td>
<td>24.7</td>
<td>10.6</td>
</tr>
<tr>
<td>1998</td>
<td>14.0</td>
<td>5.2</td>
</tr>
<tr>
<td>1999</td>
<td>21.7</td>
<td>1.5</td>
</tr>
<tr>
<td>2000</td>
<td>14.0</td>
<td>3.0</td>
</tr>
<tr>
<td>2001</td>
<td>24.7</td>
<td>3.0</td>
</tr>
<tr>
<td>2002</td>
<td>6.7</td>
<td>0.5</td>
</tr>
</tbody>
</table>

*Source: PPI Database World Bank*

**Figure 3. Geographic Imbalance in Private Investment in Electricity**

- **South Asia**: 10%
- **Sub-Saharan Africa**: 2%
- **East Asia & Pacific**: 30%
- **Europe & Central Asia**: 10%
- **Latin America & Caribbean**: 44%
- **Middle East & North Africa**: 5%
- **Others**: 49%

*Source: PPI Database World Bank*

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2 The World Bank PPI database that is the source for this data includes all private investments in power, including both investment in power generation capacity that supplies the public power system and investments in capacity by industrial and commercial users to provide electricity for their own needs.
Figure 4. Distribution of Private Investment in Power Sectors of Developing Countries 1990-2002: Generation, Transmission and Distribution

Source: PPI Database World Bank

Figure 5. Private Greenfield and Divestiture Investments in Electricity in Developing Countries 1990-2002

Source: PPI Database World Bank

The decline in private investment from 1998 onwards is attributable to a number of factors in developing countries:

- The East Asian and Russian financial crises in 1997 and 1998, respectively. Investors had experiences in some developing country electric power sectors, which outweigh some good experiences. The unattractive investment climates of many countries. The difficulty for many developing countries in sustaining reforms to sector and corporate governance needed to place the power sector on a commercial footing. This experience
shows that current forms of financing for foreign private investment in the power sectors of developing countries are highly vulnerable to economic conditions in these countries.

These factors were reinforced by a substantial decline in the number of major European and North American investors in developing country electric power sectors because of developments in their home markets: European investors merged or withdrew in the face of competition – or the imminent prospect of competition – in their home markets under market liberalisation in the European Union. Many investors from the United States experienced severe financial difficulties and have been withdrawing from foreign markets because of losses from energy trading in the US following Enron’s collapse in 2001. American investors also withdrew from foreign markets due to Wall Street’s downrating of electricity companies with exposure to foreign electricity markets following heavy losses following major devaluations (as in Argentina and Brazil). As a result of these developments, overall investment in developing country electric power sectors, apart from China, has generally not kept pace with the estimated needs during the 1990s. The current level is a fraction of total investment requirements of over $100 billion in developing country electric power sectors (IEA 2003b). Consequently, many developing countries face a huge backlog of maintenance and capacity expansion in their electric power sectors, and have experienced a marked deterioration in service quality and an increase in unserved power demand. Industrial and commercial enterprises in many countries have resorted to installing their own generator sets to serve their power needs, but at substantial cost that is undermining their businesses in competitive markets.

Furthermore, the timing and extent of any recovery in the interest of foreign investors in developing country electric power sectors cannot be predicted confidently. Yet more than forty developing countries have announced their intention to privatize some or most of their electric power assets, which indicates a high demand for private investment.

The challenge, therefore, is to find new investors and ways to manage the financial risks for investors. In this situation, only those countries that show a strong commitment to improving governance are likely to attract investors to their power sectors soon.

2.4 Experience with independent power producers

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 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 discussed in section 2.2, but in developing countries IPPs have generally entered under model 2 to set up new power generating capacity and sell the output to the state owned utility on the basis of a power purchase agreement (PPA) with a state-backed guarantee for the off-taking utility’s performance. Under this model, IPPs had spread across the developing world to 46 countries by 1998 (ESMAP 1999) and over 50 countries by 2001 (World Bank 2003a).

IPPs have provided timely and cost-effective solutions to chronic supply shortages in some countries under appropriately structured contracts. They mobilized financing and added supply capacity where governments had virtually no alternative. Where IPPs signed long term PPAs, they generally accepted construction and operating risks. In many cases, they shared fuel availability risk with fuel suppliers, either by signing a third party agreement or by transferring equity in the project company to the fuel supplier. IPPs are generally insulated under the terms of their PPAs against demand risk, dispatch risk, price risk, and exchange rate risk.
Successful investments for IPPs can contribute to the success of power sector reform, but efforts to bring about this success cannot ensure by themselves, and may even impede, attempts to produce good sector-level outcomes. In some countries (Pakistan and the Philippines, for example) the success of IPPs in resolving power crises had the effect of relieving pressure on leadership and policymakers for needed reforms. Some countries that opened their power sector to IPPs in response to capacity shortages were slow or weak in reforming the transmission and distribution subsectors, resulting in downstream bottlenecks to fully utilizing the new generation capacity. In Pakistan, the failure to address downstream reform and capacity provision, coupled with weak system planning, resulted in under-utilization of the IPP capacity even as demand remained unmet (World Bank 2003).

Overall, access to the transmission network on transparent and equitable terms is a pre-requisite for efficient use of new generation capacity and to avoid presenting IPPs with a serious risk to the sustainability of their investments. The most credible way is to form an independent transmission entity that is regulated in accordance with these terms and is legally barred from cross-ownership with generators (Chile did this after initially keeping transmission bundled with generation over concerns about abuse of market power). For IPPs to provide power at a competitive price, they must have freedom over plant specification, procurement, construction and operation.

Better selection and more efficiently managed investment and operation of generation capacity is expected from IPPs under their commercial incentives, compared to the performance of state-owned generators constrained by governmental non-commercial objectives for the power sector. Empirical evidence for this expectation is limited by differences in generating technologies, because IPPs have generally preferred to build gas-fired gas turbines based on new combined cycle designs under commercial incentives to manage the risks to their investments, whereas state-owned utilities have been slow to switch from older but familiar generation technologies such as fossil coal-fired steam turbines or hydropower. These technologies differ markedly in construction and operating characteristics. Relative to the older generation technologies, combined cycle plants have lower capital costs, shorter construction periods and generally higher fuel costs. The comparison is further complicated by differences in cost of capital, with IPPs at a disadvantage to state-owned utilities backed by their governments. In general, after adjusting for differences in cost of capital but taking account of better control of construction cost and schedule risks by IPPs, the cost of power produced by IPPs is competitive with the cost of power from new plants constructed and operated by utilities.

Prices for power from the first IPPs in countries have tended to be higher than from subsequent IPPs. High prices from the first IPPs reflected the high-risk associated with pioneering investments in sectors new to private capital where the business climate and regulatory environments were highly uncertain. Subsequently, prices fell as developers and equipment suppliers competed for business following the initial success of the early entrants.

The process for selecting IPPs is critical to obtaining the benefits from them. In many countries, the initial contracts with IPPs were concluded under non-transparent processes that attracted allegations of corruption and exposed these contracts to pressure for renegotiation that substantially reduced the investment returns for IPPs. A loss-sharing solution of lowering PPA rates in exchange for an extension of the PPA term has been the most common approach and successfully used in Pakistan, Thailand, and Guatemala. In a few cases, PPAs were cancelled or
remained in dispute for years (India, Indonesia, Tanzania), particularly where the off-take prices were extremely high by international standards for generation costs in US dollar terms.

*Much of this risk of renegotiation can be avoided by obliging IPPs to earn the right to enter into PPAs under a competitive bidding process,* using internationally acceptable bidding documents that give transparency to the process and thus sustainability to the agreement (World Bank, US Agency for International Development 1994). Countries that engaged in transparent and competitive bidding processes for contracting with IPPs on the whole have got lower prices, especially in countries able to provide low cost natural gas to IPPs (Bangladesh, Egypt), and more sustainable contracts than countries that adopted non-competitive processes.

*An endemic risk in countries with generally poor governance and contract protection under the law is the failure of off-takers to honour their payments commitments to IPPs.* This usually arises when off-takers do not have sufficient revenues to meet these commitments because their retail tariffs are kept below supply costs by political pressure and a large proportion of their bills are not paid by consumers (Dominican Republic), or because of a macro-economic shock that resulted in a major devaluation of the local currency.

*The cumulative obligations to purchase power from IPPs exposed power utilities in many Asian countries to serious financial risks and strained their already precarious financial condition as a result of the 1997 Asian financial crisis,* as happened in Indonesia, Pakistan and Philippines. They were obliged to continue payments to IPPs under the PPAs for energy that they did not need when retail sales fell below forecast levels, and their governments prevented them from raising their retail power tariffs to cover increases in power purchase costs in local currency terms under PPAs following currency devaluations (Gray and Schuster 1998).

*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 assessed in Table 2 for five types of risk exposure for four Asian countries (Indonesia, Malaysia, Philippines, and Thailand) that followed the IPP route. The results show a wide difference in risk exposure among these four countries. Philippines had the greatest overall exposure, with a high rating for all five exposure indicators, which created enormous problems (Roxas 2001). Indonesia also had a high overall exposure, with a high rating for four indicators, whereas Thailand had a moderately low overall exposure, with a high rating for two indicators, and Malaysia had a low overall exposure, with a high rating for only one indicator.

<table>
<thead>
<tr>
<th>Determinant</th>
<th>Indonesia</th>
<th>Malaysia</th>
<th>Philippines</th>
<th>Thailand</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPP capacity in operation in mid-2000 (MW)</td>
<td>2329</td>
<td>7121</td>
<td>3676</td>
<td>2419</td>
</tr>
<tr>
<td>Exchange rate exposure through origin of fuel supply</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>(high if the fuel is imported)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposure to exchange rate through currency of PPA tariff</td>
<td>High</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>(high if denominated in a hard currency)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Exposure to exchange rate through foreign debt for project financing (high if the foreign debt made up more than 50% of project financing) | High | Low | High | Low
---|---|---|---|---
Exposure to market risk through proportion of domestic power needs supplied by IPPs (high if this proportion is over 50%) | High | High | High | Low
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 kWh) | High | Low | High | Low


Unsustainable long-term PPAs with state-owned off-takers are now appearing riskier to IPPs than transparently and competitively chosen merchant plants in fully functioning Latin American power markets. When some Latin American countries experienced more recently a sharp substantial currency devaluation, the cost of power from IPPs in local currency terms rose to unaffordable levels under PPA prices denominated largely in US dollar terms, as occurred in Argentina and Brazil.

High PPA prices (in local currency terms) also become a problem in countries that want to move towards competitive power markets. The prices that emerge from a liberalized wholesale power market are likely to undercut the PPA prices, and the difference between these prices become stranded costs that are have to be absorbed under the restructuring of a power utility (Woolf and Halpern 2001). One way to remove stranded costs would be to renegotiate more flexible off-take terms to PPAs, but IPPs and their lenders generally resist this policy to avoid exposing their power plants to lower market prices that might occur under competition. One solution is a state-backed special purpose financial entity that takes over the off-take commitments with IPPs and then recovers at least a part of the stranded costs through a retail tariff surcharge (in California called a “competition surcharge”).

Power utilities should not risk over-extending their financial capacity for long-term commitments under long-term inflexible PPAs. To avoid creating stranded costs when the power market is liberalized, these utilities should sign only a few PPAs before they are restructured. Hungary and Poland faced stranded cost issues with their single-buyer approach to contracting with IPPs (Krishnaswamy and Stiggins 2003), and so do countries such as Philippines, Pakistan and India. 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. In the other countries, 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.

Where the pressure to sign PPAs is caused by 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 financial 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, Nigeria, Philippines, Jamaica, Dominican Republic, and Guatemala.
2.5 Emergence of complementary public/private approaches

The challenges facing developing countries in meeting their electric power needs cannot be met by any turning back to the old ways of supplying power under state-owned monopolies, when pure public financing and provision failed to adequately support economic and social development under the poor governance standards and shortage of resources found in most developing countries. Developing countries therefore need to attract the resources of the private sector to complement their public sector resources, despite the current difficulties in attracting private investors to developing country power sectors.

Creating the framework for attracting private investment under current market conditions appears to be beyond the political and institutional capacity of many developing countries. This difficulty, allied to the general withdrawal of private investors, indicates that many countries cannot attract from the private sector the necessary amounts of investment needed for their power sectors for the foreseeable future.

The public sector will remain an important, and often for the medium term the main, source of capital financing for the sector where the country risk deters private investors, or for regulated segments of the power market where regulatory risk deter private investors. Hence state-owned power utilities are likely to remain important providers of services in the power sector, either as the default provider to consumers generally or as provider in segments of the power market that are not attractive to private investors under current market conditions.

Between models 1 and 2 (section 2.2) lies 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. This “middle way” combines public and private investment, or only public investment initially if little or no private investment is forthcoming, by means of public-private partnerships. This model is also emerging at least as an interim approach to reforming electric power sectors in many developing countries. The anticipated benefit from these public-private partnerships 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.

Public-private partnerships currently offer the only feasible reform options for countries with distressed power sectors and poor investment climates. Options for public-private partnerships range from contracting out of specific services such as billing collections and maintenance, management contracts for the whole or a major part of the utility (especially small utilities), leases and the French model of affermage concessions which transfer only limited risks and responsibilities to the private sector, to public/private joint ventures with share ownership divided between the state and private investors.

In formulating their approach to public-private partnerships, governments should assess what particular issues need to be addressed, and thereby the roles that need to be performed by the private sector.

