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THE
WORLD BANK'S
ROLE IN THE
ELECTRIC POWER
SECTOR

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The World Bank's Role in the Electric Power Sector

Policies for Effective Institutional, Regulatory, and Financial Reform

*A
World
Bank
Policy
Paper*

*The World Bank
Washington, D.C.*

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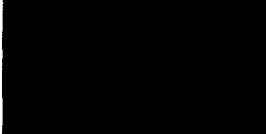
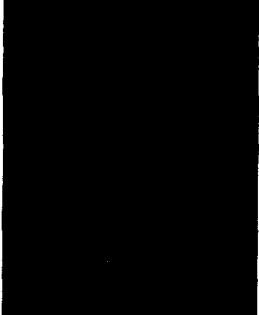
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Foreword




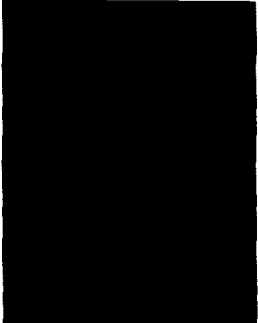
This policy paper is based on the World Bank Industry and Energy Department's ongoing policy and research work, which (i) examines experiences of industrial countries and the Bank's borrowers in developing their power sectors, (ii) analyzes issues facing these sectors, and (iii) describes options for dealing with these issues in developing countries. The paper is supported by a large body of research, including the Bank's recent work on governance and public-sector management, the Latin America and Caribbean department's regional review of the power sector, the Operation Evaluation Department's review of power lending in Colombia, the Asia region's study of private investment in power and coal, the Africa region's analysis of Sub-Saharan power sector successes and failures, and the World Bank companion policy paper, *Energy Efficiency and Conservation in the Developing World: The World Bank's Role*. This paper has also benefited from extensive outside consultations with developing- and developed-country government officials, utility managers, academics, researchers, and nongovernmental organizations.




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Glossary



BOO/BOOT schemes

Build-Own-Operate (BOO) and Build-Own-Operate-Transfer (BOOT) schemes are methods by which private sector participation in the power sector is encouraged. Under these approaches, a project company under private ownership, or a joint venture with a minority public participation, is set up to plan, finance under limited recourse, design, construct, and operate power generation facilities. In a BOOT arrangement, ownership of the facility is ultimately transferred to another entity after a specified period of operation.

Country commitment

Commitment must be judged on a country-by-country basis within the framework of a country-assistance strategy around the themes of significant progress toward needed reform and no more "business as usual."

Demand-side management

Identifying and implementing initiatives that improve the use of energy-supply capacity by altering the characteristics of the demand for energy. DSM involves a mix of pricing, other load management, and conservation strategies designed to increase the incentives for a more efficient use of energy.

Energy-efficiency improvements	Any measure that results in the delivery of any energy service with a reduction in energy consumption. Thus, carrier substitution or fuel-switching measures that lead to reductions in energy demand also become examples of energy-efficiency improvements.
Energy end use	Energy applications such as motive power, lighting, process heat, water heating, refrigeration, air cooling, cooking, and so on.
Integrated energy strategy	An interrelated set of measures that points the energy sector toward the most efficient, equitable, and environmentally-benign resource use. The strategy requires decisions on both the energy supply and demand side about sector structure, institutions, ownership, financing, fuel availability (coal, oil, gas), technology availability (import restrictions), structures of end-use markets, pricing policy, standards, service levels, and so on.
Integrated energy resource planning (IERP)	Primarily a U.S.-type planning process whereby utilities (and in the U.S., their regulatory commissions) evaluate available demand- and supply side-options to provide energy services (including purchased power) and determine an optimal energy service strategy, given economic and environmental factors. The essential concept of IERP is the equal treatment, or integration, of energy-based and conservation-based energy services. Planners attempt to rank by cost all the different energy supply and end-use technologies, processes, and programs that might be used to provide energy services and implement them beginning with the lowest-cost opportunities.
Load factor	A key measurement that compares a utility's average kilowatt-hour load to its peak, or maximum hour's usage, in a given year. A high load factor means greater plant utilization, since a company must build capacity to meet its peak demand, not its average demand.

Load management	Any effort to control loads by economic incentives, direct interventions, or new technology. Shifting load from peaks to valleys, or simply shaving the peak, defers capacity additions and transfers load from high cost, inefficient peaking generation to more economically efficient base-load units.
Marginal cost	The increase in the total costs of an enterprise caused by increasing its output by one extra unit. Marginal cost pricing is the setting of the price of an item equal to the cost of producing one extra unit of the item. Marginal cost represents the opportunity cost, or the total sacrifice to society, for producing an item. Long-run marginal cost is the cost of meeting an increase in consumption, sustained indefinitely into the future, when needed capacity adjustments are possible. In the long run, an increase in demand will result in a corresponding increase in the operating costs as well as in the capacity costs.
Peak pricing	The setting of higher prices than average when supplying services during a period of peak demand. Enough electricity capacity must be installed to satisfy demand at peak times, because, in general, electricity cannot be stored. At off-peak times the cost of electricity is lower at the margin than at the peak, at which less-efficient power stations have to be switched in to meet the demand.
Regulation	The supervision and control of the economic activities of private and arms-length public enterprises by government in the interest of economic efficiency, fairness, health, and safety. Regulation may be imposed simply by enacting laws and leaving their supervision to the normal processes of the law, by setting up special regulatory agencies, or by encouraging self-regulation by recognizing, and in some cases delegating powers to, voluntary bodies.

1

Summary and Conclusions

The power sector in most developing countries consists of a single national electric utility operating as a public monopoly. This structure is partly based on the view that electricity is a strategic and publicly-provided good and that people have a right to power at low prices. Over the past thirty years this public monopoly approach has facilitated expansion of power supplies, captured technical economies of scale, and made effective use of scarce managerial and technical skills in the early years.

World Bank lending has largely supported the state-owned monopoly power utilities with the principal objective of helping provide the basic infrastructure required by the directly productive sectors (see World Bank Operational Manual Statement 3.72, published in 1978). The main components of the Bank's power lending strategy have been to (a) develop sector institutions; (b) mobilize local resources for expansion through appropriate power pricing and utility financial management; (c) improve sector planning by emphasizing least-cost investment; and (d) help governments organize foreign exchange cofinancing, albeit with repayments publicly guaranteed. During the 1980s the Bank's lending strategy aimed to improve economic efficiency and financial sustainability in the sector by encouraging least-cost planning, marginal-cost pricing, international accounting standards and practices, rates of return on revalued assets sufficient to provide a reasonable level of self-financing, and international competitive bidding. The Bank also tightened its policies on environmental and resettlement standards and implementation arrangements. These changes were reflected in the power sector support strategy paper in 1983 and the power sector Operations Directive of 1987.

The World Bank's lending for the power sector in developing countries through FY91 was about \$40 billion (about \$75 billion in 1990

prices)¹ or about 15 percent of total Bank lending. In spite of the impressive expansion of power systems in developing countries and despite the Bank's persistent dialogue with borrowers, the overall technical, institutional, and financial performance of power utilities in most developing countries has deteriorated. There are several examples of efficient power sectors and many successful individual projects; but a review of World Bank lending for electric power confirms a declining trend in the sector's pricing, financial, technical, and institutional performance, mainly due to governmental failure to address the sector's fundamental structural problems.

Over the period 1979–88, average real power tariffs in developing countries declined from 5.2 cents to 3.8 cents/kWh, quality of service deteriorated, technical and nontechnical losses and fuel consumption continued to be high, and poor maintenance of plants persisted. Inadequate metering, billing, and collection were the result of insufficiently commercial operations and lack of enforcement. While institution building (training of power utility staff, modernization) has continued to progress, conflicts between government's role as owner and its role as operator of utilities have affected sector performance. Opaque command and control management of the sector, poorly defined objectives, government interference in daily affairs, and a lack of financial autonomy have affected productive efficiency and institutional performance.

Financial performance, as measured by indicators such as the rate of return on revalued assets, self-financing ratios, and the level of overdue accounts, has also declined. On average, rates of return have fallen from levels averaging about 9 percent before the mid-1970s to less than 5 percent in 1991. Self-financing ratios on average were only 12 percent of investment requirements in 1991, against targets of between 20 to 60 percent; and the actual number of days receivable increased from seventy-seven days during 1966–73 to 108 days in the 1970s to 112 days in the 1980s. The overall average of accounts receivable by 1991 was ninety-six days compared with the general Bank target of sixty days. Developing countries' deteriorating macroeconomic situation and the debt overhang of the 1980s exacerbated these financial problems and worsened debt service coverage.

In the 1990s the continuing macroeconomic difficulties of many developing countries will severely reduce the availability of public resources to fund planned power sector investment programs. Furthermore, the changing global environment of the 1990s and the competition for access to financial resources underscore the need for the efficient utilization of power sector resources.

Under these circumstances, neither the developing countries nor the Bank can continue with a "business as usual" approach to managing the

power sector. In the absence of new approaches to restructure and evaluate sector management on the basis of commercial principles, with enterprises distanced from excessive government day-to-day management, and with clear strategies for generating confidence for new entrants, it is unlikely that the required power sector investment can be mobilized in the 1990s.

A number of developing countries are already changing the way they do business in the power sector. Examples include Korea, Malaysia, and Philippines in Asia; Argentina, Chile, and Mexico in Latin America; Turkey and Eastern European countries and Côte d'Ivoire, Guinea, Ghana, and Malawi in Africa. Given the large capital requirements and ingrained sector inefficiencies, there is an urgent need for the Bank to encourage and support these evolving business methods and commercial structures.

Many governments have also attempted to use the power sector and other publicly-provided infrastructure services to address issues of social equity. Experience has shown that such policies are costly and ineffective ways of dealing with these issues. Subsidized power has further softened budget constraints on power utilities, and the resulting large deficits have usually been financed from regressive general taxes. The power shortages that inevitably result from the inability to finance expansion to meet increased demand mean that some form of rationing is required and, just as inevitably, power supply to the poor is usually the first to be rationed. Clearly, there are much more effective means for addressing social equity issues overall than through power sector subsidies.

This paper focuses on the interrelated institutional, regulatory, and financial reform issues that are essential in improving power sector performance. The Bank's evolving role in addressing power sector needs in developing countries is a natural extension of the Bank's work on governance, public sector management, and ongoing structural adjustment reforms. This paper does not specifically address issues of technology and fuel choice. These issues and their environmental implications, and policy issues related to the rural fuels chain, will be addressed separately in subsequent papers. Issues related to the end-use efficiency of electric power are addressed more completely in a separate Bank paper, *Energy Efficiency and Conservation in the Developing World: The World Bank's Role* (1993).

Guiding principles for Bank support of power sector restructuring programs are summarized below. Given the range of regional and country situations, however, these principles will need to be translated into specific action programs at the individual country level and be part of the Bank's agreed country assistance strategy.

Transparent Regulation

A requirement for all power lending will be an explicit country movement toward the establishment of a legal framework and regulatory processes satisfactory to the Bank. To this end, in conjunction with other economy-wide initiatives, the Bank will require countries to set up transparent regulatory processes that are clearly independent of power suppliers and that avoid government interference in day-to-day power company operations (regardless of whether the company is privately or publicly owned). The regulatory framework should establish a sound basis for open discussion of power sector economic, financial, environmental, and service policies.

The dual role of the government as operator and owner of utilities has drawn governments into day-to-day interventions in power sector operations. There is therefore a need to set up some form of regulatory body as part of a broader governmental effort to redefine the respective roles of government, utility, and consumers. This implies a shift away from the monolithic type of governmental management and toward more decentralized and market-based systems. Government would retain responsibility for setting objectives and articulating overall policies and for planning and coordinating sector development. It would also establish the legislative and legal framework to protect the interests of the various stakeholders and the public. But regulatory approaches need to be established that appropriately balance protection of the public interest with the need for enterprise autonomy. This may require regulatory bodies independent of both government ministries and enterprises themselves.

With a more independent and transparent regulatory body, consumers, investors, and environmentalists could all be heard in determining policies related to investment programs, pricing, access to service, reliability of service, energy conservation, plant location, and environmental issues. Essential features for a sound regulatory framework include:

- transparency and openness;
- clear articulation of reform objectives, including tariff policies;
- a legal structure that clearly defines the rules and procedures for reducing the level of government involvement and increasing the autonomy and accountability of enterprise directors and managers; and
- defined entry and exit conditions for private power producers.

Such a regulatory framework should instill investor confidence and facilitate at least some competition among suppliers. Developing effective regulatory institutions will take time, and concerns about political interference and corruption hampering the effectiveness of the process

may persist, but these concerns should not delay necessary actions in implementing regulatory reform. The benefits of moving away from current inefficient practices far outweigh the costs.

In much of the developing world the present institutional structure has failed to produce responsible actions in response to environmental concerns. Government enterprises, in particular, have found it difficult to add environmental concerns to their already overburdened social agenda. Enforcement actions must be seen as one element in a dialogue between regulators and enterprises, the objective of which is to improve the environmental performance of the plants under scrutiny. Such a dialogue is particularly difficult when both parties are government agencies. The situation in Eastern Europe is an extreme example of the problems that exist in many developing countries. The direction of regulatory and institutional change proposed in this paper should go a long way toward developing institutions that would deal with environmental issues in a more responsible manner. A clearer recognition of the role of the government as policymaker, rather than producer, will avoid the confusion of roles that is behind much of the poor performance in this area. The development of regulatory bodies will provide a natural focus for articulating environmental concerns and provide the forum for a more open process of input into decisionmaking by all interested parties.

Because electric power generation accounts for 30 percent of all fossil fuel consumption and 50 percent of all coal consumption worldwide, the gains from reducing emissions of particulates and gases are substantial. Shifting to natural gas and using clean-coal technologies can reduce emissions of particulates and carbon monoxide by 99.9 percent and emissions of sulfur dioxide and nitrogen oxides by more than 90 percent. Curbing emissions of particulates should be the first point of attack. It is cheap—1 to 2 percent of the total capital costs of electric power supply, on average—and it is important for human health. All new power plants should have equipment for control of particulate matter, and it should be well maintained to ensure continuous functioning. The costs of reducing sulfur dioxide and nitrogen oxides are higher (unless natural gas is available), at 10 to 20 percent of capital costs. The effects on health of reducing these emissions are usually much less than for particulates, and the impacts on forests, agriculture, freshwaters, and buildings vary greatly by area. The specific standards on nonparticulate emissions, therefore, will depend on circumstances.

With regard to CO₂, there is currently no feasible solution for mitigating CO₂ emissions apart from switching fuels (coal to oil to gas to hydro or biomass) and increasing energy efficiency.

Importation of services

In some of the least developed countries, the Bank will assist in financing importation of power services to improve efficiency.