The public sector can have a financing and/or a risk bearing role in all of these arrangements. For example, under concessions and divestitures, the government can provide financial support through subsidies. Table 3 summarizes the main features and prerequisites for these arrangements. These options are distinguished by how they allocate responsibility for such functions as asset ownership and capital investment between the public and private sectors. The
more risk and responsibility that are passed to the private sector, the more powerful are the incentives for the contractor to improve services, and hence the greater the potential benefits.

Table 3. Main Forms of Public-Private Partnerships

<table>
<thead>
<tr>
<th>Factor for assessment</th>
<th>Option for contractual arrangement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Management contract</td>
</tr>
<tr>
<td>Allocation of responsibilities</td>
<td></td>
</tr>
<tr>
<td>Asset ownership</td>
<td>Public</td>
</tr>
<tr>
<td>Operation &amp; Maintenance</td>
<td>Private</td>
</tr>
<tr>
<td>Capital investment</td>
<td>Public</td>
</tr>
<tr>
<td>Commercial risk</td>
<td>Public</td>
</tr>
<tr>
<td>Duration</td>
<td>3—5 years</td>
</tr>
<tr>
<td>Prerequisites for successful implementation of option</td>
<td></td>
</tr>
<tr>
<td>Political support</td>
<td>Low to moderate</td>
</tr>
<tr>
<td>Cost-covering tariffs</td>
<td>Preferable but not necessary</td>
</tr>
<tr>
<td>Good system information</td>
<td>Sufficient to set incentives</td>
</tr>
<tr>
<td>Well-developed regulatory framework</td>
<td>Moderate monitoring capacity</td>
</tr>
<tr>
<td>Good country risk rating</td>
<td>Not necessary</td>
</tr>
<tr>
<td>Scope for overcoming constraints on commercial performance</td>
<td></td>
</tr>
<tr>
<td>Financial</td>
<td>Low</td>
</tr>
<tr>
<td>Corporate governance</td>
<td>Low</td>
</tr>
<tr>
<td>Operating</td>
<td>Low</td>
</tr>
</tbody>
</table>

Source: Internal World Bank document

Management contracts transfer only limited risk and responsibility to the private sector, and offer commensurately small possible gains (as in the case of Orissa in India during the mid 1990s before distribution was privatised under concessions). They are often recommended as a transitional arrangement, to bring in private sector managerial expertise in cases where the private sector views investment risks as unacceptably high.

The major difficulty with management contracts generally has been demarcation of responsibilities between owner and manager, and the need for the full support of owners and employees for the arrangement (World Bank 2003b). Experience with management contracts and the French model of affermage concessions in the power sectors of developing countries during the 1990s was generally disappointing. Much of this experience was obtained in Sub-Saharan Africa (in Benin, Congo DR, Ghana, Mali, Rwanda, Senegal, Sierra Leone and Zimbabwe). The contracted service providers invested little risk capital because they faced little incentive to do so under the small performance-related components in their contracts. Similar experience was obtained elsewhere (Bolivia, Laos). Cote d’Ivoire was a notable success with a 15-year operating concession starting in 1990 that resulted in substantially improved technical
and financial performance and service quality which attracted the first IPPs to the region. These improvements could not be sustained, however, once the political and economic conditions in the country deteriorated substantially after 2000.

More recent experience indicates that well-structured management contracts can soon lead to some improvements in operating and financial performance (Tanzania, Botswana, Togo). This experience shows that under management contracts and similar arrangements, operators must be able to manage the utility autonomously and governments must be committed to the success of the arrangement. However, designing these contracts to provide the appropriate balance between risks and rewards for the contractor remains difficult, and evidence also suggests that the effectiveness of these contracts diminishes over time after the initial gains. While some management contractors have been able to improve performance to the point where the utility's cash flow is sufficient to attract some local commercial debt, in most cases access to commercial debt remains out of reach.

The economics of long-term (25- to 30-year) concessions differ little from those of joint ventures with licenses. For example, issues about remuneration of investment in new assets become similar. What does differ is the degree of perceived protection offered to investors—contract-based private sector participation may be seen as being less risky for investors than license-based participation because of the legal context of each type of approach.

One option within the joint ventures is the capitalization-type approach as used in some parts of Latin America, such as Bolivia. This approach allows the revenues from a sale of assets to be used as a way to add value to the enterprise. Additional benefits from capitalization approaches are the short-term financing for both new investment and working capital provided from incoming cash, and the support to balance sheet restructuring of the enterprise.

Private investors, as opposed to private contractors, do not appear to be keen on these types of public-private partnerships. A recent survey of fifty two international private investors in developing country power sectors found that fifty of these investors did not rate public-private partnerships as being important for them, and they ranked this arrangement lowest among the factors that lead to successful outcomes for their investments (Lamech and Saeed 2003).

Public-private partnerships should be viewed as interim arrangements in preparation for deeper reforms, in view of the limitation of public-private partnerships for attracting back private investors to the power sectors of developing countries, yet given the desirability of creating appropriate incentives for private contractors through taking a financial stake in the operation of the power concession.

2.6 Outcomes of power sector reform

Power sector reform in developing countries should be assessed against the following three outcomes (section 2.1): better service quality for electricity consumers, improvement in government’s fiscal position, and more affordable access to electricity for the poor. The main elements of reform – restructuring power suppliers and markets, regulation, competition and the roles of public and private participants – are considered as means for achieving these outcomes.

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3 Long term concessions are discussed in the subsection on regulatory contracts under section 3.2.

4 In accordance with aligning the interests of managers with those of owners to resolve the principal-agent problem identified in the theory of the firm.
Empirical analysis to date about reform outcomes has been carried largely for OECD countries, Latin America and Eastern Europe where outcomes have been systematically monitored.

**Overall, successful implementation of reforms has been constrained by lack of country commitment, macroeconomic and political crises, and lack of experience among reform practitioners, particularly with political economy factors** (World Bank 2003b). These reforms have not been in place for sufficient time to take full effect. Power sector reforms that restructured and privatized power suppliers and liberalized power markets beyond just bringing in IPPs started only in the mid-1990s, and most countries that embarked on this course are still at the early stages of reform.\(^5\)

The benefits of reform have been constrained in some cases by poor market design or regulation. The public image of reform has been coloured by some notorious cases in OECD countries such as in California (Besant-Jones and Tenenbaum 2001, Wolak 2003), as well as highly publicized controversies with IPPs in some Asian countries (section 2.5) and politically inspired public opposition to the removal of general subsidies in power tariffs\(^6\). These cases do not provide reliable evidence about reform outcomes.

The main policy conclusions from one econometric assessment are that (i) on their own privatization and regulation do not lead to obvious gains in economic performance; (ii) an effective regulatory framework should be emphasized when privatising electricity supply under monopolistic conditions; and (iii) introducing competition is effective in improving performance, irrespective of changes in ownership or regulation. This assessment examined the effects of privatization, competition and regulation on the performance of the electricity generating industry uses panel data for 51 developing countries (Zhang, Parker and Kirkpatrick 2002\(^7\)). The study identifies the impact of these reforms on generating capacity, electricity generated, labour productivity in the generating sector, capacity utilisation, and industrial and residential user prices. It concludes that competition appears to bring about favourable results for service penetration, capacity expansion, labour efficiency, and prices to industrial users. The effect of privatization and having an independent regulator separately is statistically insignificant, whilst the co-existence of these two reforms is correlated with greater electricity availability, more generation capacity, and higher labour productivity.

Experience in the OECD countries does not yet provide conclusive evidence that privatising and restructuring the power supply industry will deliver sustainable improvements in these countries relative to pre-reform industry structure. Econometric studies can pick up the effects of reforms and restructuring on prices, investment and productivity, although the length of time since most reforms occurred is still rather short for the long-run effects to be clearly identified. Cost-benefit case studies can identify the net social gains from restructuring, but they are few and far between, and are also restricted to a relatively short time period (Newbery 2004). But it is

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\(^5\) By 1998, only about 20 percent of 115 developing countries had undertaken substantial restructuring and some privatization and liberalization (ESMAP 1999). This proportion has not increased much since 1998.

\(^6\) Even serious power shortages in recent years caused by abnormally low rainfall in countries dependent on hydropower (Brazil, Colombia, Ghana, New Zealand, Norway, Tanzania) have been spuriously linked to actual or nascent power sector reform in these countries.

\(^7\) These conclusions are subject to trade-offs between methodology and data availability (Jamasb, Mota, Newbery and Pollitt 2004).
certainly early enough to say that poor market design and poor regulation can make matters considerably worse, as California demonstrates (Joskow and Kahn, 2002).

The quantitative evidence on reform experience is not extensive and is based on analysis limited by methodological issues and insufficient data (Jamasb et al. 2004). This situation can result in differing conclusions about similar issues. Steiner (2001) and Hattori and Tsutsui (2003) examine the impact of regulatory reform on the power supply industry using panel data for 19 OECD countries. The two studies reach different conclusions about the effect of creating a wholesale market on the industrial price of electricity, probably due to slightly different definitions of regulatory reform indicators. However, both of them find that third party and retail access tend to lower industrial electricity prices and also lower the ratio of industrial to domestic prices, which in many countries represents an improvement in allocative efficiency. Steiner (2001) finds that privatisation improves operating efficiency and capacity utilization (Newbery 2004).

Conclusions reached from empirical analysis about reform outcomes in OECD countries should be applied with caution to developing countries, because of key differences in the main reform objectives as well as the huge differences in their economic and institutional resources (Box 3). Country case studies are therefore critical sources of evidence for reform outcomes in developing countries.
Box 3. Relevance of OECD reform experience to developing countries

The need for caution in applying OECD reform experience to developing countries is evident from consideration of the three key reform outcomes.

• First, efficiency improvements in OECD countries usually applies to power suppliers whose technical and financial performance satisfies prevailing commercial standards, and competition and regulatory incentives are required to raise these standards and thus apply pressure to improve performance. In most developing countries, however, the priority is to find ways to raise technical and financial performance standards up to commercial levels from low levels under much weaker regulatory capacity and less scope for introducing competition. Hence positive reform outcomes can differ, as in the case of retail electricity prices. In OECD countries reform is expected to lower prices by lowering costs, but in many developing countries reform requires substantial price increases to cover costs fully - at least for some consumer groups such as households.

• Second, the main fiscal impact of power sector reform in OECD countries occurs through the receipt of privatization proceeds. Although this was also important for some South American countries (Brazil, Colombia, Argentina, Chile), such proceeds are seldom substantial elsewhere because of the poor investment climate, and sometimes these proceeds are used to recapitalise the sector, as in Bolivia (Moen 2000). The main fiscal impact in developing countries is through reduction in subsidies for below-cost tariffs to certain consumer groups and state guarantees to long term debt financing and power purchase commitments by state owned power entities.

• The outcome of helping the poor has much greater relevance to developing countries than to OECD countries, given the low affordability in terms of per capita incomes and the substantial proportions of households without access to electricity in developing countries, whereas affordability concerns are extremely limited and the access rate is virtually 100 percent in OECD countries.

Better service quality for electricity consumers

Better supply quality at reduced cost should be the main outcome of investments in supply capacity. Additions to generation capacity are a meaningful indicator of an improved outcome when they improve the balance between supply and demand, which happened in some countries by reducing supply shortages, although temporary surpluses occurred under constrained demand. As noted in section 2.4, early power sector reforms led to increased generation capacity in many countries through IPPs from the mid 1990s onwards. These additions generally led to better balancing of overall electricity supply and demand when many developing countries were experiencing severe supply shortages in the midst of global financial crises.

Consumers should benefit from lower prices provided that suppliers pass on the gains in efficiency resulting from reforms. These outcomes have been achieved successfully so far in a few OECD countries (notably in England & Wales and the Scandinavian Nordpool) and South American countries that have been able to make competition in the power market work, and even then only under regulatory pressure on suppliers to pass on some of their efficiency gains to power consumers.

Cost savings have not been shared equitably among consumers, however, since real prices have generally decreased for industrial and commercial consumers, but not for residential consumers. A comparison of prices in the power market after reform with those before reform should be interpreted cautiously, however, because this type of comparison can be distorted by specific regulatory actions over prices. The comparison becomes more reliable when post-reform prices are largely determined under market forces, as in the case of some Latin American countries.
In general terms, the privatization-cum-regulation of Latin America’s electricity sectors was successful in that privatized firms increased their efficiency and coverage substantially. But these productivity gains were passed on to consumers only in those cases featuring competition, which reinforces the idea that competition is the ideal regulator. The main policy lesson that can be derived from this experience with privatized electricity sectors is that countries should aim to establish conditions that lead to the broadest possible scope for competition.

In Chile, for example, power suppliers increased their capacity substantially by more than doubling annual generation from 1990 to 1998. Privatization also increased the productivity of utilities by cutting energy losses by more than half to 8.3 percent in 1997, by doubling labor productivity in distribution, and by tripling energy generation by worker in the largest generating company. Although privatized companies became substantially more efficient, however, these gains were only transferred to customers in areas characterized by competition. In the main market, the regulated wholesale price of electrical energy fell by 37 percent, and technological change stranded (that is, rendered uneconomical) a large fraction of existing thermoelectric plants. In contrast, the final price to customers did not fall to reflect the huge productivity gains that were achieved after privatization. Between 1987 and 1998 the regulated price to consumers fell by only 17 percent. This situation led to spectacular increases in the profit rates of distribution companies: the rate of return of the largest distributor rose from 10.4 percent to 35 percent in this period. These profit rates are striking considering the low market risks carried by distribution monopolies (Fischer and Serra 2000).

In the case of Argentina, the substantial drops in wholesale power prices and unserved demand following sector reform is shown in Figure 6. Although the average energy spot price dropped steadily from around $46/MWh in 1992 - the first of operation – to $25/MWh by 1998, retail power prices did not decline as much because of contracts between distributors and generators concluded before the parties were privatized. Electricity prices for industrial users declined more than prices for residential users.
Figure 6. Argentina: declining prices and improved quality in competitive wholesale electricity market

<table>
<thead>
<tr>
<th>Fall in average energy spot price</th>
<th>Edesur – Reduced unserved demand from 1990 after reform</th>
</tr>
</thead>
<tbody>
<tr>
<td>from start of market in 1992</td>
<td></td>
</tr>
</tbody>
</table>

Source: www.cammesa.com

Similar price trends occurred in other South American countries (Bolivia, Colombia, Peru) that followed the same reform model as Argentina, with wholesale prices dropping by more than retail prices.

Liberalization of the power market is vulnerable to a public backlash if increases in electricity prices are perceived as entirely a consequence of this reform. Electricity prices did not fall in all countries that liberalized their power markets. In El Salvador, electricity prices to final consumers increased slightly after reforms were implemented, creating a public backlash against the reform. In Bolivia, electricity prices rose as a result of an increase in natural gas prices which increased the cost of generated power (World Energy Council 2001b). The elimination of cross subsidies between consumer categories led to tariff increases for consumers from whom the subsidies had been removed.

Private investments in generation are vulnerable to financial problems in the distribution end of the industry and to local vested interests defending the status quo, as noted in section 2.4. The sustainability of private investment in generation depends crucially on collecting payments in full from electricity consumers. Liberalizing the generation subsector without reforming distribution and retail consumer services to achieve commercial standards can impair the effectiveness of the overall reform program. Yet power utilities in most developing countries – generally in South Asia and Sub-Saharan Africa but in many countries elsewhere - are financially insolvent, provide poor and deteriorating service, and are unable to maintain or rehabilitate their existing supply capacity or construct new capacity to keep pace with the rising demand for electricity.

Improvements in the distribution subsector—better cash collections, loss reduction, good governance, better targeting of subsidies, and distribution privatization—are a priority where performance is poor before the start of reform.

Improvement in governments fiscal position.

Governments fiscal position can improve in three ways from reforms to the power sector. First, by removing or reducing support for power suppliers debts. Second, by removing or reducing
direct subsidies for specific groups of power consumers. Third, by receipts of proceeds from divestiture of some or all of the state’s shareholdings in power suppliers. The first two benefits recur continually over time, whereas the third constitutes a single boost to the public exchequer. Investments by IPPs under long-term contracts with state-owned off-takers, however, do not relieve the fiscal burden entirely because they substitute government backing for borrowing by government backing for off-take commitments by state-owned entities, especially if the latter involves payment guarantees that rank as contingent liabilities.

Successful privatizations of electricity undertakings brought substantial fiscal gains to Latin American countries, although the high transaction costs of restructuring the sector reduced the immediate benefits for governments budgets. Divestitures of public power assets yielded around $60 billion between 1990 and 2002 for the most successful nine countries in the region, as shown in Table 4, during a period when such infusions of funds were needed for economic stability and social programmes in Chile in the 1980s, Argentina and Bolivia under the Brady Plan, and then Brazil, Colombia and Peru in the mid 1990s. In comparison, divestitures of public power assets yielded around $10 billion between 1990 and 2002 for the most successful eight countries in Asia.

Table 4. 1990-2002 Private Power Investments in Latin America and Asia (US $ million)

<table>
<thead>
<tr>
<th>Country</th>
<th>Divestitures</th>
<th>Concessions</th>
<th>Greenfield projects</th>
<th>Total PPI investment</th>
<th>Country</th>
<th>Divestitures</th>
<th>Concessions</th>
<th>Greenfield projects</th>
<th>Total PPI investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latin America</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Asia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brazil</td>
<td>34,644</td>
<td>9,913</td>
<td>44,557</td>
<td></td>
<td>China</td>
<td>4,084</td>
<td>15,599</td>
<td>19,684</td>
<td></td>
</tr>
<tr>
<td>Argentina</td>
<td>11,046</td>
<td>5,070</td>
<td>16,116</td>
<td></td>
<td>Philippines</td>
<td>2,683</td>
<td>10,730</td>
<td>13,412</td>
<td></td>
</tr>
<tr>
<td>Chile</td>
<td>4,163</td>
<td>4,330</td>
<td>8,493</td>
<td></td>
<td>India</td>
<td>378</td>
<td>11,960</td>
<td>12,338</td>
<td></td>
</tr>
<tr>
<td>Colombia</td>
<td>4,348</td>
<td>2,210</td>
<td>6,557</td>
<td></td>
<td>Indonesia</td>
<td>-</td>
<td>9,960</td>
<td>9,960</td>
<td></td>
</tr>
<tr>
<td>Peru</td>
<td>3,166</td>
<td>1,137</td>
<td>4,303</td>
<td></td>
<td>Thailand</td>
<td>1,545</td>
<td>6,471</td>
<td>8,016</td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>-</td>
<td>3,897</td>
<td>3,897</td>
<td></td>
<td>Malaysia</td>
<td>1,395</td>
<td>6,296</td>
<td>7,691</td>
<td></td>
</tr>
<tr>
<td>Dominican Rep.</td>
<td>1,208</td>
<td>1,101</td>
<td>2,309</td>
<td></td>
<td>Pakistan</td>
<td>291</td>
<td>5,646</td>
<td>5,937</td>
<td></td>
</tr>
<tr>
<td>Guatemala</td>
<td>651</td>
<td>782</td>
<td>1,433</td>
<td></td>
<td>Bangladesh</td>
<td>-</td>
<td>1,040</td>
<td>1,040</td>
<td></td>
</tr>
<tr>
<td>Panama</td>
<td>937</td>
<td>128</td>
<td>1,065</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>60,163</td>
<td>28,568</td>
<td>88,730</td>
<td></td>
<td>Total</td>
<td>10,376</td>
<td>67,702</td>
<td>78,078</td>
<td></td>
</tr>
</tbody>
</table>

Source: World Bank PPI Database

Table 4 also shows that these Asian countries attracted much more private investment in power greenfield projects (around $68 billion) than the Latin American countries (around US$29 billion) over the same period. In terms of total private investment in power, the Latin American countries attracted about $10 billion more than the Asian countries.

Latin American experience shows that privatization of power sector assets can yield substantial fiscal benefits under stable macroeconomic conditions. Substantial additional fiscal benefits flowed from payment of income and other taxes and dividends to governments for their remaining shareholdings in divested entities, as well as reductions in subsidies to the power sector, as shown by the following cases from Latin America (World Bank 2003b).

- Bolivia: Fiscal revenues from the power sector (sales and profit taxes) increased by 247 percent in three years (from US$17 million in 1994 to approximately US$42 million in 1997). In addition, debt service of approximately US$61 million for the main power...
entity pre-privatization, which was guaranteed by the government, was transferred to the private companies.

- El Salvador: The sale of 75% shareholdings in the distribution companies totaling US$575 million had a substantial financial impact equivalent to 5.5% of the 1996 national GDP.

- Panama: In FY 2000, the privatized power sector companies contributed US$70.8 million to the treasury, of which US$34.5 was in income taxes and US$36.3 million in dividends for the shares still in government hands.

- Peru: The sector has shifted from draining the public treasury from a loss of US$300 million in 1990, to being a source of fiscal income from US$300 million in profits in 1998.

Private power operators saved governments the need to provide heavy operating subsidies. Where private operators took over retail supply, they also drastically reduced payment delays, theft, and unpaid bills (from 30 percent to 12 percent in Buenos Aires, and about the same in Côte d’Ivoire, where assets were not sold but just leased). A lot of the gains that eliminated or reduced the need for subsidies stemmed from better asset management. Typically in the reformed Latin American power sectors, over a five-year period plant availability increased by 10 percent to 40 percent, the number of customers per employee also increased by 50 percent, and power outage indicators decreased by more than half.

*Latin American distribution companies substantially improved their performance following privatisation through long term concessions. These improvements show the benefit of having private management focus on commercial performance, which has been a major weakness of state-owned utilities.* The improvement in efficiency after privatization of four South American distribution companies is summarized in Table 5. 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: energy sales - positive if amount increased; energy losses - positive if level declined; employees - positive if amount declined; customers per employee—positive if number increased; net receivables - positive if level declined; and provisions for bad debts - positive if level declined. Positive outcomes for all the indicators - except possibly the number of employees - lead to positive welfare outcomes.

**Table 5. Performance Improvement of South American Electricity Distribution Companies Following Privatization, Selected Countries and Companies**

<table>
<thead>
<tr>
<th>Item</th>
<th>Peru, Luz Del Sur</th>
<th>Argentina, Edesur</th>
<th>Argentina, Edenor</th>
<th>Chile, Chilectra</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in energy sales (%)</td>
<td>+19</td>
<td>+79</td>
<td>+82</td>
<td>+26</td>
</tr>
<tr>
<td>Change in energy losses (%)</td>
<td>−50</td>
<td>−68</td>
<td>−63</td>
<td>−70</td>
</tr>
<tr>
<td>Change in number of employees (%)</td>
<td>−43</td>
<td>−60</td>
<td>−63</td>
<td>−9</td>
</tr>
<tr>
<td>Change in customers per employee</td>
<td>+135</td>
<td>+180</td>
<td>+215</td>
<td>+37</td>
</tr>
<tr>
<td>Change in net receivables (days)</td>
<td>−27</td>
<td>−38</td>
<td>—</td>
<td>−68</td>
</tr>
<tr>
<td>Change in provisions for bad debts</td>
<td>−65</td>
<td>−35</td>
<td>—</td>
<td>−88</td>
</tr>
</tbody>
</table>
(percentage of sales)
— Not available.

Note: Performance improvement is measured from the date of privatization until 1998 in terms of performance relative to the year of privatization.
Source: Bacon and Besant-Jones 2002.

More affordable access to electricity for the poor.

Little is known about the impact of reform on the poor because data has not been gathered systematically. The little evidence available indicates that the poor are often the last to benefit from increased access due to reform (Chisari et al. 2001). In most countries, the rural poor tend to be omitted because private operators are reluctant to serve low-income clients given that these markets are not financially viable on a freestanding basis. In urban areas, residential customers are more exposed than commercial users when connection costs increase due to reforms, and the social impact is especially acute when residential use has been previously subsidized.

Where reforms involved adjusting tariffs to cover costs, poor households were adversely affected, at least in the short run. In Poland, energy subsidies have tended to help the rich more than the poor (Freund and Wallich 1995). In Hungary, energy price reforms did not appear to have a regressive impact, suggesting that subsidies prior to reforms were not effectively targeted at the poor (Newbery 1995). In Guatemala, the social tariff introduced following privatization of the power distribution companies largely fails to reach poor households, and access to modern utility services remains highly inequitable (the richest 20 percent are twice as likely to have electricity connections than the poorest 20 percent). Electricity coverage is close to universal in urban areas, but reaches little more than half of rural households (Foster and Araujo 2001).

Most of the poor in developing countries have benefited little from private capital flows into developing country electric power sectors, because they do not have access to public electricity supply. In many developing countries, improving electricity access for the poor was overshadowed in the 1990s by the pressing need to add generation capacity. Existing customers, including low-income consumers and industries that provide employment to the poor, clearly benefited from the relatively quick elimination or reduction of supply shortages. However, lagging reforms in transmission and distribution constrained power delivery and expansion of access especially for the poor. Furthermore, investment and operating costs of rural energy projects are high relative to revenue potential, making returns unattractive to private investors. Meanwhile, few private rural energy and renewable energy investments have been commercially viable or competitive with investment opportunities in the generation subsector (World Bank 2003).

Reforms have led to improved access in some countries. In Panama, electrification coverage has grown significantly as consumer prices have dropped. New connections and the percentage of households having electricity access also grew in Chile from 64 percent to 95 percent in 1990–94; in Bolivia from 56 percent before the reform to 70 percent in 1997; and in Peru from 53% in 1993 to 70% in 1998.

Globally about 1.6 billion people lack electric power (IEA 2002b). Based on research findings that growth is good for the poor (Dollar and Kray 2001), the argument has emerged that addressing the generation supply constraint has led to GDP growth, which in turn benefited the poor. While this may be demonstrable in a macroeconomic context of trade liberalization and transition into market economies, the argument is less tenable in the sectoral context of private
capital flows into developing country electric power sectors suffering from transmission and distribution constraints on reaching the poor.
3 Lessons for Sector Governance through Commercialization, Regulation and Competition

Governance encompasses institutions and processes that influence the relationship between power companies and the state. It reflects the multiple roles of government as policy maker, utility owner, regulator, legislator, taxer and enforcer of property rights. It also reflects the multiple roles of power utilities as provider of public services, employer, corporate citizen and protector of shareholder values. The World Bank identifies four components to governance: efficient public sector management, accountability, a supportive legal framework, and transparent information flows.

Experience in many countries shows that the traditional corporate governance model of state control of service provision and revenue control does not provide the correct incentives and governance for providers of electricity services to meet consumer demands efficiently. The performance of many state-owned power utilities or their distribution offshoots has been undermined by highly distorted incentives and governance for utility managers, employees and customers under. Governments have controlled these power utilities closely through key appointments, tariff setting, investment approvals and financing, employment conditions and bureaucratic processes.