In some lower income countries with weak public and private sectors, undeveloped capital markets, and a relative lack of market forces, a way to help bring about power sector reform and increase sector management efficiency would be to bring local or international industrial or developing-country services into the sector under utility management contracts or on a twinning basis. The Bank will consider the partial financing of these arrangements. Potential services for contracting out could include plant maintenance, billing, revenue collection, vehicle maintenance, line stringing, and pole and tower fabrication. Other issues that could be addressed with outside involvement include reducing supply-side power losses and increasing generating-plant availability. The financial costs of these initiatives would generally be low relative to the benefits.

Commercialization and corporatization

The Bank will aggressively pursue the commercialization and corporatization of, and private sector participation in, developing-country power sectors.

The Bank will assist in developing power sector strategies to bring about commercialization. For power enterprises to operate on commercial principles, they must be treated like commercial enterprises. They should pay interest and taxes; earn commercially competitive rates of return on equity capital; and have the autonomy to manage their own budgets, borrowing, procurement, salaries, and conditions pertaining to staff.

The Bank may be able to facilitate the commercialization and corporatization of the power sector by linking support for financial sector reform to power sector financing. This could be done by channeling some portion of Bank lending to sector enterprises through financial intermediaries in accordance with existing Bank guidelines. Given the potential importance of the power sector for capital market development and the comparative price and income stability that will come through more transparent regulation and commercialization, the power sector could be in a better position to play a leading role in channelling domestic savings in banks and pension funds to investments in long-term bonds and equity issues of power companies.

Commercialization and corporatization of state-owned power utilities are necessary first steps in the process of restructuring and attracting

private-sector participation. Only a few countries have governmental checks and balances to maintain the impetus for efficiency that comes initially from corporatization. Competition in power supply and greater reliance on the pressures of the capital market for financing power expansion are required to sustain the effort, and these can only come from greater participation by the private sector. This can include the participation of private generating companies, the private contracting of construction, maintenance, and various other services, or restructuring and complete privatization.

Commitment lending

Bank lending for electric power will focus on countries with a clear commitment to improving sector performance in line with the above principles.

Despite financial and pricing issues having been an important part of the policy dialogue in Bank operations in the power sector, and despite the Bank's having stopped lending to power sectors in a number of countries because of continued noncompliance with pricing and financial covenants (Brazil since 1986, Egypt between 1980–89, Mexico between 1972–88), the Bank's leverage is limited. The Bank has leverage for policy change only when it is perceived as an institution that requires performance and compliance in order for resources to be made available. For this reason, the Bank needs to enforce its lending policies and instruments better and focus its delivery of services better to match the changing and varied needs of its borrowers.

It is clear that helping countries pursue fundamental institutional and structural reforms will require an expanded sector work program. Such a program will require the borrower and the Bank to identify and analyze better the political, legal, regulatory, and institutional constraints to improved performance and to spell out clearly the financial goals and strategic options for the sector. More analysis of the robustness and the environmental implications of investment programs will have to be undertaken. Above all, issues of accountability and incentives for improving efficiency will have to be identified clearly and remedial actions defined and agreed upon. Finally, governments will need to realize that the time of "business as usual" is over and that they will not be able to roll forward financial and performance covenants to successive Bank lending operations (thereby expanding time frames for compliance). For countries that do not have the local expertise to address restructuring and regulatory issues, the Bank can provide funding for technical assistance.

Private investment

To encourage private investment in the power sector the Bank will use some of its financial resources to support programs that will facilitate the involvement of private investors.

Many potential private power investors are concerned about security and price of fuel supplies, timely payments for purchase of power by a dominant state-owned power company, and delays in the agreed conversion of local currency into foreign exchange. Using existing instruments, the Bank can play an important role in helping governments develop financial mechanisms for mitigating some of these risks. While the proposed Pakistan guarantee operation (Hub Power Project) is the most publicized effort thus far, there is a wide range of possible interventions of this type, many of which could be relatively small and entail limited risks. The Bank will work with the Multilateral Investment Guarantee Agency (MIGA) and the International Finance Corporation (IFC)—both agencies of the IBRD—in supporting such operations, focusing on sovereign risk issues in accordance with existing Bank guidelines for guarantee operations. Such a focus should help countries develop or strengthen private capital markets and will be a positive force toward meeting the projected large capital shortfalls in the power sector over the next decade. The Bank will give such assistance only when satisfied with the government's institutional and structural reform policies for the power sector.

2

Recent Experience

Changing Policy Picture

Because the electric power sector is a requisite for growth and modernization in many developing countries, the Bank has contributed to the rapid development of the sector. This assistance has increased availability of power, access to service, and consumption of electricity, and in many countries has resulted in the power sectors being better organized and performing better than most other sectors of the economy.

In spite of these successes, however, overall sector performance has deteriorated since the mid-1970s, due to three sets of factors:

- exogenous factors beyond the countries control, such as world oil prices, access to foreign loans, interest rates, and inflation;
- inappropriate national policies on energy pricing, investments, institutional development, and methods of governance (that is, regulatory arrangements and lack of autonomy of utilities); and
- enterprise-related factors, including conflicting objectives and lack of management accountability, resulting in technical, operational, and financial problems.

Power utilities have had to face oil price increases and high inflation, and they have been hampered in their efforts to recover the cost of power supply because governments have been slow to respond to changing conditions and to grant adequate tariff increases. Subsidies to some categories of consumers and inadequate tariff levels also have led to prices that give incorrect signals to users.

In parallel with these pricing distortions, institutional weaknesses in many countries have arisen mainly because the single electric utility is treated as a direct extension of the government. While modernization and the training of power-utility staff have continued to progress under

public monopolies, conflicts between government's roles as owner and operator of the utility have affected sector performance. In many cases, institutional weaknesses have arisen from opaque command-and-control management and poorly defined objectives. For example, sociopolitical objectives have emphasized rural electrification and extending supply to new areas rather than maintaining installations and improving quality of service. Other factors contributing to institutional weakness in the power sector have been government interference in

Box 1. There is Considerable Scope for Improving the Performance of Electric Utilities

One indicator of the overall performance of electric utilities is the number of utility customers per utility employee. Based on 1987 statistics, the developing-country range is a high of 292 customers/employee for Korea, to a low of six customers/employee for Rwanda. Below is a list of the ten highest and ten lowest power-sector productivity performers among the developing countries. Although some of the differences are due to scale effects, most of the better performers are middle-income countries; most poor performers are lower-income countries. Performance is not entirely income-related, however. As a reference point, the U.S. has 240 customers/employee, France has 222, and the U.K. has 153.

Utility customers per employee in 1987

<i>High performance</i>		<i>Low performance</i>	
<i>Country</i>	<i>Customers per employee</i>	<i>Country</i>	<i>Customers per employee</i>
Korea	292	Rwanda	6
Colombia	180	Botswana	8
El Salvador	175	Burundi	9
Cyprus	165	Central Africa Rep.	14
Mexico	161	Malawi	14
Indonesia	160	Papua New Guinea	18
Barbados	159	Zambia	20
Jamaica	142	Mozambique	22
Paraguay	136	Comoros	25
Venezuela	128	Zaire	25

Source: Escay, 1990.

day-to-day affairs, the utility's limited financial autonomy, and lack of incentives for utility managers to pursue technical efficiency and financial discipline.

The combined effects of electricity pricing below cost and institutional weakness have hurt the financial performance of utilities. Declines in financial performance, as measured by such indicators as the rates of return on revalued assets, self-financing ratios, and level of overdue accounts, were already evident shortly after the first oil crisis in 1973–74. The 1979 oil price increases and the debt problems of the 1980s continued to worsen the utilities financial situation. Power sectors in the 1980s accounted for up to one-third of total public investment in a few developing countries and constituted a significant portion of the public debt. Given the problems of debt overhang and structural imbalances, governments in the 1990s will face great difficulty in financing their planned power sector investments.

The Bank's role in the power sector has been that of a lender to expand electricity supply and facilitate institutional development. The Bank's main lending instruments have included specific project loans, time-slice or program loans, technical assistance loans, and sector or subsector policy loans. In addition, power sector policy components have been included in multisectoral lending instruments (structural adjustment loans—SALS and Public Enterprise Restructuring Loans—PERLS), which have made the power sector lending program more dependent on the quality of the Bank's dialogue with its borrowers. Financial and pricing problems have been sources of poor project performance and consequently the overwhelming concern of policy dialogue. In fact, the Bank has stopped lending to power sectors in a number of countries (Brazil since 1986, Egypt between 1980–89, Mexico between 1972–88) for non-compliance with pricing and financial covenants.

Despite the Bank's efforts, however, the overall quality of its power sector portfolio has declined. The main reason is that leverage has been limited, since a country's perspective must be considered if the Bank is to maintain an ongoing dialogue with a government on the need to implement policy reforms. The Bank's perseverance in its policy dialogues with borrowers has convinced some governments to implement reform measures, particularly because many governments have experienced economic deterioration as a result of distorted macroeconomic policies and the burdens of past debt.

This paper develops a policy framework for power sector restructuring. It focuses on policy options and related mechanisms that govern pricing, institutional and regulatory structures, and financial reform. It concludes by proposing that formation of a more transparent regulatory framework, together with a business-like focus, should be essential

conditions of Bank involvement in the sector. Given the regional and country diversities, individual countries should be encouraged to review and select the options, mechanisms, and pace of reform most appropriate to their needs and circumstances.

Rapid Expansion of Power Supplies

During the past thirty years, power sectors in developing countries have grown rapidly. Most major towns and many smaller towns now have electricity from integrated networks that use large power plants developed and operated as a system. Many countries now serve most urban populations, and some have embarked on ambitious rural electrification programs.

A recent Bank study has shown that in most of the largest developing countries, installed capacity and per capita generation grew at more than twice the real rate of GDP over the 1969–1989 period. Power connections grew at 9 percent per year, or about two-and-a-half times the average population growth rate.

The impressive physical expansion of power systems has been an important factor in the economic growth of developing countries over the last decades. Despite this rapid growth, still only a relatively small proportion of populations in developing countries is connected to electricity supply.

Poor Performance

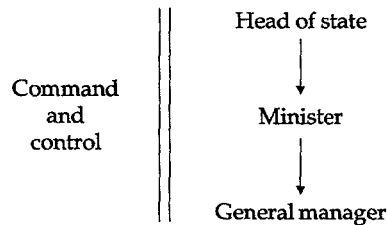
In spite of the success in increasing the supply of electric power, strong evidence exists that since the early 1970s, both the operational and financial performance of power utilities in a majority of developing countries has deteriorated. The result has been high economic costs to the countries, the power utilities, and consumers. It has been estimated that older power plants in many developing countries consume from 18 to 44 percent more fuel per kilowatt hour of electricity produced than do plants in OECD countries. Transmission and distribution losses are two to four times higher than the “normal” level for an efficient utility. In fact, technical and nontechnical transmission and distribution system losses in the delivery of electricity are commonly greater than 20 percent—occasionally approaching 40 percent. Currently, losses during transmission and distribution represent 31 percent of generation in Bangladesh, 28 percent in Pakistan, and 22 percent in Thailand and the Philippines. (In the United States only 8 percent of electricity is lost during transmission, in Japan, 7 percent.) These losses, the equivalent of about 75,000 megawatts of capacity and 300 terawatt hours (300 billion

kilowatt hours) a year, represent a loss to developing countries of approximately \$30 billion a year through increased supply costs. Worse, by the end of the century, based on present trends, aggregate losses would double. While some of the losses represent theft and abnormalities in billing and collection, it is also clear that technical losses in networks are high.

Developing-country power sectors, which tend to be characterized by opaque command-and-control management structures and cost-plus pricing, do not always provide for adequate management accountability nor incentives for sector agencies to minimize production costs consistently and operate reliably. Another problem is that the primary focus on increasing supply does not always give due emphasis to end-use efficiency options. These drawbacks are becoming increasingly serious as power systems become more important to national economies and have greater local, regional, and global environmental impacts.

In many countries, utilities have given insufficient consideration to opportunities for major plant rehabilitation and life extension projects when they have prepared investment programs. In fact, most Bank borrowers still have substantial scope to upgrade processes and technology to increase the productivity of sunk investment in existing power supply facilities. This upgrading would begin with better maintenance

Box 2. Command and Control



In a closed command-and-control environment it is politically difficult to:

- make unpopular tariff decisions, and
- resist the temptation to meddle in sector investment and management decisions, to use the utility as a vehicle for political patronage, to invest in the *new* rather than maintain or renew the *old*, to divert funds, to ignore bothersome environmental issues, etc.

Box 3. Poor Performance of the Power Sector

The government utility corporation in a small African country is an example of a small utility performing poorly while functioning as a government department that provides electricity, water, and sewerage services. The power component has roughly \$5 million gross income, 40 MW of generating capacity, 12,000 consumers, and a third of the staff of 1,000. Government dissatisfaction with electric service is apparent in the eight changes of the utility's managing director in twelve years. Various approaches to improving performance have been used: prior to 1981, U.K. expatriate assistance was used; from 1981 to 1988, GTZ (Germany) funded expatriate technical assistance plus spare parts; in late 1987, the utility corporation signed a performance contract with the government, but results have been disappointing. The government is now considering various options: (a) a management contract with a fixed fee; (b) leasing with a rental fee; (c) selling the utility to a private firm regulated by the government; and (d) continuing the present performance-contract arrangement between the utility corporation and the government. Meanwhile, system shutdowns averaging two hours in duration continue to occur about twice a week.

Source: World Bank reports.

to increase plant availability, reduce technical losses, and reduce fuel consumption of thermal power plants. In general, the thermal efficiency of electricity generation in developing countries tends to be low, especially in the many instances in which such generation is based on old coal- and oil-burning technologies.

For many borrowers, improved maintenance, plant rehabilitation, and life extension initiatives offer significant potential for deferring new investment. Improving maintenance to increase supply capacity by 10 to 20 percent delays the need for investment in an equivalent amount of new capacity. A power efficiency program that succeeds in reducing technical losses by 25 percent (for example, from 20 to 15 percent) may defer total investment requirements for new capacity by 10 to 15 percent. Improved generating plant availability also reduces the need for excessively high plant reserve margins.