Governance is an important issue regardless of whether a utility is publicly or privately owned. The experience of private investors has been particularly bad in countries where governance was especially weak, for example in the transition economies of eastern Europe (Krishnaswamy and Stuggins 2002).

The importance of governance has emerged in a situation of large needs for investment in the power sectors of developing countries, yet low private sector willingness to invest in them. Only by reforming both sector governance and corporate governance can governments create an environment in which investors and operators face reasonable commercial risks, and in which consumers, regulators and other stakeholders honor the contractual rights of power suppliers to recover their revenues.

Change from the traditional governance model to commercially oriented governance is fundamental to achieving sustainable reform of power sectors in developing countries.

This review of the lessons for improving the governance of the power market therefore starts with defining the basic requirements for achieving commercial performance standards by power suppliers. This is followed by examining experience with the means for improving governance, first by alternative arrangements for regulating the power market, and then by various degrees of power market liberalization and the introduction of competitive pressures on power generators and suppliers. These two approaches should be viewed as complementary, rather than as alternatives, since outright competition for the business of retail power consumers is not generally a realistic option. Finally, the needs of the poor in developing countries must be factored into strategies for reforming power sector governance, and already some lessons of experience are available.

3.1 Governance requirements for commercialization

Poor governance of power service providers usually leads to operational inefficiency, limited access, financial loss and the need for public subsidy, often in an environment of widespread corruption. The persistence of high levels of non-technical power losses (theft, etc.) from state-
owned power utilities in many developing countries reflects widespread theft by all classes of consumers – from large industrial users to small residential users.

*Consumers are also the target of corruption by utility employees.* Poor consumers in particular are vulnerable when access to electricity supply and payment for electricity consumption is controlled by a monopolistic utility and its employees (Lovei and McKechnie 2000). A survey of corruption carried out in South Asian countries found that power consumers faced endemic petty corruption (Transparency International 2002). The survey reported that more than 60% of the electricity users surveyed reported irregular connection processes, and that direct payment to office staff was the dominant irregular practice. Bribes paid to get a proper supply and over-billing were the most common forms of corruption, with meter readers and linesmen identified as the key facilitators by means of direct extortion. Users considered the power suppliers lack of accountability and monopoly of service provision to be the major contributors this corruption. These users lacked the recourse of having a choice of service provider.

*Reform of governance arrangements should start with commercialization of power distribution and retail supply, rather than with wholesale power trading arrangements.* Reforms of governance in wholesale power markets cannot be sustainable when power purchasers in these markets suffer from acute financial difficulties because of poor governance. This is the situation in many developing countries. The priority is to increase the cash flowing into the power system from power users by reducing all forms of losses and improving the quality of service to commercial standards. This would enable all participants in the power supply chain up to generators and their fuel suppliers to improve payment discipline, thus fulfilling a critical requirement for achieving commercial performance in the sector.

*Commercialization includes irreversibly removing the management and development of power supply from political and bureaucratic control.* Efforts to improve incentives and governance for power service providers are not sustainable under political pressures and noncommercial business processes. Power service providers can only function commercially on the basis of respect for property rights and a legal framework that enables them to collect their revenues and penalizes theft and non-payment.

*Legislative action alone not enough to reform governance, even when supported by institutional and market restructuring under sector reform.* Improvement in governance is an outcome is often mistakenly assessed in terms of reform outputs such as enactment of laws, appointment of boards, incorporation of companies and so on. While these actions are objectively verifiable, they often give little indication of outcomes in terms of the quality of governance when political interference continues via informal mechanisms.

*The appointment of an independent and competent Board of Directors is critical for combating political and bureaucratic interference in the management of a power utility.* The board should consist of outside professionals of high standing and other knowledgeable eminent persons (rather than limiting board membership to a few civil servants and utility executives), and experience in Lithuania shows that this policy has a healthy impact on the corporate governance of the utility. If for some reason it proves difficult to improve performance with the existing set of managers or the Board, the alternatives of using management contracts or cooperation with or franchising from western utility groups could be considered as an interim measure (Krishnaswamy and Stuggins 2002).
Privatization would effectively change the governance arrangements for a power utility because the profit maximising interests of private owners differ from the vote winning and rent seeking interests of politicians and bureaucrats. Since a privatized utility is legally and functionally independent of the government, its owners can be expected to resist government pressure to pursue noncommercial goals in nontransparent ways as well as to push for commercial arrangements such as tariffs that fully cover costs.

Commercializing a distribution business cannot be achieved even under private ownership when politicians continue to interfere in the business such as by exerting patronage over jobs, and the government does not support measures necessary for commercialization such as prosecution of theft of power and power utility property. Private owners can only achieve commercialization by being able to control the board of directors and the labor force. The Indian state of Orissa’s experience with private participation in power distribution shows that changing sector governance involves more than a change of corporate ownership (Government of Orissa 2001).

Where privatization is not feasible because of daunting risks for investors, governments have options for improving the governance arrangements for their state-owned power utilities (Irwin and Yamamoto 2004). These options still require political commitment to achievement of commercial goals by the utilities, without which the utilities performance and their public services would continually decline. Hence the sustainability of this approach is a major concern, especially under the possibility of a change from a committed to a populist government that attracted votes by promises of subsidized electricity and reduced anti-theft efforts.

The scope for improving governance arrangements without privatization is shown by the experience of the Indian state of Andhra Pradesh. The state government launched a campaign in January 2000 to control theft of electricity from the state-owned power companies and to improve their revenue collection. So far the campaign has reduced losses from 38 percent in 1999 to 26 percent in 2003, and increased the collection rate to 98 percent. The campaign has focused on four measures: enacting a new law to address electricity theft, strengthening enforcement mechanisms, reorganizing the anticorruption function in the utilities, and reengineering businesses processes to improve management control and customer service (Bhatia and Gulati 2004).

The main governance requirements for power distributors are summarized in Box 3.
Box 3. The main governance requirements for power distributors

The main financial governance requirements are:

(i) Revenues from electricity sales, including subsidy receipts from the government, fully cover the costs of supply and distribution and generate a competitive return on capital employed.

(ii) Large cross-subsidies among consumption categories are eliminated under a series of regulatory orders.

(iii) Tariffs are set by a reasonably independent electricity regulatory commission on a multiyear basis under a legally credible statute supported by a legally and technically knowledgeable appellate tribunal for dealing with disputes between the licensee and the regulator.

(iv) Consumers receive good quality power supply that moderates their resistance to tariff increases.

(v) Utilities face the financial discipline of a hard budget constraint.

(vi) Government subsidies are efficiently targeted and transparently delivered.

(vii) Most consumption is metered accurately by distribution companies.

(viii) System technical and commercial losses are reliably estimated by distribution companies.

The main legislative governance requirements are:

(i) The legislative framework should specify that the supply of electricity is a commercial service available only to those who pay the bills for electricity supplied to them.

(ii) Utilities have the right in accordance with regulatory procedures to deny service to any consumer who fails to pay for service provided.

(iii) Procedures for the recovery of payment arrears are simple, fast and cost effective.

(iv) Theft of electricity is made a cognizable criminal offence that can be prosecuted quickly and punished accordingly.

(v) Politicians and their officials cannot interfere in these procedures and in court cases.

The main corporate governance requirements are:

(i) Utilities are able to combat fraud perpetrated by consumers and utility employees under the perception, sometimes fostered by politicians, that the utilities have weak property rights under common public ownership.

(ii) Politicians refrain from using of power utilities as a source of patronage for employment which undermines management’s control over the labor force.

(iii) Utility managements exert full authority over their employees notwithstanding public service employment rules and the activities of politically influential unions.

The main operating governance requirements are:

(i) Utilities are not subject to political pressure to delay or modify tariff filings and sometimes also on investment and procurement decisions.

(ii) Utility managements possess the full range of critical skills (finance, economics, human resources management as well as engineering).

(iii) Utilities have reliable information about their operating data from efficient management information systems.

Competitive power markets raise specific governance issues. The governance of the system operator should be kept independent of the market participants, as shown by the Californian experience (Besant-Jones and Tenenbaum 2001). Independence can be achieved directly by prohibiting market participants from having an ownership interest in the system operator and requiring that the system operator’s governing board be composed of non-market participants (i.e. non-stakeholders). Governance boards composed of stakeholders should not be too large or dominated by one or more classes of market participants. The system operator should monitor markets carefully and continuously for signs of trouble—such as unusual price movements that may indicate abuse of market power—and give the system operator the authority to penalize those who violate market rules.

3.2 Regulation of the power market

Economic regulation of the power market is the formal arm of governance that balances the interests of the participants – energy suppliers, users, and service providers – in the market. It should also take account of the interests of those who aspire to participate in the market –new
entrants that are either energy suppliers that want to sell their product or energy users that want access to the public power system. Economic regulation forms part of a broader regulatory framework that encompasses public safety, employment conditions and environmental safeguards, and more broadly the legal framework in which the power market operates.

Public regulation, as opposed to relying entirely on competition among private firms under general business regulation, has been and is the dominant form of power utility regulation. The following characteristics of the electricity supply industry make public regulation both necessary and difficult (Stern and Holder 1999).

- The assets are capital intensive and become sunk costs once invested since they cannot be profitably redeployed, and so investors need protection from expropriation.
- The electricity supply industry has considerable economies of scale and scope, especially in the network segments, which limits the number of firms that can support the power market viably. This means that governments cannot rely on the development of competition in the market to protect consumers from abuse of market power by these firms.
- The price of electricity services is highly political because these services are important for the welfare of households.
- The quality of electricity services matters for economic growth because these services are important intermediate inputs for other economic sectors.

Public regulation functions without competition in the case of a state-owned monopolist power supplier. But once private capital is introduced, governments have usually chosen to combine limited, transparent and arm’s length public regulation with competition to manage the power market. The balance between regulation and competition varies, with least regulation when competition occurs sustainably in the power market, and most regulation when competition is limited to periodic bidding for a monopolistic concession.

Public regulation works better with private investors because they respond more readily than state-owned entities to commercial incentives. These incentives can best be channeled in the public interest (including restraining abuse of market power against its customers) under a clear formal regulatory process, rather than by the informal oversight and non-commercial objectives that governments impose on their state-owned suppliers. One example is the use of a pre-set payment per connection to a private investor for meeting annual targets of new connections to the power system under rural distribution concessions, as in the case of Guatemala (Economic Consulting Associates 2002).

Regulation and ownership of power supply

Public regulation of power supply is necessary under any ownership form of the electricity supply industry. If governments are unable or unwilling to create effective regulatory governance arrangements, state ownership and financing of the electricity supply industry becomes the fall-back solution (Levy and Spiller 1994). Under state ownership, regulation of the power market has traditionally been carried out implicitly by governments in combination with their roles of policy maker, legislator, power supplier as owner, system operator and majority or only investor in the power sector, user of power services through its numerous agencies, and employer when power workers are subject to civil service employment conditions.
Price setting arrangements under state ownership of power suppliers usually results in severe distortions to electricity prices, especially low prices for households and influential consumer groups (such as irrigation farmers in India). Price setting tends to be a process of negotiation between government ministries, the supplier and influential consumers in which political considerations are as influential as financial requirements. The regulatory function is usually carried out by the line ministry responsible for the power sector under a command and control approach. This tendency can be observed in many countries in Asia and Africa. Once a government decides to attract substantial private investment to the sector, it is faced with the need to put regulation at arm’s length from its executive agencies.

A well designed regulatory system reduces the cost of private capital for the power sector. Such a system ensures that regulatory responsibilities for financially important decisions for the investors such as license awarding tariff setting are based on technical, rather than political, factors. Otherwise, private capital would be attracted only on costly terms to the country. This would be apparent by either high rates of return sought by investors, or mitigation of risk exposure at more competitive returns by high front loading of returns to equity, take-or-pay contracts as used in PPAs by IPPs for their first projects in many countries, and by sovereign guarantees or third party guarantees. The World Bank’s Partial Risk Guarantee, for example, can backstop a government’s commitment to a pre-defined regulatory framework and a process of dispute resolution, thereby helping to mitigate regulatory risk for private investors in electricity (Gupta et al 2002).

The development of capabilities and institutions to regulate power markets financed with private capital is an important part of sector reform. This development covers both regulatory governance (who does what under which laws, rules and procedures) and regulatory substance (how tariff levels and structures are established and approved, mechanisms for coordination of tariffs and subsidies and the establishment of quality of service standards).

The design of a new regulatory structure should take account of the political, legal and constitutional arrangements under which it has to function, just as the design of the new power market structure should take account of the economic, physical and geographical characteristics of the power market. It should be consistent with country endowments (including checks and balances), technical expertise, auditing competence and fiscal resources, as well as the economic characteristics of the power market (Kessides 2004).

The US model of regulation, for example, operates in a strong and well-established constitution, an administrative law code and a tradition of using the legal system to resolve issues. The UK model of regulation, on the other hand, relies on achieving compromises between parties, rather than resorting to the courts in the absence of a written constitution and a formal code of administrative law. In many European countries, regulatory systems operate within Napoleonic law codes with traditions of public service obligations (Stern and Holder 1999). In developing countries, regulatory systems tend to operate within legal frameworks modeled on one of these frameworks. Thus Latin America generally follows the European framework, Asia follows either the US or the UK frameworks, and Africa either the UK or European frameworks.