Deteriorating Finances

The development of power supply has absorbed a relatively large share of the public resources in developing countries. Governments have traditionally used public and publicly-guaranteed resources to finance

Box 4. High System Losses Continue in Bangladesh Despite Covenants Linked to Disbursements

System losses have been excessive (World Bank covenants have been ineffective) in Bangladesh throughout IDA's power lending program of six projects in the country over eleven years. Losses were 35 percent before 1979, ranged from 33 to 43 percent a year between 1980 and 1988, peaked at 46 percent in October 1987, and were 43 percent in May 1990. These high loss levels are continuing despite a covenant in the fiscal 1988 Transmission and Distribution Project requiring a loss reduction to 32 percent, and a second tranche release covenant in the fiscal 1989 Energy Sector Adjustment Credit also requiring a loss reduction to 32 percent. Due to high system losses and poor collection, a January 1991 supervision report states that payment for electricity reflects only 57 percent of the energy generated. Because of this lack of progress, IDA suspended lending for new energy projects in 1990 and suspended disbursements for ongoing projects in September 1991. The conclusion is that fundamental sectoral change is needed, and without it power loss reduction patch work will not succeed in Bangladesh.

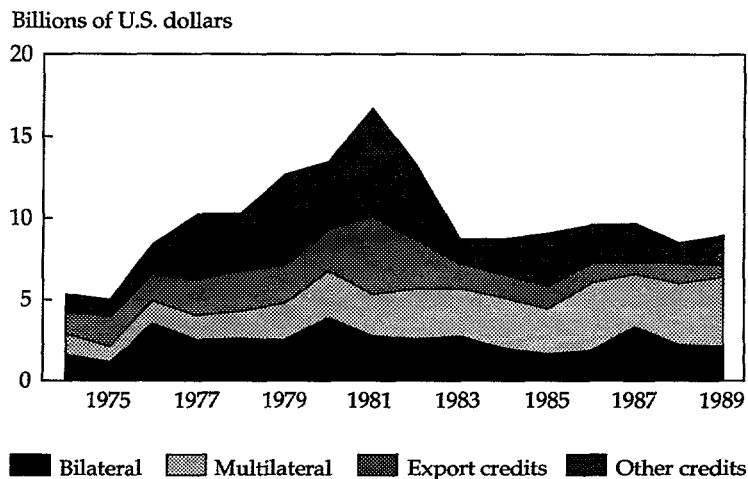
Source: World Bank records.

the development of power supply, which is one of the most capital-intensive sectors in the economy. Their objective has been to ensure adequate financing at low cost, on the assumption that low-priced electricity is critical to achieving economic and social development. Partly to keep costs down, the sector has also generally benefited from subsidies in the form of exemption from taxes, duties, and dividends.

In many developing countries, tariff levels are a problem because governments are slow to adjust electricity tariffs to reflect higher costs from inflation, fuel, and interest charges. A recent Bank survey of electricity tariffs in 60 developing countries has shown that average tariffs declined over the period 1979–88 from 5.2 cents to 3.8 cents/kWh in constant 1986 US dollars. This put the tariffs at about half the OECD level (see figure 2). The survey also found that average tariff levels for nearly 80 percent of the utilities did not cover the long-run average incremental cost of supply.

In addition to encouraging waste in energy end use and making many of the more energy-efficient process and technology initiatives financially unattractive, these tariff policies cause financial strain on the sector—that is, there are low financial returns on very large capital investments and low self-financing levels. In 58 percent of the countries

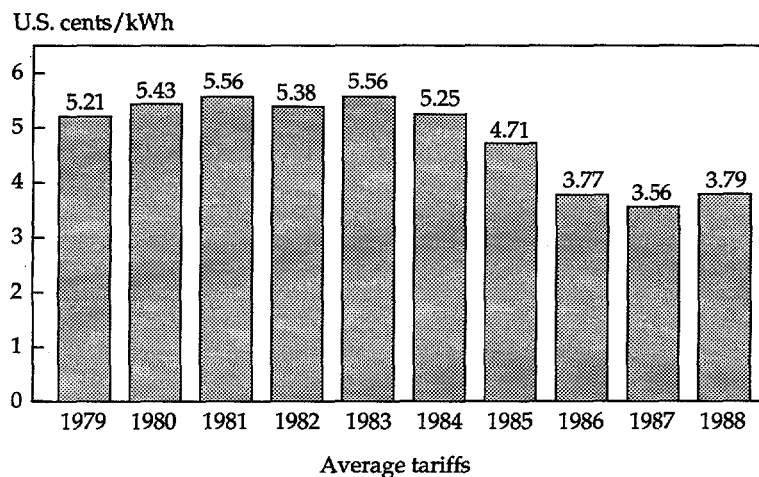
Figure 1. External Financing for Electric Power, Grouped by Credit Types



Source: World Bank data.

Figure 2. Trends of Electricity Tariffs in Developing Countries, 1979-88

(constant 1986 dollars)



Source: Based on sample of 60 World Bank member countries.

sampled, net revenues were inadequate to cover debt service by a factor of 1.5 times (the minimum level of coverage normally required by the Bank). Twenty percent of the countries did not even show a 1.0 times coverage; the utilities in these countries are, in effect, insolvent and would be unable to cover their costs without government support or loan guarantees.

A review of sources of finance for power system development in sixty developing countries has shown that the average level of cash generation of the utilities was only 12 percent of their investment requirements. This compares unfavorably with Bank targets of between 20 percent and 60 percent and with 30–40 percent average levels of cash generation achieved by these utilities in the 1960s and early 1970s. Average rates of return have also fallen from about 9 percent (1966–73) to less than 5 percent. As a result, in many countries, power supply, a sector that should play a major role in the mobilization of domestic resources, has become an unnecessarily large and inefficient component of government spending.

In addition to the decline in internal cash generation, the international debt problem has also undermined or reduced the creditworthiness of many power utilities, particularly in middle-income developing countries, to the point where many of them no longer attract commercial or supplier credit funds. To get around this constraint, governments sometimes borrow on behalf of their power utilities or through such intermediaries as the Power Finance Corporation in India or *Financiera Eléctrica Nacional* in Colombia and onlend the proceeds, sometimes at concessional rates.

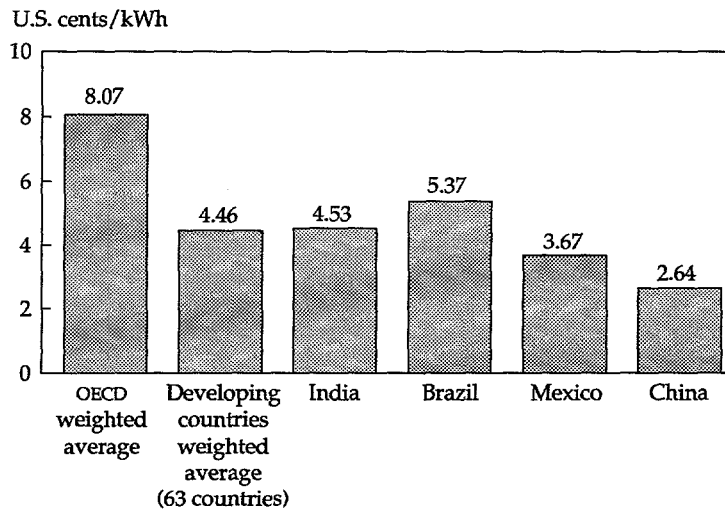
Macroeconomic Impacts

While the economic impacts of power sector inadequacies are difficult to quantify, it is clear that the lack of adequate internal funding, together with poor operation and maintenance practices, has resulted in a maintenance backlog that has affected power plant availability and system reliability, with expensive consequences for countries. These are not merely sectoral or technical consequences; in the Latin America and Caribbean (LAC) region alone, it has been estimated that power shortages cost the regions economies an estimated \$10–15 billion annually in lost output and excess investment.

Also in the LAC region, because of poor maintenance and low plant availability, it has been estimated that fuel costs for thermal generating plants are more than \$600 million per year higher than they need be. Because of the low overall reliability of electricity supply, utilities have invested some \$26 billion in building up levels of reserve generating

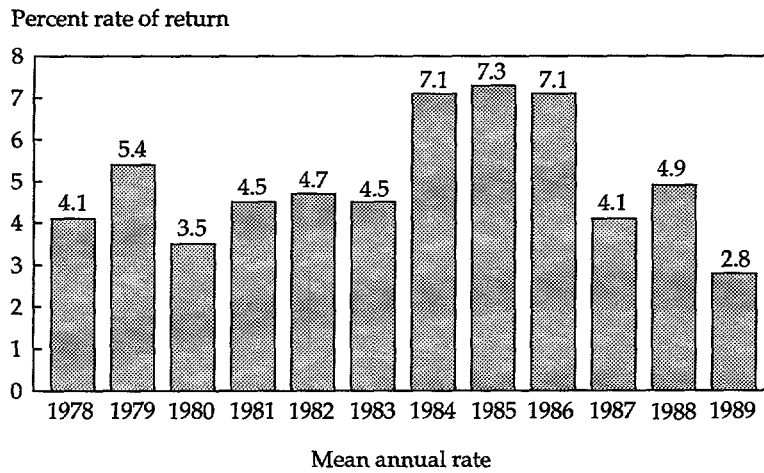
Figure 3. Comparative Electricity Tariff Levels

(current 1988 US dollars)



Source: World Bank data.

Figure 4. Mean Annual Rates of Return on Revalued Net-Fixed Assets for Developing Countries



Source: Based on sample of 360 actual financial rates of return recorded for 57 World Bank member countries.

capacity that would not be needed if maintenance standards were more like those in OECD countries.

In Nigeria similar estimates show that if power generation and maintenance practices were improved, the country would have a power supply capacity overinvestment of about \$2.4 billion. Because of unreliable service, about 25 percent of the electric power consumed by the largest manufacturers in Nigeria is now self-generated, at a cost ten to forty times higher than for power purchased from the national grid.

Finally, a study in Pakistan (which did not include the value of future investments foregone because of unavailable or unreliable power) found that load shedding to the industrial sector alone has led to a 1.8 percent decrease in GDP and a 4.2 percent decrease in the country's foreign exchange earnings. For India the cost of unreliability in electricity supply to the industrial sector has been estimated to be at least 1.5 percent of GNP.

An Expanding Investment Program

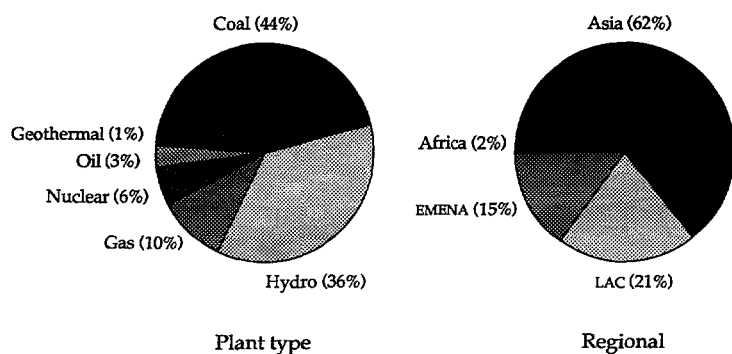
Notwithstanding the financial constraints and operational inadequacies confronting the sector, governments and utilities in developing countries have expanded plans for large power investment programs for the 1990s, which, if major energy efficiency gains do not take place, will require up to \$1 trillion to finance in current terms. According to these plans, total power supply capacity by the end of the century would increase by 384 GW, to about 80 percent above the 1989 level. Developing countries must also make large investments to develop the primary energy sources (coal, gas, petroleum) that support the power production and energy consuming sectors. These requirements will force governments to consider policies that encourage the more efficient production and end use of power and to seek new ways of mobilizing financial resources for sector development.

About 40 percent of these projected financing requirements, up to about \$40 billion annually during the 1990s, is in foreign exchange. Developing countries as a group have little prospect under current conditions of mobilizing foreign resources on this scale, however, and official financing agencies are unlikely to increase their commitments for power development—now around \$7 billion annually—because of claims on their limited funds to assist other sectors. Private creditors are also reluctant to re-enter many developing countries that continue to experience difficulties in servicing their foreign debts. These debts include outstanding commitments of some \$60 billion on publicly-guaranteed power loans.

Box 5. \$1 Trillion Power Capital Expenditures in the Developing Countries in the 1990s

According to a World Bank study of the electric utility expansion programs in seventy developing countries, including the Eastern European countries of Hungary, Poland, Romania, and Yugoslavia, developing-country power utilities want to spend up to \$745 billion in 1989 dollars (almost \$1 trillion in current terms) for system expansion in the 1990s. While this figure may seem high, such an expenditure would, in fact, imply an average electricity growth rate of only 6.6 percent per year. Such an expenditure would enable developing-country utilities to add a total of 384 GW of capacity, raising total capacity from 471 GW in 1989 to 855 GW in 1999. Regional and plant breakdowns of the \$745 billion capital expenditures and 384 GW capacity addition are shown below.

\$745 Billion Capital Expenditures



Source: Moore and Smith, 1990.

The financing requirements in local currencies, up to \$60 billion annually, are also large. In fact, even at much lower investment levels, local currency financing would likely be a key constraint. Domestic capital markets in many developing countries are still too undeveloped to make a significant contribution to financing power development.

Environmental Concerns

Compounding the difficulties of meeting expanded power requirements, many developing countries are experiencing energy-related deg-

radation of their environments. The main concerns are CO₂ emissions into the global commons; the dislocation of peoples and the disruption of the environment from hydropower development; emissions and effluents near densely populated areas from fossil-fuel generating plants; and the use of large tracts of land to construct power generating and transmission facilities.

It is likely that fossil fuels will continue to be the predominant energy source for the next several decades, and the main task ahead will be to use them in economically and environmentally satisfactory ways. Expansion plans for fossil-fuel power generation in several developing countries, particularly those based on coal, give rise to concern in the host and neighboring countries about acid rain from sulphur and nitrous oxide emissions. Measures to mitigate these effects can produce significant environmental benefits, while increasing capital costs by 10 to 20 percent and operating costs by 5 to 10 percent. If these higher costs were passed on to consumers, they could lead to increased energy conservation. There is currently no feasible solution to mitigating CO₂ emissions

Box 6. Investment in Maintenance Usually Gives Higher Returns Than Do New Facilities

Many developing countries suffer from low utilization of power production facilities. Typical generation-capacity factors are only around 40 percent. Some examples for 1987 are: India 44 percent, Indonesia 35 percent, Jamaica 36 percent, Jordan 41 percent, Kenya 52 percent, and Liberia 25 percent.

When plant availability is low because of poor maintenance, extra generating capacity is necessary to maintain the power supply. In well-managed systems, a 20 to 30 percent reserve margin of generating capacity is adequate, but some developing countries have reserve margins of 100 percent or more. If capacity costs 1,000/kW and the excess margin is 50 percent, this translates into overinvestment of \$500/kW load, or roughly 16/kWh of electricity produced.

On the other hand, if additional maintenance expenditure is undertaken (for example, equivalent to 2 percent annually of the investment cost), the annual cost would be only \$26/kW or 0.56/kWh. Therefore, increased maintenance gives a much higher return than added generating capacity. Ironically, the World Bank probably contributed to the excess capacity in the developing countries because for many years Bank lending for recurrent costs, including spare parts, was not allowed.