Developing and transition economies need to find an appropriate ways to balance the costs and benefits of regulation in their circumstances. Although they are generally following the US structure of independent regulatory commissions, they lack the legislative background and...
substantial resources needed to replicate the regulatory processes of U.S. style cost of service regulation developed for investor-owned vertically utilities.

**Regulatory credibility**

Attracting the long-term private capital needed to secure an adequate, reliable supply of electricity services requires credible regulation that safeguards the interests of both investors and consumers. Credibility covers a number of characteristics, particularly independence, transparency and accountability. The pressing need for this capital gives governments the incentive to improve the credibility of sector regulation.

The principal means for developing credibility is by establishing a designated regulatory agency that discharges its duties in a neutral and depoliticized manner between power suppliers and users. Failure to satisfy these requirements negates the purpose of creating the agency. For countries that are liberalizing their power markets, the regulator acts as a specialized competition agency in the competitive wholesale power market, and regulates services provided by retail power suppliers (prices, service standards, access, etc) to protect consumers’ interests and ensure that they benefit from competition among suppliers.

A regulatory agency offers a number of institutional advantages. It can attract and develop the highly specialized technical skills needed for this complex sector to relieve overstretched and under-resourced government departments of this burden. It can also use its powers of arbitration to relieve the judicial system of a heavy caseload arising from disputes and clarifications of electricity regulations, providing a faster and more flexible service than available under the formal, lengthy and costly procedures of the typically overburdened law courts in developing countries.

From the early 1980s to the present, 134 countries around the world – both OECD and developing – have set up separate regulatory agencies for their infrastructure markets as a prelude or in tandem with sector unbundling and private participation (ERM 2004). In the developing world, Latin America has advanced furthest, Central and Eastern Europe has also advanced far, Asia is advancing, and Africa is starting to make progress.

Independence of a regulator usually means both autonomy in its organization, procedures, processes and finances from political and bureaucratic interference, and from undue influence from regulated companies and consumer interests. Independence from governments can never be total because ultimately governments are responsible for providing this public good. Regulatory independence is a means to the end of establishing an institutional structure that meets the goals for regulation, rather than an end in itself. Furthermore, independence does not mean absence of accountability. A recent survey of private investors concluded that they rank as most important the stability and enforceability of laws and contracts, under which they look for independence of regulatory institutions and processes from arbitrary government interference (Lamech and Saeed 2003). A regulator needs to show independence to establish a track record that builds up its credibility.

A regulatory agency needs the legal status that gives it a substantial degree of independence from political and market influences. This can be achieved by a few key measures, of which the following are critical: making the regulator accountable to the legislators that provided its legal status, instead of to an executive ministry; funding it independently of government budget allocations, such as through a small surcharge on consumer’s bills or a levy on the utility’s
revenues in a process not open to diversion by the government (Kelley and Tenenbaum 2004); appointing commissioners on fixed, staggered terms with limitations on government’s powers to dismiss them; and limiting government’s ability to delay or overrule commission decisions (Tenenbaum 1995). Many developing countries provide for operational autonomy in the enacting legislation, which is followed in practice to varying degrees among these countries, but few of them meet the requirements for financial autonomy.

*Transparency in a regulator’s procedures and processes is critical for public credibility, especially for tariff setting.* A transparent tariff revision process at least helps unearth data that was shielded from public scrutiny, as in the case of Indian state electricity commissions. It also help develop public understanding of the issues involved, including their serious nature and the symptoms and sources of problems (Prayas 2003).

The powers of the regulator should depend on how much independence it is likely to have. If independence is likely, then the regulator can be given substantial decision making powers without undue risk of regulatory capture by one of the regulated parties. The reverse risk, that of excessive use of these powers, becomes the main risk, as was the case in Argentina and – according to some commentators – in the Indian state of Orissa. These risks are best managed within the checks and balances built into the broader legal framework.

Where the regulator is likely to be only semi-independent, then it may be least risky to give it just advisory roles, and vest rulemaking and enforcement powers in other agencies. This trade-off is an option for countries with little separation of legal and executive powers. In Asia and Africa, the new regulatory agencies have less decision-making powers and independence from government than those in Latin America and Central and Eastern Europe.

*A credible regulatory system requires more than a formally independent regulatory entity to safeguard the interests of private investors, especially in the critical early years right after it is created.* Experience shows that the development of robust regulatory frameworks and strong regulatory institutions can be hampered by a variety of constraints, in particular under-funding and a reluctance by governments to transfer real independence in decision making to regulatory authorities, even when required to do so by law. Private sector investors contend that a credible regulatory system requires more than a formally independent regulatory entity, especially in the critical years right after it is created. Regulatory independence, while important, is not sufficient to meet the goals of regulation (Bakovic, Tenenbaum and Woolf 2003).

**Contracting out of specific tasks can help utility regulators improve their competence, independence and legitimacy,** especially for newly established regulators that need external support for their initial start-up phase. Suitable tasks for contracting out include gathering information, monitoring compliance with existing rules, determining new rules and enforcing rules.

- **Competence can be increased** by providing access to specialised skills, mitigating the risk of regulatory obsolescence, and building core in-house skills through training.
- **Independence can be strengthened** by enabling the regulatory body to benefit from the reputation of an external agent, and giving the regulator a higher degree of control over who does the work, particularly in countries where there are constraining civil service rules.
• *Legitimacy can be established* in countries with weak or fledgling institutional capacity where external studies may be perceived to be more credible and can increase the transparency of the regulatory process.

Contracting out of regulatory tasks is particularly widespread in Latin America and Africa, according to a recent survey, but it is less prevalent among electricity and energy regulators than among water and telecommunications regulators in developing countries (Environmental Resources Management 2004). The functions most contracted out include monitoring compliance with physical and quality targets, monitoring compliance with quality parameters, and legal opinions. Most regulators contract out functions that are advisory/non-binding in nature, and few agencies use contracting out to produce binding inputs into the decision making process because the agencies are accountable by law for their decisions.

**Regulatory contracts**

Transitional arrangements may be needed to provide stability and credibility for a new regulatory regime, since many regulators begin performing their functions with the disadvantage of limited independence and capacity. Governments may have to play a major role in setting the initial terms and conditions of key regulatory instruments, since these are best established as an outcome of the transaction process with private investors.

Regulatory contracts can jumpstart new regulatory processes by helping to provide stability and credibility during the transition to regulatory independence. This is achieved by setting out details on key terms, such as initial price controls, in the key regulatory instruments (licenses or contracts) or by having clear tariff setting principles in the country’s legislation. This arrangement limits the amount of discretion that regulatory bodies have in setting prices and targets for key performance parameters in this situation, particularly during the initial years of public private partnerships where the private sector is investing substantial capital (Bakovic, Tenenbaum and Woolf 2003).

The credibility of regulatory contracts requires that the underlying principles and initial parameters of the contracts should be clearly specified in the country’s primary or secondary electricity laws (as in Chile, Argentina, Bolivia and Peru). A regulatory contract is less likely to survive if it is poorly specified or exists only within a stand-alone concession or license agreement with little clear support in national laws (as in Brazil).

A major design issue for a regulatory contract is which parties bear risks, especially risks from pass-through of power purchase costs, technical and non-technical loss-reduction targets, foreign exchange fluctuations, and obligation to supply. Under a regulatory contract or concession, the parties to the contract act as agents for their principals, and so it is the principals that bear these risks. The regulator acts for the electricity users served under the contract, the government acts for the citizenry, and the managers act for the investors and shareholders in the company that wins the contract. In addition, the government sustains the credibility of the regulator’s position (Stern and Holder 1999).

The risk of contract reopening poses a major risk for investors in the highly politicised conditions found in most developing countries, because these countries don’t have a tradition of separation of legal and executive powers, nor do they have well developed parliamentary and legal systems. This limitation applies particularly when such contracts involve many parties,
investment in sunk assets, and politically accountable governments that cannot or are unwilling to legally bind their successors. There is no economically perfect solution to this problem.

**Regulatory contracts do not displace the need for regulatory agencies.** This is because it is not possible to write enforceable long term contracts that can cover all necessary contingencies in a power market. Often events during the term of contracts lead to pressure to reopen them, which runs the risk of opportunistic behaviour by the parties to them. Regulatory contracts may also set out the terms and conditions incompletely, which can lead to problems between the regulator and the investors early in the life of the concession, as has occurred in the case of the electricity distribution concessions in New Delhi (Agarwal, Alexander and Tenenbaum 2003).

**Regulation provides elements that cannot be readily provided by contracts.** In particular, the presence of a regulator operating under a defined regulatory process helps deal with substantial renegotiations (Stern and Holder 1999). Contract features have been found to influence the incidence of renegotiation of infrastructure regulatory contracts in Latin America. Features that appeared to increase the incidence of renegotiation are awards based on lowest tariff, investment requirements specified in the contract, price cap regulation (see next section), a regulatory body not in existence, and the regulatory framework embedded in the contract (Guash 2004).

The presence of a regulatory agency allows for simpler contracts that are easier to monitor, enforce and revise. Under a regulatory contract, the discretion of the regulator is limited in areas that are known to deter investment, while the independence of the regulator is used to avoid uncertainties for investors created by political micro-management and changes of government or governmental policy. The objective is to define the trade-offs between the regulatory objectives of protecting the interests of both consumers and investors. Hence a regulatory contract specifies in one or more formal or explicit agreements the formulas and procedures that determine the prices that a distribution company will be allowed to charge for the electricity that it sells. These formulas can be based on either cost of service regulation or incentive regulation, or sometimes a combination of both. The key component of the contract is a performance-based, multi-year tariff-setting system.

A regulatory contract is sustainable only if the underlying economics are viable. The contract will not work if revenues are much less than costs. The gap must be closed by lowering costs, increasing revenues, or both. Investors must be protected, and the regulatory contract might need to be combined with transition subsidies. Even in those countries where effective independent regulatory decision-making has been achieved, regulators are not likely to follow policies that balance consumer and private investor interests where the financial, institutional and technical performance are poor at the outset, and the transition to commercial standards takes longer than expected.

The performance of regulatory contracts has been variable in the power markets of developing countries. Regulatory contracts have been combined with independent or partially independent regulatory commissions in many Latin American countries, and this combination has generally been successful in inducing and sustaining private sector investment in more than 60 privatizations of electricity distribution systems\(^8\).

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\(^8\) See Guash 2004 for an extensive bibliography on experience with infrastructure concessions in Latin America.
Regulatory contracts cannot absorb major economic shocks to the regulatory system. Long term PPAs with IPPs and long term contracts for distribution concessions in Latin America have been highly vulnerable to exchange rate shocks. But neither could any other regulatory system absorb such shocks. Since the time that Argentina, for example, abandoned its Convertibility Law in December 2001, leading to a major devaluation, government has overruled to date the regulatory commitment under concession agreements to allow pass through to the retail electricity tariff of the increase in resulting increase supply costs in its desire to protect the economic welfare of power consumers, at considerable cost to private investors in power distribution.

Regulatory contracts for power distribution resemble PPAs with IPPs for investments in power generation, and this familiarity appeals to private investors. But they are more difficult to negotiate and sustain than PPAs because of the large number of customers, the high visibility of the retail price and the need for ongoing investments. The experience in Argentina with regulatory contracts was similar to the pressure on IPPs from governments to lower the sale price of power under their long term PPAs in East Asian countries following the 1997 financial crisis.

Regulatory contracts also resemble long term concessions such as the French affermage approach that has been used for small power utilities in West Africa with generally disappointing results because one or other party failed to comply with its commitments under the concession. Unlike regulatory contracts, however, PPAs and concession agreements do not require an independent regulator when these agreements specify the investments to be undertaken. But governments often delegate their monitoring responsibilities to their regulator in the case of distribution concessions (as in the Latin American cases), especially when they have concluded many concession agreements (as may be the case with a horizontally unbundled distribution sector and with numerous off-grid concessions) because of the heavy monitoring workload.

Finally, since it will not be possible to anticipate all future events, there must also be robust and workable mechanisms for resolving disputes. Alternative dispute resolution mechanisms to going through local courts are often preferable, including international arbitration.

Incentive regulation

Under the incentive form of regulation, power suppliers are given explicit financial and other incentives to achieve certain performance goals as well as significant discretion on how to achieve the goals. Performance goals are typically to improve investment and operating efficiency or connect a target number of new consumers. This discretion is the main distinction between incentive regulation and old-style cost of service regulation. Another important distinction is that the link between a supplier’s authorized prices and its realized operating costs are weaker and less explicit under incentive regulation than under cost of service regulation.

Incentive regulation offers the following advantages over cost of service regulation.

- A stronger incentive to reduce costs, because the supplier keeps more of its gains under the weaker link between rates and costs.

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9 Incentive regulation was first proposed for infrastructure sectors in the U.K. during the 1980s (Littlechild 1983). In the U.S.A., incentive regulation is often called performance based regulation.

10 Sometimes called rate of return regulation.
• Lower costs of administering regulation plans, because these plans avoid the micro-management of the regulated entities and intensive data collection and authentication required under cost of service regulation.

• Helps power suppliers to adapt to competition, if and when some or all of their markets are liberalized, because it offers incentives similar to those that face firms in competitive markets.