Source: Escay, 1990.

apart from switching fuels (coal to oil to gas to hydro or biomass) and increasing energy efficiency.

A relevant question is how best to respond to the threat of greenhouse warming. If it is necessary to restrict the use of fossil fuels, could the world's demands for commercial energy still be met, and if so, at what cost? More efficient use of fossil fuels and a switch from coal to fuels lower in carbon could substantially reduce emissions of carbon dioxide per unit of energy output. Beyond that, the options would be nuclear energy or renewable energy (primarily solar, biomass, hydropower, and wind).

Nuclear power currently provides less than 1 percent of the energy used in developing countries. World Development Report 1992 concludes that that share seems unlikely to rise significantly in the foreseeable future. However, technical developments in renewable energy in the 1970s and 1980s—in solar, wind, and biomass energy, in particular—have led to remarkable cost reductions in these technologies. There is now a growing awareness that renewable energy is an abundant resource that increasingly can be harnessed.

Reasons for the Problems

Government policies in the power sector have frequently emphasized that (a) the power sector is an engine for promoting economic development and, therefore, should be sustained through public investment, and (b) electric utilities can also be a tool for addressing social equity and employment issues and improving quality of life. While these policies have facilitated availability of, and access to, power supplies, they have also perpetuated the notion that people have a right to electric power at low prices. This has resulted in increasing demand on scarce public resources to fund power needs, continuous central government subsidies to the sector, and unbalanced investments. Social equity and employment objectives have led to overstaffing, subsidies to consumers, inefficient pricing, and inadequate resource mobilization.

In the 1970s and 1980s, problems at the sector and enterprise levels were exacerbated by exogenous factors such as world oil prices and by economic problems such as rising national debt, high inflation, and large and unpredictable exchange-rate devaluations. As a result, many power sectors have experienced problems in servicing debt, shortages of foreign exchange, poorly performing state enterprises, a poorly trained workforce, and a weak legal system unable to enforce contracts. The foreign exchange shortage, together with protectionist trade policies that limit joint ventures and imports, has restricted access by many countries to the foreign capital and energy-efficient technologies to develop their

power supply and utilize it efficiently. These constraints have caused an estimated yearly foreign exchange gap for developing electricity supply of about ten times the recent level of Bank lending in this sector.

The Bank's experience has shown that when power sector programs and projects appear technically sound but fail to deliver results, in many instances the reasons are conflicting social objectives, overall weak country institutions, lack of adequate legal framework, damaging discretionary interventions by governments, uncertain and variable policy frameworks, and a closed command-and-control decisionmaking process without adequate checks and balances. Sector reforms may become ineffective if laws are not enforced or if there are severe delays in the settlement of claims. Efforts to increase private sector participation may not be politically sustainable, and the supply response to improved pricing policies may not occur unless there are clear and enforceable rules and unless institutions explicitly acknowledge transaction costs (the costs of arranging, monitoring, and enforcing contracts). Reform efforts may also fail if accounting systems are so weak that budgetary policies cannot be implemented or monitored or if closed procurement procedures encourage corruption and distort investment priorities.

Although all of these constraints are significant, it can be argued that the basic sectoral problem relates to undue government interference in those day-to-day organizational and operational matters that should be under utility control. Such interference has undermined the accountability of those responsible for day-to-day management functions. It has influenced procurement decisions, mitigated against least-cost fuel choice, resulted in an inability to raise power tariffs to meet revenue requirements, restricted utilities' access to foreign exchange, mandated low managerial and technical salaries that are tied to low civil service levels, and promoted excessive staffing and political patronage. These problems have, in turn, in many cases, brought about generally inadequate utility management and organization; lack of accountability; flight of experienced and capable staff due to uncompetitive employment conditions; weak planning; inefficient operation and maintenance; high technical and nontechnical losses; and weak financial monitoring, controls, and collection.

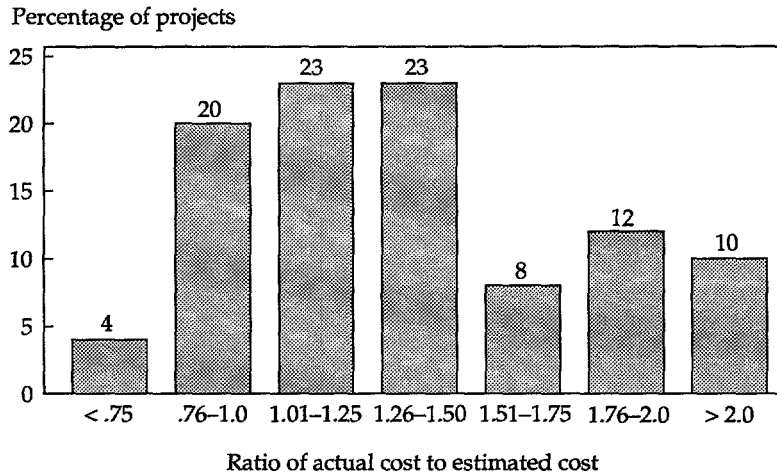
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The World Bank's Role in the 1970s and 1980s

The World Bank historically has been a major supporter of the power sectors of developing countries. Power has been one of the primary sectors in the Bank's lending program, accounting for \$40 billion (about \$75 billion in 1990 prices) through fiscal 1991, or about 15 percent of the cumulative total of the Bank's lending. In the 1980s, the Bank financed about 7 percent of total power investments in developing countries and also helped these countries raise additional cofinancing. If, hypothetically, power lending leveled off at about \$3 billion a year and developing countries were to achieve most of their planned power investments, the proportion would decline to about 4 percent of total planned power investments and would remain at slightly less than 7 percent of foreign exchange requirements during the first half of the 1990s.

The Bank's lending in the power sector has operated in the framework of state ownership and public control of a power monopolist. This approach helps capture economies of scale in small power systems and provides financing in the absence of capital markets. Prior to the mid-1970s, this approach was generally satisfactory in most developing countries, in an environment of low inflation and low debt levels, and with governments allowing utilities a significant degree of managerial autonomy.

The Bank has also stressed the importance of overall institution building in the sector. Most power utilities are now much larger and more sophisticated institutions than they were twenty to twenty-five years ago. The Bank's objective in supporting the growth of these utilities has been to encourage economic efficiency, financial sustainability, and professional management by advocating least-cost planning, marginal cost pricing, international accounting standards and practices, acceptable rates of return, and international competitive bidding.

Figure 5. Hydroelectric Project Costs Actual to Appraisal Estimate

Source: World Bank data.

However, with the exception of a few relatively well-managed commercialized utilities, such as those in Korea, Thailand, and Malaysia, power sector finances, efficiency, and institutions have deteriorated over the past two decades. The fundamental problem has been that the closed command-and-control management approach is often subject to political compromise and that in numerous developing countries the political will to implement and adhere to financial and operating covenants and sound pricing policies has been disappointingly weak. The World Bank's Operations Evaluation Department (OED), in a recent review of power sector lending to Colombia for the years 1970-87, concluded that the Bank should continue to support the sector only if government is willing to tackle much broader and more fundamental institutional and organizational issues than in the past.

A recent review of the widespread use of performance contracts in Sub-Saharan Africa has shown that in the absence of political will, such contracts are merely formal documents that produce few tangible results. An exception is the case of Electricidade e Aguas de Guinea-Bissau (EAGB) in Guinea-Bissau, where the government was so committed to the goals of the performance contract that it complied with its obligations prior to signature. In the majority of cases, however, it was found that governments did not fulfill their obligations, which essentially rendered

the performance contracts meaningless. Traditional government practices with regard to tariffs, timely payment of electricity bills, and employment usually remained in force regardless of the provisions of the performance contracts. The review also found that governments limited the utility management's authority and consequently impeded transparency and accountability.

In response to the changing needs of developing countries, the priorities for Bank lending in the power sector have over the years expanded from the traditional primacy of loans for electricity supply to addressing the interrelated issues of pricing, institutional strengthening, and investment planning. New lending instruments have been designed to address the policy issues that constrain sector efficiency and impede resource mobilization. Although project loans have continued, sector lending instruments now address a much wider scope of issues:

- policy weaknesses that constrain sector development at least as much as capital shortages;
- policy reforms that yield benefits at both sector and macroeconomic levels;
- sector lending that acts as an umbrella to expedite project lending;
- interrelated subsectoral issues that are not easily dealt with in project lending;
- policy issues that need to be resolved at the sectoral level; and
- policy loans to cover small items in several subsectors that would be cumbersome in a project loan.

While there have been many sector improvements, there have also been problems, mainly because of (a) the failure of governments to respond quickly to required policy changes, and (b) the Bank's limited leverage, especially in large countries where the volume of Bank lending in relation to the countries investment needs is low. The effectiveness of the Bank's lending objective to bring about least-cost investments has also been limited. Bank reviews have shown that many projects that were part of assumed least-cost investment programs based on a priori forecasts of power demand, capital costs, fuel prices, and exchange rates did not ultimately result in least-cost development. This was because sufficient attention was not given to reliability criteria—that is, loss of load probability and reserve plant margins. In retrospect, this result is partly because of a preference for large generation projects and partly because of difficulties in forecasting the myriad variables involved. An analysis of forty-nine hydroelectric projects that were partly funded by the Bank between 1964 and 1986 has shown that in 67 percent of the projects, final costs varied much more than thought possible (usually increased) from appraisal estimates.

One of the Bank's longer-term aims has been that its power-sector borrowers achieve financial and technical viability, which would enable them eventually to attract capital from commercial sources. One measure of the Bank's success in the sector is the ability of the utility to raise resources in the domestic capital market. In practice, this has occurred in relatively few instances. In the period 1979–88, the cofinancing obtained by Bank borrowers from commercial sources averaged only \$200 million a year because few power-sector borrowers could qualify for commercial loans without a sovereign guarantee. This situation was compounded by the deteriorated international debt situation during that period.

The Bank has tried to establish financial targets as surrogates for capital market pressure through its revenue covenants (rate of return and cash generation) and its capital structure covenants (debt/equity or debt service coverage). The revenue covenants try to ensure that borrowers cover operating costs, including depreciation and debt service, and provide a reasonable contribution to expansion needs. The capital struc-

**Box 7. \$50 Billion Investment Savings by Reducing
Generating Capacity Margins Through Maintenance
Improvements**

Power systems require a margin of generating capacity above the system load to maintain supply when some units are out for scheduled maintenance or forced out due to failure. In well-planned and operated power systems, the required reserve is typically 20–30 percent above the system load.

In a recent 1989 sample of seventy developing countries, generating-capacity reserve margins averaged 43 percent, with twenty-six countries having margins of 60 percent or more. Given the 1989 total system load of 331 GW and an assumed target reserve margin of 30 percent, this means the excess capacity is 43 GW. This represents an investment of about \$50 billion, using \$1,150/kW as the weighted average mix of capital costs for hydro, thermal, nuclear, and geothermal. Since the 43 GW capacity savings would meet two years of load growth at 6–7 percent a year, improved maintenance to increase unit availability and reduce the capacity reserve to 30 percent could save \$50 billion initially and roughly \$25 billion each year (starting in the third year) in terms of future generation investment in the developing countries.

Source: Moore and Smith, 1990.

ture covenants constrain borrowing to prudent levels, subject to consultation with the Bank. Most power loans now incorporate these covenants.

Despite the Bank's financial covenants, it is well documented that the performance and viability of many borrowers has deteriorated steadily since the mid-1970s (see chapter 2). In spite of frequent confrontations with borrowers over such issues as tariffs, earnings requirements, and asset revaluation, these financial covenants are not always effective because of changing economic and political conditions. Also, because of concerns about country, sector, and entity relations, the Bank does not always invoke meaningful remedies when covenants are not met.

The overall deterioration in sector finances and institutional and financial performance has generally made the power sectors a burden on national budgets. Many governments are beginning to realize that they have no choice but to acknowledge the deficiencies of their policies, relinquish their traditional role as the dominant provider of resources to their power sectors, and realize that tinkering with policy tools such as performance targets and cost-plus financial covenants will not improve sector efficiency or facilitate resource mobilization. Since it will be difficult to reverse operating and financial deterioration in the power sector in the absence of the political will to put in place proper macroeconomic policies and conditions, there is a need to increase the overall arsenal of responses, with new approaches and initiatives to facilitate power sector development. Under these conditions, the Bank's role in the power sector should focus more on the broader objectives of sector efficiency through restructuring. The Bank's considerable sector and macroeconomic expertise should enable it to continue to help developing countries design and put in place effective mechanisms to address the interrelated issues of pricing, institutional regulation, and financing sector investment.

New Approaches to Power Sector Development

Pressures for Change: A New System of Sector Governance

Today, the large capital investment requirements, ingrained sector inefficiencies, and desperate financial circumstances of many developing-country power utilities have generated pressures for new approaches. These approaches revolve around a new framework for addressing the sector's financial, regulatory, and institutional issues and around such effective reform mechanisms as greater transparency and public accountability in governing sector institutions. Since relationships among government institutions, power utilities, and customers are heavily influenced by regulatory arrangements, regulatory reforms are necessary to redefine sector governance. Governments must demonstrate political and legislative leadership and a strong and sustained political commitment to regulatory and institutional changes.

These reforms will usually require difficult political choices. Governments will have to intervene less in the power sector and allow the sector greater managerial and financial autonomy while still requiring accountability. This implies a shift away from the states having conflicting responsibilities as both the owner and the operator of electric utilities, toward decentralization and market-based incentives. Government would, of course, retain responsibility for setting objectives, articulating overall policy, and coordinating sector development. It also would establish the legislative and regulatory framework to protect the interests of the various stakeholders and the public.

It is clear that sound management of overall country development is critical for ensuring adequate economic returns and the efficiency of power sector programs and projects. With governance being defined as management of a country's economic and social resources, the Bank's

concern with sound development management extends beyond the capacity of public-sector or power-utility management. Concerns extend to the proper role of the government, whether the power sector is publicly or privately owned; to the rules and institutions that create a predictable and transparent framework for the conduct of public and private business; and to accountability for economic and financial performance. Regardless of whether the ownership of power enterprises is public or private, governments should establish sector policies and be responsible for regulation. The utilities should be responsible for investment planning and financing, construction, and operation and maintenance of facilities.

Box 8. Electric Utility Regulation in the U.S.

The traditional form of regulation practiced in the U.S. electric power industry is a cost-based method known as rate-of-return regulation. Electricity prices are set to reflect the embedded or historical costs of providing supply to each class of consumer. Rate increases are based on a utility's revenue requirements—that is, to provide a reasonable return on equity. More recently, the Federal Energy Regulatory Commission has required utilities to study marginal cost pricing, and several states are now applying rates based on long-run incremental costs and are implementing time-of-day and seasonal rates.