_Price cap regulation has emerged as the most popular form of incentive regulation._ Even in the U.S.A., where cost of service regulation for electricity suppliers has prevailed since the early twentieth century, 28 electric utilities (about 10 percent of the total number) were identified in a survey as being subject to incentive regulation (Sappington et al 2001). An incentive regulatory scheme typically specifies a commitment period (such as five years) during which the regulated company can adjust its rate as long as, on average, its rates rise no faster than inflation less a productivity offset (which allows consumers to share in the productivity gains). A variant on this approach\(^1\) is to cap revenues, but this has the disadvantage for many developing countries of discouraging connections to new consumers because more profits can be earned by increasing sales to existing consumers under the allowable growth in sales revenue.

The policy and regulatory framework based on incentives should cover not only the entities targeted for privatization, but also the entities that are likely to remain under state ownership in the medium term, especially the naturally monopolistic segments. This principle applies even though incentive regulation is based on the fundamental assumption that the regulated entity responds to economic incentives, such as those which increase profits if efficiency targets are exceeded, yet publicly owned service providers generally do not respond strongly to economic incentives.

_Problems have occurred with incentive regulation._ If the regulator sets productivity offset too low, then the regulated firms can make super profits as they cut costs, but at the risk of arousing public ire and demands for price reductions, as occurred in the U.K. during the years following privatization of the electricity supply industry in the early 1990s. The rate freeze form of incentive regulation, under which a company cannot change its rates during the commitment period, is dangerous in the absence of provisions for pass-through of significant costs outside the control of the regulated firms, especially in the presence of other factors unrelated to the implementation of incentive regulation that provoke a crisis in the power market, as shown dramatically in California in 2001 (Besant-Jones and Tenenbaum 2001).

Well designed incentive regulation can deliver benefits to power suppliers and consumers by virtue of its relative simplicity, clear economic incentives, careful balancing of risks with rewards, and confidence about lasting to the end of the commitment period.

A common feature of incentive regulation schemes is their use of benchmarking, which involves comparison of a measure of actual performance against a reference benchmark performance. The yardstick form of this approach can be used to promote indirect competition among regulated firms operating in geographically separate markets, under which the performance of a regulated firm is compared against that of a group of comparable firms. The National Energy

\(^1\) There are other variants to incentive regulation which are much less common than price cap regulation (see Jamasb and Pollitt 2001).
Commission in Chile was the first to apply this approach to its electricity distribution firms. Benchmarking has been applied to many OECD countries for electricity distribution, but apparently to few developing countries – Chile, Brazil, Colombia and the Indian State of Orissa. 

Regulators have adopted a variety of benchmarking methods and techniques in incentive regulation. One approach to classify these approaches is whether they the benchmarks represent the best (“frontier”) practice or some measure of representative (“average”) performance\(^\text{12}\). (Jamasb and Pollitt 2001). The former focuses more strongly on performance variations between firms, and is suitable for the initial stages of regulatory reform when a priority is to improve performance. Average benchmarking may be used to mimic competition among firms with relatively similar costs or when there is a lack of sufficient reliable data and comparators for application of frontier methods.

Benchmarking is particularly useful for regulating small off-grid power systems, particularly in its average form, because it costs relatively little to administer under the wide variety of production technologies and local market characteristics found in these systems. Benchmarked cost levels will seldom be optimal, but this disadvantage is outweighed by ease of application. The essence of off-grid regulation should be “light handed” with a focus on lower but affordable service standards and fewer regulatory requirements and decisions than applied to the main power grid supply. Otherwise regulation becomes unworkable such as when using individual cost of service calculations for 119 cooperatives encountered in Philippines. In contrast, Bolivia applies service areas that permit the use of yardstick competition (Tenenbaum 2004).

### 3.3 Power market liberalization and competition

*Sector governance underlies the case for liberalizing power markets,* which is to better expose power suppliers to profit-related incentives under effective competition. Unbundling of integrated supply functions, competition, private participation and other reform elements that constitute liberalization of the power market are not ends in themselves, but rather intended to contribute to the achievement of broad goals for poverty reduction, economic growth and environmental sustainability.

*Competitive pressure on power generators sustains improvements to productive efficiency and makes producers share their efficiency gains with distributors and suppliers.* Without competition, regulators are responsible for pressuring these parties to pass some of these gains on to consumers. As competition develops, the focus of regulation evolves to monitoring for abuse of market power and ensuring that free and fair access to a separately owned transmission system is possible—for the established generators and distributors and for sales from consumers’ own-generation plant and by new entrant generators. Achieving this type of access regime will require regulatory intervention as well as market structure interventions, for instance, maintaining a strict separation between transmission, generation, and distribution activities.

*The initial liberalization of the Chilean and British power markets showed that radical restructuring of an integrated power supply chain of functions is feasible,* contrary to forebodings about disrupting technical coordination of a vertically integrated power supply.

\(^{12}\) The main frontier benchmarking methods are Data Envelopment Analysis, Corrected Ordinary Least Squares and Stochastic Frontier Analysis. The main average benchmarking methods are Ordinary Least Squares and Total Factor Productivity.
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 technically feasible while still ensuring proper coordination among these power-supply functions and maintaining security of supply to power users.

The drivers for reform (section 2.1) were supported by rapid changes in technology that occurred in both the generation of electricity and in the computing systems used to meter and dispatch power. These changes made new industrial structures possible, based on the introduction of competition in the electricity market, and in facilitating the unbundling of potentially competitive generation and supply segments from the transmission and distribution segments of the electricity supply chain. In other words, these changes reduced the transaction costs between these segments when structurally separated, although these costs remained higher than under vertical integration of the segments of the electricity supply chain.

Power market liberalization evolved in OECD countries to achieve further efficiency gains, even though the electricity supply industry in most of these countries worked well technically under vertically integrated, largely state-owned structures. OECD countries offered favourable conditions for liberalization because of their well developed power sectors, excess capacity, moderate demand growth, and the availability of natural gas (which allowed the entry of gas-fired generating plants into the power market at modest scale and relatively low cost). As a general rule, the larger the gas and power markets, the greater the scope for competition.

The restructuring and liberalization of the electricity supply industry in England and Wales produced a number of key lessons for other reformers (Newbery 2004).

- Competitive pressure on generators is needed to reduce costs, and this requires separating generation from transmission and distribution. All generating companies dramatically increased productivity and drove down costs immediately following restructuring. Whether these benefits will be passed on to consumers depends upon the intensity of competition - particularly the number of competitors and the existence of an open access wholesale market.

- These benefits were initially almost entirely captured as higher profits by the companies, since wholesale prices did not fall in line with the fall in costs. Eventually, prices fell under increased competition in the market following regulatory intervention that forced the companies to extensively divest substantial amounts of their generating capacity (Newbery and Pollitt 1997a).

- Regulators have to work hard to translate efficiency gains into lower consumer prices. Securing efficiency improvements in transmission and distribution requires tough regulatory price controls. In Britain, the performance of the distribution companies has improved after privatization relative to the counterfactual of continuing under public ownership, although improvements in the first five years under the initial price controls were modest, with most of the price cuts, efficiency gains, and transfers to consumers confined to the second and subsequent regulatory reviews (Pollitt and Domah 2000).

- Well regulated network companies can deliver adequate infrastructure investment. Britain has invested £16 billion in transmission and distribution since privatisation in 1990.
These economic lessons of liberalization are reinforced by evidence from the Nordic power market.

- Effective competition in generation under private ownership reduces costs and passes those cost reductions through to consumers in price reductions.
- Effective competition in generation requires regulated third party access to separately owned networks to lower the barriers to the power market.
- This in turn requires *ex ante* regulation by specialised utility regulators, as competition law alone is inadequate given the special properties of electricity.
- Cost reductions will be passed through to price reductions under many competing generating companies and a well-designed market for the various ancillary and balancing services, as well as adequate supply capacity to meet demand reliably. The number of actively competing generators may be increased by improving transmission links, as among the countries of the Nordic market. Otherwise, enforcing or encouraging divestiture of plant by the incumbent may be necessary, as in England and Wales.

The major concerns arising from liberalization of OECD power markets are that reforms have frequently failed to address issues of market power, and conversely that competition in the market may not be sustainable. Since generating companies benefit from a shortage of supply through higher prices for their output, they may therefore delay investment and increase scarcity. Easy entry and a profitable market can lead also to excess entry. Competition in the English electricity wholesale market drove prices to cover only just variable costs, which are only half total costs. The complex reforms involved in market liberalization also run risks of incurring substantial economic costs if they are imperfectly designed, as shown by the Californian electricity crisis of 2000.

A country’s reform design has to allow for its current stage of economic and political development and the size and features of its power market, because developing countries have a different risk-reward trade-off from the OECD countries. Most developing countries have less to lose since their electricity supply industries perform far short of technically proficient and commercially viable standards, even though the concerns about liberalization also apply to them. They can also obtain many of the gains from liberalization by less risky reforms than striving for full competition in the power market. In this sense, liberalization design is still work in progress all over the world.

Restructuring the electricity supply industry

The potential benefits of moving to more competitive trading arrangements, in addition to governance and regulatory motivations, usually underpin the extensive vertical and horizontal unbundling of service providers. The main issues for power market restructuring concern the extent of vertical and horizontal unbundling of the generation, transmission and distribution/supply segments of the market. This should be assessed on a case by case basis. Full unbundling is generally preferred in medium to large power markets to facilitate the introduction of competition at least in the market for wholesale trade in power.

The economic criteria for unbundling a vertically integrated power utility rests on whether the gains from unbundling exceed the costs of transactions among the separated segments. This matter depends on factors such as power system size and country institutional capacity to manage complex trading mechanisms. In the weakest countries with little prospect of cross-
border power trading, a key issue is whether arm’s length contracts among sector participants can be sustained. The case for unbundling is strongest in large power systems in countries well endowed institutionally. The case for unbundling gets weaker the smaller the system and the more undeveloped the institutional capacity.

*Countries with power systems that are too small to support competition in the market, and with little or no opportunity for cross-border trade in electricity, have a number of options for unbundling.*

- Privatizing the vertically integrated utility as a whole and regulating it until the market has grown substantially. This course of action runs the risk of private monopoly with weak regulation.
- Splitting the vertically integrated utility into two or three vertically integrated regional utilities, privatizing and subjecting them to regulation.
- Unbundling the existing utility into one generating utility, one distribution utility and one transmission and dispatch utility, privatizing generation and distribution, and retaining transmission and dispatch in the public sector, if needed. All three would be subject to regulation.
- Forming power trade areas with neighbouring countries and unbundling as in the previous option to the extent that makes sense in the larger regional power market. This trend is noticeable around the world with the Southern Africa Power Pool (SAPP) and in Central America, and the nascent regional power markets being developed in East Africa, West Africa, the Mekong and Southeast Europe.

*In small countries heavily dependent on imported electricity, as appears to be the case in Albania, the last of these options may be relevant.* In Moldova something similar was done, though the fragmentation of the small distribution system into five tiny entities with poor economies of scale is difficult to understand. In Tajikistan, the Bank and IFC, in a novel experiment, has recently promoted and financed a small NGO owned vertically integrated utility operation, on the basis of a long-term concession, in the remote and poor area of Gorno Badakshan. Under the circumstances of the country and the area, this is considered a reasonable solution.

*In some small power sectors, some level of vertical unbundling is likely to improve services and lower costs,* because it helps regulation of power service providers and even introduction of competitive pressures in the generation and supply markets (Table 6). Unbundling of accounts, staff and management should be the first step in this case to increase the transparency of price setting and facilitate benchmarking of costs and service standards, but full unbundling will be required to make these changes effective. These actions will also facilitate regulation by providing better information about costs.

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13 This utility will have a generating capacity of about 30 MW and serve 250,000 consumers with an annual sale of about 137 GWh.
### Table 6. Types of Vertical Unbundling

<table>
<thead>
<tr>
<th>Type of separation</th>
<th>Description</th>
<th>Effect on incentives to discriminate:</th>
<th>Effect on ability to discriminate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounting</td>
<td>The preparation of separate accounts on a defined basis for specific functions or services</td>
<td>None</td>
<td>Very little without effective regulatory oversight</td>
</tr>
<tr>
<td>Functional</td>
<td>Separation of different services into different divisions of the same firm, possibly with different management and information systems and prohibitions on the flow of business sensitive information between them.</td>
<td>None</td>
<td>Very little without effective regulatory oversight</td>
</tr>
<tr>
<td>Corporate</td>
<td>The separation of different services into different corporations, although owned by the same company</td>
<td>None</td>
<td>Very little without effective regulatory oversight</td>
</tr>
<tr>
<td>Joint ownership</td>
<td>Each competitive firm owns a share in the non-competitive agency</td>
<td>None for newcomers; eliminates for incumbents</td>
<td>Some, but requires regulatory oversight</td>
</tr>
<tr>
<td>Operational</td>
<td>Putting the operation – but not the ownership – of the non-competitive component under the control of an independent entity</td>
<td>None</td>
<td>Some, but requires regulatory oversight</td>
</tr>
<tr>
<td>Ownership</td>
<td>Separate owners of the competitive and non-competitive components</td>
<td>Eliminates</td>
<td>Some</td>
</tr>
</tbody>
</table>


The two main issues for horizontal unbundling is how many distribution companies and generating companies should be formed.

The need to attract investors with differing objectives to the power distribution business may favor a mixed configuration of distribution businesses, some large enough to attract strategic investors, some medium sized for consortia of foreign power utilities and local investors, and some that are almost entirely rural and are suitable for alternative institutional arrangements.