Rate-of-return regulation is generally encouraged by the World Bank in its lending to developing countries. The Bank has, however, modified the U.S.-type rate-of-return regulation to take account of inflation by seeking regular revaluation of fixed assets. This has increased annual charges for depreciation and in concept has encouraged Bank borrowers to raise rates to meet minimum rate-of-return targets.

Traditional U.S. cost-based regulation has many strengths:

- The industry has sustained a good financial record—bankruptcy is extremely rare.
- Customers, investors, suppliers, environmentalists, and the public are able to participate in the regulatory process.
- Regulatory bodies have independent and professional staff who are free of political influence and are protected by law from dismissal for political reasons.
- Open hearings and transparent information on costs and performance help to ensure the integrity of utilities.
- Costs of regulation are borne by electric utilities.
- Each state can shape regulation to meet local needs.
- Members of regulatory commissions are independently appointed by the state, most for fixed terms.

In both developed and developing countries, new regulatory, organizational, and management approaches, which cover a wide spectrum of ideas and concepts, are being developed. Basic precepts, even the view that the electricity supply industry should be a regulated monopoly, are being challenged. Although some of the reform proposals are not yet clearly or persuasively established, implemented, or operationally proven, support for change is increasing with experience. Many of these approaches are drawing support from recent developments in economic theory (particularly on the contestability of markets), which provide new insights into what constitutes a natural monopoly and an efficient

- Commissions have authority to require disclosure of financial information and to direct how accounts will be maintained.
- Regulators can promote affordable rates, take account of customers ability to pay, and consider marginal costs when setting rates.
- Regulators can examine the reasonableness of investments and exclude them from the rate base when such investments are considered imprudent.

On the other hand, traditional regulation has certain weaknesses:

- Rate-of-return regulation encourages utilities to seek rate increases to cover increases in costs rather than reduce costs or increase efficiency.
- Utilities that over-invest and maintain excess capacity usually are able to pass on these costs to consumers.
- Costs of regulation are high, especially for parties participating in studies and hearings.
- Electricity prices may not encourage maximum economic efficiency.
- Other than regulatory directives, there are no cost- or market-based incentives to adopt least-cost investments, load management, or energy conservation.
- Delays can be frequent because of quasi-judicial proceedings for rate increases.

Utility regulation is changing in the U.S., with regulators encouraging more competition. Where competition is not an option, incentives or performance-based and price-cap regulation are being encouraged. The latter focus on improving efficiency of plants and setting targets for conservation and load management. Many observers see this approach increasing in importance as the industrys reliance on non-utility generation capacity grows.

industry structure and into the roles that market and nonmarket institutions can play in improving sector development and performance.

Some Developed-Country Examples

The United States and the United Kingdom have been among the leaders in challenging the notion that the electricity sector is a natural monopoly. In the U.S. the Public Utilities Regulatory Policies Act of 1978 has encouraged deregulation and competition in the U.S. power sector. Non-utility power producers are currently contributing 38,000 MW to U.S. electricity supply, or about 5 percent of total U.S. power generation. The non-utility producers have another 60,000 MW under construction or in various stages of development, which means that at the margin, most new generating capacity in the U.S. is being produced by the independent power industry.

In the U.K. the changes have been even more dramatic, with privatization of most of the power industry. First, the assets and liabilities of the former Central Electricity Generating Board (CEGB) were transferred to four new companies: the National Power Company, PowerGen, Nuclear Electric, and the National Grid Holding Company. Second, the area boards that had been responsible for distributing electricity were reestablished under license as regional companies, with shares offered to the public. The National Power Company and PowerGen are now listed on the stock exchange as public companies, while Nuclear Electric (because of its uneconomic asset base) will remain under public ownership. In addition, the transmission system, including connections to France and Scotland, is owned by the National Grid company, a holding company in turn owned by the regional distribution companies. Transmission and distribution are regulated under the Electricity Act by the Director General of Electricity Supply, who is responsible for granting licenses.

Another example is New Zealand, where the government has broken up and corporatized the various parts of the power sector, bringing about major increases in sector efficiency. The government is expected eventually to sell shares to the public. In Australia the government has been studying ways to increase the efficiency of the industry by operating on a more commercial basis, for example, requiring utilities to pay dividends and taxes.

Other countries are not considering a significant restructuring of the power sector. France is one example of here an open regulatory system is already in place, the management of the national power utility is already highly decentralized with every profit center subject to a performance contract, and the utility in borrowing large sums of money in private capital markets is subject to the discipline of the markets.

Generic Approaches and the Developing Countries

The objectives of governments in changing the way electric utilities are owned and operated are to:

- increase economic and utility operations efficiency;
- reduce the financial and administrative burdens they impose on government;
- reduce the level of public-sector debt imposed by the power sector; and
- reduce the cost of electricity by subjecting producers and distributors to competitive market forces.

Various generic approaches are being discussed and adopted in developing countries to pursue these objectives as indicated below.

Regulatory change

To reduce the extent to which governments micro-manage utilities and thereby reduce management accountability by controlling tariffs, borrowing, budgets, investment plans, procurement, staffing levels, and employment conditions. The dual role of government as both regulator and owner has drawn it into day-to-day management, planning, and staffing decisions that should be the responsibility of autonomous utility managements and boards of directors.

The first step in regulatory reform of the sector is to articulate clearly the objectives of reform and to focus on greater transparency and public accountability in governing energy-sector institutions. Since the relationships among government institutions, power utilities, their business partners, and their customers are heavily influenced by regulatory arrangements, regulatory reforms are viewed as necessary to redefine the fundamental governance of the sector. The second step is to put in place a legal structure that clearly defines the rules and procedures for reducing the level of government involvement and for increasing the autonomy and accountability of boards of directors and managers.

A relaxation of restrictions on entry and exit will be required if competition is to be permitted. Regulated entry can be allowed at the generation end, with the utility or the grid entity acting as an interface to enable efficient dispatch and economies of scale to be maintained.

Essential features for regulatory focus include transparency and consistency in decisionmaking, investment policy, service levels, pricing policies, integration of supply- and demand-side planning, entry and exit conditions, and so forth. Of course, the undertaking of these responsibilities, as well as the sector's capability to manage the reforms, will often be a gradual process.

Box 9. Regulation of Electricité de France

Electricité de France (EdF) was formed in 1946 as a publicly-owned company that assumed control of a few municipal companies and some nationalized industries that produced power for their own needs. EdF operates as a public corporation, with its board of directors appointed by the government, but with almost the same degree of autonomy as a private industrial or commercial corporation in France. It is organized on an industrial model (that is, like an industrial corporation) under a performance-based regulatory system.

At the end of the 1960s, EdF sought to shift its attention towards competitive markets by adopting a nuclear energy program and establishing electric heating projects to compete within the industrial-heating market. At the same time it adopted a profit-center approach and decentralized financial management. Government regulation was reduced by establishing a contract plan. These changes allowed greater regulation by market forces. After the drop in oil prices in 1987, electric rates fell and excess nuclear capacity led to a suspension of nuclear investments. EdF then sought to sell its surplus capacity by exporting to other European utilities. These sales expanded its scope for competition, and its contract plans sought to increase efficiency and reduce costs.

Contract plans (see Box 10) cover a five-year period. Regulation is applied through a comparison of actual performance against a number of key objectives, including productivity targets, rate commitments, sales and investment strategies, self-financing and debt strategies, and wage and salary scales. The contracts are objectives set by each departments corporate plan. Efficiency is encouraged by comparing the performance of similar units. Recent contract plans have sought to decentralize management and enhance competition with other electric utilities.

Rates are based on the marginal cost of system development. Price increases are limited to a ceiling negotiated with the General Directorate of Consumption and Competition and are determined by the rate of inflation minus a percentage for productivity gain. Tariffs are applied uniformly throughout the country.

Generation and transmission are organized into thirty-five basic units. Each plant is administered by an independent management with its own budget, which is based on standard costs for personnel and maintenance. Fuel costs are reimbursed directly. Distribution of electricity is decentralized, with each distribution center responsible for a single administrative area in France.

Greater openness through a more transparent regulatory process can also have significant long-run environmental benefits. Currently in many countries there is no intervention point within the command-and-control form of regulating monopoly power sectors where nongovernmental environmental concerns can be articulated. With a more open

regulatory body, consumers, investors, and environmentalists can all be heard in setting policies regarding the investment program, pricing, access to service, reliability of service, energy conservation, plant location, and environmental issues.

Countries in which a more independent regulatory framework has been proposed or implemented include Argentina, Colombia, Indonesia, Malaysia, and Venezuela.

Organizational changes

To facilitate within the utility structural change from public monopoly and centralization to decentralization and exposure to competition. Decentralization, with more local decisionmaking, microlevel accountability, and participation of beneficiaries in the design and monitoring of electricity service, should be encouraged. Decentralization partly requires the establishment of independent cost or profit centers inside the utility. Also required is the means to monitor these centers and compare their performance by designing objective indicators to measure management effectiveness, service quality, and technical, operational and financial performance.

Other changes can include separating generation from transmission and distribution, and encouraging cogeneration and independent power production through private investment in plants that sell to the grid. Distribution companies can be separated by municipality, with limited overlap in some fringe franchise areas. Private ownership or

Box 10. Contract Plans as an Instrument of Change

Contract plans (CPs) are negotiated performance agreements between governments, acting as owners of a public enterprise, and the managers or directors of the enterprise itself. In a contract plan, the intentions, obligations, and responsibilities of the two parties are freely negotiated and clearly set out. This appears simple, but the fact is that ambiguity of goals and conflicting objectives are major obstacles to the effective and efficient performance of public enterprises. CPs define the enterprise's objectives and state what resources and latitude the government will provide to enterprise management so that it can accomplish the specified goals. Many CPs set out the physical and financial indicators to measure enterprise performance. Many establish the principle that government will compensate the enterprise for costs incurred in fulfilling noncommercial objectives and specify how the compensation will be made. In theory, the agreement binds both parties, in the manner of a formal contract.

ownership by consumer cooperatives can be permitted. In this way, power consumers can also become shareholders who would be concerned not only with service access, reliability, and cost but also with the financial viability of the company.

A number of countries have been considering separation of transmission and distribution from generation. In Argentina, legislation is being drafted to encourage privatization of distribution through the establishment of separate distribution franchises. Indonesia is considering setting up separate business units for distribution in Java to facilitate improved performance. India has established the National Power Transmission Corporation. Other countries considering major internal organizational changes include Bangladesh, Jordan, Turkey, and Venezuela.

Commercialization and corporatization

Increasing the utility's business orientation to operate more like a private corporation and less like a government department and subsequently to subject the utility to corporate legislation and require it to compete with other private companies on equal terms.

Following the establishment of a more transparent regulatory process, the electric power enterprises can be allowed greater autonomy from government. For power enterprises to operate on commercial principles they must be treated as commercial enterprises. They should pay interest and taxes; earn commercially competitive rates of return on equity capital; and have responsibility for their own budgets, borrowing, procurement, staff pay, and personnel relations. They should also be market oriented in setting prices, and governments should likewise regard pricing not only as a social issue but also as an issue of financial discipline and sustainability. They should also legislate fair conditions for private entry into supplying power and related services.

Commercialization and corporatization are currently being implemented or are under consideration in Jordan, Malaysia, Nigeria, and Portugal, among other countries.

Increased private sector participation

Occurring in many forms, including the sale of some or all assets, stock exchange listing, franchising, leasing, contracting out, and nonutility power generation. Initially, after the articulation of clear objectives and the establishment of a satisfactory legal and regulatory framework, governments can begin the process of increased privatization by encouraging utilities to procure services from the private sector. Public or private utilities in developed or more advanced developing countries, as well as consultants, major

manufacturers, and contractors, can provide various services under service, management, performance, or technical assistance contracts or under twinning agreements. Civil works and activities that do not entail large investment costs, such as plant maintenance, billing, revenue collection, vehicle maintenance, line stringing, and pole and tower fabrication, are particularly suited to such contracts. Other areas for private-sector involvement include reducing supply-side power losses and increasing generating plant availability. The financial costs of these initiatives are generally low relative to their benefits. Other possibilities include setting up franchises or concession arrangements for electricity supply.

For some countries, performance-based management contracts with experienced or innovative private firms or utilities for full or partial

Box 11. Success Story in Guinea-Bissau

The introduction of a five-person management team under an expatriate management contract has been effective in improving the performance of this small country's national electric utility, *Electricidade e Aguas de Guinea-Bissau*. Before the management team was introduced, service interruptions were chronic, and most areas had electricity for only a few hours a day. Turnaround can be seen in the comparative statistics for 1987 and 1990:

	1987	1990
Installed capacity, MW	7.2	8.6
Operable capacity, MW	2.2	7.5
Capacity factor	32%	51%
Fuel consumption, kg/kWh	0.300	0.254
System losses	30%	26%
Electricity sales, GWh	14	28
Average revenue, \$/kWh	0.12	0.25

Implementation of the expatriate management contract was a joint initiative of the French Ministry of Cooperation, UNDP, the African Development Bank, and the World Bank. It reduces wastage of foreign aid (in the previous ten years, foreign funding for power was more than three times the estimated value of the utility at the end of the period) and provides the reliable service necessary for economic expansion.

Source: World Bank documents.

Box 12. Regulation of the Spanish Electricity Industry

Not unlike the U.S., the Spanish electricity industry is made up of privately-owned corporations and a mix of private and public enterprises. Private investor-owned utilities provide about two-thirds of the electricity produced in the country. The remainder is controlled by the central government. The transmission and dispatch systems are also controlled by the government, which owns 51 percent of the shares. There are many utilities responsible for distribution, but almost 90 percent are owned by the investor-owned generators.

The industry is regulated by the Ministry of Industry, Commerce and Tourism. A new regulatory incentive system was introduced in 1988, called the Marco Legal Estable. It established, by royal decree, a methodology for automatically setting uniform national tariffs annually, based on estimates of the cost of supply and forecast consumption. An inter-utility compensation system ensures that all utilities earn a fair return on investments regardless of the plant mix or market structure. Incentives for improved performance are provided through comparisons of industry costs. Companies whose costs are below industry standards keep the difference. The government also has established standard valuations for assets, standard depreciation rates, and a uniform approach to calculation of rates of return.

Electricity tariffs in Spain cover costs, and as in the U.S, they reflect average rather than marginal costs. The tariffs are set by the ministry, which also authorizes new investments for the entire energy sector.

The Spanish regulatory system has a number of advantages:

- It has improved the financial position and efficiency of the utilities since it was introduced and has replaced time-consuming negotiations over tariff increases.
- The system offers incentives to improve performance and minimize costs.

operation of plants can be a first step toward overcoming a shortage of qualified or motivated utility managers.

A recent study of private power investment in Asia has concluded that the first step in promoting private investment in the power sector is the articulation and adoption of clear policies that open the sector to private participation and encourage both local and foreign private investment. The study concludes that Asian governments should consider policies that open their power and coal sectors for private investment and also create demand for their products, and it suggests ways of doing both. The study notes that in the U.S. and the Philippines, legislation or executive orders were enacted that gave certain nonutility generators

- The independent grid company controlled by the government has improved sector coordination and could eventually facilitate competition among generating companies.
- Privatization has been encouraged through issue of shares to the public. Attractive dividends help to maintain future financial support from markets.
- It has facilitated some financial restructuring by issuing shares to the government in exchange for the government's assuming some of the assets and debts of private utilities.

However, as with all regulation, the system has some weaknesses:

- There is no independent regulatory body, the centralized decisionmaking process is sometimes cumbersome, and it provides for only limited competition.
- The electricity sector is used to collecting taxes, including VAT, on electricity consumption, and the sector provides subsidies for various industries (such as the coal industry) and for supplies to rural consumers.
- Since tariffs reflect average rather than marginal costs, they do not provide meaningful price signals to consumers.
- Uniform national tariffs do not reflect the different costs of supply throughout the country.
- Some political uncertainty remains because the government can directly control prices.
- The central ministry has complete discretion in setting standard costs and allowable rates of return.
- There is no opportunity for appealing the investment decisions, since the government approves investments.
- Electricity prices have lagged behind inflation, mainly because fuel prices to electricity generators do not fully reflect international price levels.

the right to sell power to local utilities; that in Guangdong, China, government authorities welcomed private power initiatives on an ad hoc basis in response to emergency power shortages; and that in the U.K., privatization of the Central Electricity Generating Board and the regional distribution boards went hand in hand with opening the sector to nonutility generation. Different approaches are appropriate for different countries, but in each of the cases studied, the private sector has come forward and invested in the development of new power supplies.

In all successful cases, dangers from hasty privatization were avoided by first articulating a clear policy for privatization and then implementing that policy through laws and regulations. It is significant that the

Box 13. The Privatization of the Electricity Industry in Eastern Germany

After conclusion of the economic and monetary union between East and West Germany in July 1990, West German utilities signed partnership contracts with the former state-owned electricity trusts (GDR Kombinate) and founded joint ventures. A far-reaching electricity contract in August 1990 established a follow-up utility, Vereinigte Energiewerke AG (VEAG).

Although VEAG is still owned by Treuhandanstalt, the German Federal Government's holding company charged with administering (and privatizing) the former GDR state-owned enterprises, the three largest West German utilities—RWE Energie AG, PreussenElektra, and Bayernwerk AG—took charge of the management of VEAG. A 75 percent share in this company is planned for later. VEAG consists of the successors of the former Kombinate utilities. It operates the largest part of the electricity supply (on a brown-coal basis) and the entire high voltage transmission grid in the five new federal states.

Besides the three West German utilities cited above, other West German utilities will hold 25 percent of the VEAG shares. A maximum of 15 percent from the remaining 75 percent portion will be offered to other West European utilities (for example, the French EDF) if West German companies are granted a corresponding share in the respective foreign utilities.

Furthermore, once a dispute over property rights is settled by the Federal Constitutional Court, the three utilities plan to take over the majority of capital in eleven of the fifteen new regional electricity supply companies in eastern Germany. These are the successors to the fifteen regional VEB Energiekombinate, which acted as electricity and gas distribution companies. The other four regional VEB Energiekombinate are scheduled to be taken over by other West German utilities. Shares in all these regional entities of up to 49 percent are to be offered to eastern German federal states and municipalities if financing can be obtained.

Some eastern German cities have founded independent Stadtwerke (municipal suppliers for electricity, gas, and heat). Some municipal enterprises are also considering undertaking the co-generation of heat and electricity. Negotiations with the West German electricity corporations are in progress, pending a decision of the Federal Constitutional Court.

promotion of private investment in each country involved not only the adoption of pro-investment policies but also the enactment of laws and regulations to implement the policies and the development of new agreements between the private parties and the host utility. Thus, the promotion of private investment in the power sector involved creating

new policies, implementing laws and regulations, reaching agreements between parties, and setting up the institutional capability to administer the laws and regulations and negotiate and enforce the agreements.

Varying degrees of private sector participation have been proposed or are being implemented in Argentina, Chile, China, Côte d'Ivoire, Guinea, India, Korea, Malaysia, Mexico, Pakistan, Philippines, Portugal, Thailand, and Turkey, among others. Independent power production for sale to the grid is now being encouraged in the Costa Rica, Dominican Republic, Jamaica, Pakistan, Philippines, Portugal, and other countries.

Alternative Financing Options

Nongovernment power-sector financing options in developing countries include direct investment by banks, insurance companies, or pension funds; capital market participation through stock or bond issues; and other lending from local or foreign sources. Other options can include the sale of assets, especially surplus land, buildings, power plants, and transmission or distribution facilities. In some cases these assets could be transferred or leased to the private sector, which would operate and maintain them.

Other financing options include encouraging nonutility generation, as well as the sale of power to the public sector by operators of captive plant, cogeneration, and Build, Own and Operate/Build, Own, Operate and Transfer (BOO/BOOT) projects using limited-recourse financing. Experience indicates that (a) initiatives to encourage greater efficiency through structural change—by reorganization, commercialization, and corporatization—are worth pursuing if governments are willing to reduce their level of involvement and undertake regulatory reform; (b) creating conditions to attract private investor funding, such as fixing clear commercial pricing rules and freeing up markets to facilitate issues of shares and private investor funding of new plants, shows considerable promise for more developed middle income countries, where there are capital markets and stock exchanges; and (c) large BOO/BOOT type projects can be complex and sometimes difficult to arrange.

In a number of developing countries—India, Indonesia, Pakistan, and Turkey, for example—governments have tried without much near-term success to create conditions to attract private power projects. One reason for the failure of some of these schemes has been that governments have tended to focus on projects that are large and risky instead of beginning with smaller projects and concentrating on learning by doing. The other main reason for the failure to attract investment to BOO/BOOT schemes is that governments have not had sufficient commitment or political will

to address fundamental problems of governance, specify a clear legal and contractual framework, put in place an arm's-length transparent regulatory structure, or allow commercially-based tariffs that reflect real costs. Minor difficulties have been related to equitable sharing of risks among the parties and concern that these projects might not provide *additionality*, but would merely divert the funds ordinarily be available for other public-sector projects.

Realizing the benefits of alternative financing options involves a strategy to (a) reform legislative, legal, and regulatory arrangements to promote increased competition among energy suppliers, partly by increasing the private provision of risk capital; (b) strengthen the accountability and the internal organizational structure of energy-supply enterprises; and (c) shift investment resources at the margin from increasing capacity to improving efficiency in both supply and end use.

End-Use Efficiency

Recent experience has shown that in developed countries many energy-efficiency options relate to end-use efficiency and can be undertaken quickly and at relatively small cost. For example, the U.S. Department of Energy estimates that U.S. electricity use can be cut by about one-third (800 TWh) at a cost of only two cents per kWh. Taking the cost of electricity from a coal power plant as the base case, DOE estimates the net savings from conserved energy for typical conservation initiatives to be three cents per kWh.

There is, however, at least one fundamental difference between approaches to energy efficiency and conservation in developing and developed countries. While in the developed countries much of the potential savings and innovative energy conservation work is on the demand side, in most developing countries there is still also a large potential for energy saving on the supply side. As discussed above, this is partly because the subsidized publicly-owned monopolies in developing countries have few effective built-in incentives or checks and balances for achieving high levels of efficiency.

Nevertheless, efficiency in electricity consumption or end use can be increased in many developing countries, and—if power prices are not highly subsidized and if there are competitive markets for goods and services—it can be justified on both economic and financial grounds. For example, more efficient electric motors, motor-speed controls, refrigerators, water heaters, and air conditioners would increase end-use efficiency at little cost. If the energy requirements of all types of electrical equipment could be lowered, it would slow the growth in overall electricity demand.

Box 14. Residential Demand Side Management for Thailand

A demand-side management (DSM) assessment was recently completed for the residential sector in Thailand. The investigation encompassed a comprehensive analysis of the major residential end uses of electricity: space cooling, refrigeration, lighting, cooking, water heating, and appliances. The study outlined a large level of electrical savings from efficiency improvements that could be achieved through the use of existing technologies. A total of twenty-three economically-viable DSM measures were identified. If fully implemented, these improvements could reduce annual electricity use by up to 500 GWh and coincident peak electrical demand by 160 MWe during the first year of a residential DSM program.

The highest potential savings could come from increasing the energy efficiency of refrigerators. Improvements to the insulation and compressors of Thai refrigerators were predicted to reduce electrical use from 400 to less than 200 kWh per unit per year. Overall savings from a full program implementation indicated possible countrywide savings of up to 170 GWh per year if more efficient refrigerators were introduced into the marketplace. Negotiations are underway with a large Thai refrigerator manufacturer to produce a high-efficiency prototype unit for testing and evaluation.

Estimates for residential housing savings were based on replacing less efficient equipment in existing housing as it is retired from service and by instituting cost-effective energy-efficiency measures in new construction. With full implementation over ten years as new buildings are constructed and inefficient equipment in existing buildings is replaced, such a strategy could result in cumulative savings of more than 6,000 GWh and peak reductions of more than 2,000 MW by 2005. To put this in perspective, consider that the overall electrical consumption of the residential sector in 1989 totaled 7,025 GWh and that Thai households were responsible for approximately 20 percent of the peak utility load of 7,095 MW.

Source: Florida Solar Energy Center.

Many countries have found it difficult to make much progress in end-use efficiency, and developing countries in particular have run into obstacles. These include the lack of competitive industrial structure; imperfections in the market, such as low power prices that do not reflect costs; trade restrictions and import duties on energy-efficient equipment; regulatory and institutional barriers; inadequate information on costs and alternatives; and lack of available technologies. Nevertheless, new and evolving energy end-use efficiency technologies are promising, and along with pricing electricity to reflect the real costs of supply, there

Box 15. Highlights of Fiscal 1991 Power Lending

- The absence of major hydro or oil and gas thermal generation projects. In general, resettlement and environmental issues are discouraging hydro development. Also, heavily indebted developing countries are unable to invest in capital-intensive hydro projects.
- A \$200 million loan to the Bombay Suburban Electricity Supply Company in India for a private power utilities project. The loan was made with the guarantee of the government.
- A \$300 million loan to the Turkish Electricity Authority. It supported major price reform and financial reconstruction for this previously troublesome borrower.
- Continued support for small components in rural electrification projects. The Bank supported development of a rural electrification master plan in Burundi and some distribution in rural areas of Indonesia and Uganda. A second rural electrification project for Morocco (\$114 million) was approved.
- Two supplemental loans to Pakistan. One went for the SNGPL corporate restructuring and system expansion project (\$60 million) and the other for the second energy sector program loan (\$28 million).

is a need to reevaluate continuously the financial, economic, technical, and social feasibility of their implementation.

In most developing countries, however, the new end-use energy efficiency options and many fuel-switching options have no institutional focus and are not systematically reviewed as part of routine power-sector supply planning. This is in spite of the fact that in the short and medium term, up to 30 percent of energy savings in industry could be achieved by audit and control efforts and by some process modifications with existing technology.

5

Guiding Principles for Bank Action

Historically, the power sector has been a major project vehicle for the transfer of World Bank resources to developing countries; more than 15 percent of total Bank loans has been for electric power. The Bank's \$3.18 billion lending for power in fiscal 1992 was 14.5 percent of total Bank lending.

Today, however, the Bank is no longer a significant financier for power sectors in developing countries, except for the lowest-income countries eligible for International Development Association (IDA) credits, which accounted for 8 percent of total Bank power lending for fiscal 1992 and for about 2 percent of the total foreign exchange requirements in developing-country power sectors. Outside of most IDA countries, the Bank is becoming less involved in the direct transfer of significant amounts of resources, and more involved in helping developing countries organize themselves to mobilize the resources they need to meet large investment requirements.

To assist in mobilizing resources, the Bank must help these countries put in place systems that encourage the efficient use of power-sector resources. This efficiency objective also helps developing-country power sectors meet their local and global environmental responsibilities as they become larger components of the world energy market.

The question is, then, what specific approaches will the Bank pursue to help countries develop a self-sustaining power sector? The options discussed above show that there is a rich menu of choices for improving the performance of the sector. The great diversity of circumstances among Bank borrowers (box 16) suggests exercising care in selecting from this menu. Institutional and regulatory arrangements in each country will vary according to cultural traditions and historic relationships. Mature institutional frameworks will take time to develop.

Box 16. Wide Variation in Per Capita Electricity Use Among the Developing Countries Requires Different Sector Approaches

The varying levels of economic development and electricity access in developing countries results in a wide range of per capita electricity production. Below are the twenty countries with the highest and lowest electricity use.

Electricity produced per capita in 1987

<i>High use</i>		<i>Low use</i>	
<i>Country</i>	<i>kWh</i>	<i>Country</i>	<i>kWh</i>
Poland	3914	Guinea-Bissau	14
Hungary	3806	Burkina Faso	15
Yugoslavia	3469	Ethiopia	18
Romania	3327	Mali	26
Venezuela	2743	Burundi	26
Portugal	2267	Rwanda	28
Cyprus	2224	Nepal	31
Korea	1901	Comoros	33
Argentina	1683	Uganda	35
Barbados	1673	Benin	38

The large difference between the highest and lowest countries suggests that power-sector development policies must vary from basic sector formulation, institution building, twinning, and training in the low electricity-use countries, to legislative, regulatory, and autonomy issues in more advanced countries. There can be no one standard approach to power sector development for all countries.

Source: Escay, 1990.

Power-sector work, like public-sector management reform, is technical in nature and complements other reform efforts, such as elimination of monopolies, deregulation or removal of controls, and reduction of rent-seeking opportunities. Indeed, there is much that the Bank has been doing routinely that contributes to good governance in the power sector.

It is recognized, of course, that in poor countries, where the capacity of the public sector to manage an economy and deliver services is weak,

the prospects for rapid power-sector change can be limited. The public sector and the power sector in many developing countries have been characterized by uneven revenue collection; poor expenditure control and management; a bloated and underpaid civil service; large parastatal enterprises that provide poor returns on the scarce public funds invested; and a weak capacity of core agencies to design and implement policies to address these problems. Not only does this state of affairs contribute to large fiscal and power-sector deficits that require adjustment measures, but it also progressively erodes the capacity of the state and its subsectors to provide services. In such instances, fundamental issues of governance and economy-wide regulatory reform must be addressed across the board in parallel with power-sector reform. Power-sector lending will need to be firmly linked with well-integrated overall country strategies. Since in many countries the power sector is an important instrument of resource transfer, this link should strengthen the economy-wide dialogue.