Experience in Europe and Central Asia shows that distribution systems should not be fragmented into small and unviable entities in the hope of enabling competition, as such entities do not attract serious investors. Some countries in this region fragmented their distribution systems into tiny entities, presumably to make the franchise areas coincident with the boundaries of local administrations. Georgia, Albania and Lithuania had to regroup their entities into much fewer larger entities subsequently, but still failed to create entities sufficiently large to attract private investors. In Moldova, a private investor acquired three contiguous entities out of five distribution entities, and the other two have not attracted investors. This experience indicates that investors are mostly interested in distributors with at least a million consumer connections and 2 TWh of annual sales (Krishnaswamy and Stuggins 2002).

Policy makers should anticipate that investors are interested in acquiring stakes in more than one distributor in a country as a means of spreading their overhead costs, as happened in India and Ukraine as well as in Moldova. In the first major privatization of distribution in India, namely in the state of Orissa in the mid 1990s, an Indian investor took three of the four...
distribution entities into which the state had been divided. A similar pattern emerged from the first round of distribution privatization in Ukraine.

The way that urban and rural markets are combined or separated is particularly important for configuring the distribution entities formed by unbundling a power utility. The choice of configuration for the distribution entities lies on a continuum that spans the following two basic options:

- Divide the distribution of power into a few mixed urban-rural contiguous entities to be privatized in their entirety.
- Separate the commercially stronger main urban centers (with some surrounding rural areas) from most of the weaker rural areas, and privatize the urban centers first to investors, leaving the remainder under state ownership until other ways are developed such as public/private partnerships.

The former option is preferable, if feasible, because it avoids “cherry picking” of the viable urban areas by investors, leaving the less profitable and unviable rural areas in state hands. Investors picked only the urban segments in Georgia, Moldova and Kazakhstan.

Separation of urban areas from other areas offers quicker privatization, and should be considered if the poor performance of the rural distribution areas puts off investors in mixed urban-rural distribution entities. But this approach raises the issue of whether to continue any cross-subsidies provided from urban to rural areas under the pre-reform structure, at least for a transition period. The privatization of urban-dominated distribution businesses leaves governments with the problem of how to commercialize the operations of the non-privatised entities. A key option should be to foster new entry to unserved areas, including by small-scale private providers and cooperatives.

Restructuring the generation sector for a competitive wholesale market should focus on control of market power whilst allowing investors to manage their risks efficiently, such as by having a portfolio of investments. Even in some large, high-income industrialized countries, for example Spain, where it would have been possible to create several approximately equal-size private generators, the structure chosen has created considerable market power. Some Latin American countries managed this issue better. Argentina deliberately designed the reform so that no firm could have more than 15% of the market, and Colombia and Brazil also kept down concentration of ownership. Two countries with very high ownership concentrations are Czech Republic and Chile (where one firm has 60% of its market). 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 (Bacon and Besant-Jones 2002).

In small countries, horizontal unbundling of their correspondingly small power sectors into tiny entities does not make sense, because this would lose economies of scale and scope without gaining the benefits of competition. Such countries require simpler solutions. However, both market growth and regional power markets can be facilitated by the unbundling of even relatively small systems.

The scope for developing countries to introduce competition

Only limited competition can work in the power markets of most developing countries for the following reasons:
• Fast-growing power demand – including demand for access to electricity supply from currently unconnected households - exceeds the available supply capacity for the foreseeable future, because the development of competition requires adequate supply capacity to meet all segments (base, peak, and shoulder) of the load on the power system.

• Many existing markets are too small\textsuperscript{14} to support the number of viable suppliers and purchasers needed for full competition in the market (Bacon 1995).

• Lack of diversity in fuel supply markets needed for competition among power generators.

• Domestic capital markets are too undeveloped to provide financing on the scale and terms needed for investment in supply capacity.

• Difficulty in controlling abuse of market power if suppliers are allowed to charge market-based prices.

• Policy makers have limited tolerance for the substantial price volatility that occurs with competition in the market.

The California power crisis of 2001 gave reform an unjustified bad image. The spectacular collapse of the Californian power market in 2001 (due mainly to design faults) has created the impression that liberalization of power markets is too risky for developing countries. The difficulties in implementing competition in power markets are also by now well known, as illustrated by California’s experience (Box 5). Full competition in the wholesale power market should therefore not be attempted for the foreseeable future in most developing countries.

Wholesale power trade models

Competitive markets for trading electricity in a wholesale power market fall into two basic designs.

The nearest design to pure competition in the market is a power pool based on price bidding with risk hedging mechanisms in short and long term forward markets. Power pools of ever-increasing complexity allow progressively more competition in the market (Barker et al. 1997). Power pools based on price bidding are found in Scandinavia, Spain, Australia, and some states in USA. The cost-based bidding approach used by South American countries (Argentina, Bolivia, Chile, Peru) allows competition for market share based on auditable costs of generators that give incentives to producers to reduce their costs (see Box 1 in section 2.1).

A simpler design is a series of bilateral contracts between buyers and sellers. Electricity distributors and large consumers buy from generators based on a well-designed set of market rules according to production costs, 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. 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".

\textsuperscript{14} About 100 countries have power markets of under 1000 MW.
Box 5. Lessons from California for Introducing Competition to the Wholesale Power Market

The California power crisis produced the following useful lessons:

- A mandated, deregulated, wholesale bid-based spot market is too complex to operate and too difficult to monitor for abuse of market power for all but the most advanced developing countries. It should be pursued only if certain conditions are likely to be satisfied. Some of these prerequisites are also required for other, more limited forms of competition. But the consequences of not satisfying these conditions are most dramatic and harmful in a mandated and deregulated spot market.

- It is simpler and less risky to impose obligations on generators and distributors to provide ancillary grid support services as a condition for being connected to the grid, rather than trying to synchronize separate markets for ancillary services with an untested spot energy market.

- Vesting contracts should be allowed as a form of insurance for distributors purchasing from a new spot market. A vesting contract that fixes the sale price for trade between existing or new generators and distributors for five or more years should be established before the market goes into operation. They also provide at least initial protection against market power.

- Close attention is needed to the starting points for reform, the particular problems that need to be solved, and the appropriateness of the reform path selected for solving these problems.

- A poorly designed power market will not operate properly, and inadequate attempts or delays in correcting market distortions will spill over into a serious financial crisis.

- There is no way out of a crisis in a poorly designed power market that is quick, painless or cheap. “Quick-fix” solutions to basic design flaws usually fail and may aggravate the problems. Any real solutions will impose heavy costs on stakeholders such as suppliers, consumers, shareholders, and legislators.

- Retail tariffs should be aligned with the costs of wholesale power. Regulators should avoid rate freezes that expose distributors to the possibility of an unsustainable squeeze on their cash flow occurring when rising wholesale power costs approach or even exceed fixed retail rates.

- Regulators should encourage and even require suppliers to allow large users to adjust their demand for power in real time, through smart metering and other means, since competition works properly only when prices are seen by both the demand and supply sides of the market.

- Power suppliers should be given regulatory scope to absorb through risk management techniques the high price volatility that can occur in spot markets for power.

- One or more commercially viable entities must have a legal obligation to provide adequate supplies for small retail power users who prefer to deal with a default supplier rather than shop around in the market for a supplier and face volatile spot market prices.

Source: Resant-Jones and Tenenbaum 2001

A competitive power market has been developed successfully in Latin American countries (see section 2.6), but tried unsuccessfully in other countries. In the latter category, many countries have been reluctant to provide nondiscriminatory or even regulated third party access to their wires services, even to large consumers. In Poland such access is not available for import of power from abroad. In Hungary such access is available only if the buyer buys at least 50% of his annual needs from domestic suppliers. In Ukraine a competitive pool never functioned as intended because it was introduced prematurely in an environment of extensive non-payment and reluctance by government to let the retail prices move up or down with wholesale market prices.
A key lesson from Ukraine’s experience is that a country suffering a major economic crisis should not pursue comprehensive liberalization of its power market (legislation, regulation, unbundling, competition, privatization, independent regulation). The Ukrainian economy was barter-based at that time, with salaries and pensions in arrears and consumers could not be made to pay for electricity in cash because the government condoned the culture of non-payment. In such an environment, the introduction of an advanced model of a competitive power market was bound to fail. Sector reform objectives should have been more modest and targeted to improving technical, institutional, and financial problems (World Bank 2003b).

The following lessons from experience should therefore guide developing countries in deciding how to introduce competition into their power markets.

- **Price-based spot markets** are generally too risky for small-to-medium-sized power systems, because these systems lack sufficient bidders to maintain effective competition.

- **Cost-based spot markets**, such as those developed in Latin America, offer a simpler and less risky alternative that can yield competitive benefits for medium-sized power systems.

- **Most developing countries should start with limited forms of competition** that can evolve to full wholesale competition through spot markets once the sector can manage full competition without uncontrollable market power. The creation of bid-based spot markets should generally not be their top priority.

- **Alternative trading arrangements to spot markets**, such as bilateral trading among multiple buyers and multiple sellers, should be considered for small power systems and as transitional arrangements until the benefits of a spot market are considered to outweigh the risks.

- **A temporary single-buyer arrangement can be considered**—but with strong reservations—in situations where bilateral trading or spot markets need substantial time for development of power purchasers and sellers.

- **Full retail competition should be kept to last**. Countries that have not achieved substantial household electrification should focus on encouraging competition to serve those who do not have access to electricity, instead of on retail competition for those who already have access.

**Competition, ownership and privatization**

For competition in the power market to deliver efficient outcomes, participants – under any type of ownership - need to face hard budget constraints, have access to inputs, especially labour and capital, on the same terms, and face contestable entry (and the possibility of exit).

State or municipal ownership has few advantages for generating contestable service provision, in contrast to imposing universal service obligations and other social objectives on publicly owned natural monopolies. Public ownership might be compatible with competition either with investor-owned utilities (common in the United States) or among state (or municipally) owned power companies (as in Norway). Since state enterprises can borrow at the risk-free government bond rate, they can undercut equally efficient private competitors. To the extent that protection from the threat of take-over or bankruptcy reduces the incentives for efficiency, the lower
apparent capital costs of public ownership may be dissipated in lower efficiency, and in practice competition among state owned service providers becomes weak or non-existent.

The alternative view is that the state can better pursue its interests by direct control through ownership than by indirect control through regulation, which potentially introduces inefficiency in governance through the principal-agent relationship, as described above. The latter view may carry some weight, however, when comparing public or private ownership of a natural monopoly such as power transmission and power system control, where the issue is primarily about the quality of regulation and incentives (Newbery 2004), in particular in countries with weak or undeveloped regulatory capacity.

Public ownership of potentially competitive network services could be retained with economic justification when it would be difficult to sustain competition that was sufficiently strong to pass on full cost reductions to domestic consumers, while meeting other objectives such as security of supply and universal service obligations. This could happen under rapidly rising demand for power, as in the case of China (Box 6). If consumer inertia blunts competitive forces by allowing suppliers to earn excessively high profit margins which are paid in dividends, or dissipate efficiency gains in higher marketing costs, wages and directors remuneration, then the social costs of full liberalization could exceed the benefits (Newbery 2004).

Box 6. The Chinese approach to competition among state-owned power suppliers

In China, competition is being introduced first in plant construction, operation and management. Regulation for competitive tendering for plant construction has been introduced, and competition is in fact strong even when confined to publicly owned Chinese firms. Progress in transparency and competition in operation and management appears to be slower, except for BOT bidding rounds involving IPPs. Other market experiments have been conducted at the provincial level, of which the most successful was carried out in Zhejiang Province and involved merit order dispatch for newly constructed plants based on the energy charges in the PPAs and a complex set of incentives and penalties for local energy suppliers. Experiments have also been conducted in inter-company and inter-provincial power trading. Further reform steps towards competitive power markets are envisaged in the medium to long-term.

The ownership regime in the (Chinese) power industry is undergoing progressive changes, although total privatization is not being considered. Ownership rights have been reallocated in order to increase the autonomy of power generating companies and to create new local generating enterprises. Some control remains, however, in the hands of the State Power Corporation as the ultimate owner of a majority holding in many of these companies.


Although both privatization and competition are critical and related elements of power market liberalization, there is a trade-off between ease of privatization and introduction of competition. Liberalization therefore requires that one of these elements is given priority over the other for the reform strategy.

If competition is the priority, privatization becomes more difficult, as there must be constant post privatization vigilance needed to prevent the privatized utilities from anti-competitive behavior, through holdings, acquisitions and mergers. Cross ownership between generating and distributing companies (especially when the wires business and supply business is bundled together) has to be prohibited – or severely limited - from the beginning and guarded against
after privatization. When distribution is unbundled into supply and wires business, some cross ownership between generation and supply business may be tolerable, as seen from the example in UK. In a competitive model of this kind, the generating plants have to take full market risk and distributing utilities have to face the risk of uncertain supplies. Under such conditions it is more difficult for the investors to access long term debt at reasonable costs and therefore privatization becomes somewhat more difficult.

*If ease of privatization is the priority because competition in the power market is not feasible under present conditions in the country and the power sector, then restructuring of power supply should focus on management of investment risks for private investors.* The single buyer model (model 2 in section 2.2) removes most market risks and involves little sector restructuring, but it carries regulatory and political risks for investors. A country that wants to attract private investment under limited competition in the power market through bilateral trading, can unbundle its power supply structure but allow limited cross-ownership between generators and suppliers to help investors manage risks. Lack of clarity for this kind of choice resulted in difficulties in Georgia and Kazakhstan where, despite announced interest in competition, some investors have been allowed to acquire generation and distribution facilities in the same areas. Had these areas been privatized on a clearer basis, privatization may have been faster and privatization receipts greater.