The following guiding principles are derived from World Bank work on issues of governance and public sector management, from consultations with numerous outside parties, and from the power-sector analysis contained in this paper and the background documents (listed in the bibliography). While individual points may not be applicable in all countries, due to differences in existing institutions and stages of development, the guiding principles are consistent with the focus on the interrelated issues of institutional reform, pricing, financing, and the introduction of greater transparency, accountability, and competitive pressures into the power sector. The principles presented here reflect the broad discussions and debate that has taken place within the Bank and represent a general consensus on the directions in which the Bank should move. Box 17 summarizes sector goals, sequential approaches to achieving the goals, and resulting guidelines for the Bank.

The guiding principles do not address specific issues of when investment lending should be linked to the power sector and when, because of poor economy-wide governance and economic distortions, it should not. This is thought to be a country-specific issue. To the extent that parallel reform in the large and capital-intensive power sector can serve as an initial impetus for economy-wide reform, sector lending should be pursued. It is clear that power-sector investment loans, like adjustment loans, are most effective when they are linked to improved policies and institutional conditions in the sector. Evidence exists, however, that the rates of return on infrastructure projects are adversely affected by a poor policy environment, and where money is fungible, financing of the electric power infrastructure might enable a government to do inappro-

Box 17. Summary of Power Sector Goals, Approaches to Achieve the Goals, and Resulting Actions for the Bank

<i>Goals</i>	<i>Sequential Approaches to Achieving Goals</i>	
<ul style="list-style-type: none"> • Where justified, expand the provision of electric power in developing countries • Greater efficiency in the generation and end use of power • Reduction in the financial and debt burden of the power sector on public finances • Where cost-effective, identify and incorporate options (including fuel substitution) to mitigate negative environmental impacts of electricity supply and end use 	<ul style="list-style-type: none"> • Put in place mechanisms that allow greater autonomy for and accountability of sector managers • Provide some form of clearly defined and transparent buffer between government, with its legitimate political and policy concerns, and power enterprise managers 	<ul style="list-style-type: none"> • Independent board of directors • A more transparent regulatory framework <ul style="list-style-type: none"> • Tariffs • Service standards • Service targets • Issues of entry and exit • Supply side integration of end use options • Environmental impacts, siting, emissions, fuels, and disposal issues
Guiding principles	Principle One: Transparent regulation Principle Two: Importation of services Principle Four: Commitment lending	

priate things elsewhere. Hence, where macroeconomic imbalances and economywide distortions are severe (and where funds are clearly fungible), direct policy links to the whole country lending program would be the most appropriate approach.

Finally, the principles as stated in this paper do not explicitly address issues of technology transfer. These are addressed more explicitly in the Bank paper *Energy Efficiency and Conservation in the Developing World: The World Bank's Role* (1993).

<i>Sequential Approaches to Achieving Goals</i>	
<ul style="list-style-type: none"> • Contract plan • Commercialization • Contract out for services • Internal organizational change <ul style="list-style-type: none"> • Separate generation, transmission, distribution into separate companies or profit centers; decentralize 	<ul style="list-style-type: none"> • Corporatization and/or privatization <ul style="list-style-type: none"> • Contract out for services • Purchase power, cogeneration, BOO/BOOT • Partial or full divestiture • Encourage nongovernment investment • Sales of shares, bond issues • Use guarantees to reduce sovereign risk (but not commercial risk)
<p>Principle three: commercialization/corporatization</p>	<p>Principle five: Investment guarantees</p>

Transparent Regulatory Process

Principle one

A requirement for all power lending will be explicit country movement toward the establishment of a legal framework and regulatory processes satisfactory to the Bank. To this end, in conjunction with other economy-wide initiatives, this requires countries to set up transparent regulatory processes that are clearly

independent of power suppliers and that avoid government interference in day-to-day power company operations (whether the company is privately or publicly owned). The regulatory framework should establish a sound basis for open discussion of power-sector economic, financial, environmental, and service policies. The Bank must be satisfied that there is meaningful progress towards this objective.

TRANSPARENCY AND CONSISTENCY OF DECISION MAKING. Accountability in the power sector can be improved by clearly articulating goals, reforming country legal frameworks, and establishing a regulatory process to make decisions more transparent and to allow a fair hearing for both consumers and the general public. To this end, Bank loans need to encourage governments to develop clear rules of the game that invite broader public participation.

Transparency of decisionmaking in a regulatory framework is a safeguard against corruption, patronage, waste, and the abuse of executive authority. Competition and deregulation, the removal of unnecessary controls, clear rules, and disclosure are important first steps. With regard to a legal framework for the power sector, six basic elements must be put in place:

- a clear set of rules, known in advance;
- rules actually in force;
- mechanisms to ensure application of the rules;
- conflicts resolved through binding decisions of an independent judicial body or through arbitration;
- known procedures for amending the rules when they no longer serve their purpose, and
- a framework of regulatory incentives (including the possibility of price capping) to support competition and induce efficiency.

ENVIRONMENTAL SAFEGUARDS. In addition to the general principles of transparency and independence from day-to-day government interventions, regulation should address environmental issues. It is fortunate that the technology for addressing one of the most serious pollution problems of electric power production—emissions of particulate matter—is relatively simple and inexpensive. Increased use of gas-fired power stations will be important in this respect. Where coal is the preferred fuel, constructing tall chimneys, siting power stations away from large population centers, and using emissions-control devices all help to increase amenities and reduce hazards to health. Given the costs to life and health of particulate matter emissions and the modest costs of reducing these emissions to low levels, the case for working toward

high standards of abatement is unambiguous. Well-functioning regulatory processes can also be used to institute programs to increase the efficiency of electricity end use while offering reductions in emissions and financing needs.

To develop such regulatory processes, the Bank should commit technical assistance and general financial support to establish or strengthen regulatory institutions. The form and functions of the institutional structure, including its initial degree of transparency and independence, will vary from country to country. For those countries that desire change but do not have the local expertise to restructure or formulate an appropriate regulatory mechanism for the country, the Bank can provide funding for the necessary technical assistance. All regulatory processes should include a mechanism to review the environmental impacts of, and conservation options for, proposed projects and policies (environmental assessment) as well as to give explicit consideration to issues of involuntary resettlement and indigenous peoples. Developing effective regulatory institutions to address these issues will take time, but concerns about potential impediments and delays should be no excuse for inaction.

PRICING. The regulatory authority must provide power enterprises with clear pricing guidelines that reflect the sometimes conflicting objectives of (a) a commercially-based allocation of costs among consumers according to the burdens they impose on the system; (b) assurance of a reasonable degree of price stability; (c) provision, where economically feasible, of a minimum level of service to low-income consumers; (d) power prices that generate sufficient revenues to meet the financial requirements of the sector; and (e) a tariff structure simple enough to facilitate metering and billing.

Pricing guidelines should support the need to regulate power suppliers as commercial entities. Subsidizing the price of electricity has both economic costs and environmental effects. Low prices give rise to excessive demands and, by undermining the revenue base, reduce the ability of utilities to provide and maintain supplies; developing countries use about 20 percent more electricity than they would if consumers paid the true marginal cost of supply. Underpricing electricity also discourages investment in new, cleaner technologies. Nevertheless, the cross-subsidization of consumer groups is a common practice in most developing countries. Typically, low-income electricity consumers in both rural and urban areas receive a lifeline tariff designed to permit the consumption of a minimum block of power at a subsidized rate. Usually there are large subsidies from urban to rural consumers, and sometimes from industry to residential use, or vice versa.

Although the objectives of social equity are laudable, there have been serious practical problems. In rural areas in India, for example, political pressures for increased subsidies have resulted in almost free electricity and consequently enormous financial difficulties for the state as a whole. In Colombia, the lifeline-tariff concept has been eroded through the political process to the point where 85 percent of all households qualify. The resulting tax on industry is driving industry out of the public system and into captive generation. Conceptually, the use of carefully targeted subsidies can address equity issues. However, in the rare cases where subsidies are carefully targeted, they seldom remain so for long. In most cases there are better tools for addressing the concerns of the poor or other deserving groups than electric power tariffs.

Although long-run marginal cost (LRMC) as a concept aims to provide price signals for an effective tariff structure and for identifying new investments, price setting in the electric power sector rarely fully reflects LRMC principles. In practice, electricity tariff levels are at best often targeted only to reflect an average of the power system's LRMC. Pricing distortions continue to exist due to cross subsidies, and failure to reflect economic fuel costs or the real cost of capital results in prices that do not reflect the costs of supply. Consequently, many power utilities continue to be economically and financially nonviable and a drag on the national budget. Mobilizing additional resources for investment, facilitating a competitive environment, improving efficiency, and developing economically and financially-viable power sectors require that electricity pricing be moved toward commercial practices. Pricing policies should be flexible so that power enterprises can respond to changes in competition, economic activity, and resource costs.

Between the Bank and its borrowers, few issues are as contentious as pricing. Experience shows that the Bank has not always achieved its goals with respect to electric-power pricing. The Bank's suggestion that prices cover LRMC has proved difficult to enforce through covenants that set out financial targets, mainly because of lack of adequate progress in the implementation of tariff structures that reflect the demands of various end users.

Power entities should be encouraged to be more market oriented in setting prices and to offer a variety of pricing and service options that reflect the actual costs of providing service to customers. Aggressive load-management programs should be put in place with peak-load and time-of-use pricing, as well as prices that reflect different voltages, consumer classes, and levels of reliability and availability. Large consumers should be allowed to negotiate prices and service options directly with power suppliers. Cross subsidies that make competition

more difficult, promote inefficiencies, and lessen accountability should be eliminated. Countries with relatively undeveloped power markets should, at a minimum, put in place long-run average incremental cost-based pricing that incorporates simple time-of-use elements to meet the financial objectives of utilities.

A framework of regulatory incentives can include price capping to support competition and induce efficiency. Multipart (declining block) tariffs above short-run marginal costs could be considered for the non-competitive segments if the greater revenue requirements for financial viability would cause unacceptable welfare losses under linear tariffs. Above all, the Bank should encourage governments to regard pricing as a commercial issue and to legislate fair entry conditions for private entities to supply power and related services.

DEMAND-SIDE MANAGEMENT.² As discussed earlier, much potential for end-use electric power efficiency in developing countries remains untapped. Compared to large improvements over the last decade in the industrialized nations, energy conservation in developing countries has not kept pace. Demand-side management (DSM), if suitable infrastructure exists for its implementation, can be a lower-cost way to meet electricity service needs than new supply capacity.

DSM is not currently pursued with much intensity in most developing countries (Singapore and, more recently, Pakistan are exceptions). The reasons vary from country to country but generally revolve around the facts that (a) energy prices are low and subsidized; (b) power supply utilities are weak institutions that have major difficulties even supplying power and collecting bills; (c) end-use markets are not highly competitive; (d) regulatory agencies do not exist; and (e) knowledge about, and high-level support for, DSM initiatives on the part of governments are lacking. These barriers must all be lowered if DSM is to have a significant impact on developing countries energy consumption.

In pursuing the nonpricing DSM options that require working closely with energy consumers and equipment manufacturers, two general models have evolved. In the U.S., DSM has become part of a bigger effort known as Integrated Energy Resource Planning (IERP). IERP is primarily a U.S. process whereby utilities and their regulatory commissions work jointly to evaluate available demand- and supply-side options (including purchased power) and determine a so-called optimal energy service strategy that takes account of economic and environmental factors. The essential concept of IERP is the equal treatment, or integration, of energy-based and conservation-based energy-service strategies. Planners attempt to rank by cost all the different energy-supply and end-use

technologies and programs that might provide energy services and then implement them, beginning with the lowest-cost opportunities.

The concept is appealing. IERP is a tool that has been used in the U.S. to promote energy efficiency investments as an alternative to capacity expansion. In the U.S. this is generally performed by the power utility. IERP as practiced in the U.S. has usually developed in an environment in which most end users purchase their electricity in a noncompetitive market and where a strong regulatory regime that can allocate costs and benefits across consumer groups is in place. For example, if consumers are charged a price of eight cents per kWh but the peak cost to the utility is ten cents, the utility, and presumably the country, can benefit by discouraging demand growth and energy use during the peak period. Regulatory commissions encourage the utility to negotiate with customers on ways to reduce their overall consumption. The benefits and costs from this reduction are distributed in various ways among the utility, the customers, ratepayers in general, and the taxpayer. Usually the risks and costs are mostly borne by the ratepayers because regulators have allowed the utility to write off the costs of these demand-reducing programs against the general rate base. In many of these programs, utilities use their preferred and sometimes subsidized access to capital markets to finance equipment and services to eligible customers. There are a variety of permutations to this approach, but they all require the utility to see if it can identify investments or practices by customers that would reduce the electricity consumption of consumers and thus avoid new additions to capacity.

In contrast, in Europe and in a number of other countries that do not have relatively intrusive U.S.-style regulatory arrangements, a variety of non-utility institutions work with utilities, equipment manufacturers, and end-use consumers on demand-side issues and efficiency options. The few developing countries that have seriously pursued at least some of the available DSM options have largely followed this model and attempted to create some form of semi-autonomous energy-efficiency institution not directly associated with the power utility. In fact, it is not clear that an IERP process as it has developed in the U.S. can be applied effectively in many developing countries. In addition to a lack of strong regulatory agencies to police utilities, low energy prices and poor reliability of service often weaken the incentives for consumers to respond to DSM initiatives.

In principle, a large part of the potential gains from demand-side management comes from the utilities ability to work with some of their larger commercial and industrial customers on complementary actions that benefit both parties. In many instances these actions can be specified in contractual arrangements. The reality in many developing countries

Box 18. The Bank and Energy Efficiency

The Bank policy paper *Energy Efficiency and Conservation in the Developing World: The World Bank's Role* (1993) outlines ways the Bank can address energy supply and end-use efficiency issues that are highly relevant to the electric power sector in developing countries. The paper concludes that although the Bank clearly should continue its efforts toward increased lending for project components to improve energy efficiency and promote economically-justified fuel switching, the Bank should sharpen its focus with the following four-point program:

- *Country-policy dialogue.* To gain greater country commitment, the Bank will better integrate energy efficiency issues into its country policy dialogue so that they can be addressed at an earlier stage. In the Bank's general country-policy dialogue with developing countries, greater emphasis will be on energy pricing and on fundamental institutional and structural factors that affect supply- and demand-side energy efficiency.
- *More selective lending.* The Bank will be more selective in lending to energy-supply enterprises. Governments should clearly demonstrate that they are putting in place structural incentives that will lead to more efficient energy supply and consumption. The Bank will not continue to finance energy-supply projects where poorly performing and highly polluting public energy enterprises and their governments are unwilling to carry out fundamental structural reforms that could significantly improve the ways in which they do business.
- *Intermediation functions.* Approaches for addressing demand-side management and end-use energy-intermediation issues will be identified, supported, and given high-level in-country visibility. The Bank will increase its efforts to improve intermediation in the energy and industry information markets in developing countries to reduce the relatively high information, management, technology, and financing transactions costs.
- *Technology transfer.* The Bank will give greater attention to the transfer of more energy-efficient and pollution-abating technologies in its sector and project work. For all sectors, including basic materials processing industries, the Bank will (i) actively monitor, review, and disseminate the experience of new efficiency-enhancing supply-side and end-use products, technologies, and processes and pollution-abating technologies as they are developed and reach the marketplace; (ii) help finance their application; and (iii) encourage the reduction of barriers to their adoption. Staff working in all sectors will explicitly review technology choice options during project appraisals and in sector work.