*Although the single buyer model is easier to implement than other structural models, it is used as an interim step for moving towards a competitive model.* Governments are often reluctant to support upward revisions of retail tariffs, and when retail tariffs are not raised correspondingly or in time, the financial viability of the state owned single buyer is eroded, as the generator gets his guaranteed contract price and as the distributor gets his guaranteed margin. Often the single buyer is compelled to buy power at high prices and sell it at lower prices. Hungary represents the most prominent example of this kind of situation (Box 7). The government has been reluctant to allow the retail prices to rise to the full extent, compels the single buyer to reduce wholesale prices and compensates the single buyer through direct budget subsidies.

*The single buyer model also impedes a move towards a competitive market model.* The rigidities associated with the PPAs with their guaranteed “take or pay” provisions create significant stranded costs when the market moves to a competitive model and makes such a move difficult and unpalatable to the consumers, as the stranded costs are recovered from consumers as a surcharge to the regular tariff. These costs pose a substantial challenge to regulators (Arizu, Maurer and Tenenbaum 2004).

*Bilateral trading is suitable for succeeding the single-buyer model on the grounds of simplicity and speed of implementation.* It should start once merit-order dispatch of generators is established, metering for measuring energy traded under these contracts is in place, and settlement arrangements are in force. Each distributor is financially responsible for its own contracts. Settlement for the contracted power would also be bilateral and only the value of the power sold for the balancing pool would pass through the wholesale market settlement procedures and be subject payment risk. Although this arrangement does not generate competitive pressures in the power market, it is a first, necessary step to competitive trading arrangements.
Box 7. Single buyer models adopted in Eastern European power markets

A market structure based on a single buyer model had been adopted in Hungary, Poland and other countries as an interim measure before moving to a fully competitive pool. Under this model, the state owned transmission and dispatch company buys power from generating companies on the basis of long term and short term power purchase agreements (PPAs) negotiated with each producer and sells electricity at one single pooled average wholesale price to all distribution utilities and the large consumers eligible to buy directly from the wholesale market. The retail price for end consumers is regulated on the basis of adding a distribution charge to the wholesale price. Long term PPAs (generally 10 years or more) and short term PPAs (one year or less) are covered by “take or pay” provisions guaranteed by the state. The market risk is thus fully transferred from the generators to the single buyer, who is obliged to pay the generator for the power not purchased when the demand declines. Thus during periods when demand lags behind contracted quantities, the average wholesale price per kWh tends to rise, which necessitates the upward revision of retail tariffs. The wholesale price may also rise on account of other reasons such as increased fuel prices, exchange rate variations, etc. for which the prices in PPAs are usually indexed.

Russia and Ukraine operate wholesale electricity markets on a modified single buyer basis. No direct contractual link exists between the generators and distributors. Generators sell electricity to a regulated prices, and the wholesale market entity supplies distribution utilities at the pooled average wholesale market prices. This kind of arrangement lends itself to abuses. When supply is less than demand in the market, the wholesale market entity can be pressured by government to allocate power to favoured large users and distributors, instead of following the agreed algorithm. Likewise, when the demand is below available supply, the wholesale market entity can be pressured to allocate demand to favoured generators such as the coal-fired plants (to appease the strong mining lobby). It can also be pressured to allocate demand among all generators to ensure that every plant is kept working and employment in the plants is sustained, so that uncompetitive plant are not faced with bankruptcy. These practices distort least cost dispatch by partial loading of the thermal plants that reduces efficiency and increases fuel consumption. Further, in an environment of extensive nonpayment, the wholesale market is unable to collect dues from the distribution utilities and settle the dues of the generating companies. The wholesale market has also been known to link distributors to generators arbitrarily for purposes of payment. In an atmosphere of non-payment and selective payment, such arbitrariness can lead to corrupt practices. There seems to be a clear need to allow direct bilateral contracting and settlement between the distribution utilities and the generators, especially when the payment discipline is not fully restored.\(^1\)

Source: Krishnaswamy and Stuggins 2003

3.4 Power sector reform and the poor

Access to electricity service by the population remains low in South Asia and Sub-Sahara Africa, and the proportion of the population with access has actually declined in many Sub-Sahara African countries. Over the next 20 years, at the current rate of connection to electricity, another 450 million people will join the 1.6 billion who today lack access to electricity. To meet the minimum needs of these 2 billion people, 100 million people need to be connected each year for the next 20 years - compared with 40 million a year over the past twenty years (IEA 2003b).

Although power sector reform in developing countries should support poverty alleviation, it is generally perceived to provide limited support on the grounds that most of the poor do not access to public power supply. The focus on commercial performance by power suppliers that comes with reform - especially through competitive pressures - is also viewed as detrimental to
the interests of the poor because this focus reduces the scope for addressing social objectives through cross-subsidies from better off consumers to poor consumers. These perceptions should not be valid, however, in a well conceived reform programme, because reform offers the opportunity to introduce new ways for expanding access to electricity supply by the poor, and it also helps target subsidies efficiently on the poor in place of current approaches that largely favour the better off consumers instead of the poor. Indirectly, reform should also help the poor by allowing governments to redirect fiscal resources no longer needed to support ailing power utilities to expand social programmes that benefit the poor.

*Lack of access is far more prevalent in rural than in urban areas.* In Sub-Saharan Africa only 8 percent of the rural population has access to electricity, compared with 51 percent of the urban population. A similar disparity exists in South Asia, where only 30 percent of the rural population has access, compared with 68 percent of the urban population. Moreover, four out of five people without access to electricity live in rural areas of the developing world, mainly in South Asia and Sub-Saharan Africa.

*Unless efforts are targeted at urban areas as well as rural areas, much of the urban poor will not gain in access to electricity* (Saghir 2004). Over the next three decades nearly all of the growth in population is expected to occur in urban areas (United Nations 2001). Fast population growth, rapid urbanization, and rising demand for electricity are over-loading infrastructure capacity and creating strong demand for new investment.

*Unless electricity can be produced and delivered more cheaply than presently, it will be unaffordable without subsidies for the poor.* The costs that matter are not only the unit energy costs, but also the costs of extending the network-into an urban slum, for example, or to a rural town. The high cost in terms of each unit of energy sold of extending a power network can be a major barrier to access for poor households and small or isolated communities. As a result it is the urban poor who stand the greatest chance of benefiting from power sector reform that brings down the costs of network extension. For the rural poor, alternative solutions, including mini-grid services, are likely to be required (Powell and Starks 2000).

*The challenge for rural areas is to devise policies for creating the entire energy infrastructure network, developing new power service providers, and ensuring that their business models are economically sustainable and financially replicable.* Rural areas often lack any infrastructure for providing energy services – whether power or other modern forms of energy. Because the remote locations and low density of demand raise the costs of electrification to unaffordable levels for rural users, the main policy issue is whether to subsidize capital costs for rural grid electrification or develop off-grid solutions. Both options require careful design and skillful implementation.

*In contrast, the main policy issue in urban areas is to support or improve the power infrastructure and provide adequate regulatory guidance for enabling power service providers to extend services to the urban poor.* This is a matter first and foremost of getting the policies

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15 The source of this projection is “World Urbanization Prospects: The 2001 Revision”, United Nations Department of Economic and Social Affairs - Population Division, which states that "Virtually all the population growth expected at the world level during 2000-2030 will be concentrated in urban areas. During that period the urban population is expected to increase by 2.1 billion persons, just slightly below the 2.2 billion persons that will be added to the world population."
right. The infrastructure is generally already in place, since most urban areas already have power service providers who are already serving better-off populations. Power companies therefore face modest demands for new capital investment, such as extending the grid to a new peri-urban area, relative to the cost of extending supply to new rural areas. But even with the lower capital costs and higher incomes in urban areas, poor people still often cannot afford the connection fees or monthly rates.

Sometimes electricity service providers neglect the urban poor simply because there are genuine business obstacles to serving them, such as low sales volume per connection and unpaid bills. Regulators can help by formulating a supportive policy, for example, by allowing electricity service providers to charge different rates, using subsidized rates for poor customers and higher rates for affluent, high-volume customers to make up the total revenues needed to cover the providers’ total costs.

Experience shows the importance of removing institutional and regulatory barriers, designing subsidies carefully, ensuring local involvement in the design and delivery of energy services, and protecting the poor during reforms. This experience applies to both rural and urban settings. Poor institutional and regulatory frameworks can create serious obstacles to the delivery of electricity services.

- Policies may impede the flow of private finance to the power sector and discourage innovation in service delivery methods. In many countries, for example, it is illegal for local private or cooperative generation and distribution enterprises to enter the power market.
- Regulatory frameworks often raise the biggest barriers to decentralized options for electricity supply, including advances in alternative power technologies for locations not served by electricity and fuel distribution networks.
- Poorly formulated taxes and subsidies often undermine electricity service markets by favoring one fuel over another, giving consumers distorted price signals and creating disincentives for entrepreneurial solutions to electricity supply.
- Power sector reforms designed and implemented under top-down approaches that allow users little say in the design and delivery of electricity services can end up hurting - rather than benefiting - the poor.

Often, one or more of these issues pose the biggest obstacles to extending access to electricity services to the poor.

Power sector reform should include opening up electricity markets. Macroeconomic policies should avoid discriminating against or favoring particular power technologies. Price-distorting subsidies and taxes should be eliminated - though well formulated and intelligently implemented subsidies are needed that genuinely benefit the poor and yet avoid creating disincentives for electricity service providers. Regulatory policies should allow rival technologies to be selected on the basis of their economic merits, and regulatory or market barriers should not discriminate against any technologies.

Opening the electricity markets to entry by new service providers would involve the development of private, community, or cooperative distribution companies that are responsive to consumers. A range of business models should be considered for such participatory approaches that includes large-scale competitive licensees or sub-licensees, rural electric cooperatives and competitive
licensees (rural energy service companies), models based on various small market service providers, various community-based models, solar photovoltaic or other individual customer system providers, and management contracts and other limited investment models.

The approach to extending access to electricity to rural customers far from the grid is still subject to experimentation. But some models have had some success, including the dealer model, the concession model and the retailer model (Box 8). Under these models, suppliers could provide a range of services besides power supply, including metering and billing, rehabilitation and maintenance, system improvement, quality improvement and demand-side management.

**Box 8. Three models for providing off-grid electricity**

The **dealer model** centers on developing dealers that can sell equipment (such as photovoltaic systems) to people living far from the grid. Many countries already have retailers that serve rural areas, but they are typically weak and undercapitalized and serve limited territories. Programs based on this model have tried various ways to strengthen dealer networks, with mixed results. In Indonesia such a program failed in part because it was implemented just before the financial crisis. But it had become evident that participating retailers preferred to sell photovoltaic systems for cash rather than providing them on a lend-lease basis. In Sri Lanka a project started out successfully, but multinational companies soon took over the local retailers.

The **concession model** is aimed at minimizing subsidies and encouraging private sector participation. The model depends on regulation by contract more than by market forces, but it helps to ensure that projects achieve scale economies. In Chile and Argentina, for example, competitive bidding is used to award franchise rights for rural service territories to concessionaires providing service for the lowest subsidy. Concessionaires can choose from a range of off-grid technologies, though photovoltaic systems are expected to be the most cost-effective choice in many cases. Users pay a connection fee and monthly service tariff (set by the government), and the government pays the concessionaires a declining subsidy determined by their contract (Jadresic 2000).

The **retailer model** involves a decentralized approach to providing electricity to households without access to grid service. A community, organization, or entrepreneur develops a business plan for meeting local demand for electricity, then submits the plan to a project committee (Energy Alternatives Africa et al. 1999). If the committee approves the plan, it grants a loan or subsidy for developing the business. The retailer uses a fee-for-service arrangement to recover costs, repay the loan, and earn a profit. This approach ensures significant local involvement and consumer choice.


One key issue is which model may work best in different areas. Therefore a strategy that has liberal entry regimes may allow different approaches to develop for meeting differing circumstances.

These models should have the potential to be scaled up, and they may face constraints from financing for subsidies, technical assistance inputs, and the pace of overall sector reform. For example, in the power deficit situations that many developing countries face, expanding grid connections is of little value if the available bulk power supply cannot fully meet the demand on the power grid.
Decentralised suppliers need financing, monitoring and technical assistance, preferably from an institution that focuses exclusively on the problems of decentralized power supply and rural electrification.

These various approaches to enhanced rural electrification will also require a clearer and more supportive regulatory system. More work needs to be done on creating a model rural regulatory system that is not simply a clone of the regulatory system that is emerging for possible private licensees of the existing urban and peri-urban distribution systems. The following regulatory issues will need to be addressed.

- **Simpler legal mechanisms for extending electricity service** to unserved or poorly served customers (that is, reducing the legal barriers to entry).
- **Affordable service standards** for rural customers.
- **Wheeling charges** that facilitate the creation of multi-village power systems as a possible near-term alternative to power supply from the main grid operator.
- **Fair terms for providing backup support from the grid** for multi-village power system operators to maintain supply.
4 Lessons for Sector Planning, Pricing and Investment Financing

4.1 Government’s policy coordination functions

4.2 Electricity pricing and subsidies

4.3 The conditions required to attract and sustain private investment
4.4 Managing the Sector Reform Transition

Importance of starting conditions

Importance of sustained political commitment to the reform program.

Sequencing and pacing of reforms

Government and multilateral support
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