Box 19. Korea—Focus on Evaluating Management

The major power producer in Korea is KEPCO, a parastatal company responsible for most generation and all transmission and distribution. At the time of the first World Bank loan in 1979, KEPCO was considered a relatively well-managed company but subject to excessive government regulation and control. It also was experiencing high staff turnover because of inadequate salaries and benefits. Coordination of its many operating units was posing problems, and concern was growing that its original organizational structure, established in 1961, was no longer appropriate for maintaining or increasing efficiency. It was also noted during the Bank's appraisal of the first loan that KEPCO needed to improve its planning and organization, that the pricing structure was inadequate, and that there were no clearly-defined financial goals.

Subsequent to a Bank-financed consultants' study, it was concluded that government control over KEPCO was excessive and that KEPCO should be allowed greater autonomy for managing its affairs. As a result, internal organizational changes were made. In 1984, the government's Invested Enterprise Management Act introduced a new management structure for KEPCO and other public enterprises. The act gave greater powers to a new external regulatory board that separated policymaking from the executive functions. KEPCO's president and management became fully accountable to this external regulatory board.

The act also provided the board with criteria for evaluating KEPCO's management performance (with salary incentives being awarded based on performance), under the scrutiny of the Public Enterprise Management Council, which reviewed all public-enterprise performance. The act allowed substantial incentives for superior performance and stressed evaluating management, not company, performance.

The effects of this new regulatory structure were striking. Between 1983 and 1988, KEPCO's operating costs declined in real terms by some 34 percent. This reduction was achieved in spite of rapidly rising real-wage costs and after taking account of changes in the conversion efficiency of new generating plant as well as reductions in fuel costs during that period. In addition, technical measures on the supply side and demand-management policies—such as mandatory time-of-use tariffs—are estimated to have reduced peak load demands between 1977 and 1987 by about 800 MW, or some 7 percent of actual 1987 peak demand. Another characteristic of the new regulatory policies was that over time, tariffs were regularly adjusted to cover actual costs, including a substantial portion of capital-investment costs.

Source: World Bank records.

is that the services of the utility are so poor that many of the larger customers either provide for their own needs or have substantial standby capacity for meeting the frequent system failures. In the absence of improvements in reducing the frequency of outages, few of these customers would be willing to rely on contractual arrangements with the electric power utility.

In addition, few utilities in the developing world have the necessary customer information to begin aggressive nonpricing DSM programs. Most of them have little or no end-use data, and many do not even have data on customer use by class. They are also not strong enough institutionally to undertake such managerially- and administratively-intensive programs. Many utilities are in serious financial difficulty; they have trouble simply collecting their own bills and operating and maintaining their systems. As a first step, these utilities will require substantial institutional reforms, which are now a matter of high priority in many countries and are the focus of World Bank support. Some alternative institutional arrangements are discussed in the companion paper, *Energy Efficiency and Conservation in the Developing World: The World Bank's Role* (1993). At the same time, many utilities will need to concentrate on major plant rehabilitation and transmission and distribution loss-reduction programs as well as build up an end-use customer database.

With respect to implementing end-use efficiency, creative solutions are needed to overcome market and institutional barriers to conservation. World Bank lending in the energy sector should be based on and, where necessary, support as part of country assistance strategies the development of integrated energy strategies that help borrowing countries take advantage of all energy supply options, including cost effective conservation-based supplies and renewable energy sources. As DSM programs are increasingly put into place, lessons will begin to emerge with respect to the potential benefits to developing countries of integrating supply- and demand-side measures.

With regard to power pricing, it is clear that as in the industrial countries, developing-country power suppliers are the ones who must pursue the DSM energy-pricing options. In fact, most developing countries, having few explicit or legally-constrained regulatory policies, can more easily pursue aggressive load-management programs designed to alter the shape of the prevailing system load-duration curve by reducing peak demand and encouraging a more economical demand mix. Such programs would include pricing to reflect differences in time-of-use costs, customer classes, location, and types of loads. Pursuit of better DSM pricing policies could yield large gains in developing countries, even where average revenues do not yet fully cover costs.

Box 20. Corporatization of Electricidade de Portugal, S.A.

Electricidade de Portugal (EDP) is currently undergoing major policy and organizational reform. The head office of EDP is being transformed into a wholly state-owned holding company with a full-time executive board of directors. Within the holding company, six separate companies are being formed: a generation company, a national grid company, and four distribution companies. All new generation capacity will be built, owned, and operated by the private sector, with energy sold directly to the generation company. The generation company will then sell power to the grid company, which will sell to the four distribution companies. All six companies will operate as separate profit centers. These companies will operate under a license issued by the Director General of Energy, who is responsible for regulation.

Two forces are driving the change: the desire to increase efficiency through competition, and the need to reduce the amount of public debt. With regard to competition, the board of the holding company will closely monitor the performance of all six companies, explicitly comparing performance of the distribution companies and of the existing generation company plants. It will also compare the performance of existing generating plants with that of the new private-sector plants.

Legislation has been enacted to permit private generators to sell to the grid company.

Importation of Services*Principle two*

In some of the least developed countries, where there are weak public and private sectors, a relative lack of market forces, and undeveloped capital markets, an early step in bringing about power-sector reform and increasing sector-management efficiency will be to bring local, developed-country, or more advanced developing-country electric power services into the sector.

Among the underlying causes of poor power-sector development and management is a country's level of economic, human, and institutional development. Lack of educated and trained manpower and weak institutions reduce the capacity of countries to provide sound development management. Poverty, illiteracy, and weak institutions are all causes of poor power sector performance and make the task of sector management much more complicated and problematic.

In such institutionally-weak situations, a priority is to find imaginative ways to draw on international hands-on experience as a means of

developing local manpower, skills, and institutional capabilities. Early steps in bringing about sector improvements should involve twinning arrangements or the contracting out of selected sector services to foreign entities (other developed- or more advanced developing-country power enterprises, contractors, manufacturers, consulting firms, operating companies) that can provide in-country management services at reasonable cost and create local capacity in the sector. Doing it alone is simply too expensive for poor countries in terms of foregone economic output. An efficient productive power sector can set an example that will be more valuable than merely training a few selected engineers in an environment filled with disincentives. Learning-by-doing is a time-tested process, but providing leadership in the learning process is essential.

As discussed in chapter 4, the power sector worldwide is a mature industry with an ability to provide a wide range of services on a contract or twinning basis. Potential areas for contracting include management of civil works and activities that do not entail large investment costs, such as plant maintenance, diesel operation, billing, revenue collection, vehicle maintenance, line stringing, and pole and tower fabrication. Other areas for outside involvement could include reducing supply-side power losses and increasing generating plant availability. The financial costs of these initiatives are generally low relative to the benefits gained.

Commercialization and Corporatization

Principle three

The Bank will aggressively pursue the commercialization and corporatization of, and private sector participation in, developing-country power sectors.

Power enterprises must operate as commercial businesses. They should pay interest and taxes; earn commercially-competitive rates of return on equity capital; and have responsibility for their own budgets, borrowing, procurement, pay, and staff conditions. This means that the governments relationship with these enterprises must be more transparent and must emphasize financial discipline together with setting the overall policy framework and goals.

In view of the capital intensity of the sector, any private supply response would take time to materialize, and meanwhile, the power gap could worsen. Some direct investment by the Bank would still be needed during this transition period. Nevertheless, direct loans to energy enterprises should be linked to progress toward corporatization and commercialization.

The Bank could, in fact, support electric power lending to both the public and private sectors. To encourage broader participation of parties

Box 21. Privatization of the Electric Power Sector in Chile

The most important public power system in Chile is the Central Interconnected System. This system comprises three public utility companies—Endesa, Chilectra, and Colbun—with installed generating capacity of about 3200 MW (1988).

Since 1980, the government has encouraged a process of divestiture and privatization of publicly-owned electric utilities. The privatization of the power sector was implemented through legal and institutional changes to make the power utilities operate under the same regulations as private enterprises. Private participation was encouraged by establishing new investor-financed enterprises to purchase existing facilities or to construct new facilities (for example, large generation projects). General electricity rates were based on marginal costs and reflected the opportunity cost of producing electricity. Prices for most larger users were set largely through market forces by negotiations between investor-funded generation companies and these consumers. This approach served to create competition among producers.

Privatization in Chile's power sector was financed through three mechanisms: public auction, stock exchange listing, and so-called popular capitalism. Privatization of the sector took place over several years, with the separation of distribution from generation/transmission and the creation of several independent distribution and generation companies. The government sold some distribution subsidiaries in 1980 by public auction. By 1983, Endesa was listed on the stock exchange, with capital advances received from new consumers converted into shares in the company. Between 1985 and 1987, it sold three small hydrostations, again by public auction. Other distribution subsidiaries were also sold, with employees of the companies purchasing shares from their pension entitlements (popular capitalism). Pension funds and banks also participated by investing in shares in listed power companies.

In about 1985, government acted to further resurrect the financial structure of Endesa by capitalizing about CH\$500 million of its debt and converting it to equity held by the state. By mid-1989, virtually 100 percent of distribution was in private hands, and most of Endesa was privately owned. Chilectra became 100 percent private in January 1988, when two U.S. banks bought at public auction the 40 percent of the stock that was publicly owned. Only Colbun, which operates a hydroplant, is operating as a government-owned utility.

other than the government in all aspects of the power sector, Bank loans could be made to both private and public enterprises. Industrial firms, for example, should be able to borrow for power generation on terms

equal to those offered to public enterprises, where supply by independent power producers is shown to meet sector objectives.

In some countries the Bank should channel some portion of its lending through financial intermediaries such as commercial banks. The commercial banks or other intermediaries could receive bonds from the power companies as security and could sell the bonds in the country's capital market with a commercial bank guarantee. There are many ways in which such deals could be structured. The essential points are that (a) if power sector enterprises must compete with each other and with other non-energy enterprises for at least some portion of their financing, a direct link must be established between sector performance and the ability to raise resources for new investments; and (b) the power sector could directly assist with the development of a country's capital market by being a source of higher quality, longer-maturity paper.

Such financial-intermediary lending would have to comply with existing Bank guidelines for such lending and fit well within countries' overall financial policy frameworks. There should be an agreed financial-institution development plan that demonstrates that the institution has an effective role to play in the country's financial sector development. The plan should provide explicit target benchmarks for monitoring progress in weak areas.

As such, the Bank's lending for power would support and be a part of overall reform of the financial sector. As noted earlier, if the capital requirements of the power sector are to be met, substantial resources will have to come from private domestic savings. This will only take place through a close working relationship between the power enterprises and those institutions responsible for mobilizing savings. In addition, the financial enterprises would benefit from being able to add this important industry to their asset base. It is clear that given the potential importance of the power sector for capital-market development, and the comparative price and income stability that will come through proper regulation, the power sector has the potential to tap a large pool of savings that otherwise may have few domestic investment alternatives. Of course, as discussed under principle two, in some lower-income countries, where the power sector is relatively large in comparison to the formal financial sector, the Bank will have to continue direct loans to power enterprises or credits to these enterprises through governments.

Understanding the potential pitfalls and operational implications of launching parallel reforms in both the power and financial sectors is essential for designing a power-sector reform program. The success of such a program requires that reforms in these sectors be linked and well-integrated with the overall economywide reform process. At pres-

ent, many developing countries have launched adjustment programs that go beyond the correction of initial imbalances to the reform of economic policies and institutions. In many countries the timing is right, therefore, for initiating intersectoral reform programs.

Commitment Lending

Principle four

The Bank will focus lending for electric power on those countries with a clear commitment to improving sector performance in line with the above principles.

In a few countries where major reforms have taken place in the power sector, reform occurred after several years of sustained dialogue with the Bank and other donors. The Bank's presence can be a catalyst to encourage country commitment. Above all, the Bank will not continue to finance power projects where poorly-performing and highly-polluting utilities and their governments are unwilling to carry out fundamental structural reforms that significantly improve the way they are doing business.

Since helping countries move in the direction of fundamental sector reform is emerging as one of the Bank's primary objectives in a number of power sectors, the Bank must allocate resources for the institutional analysis and technical assistance necessary to help guide fundamental sector reform. The Bank must focus lending mostly on those countries that show a clear commitment to improving sector performance. Commitment must be judged on a country-by-country basis around the themes of significant progress toward needed reform and no more business as usual.

This will involve choosing countries for specific work according to the sector-development issues outlined above and according to the range of activities the Bank can take on and support at any given time. Some of the Bank's borrowers may neither want the Bank to be so involved nor require such assistance. Where there is need but no commitment, such work would waste resources. Similarly, the dimensions of power sector development the Bank chooses to assist should reflect both the chances of success and the Bank's own ability to provide effective assistance in terms of skills and resources.

In countries in which the Bank is active in improving power sector development, the Bank needs to assist in the design of highly differentiated responses, taking account of the countries' institutional needs, political economy, social structure, and history. The objective in each case must be to help strengthen the environment for sustainable power sector development.

It is clear that the Bank will need to expand its sector work from current low levels to help countries pursue some of the fundamental institutional and structural reforms suggested in this paper. An expanded program will require both the borrower and the Bank to identify better and analyze the political, legal, regulatory, and institutional constraints to improved performance. The financial goals and strategic options for the sector, as well as the more traditional least-cost investment program, also will have to be more clearly spelled out, and more analysis of the robustness and environmental impacts of investment programs will have to be undertaken. Above all, the issues of accountability and incentives for efficiency among government, producers, and consumers will have to be clearly identified and remedial actions defined and agreed upon.

When a country, with the Bank's analytical support, decides that the best way to develop its power sector is to step up Bank support of privatization in the sector, the first step should be to put together a comprehensive sector work program. This program would form the basis for a set of actions that would begin with putting in place acceptable legal and regulatory frameworks.

These actions would be tailored to suit the situation in each country, given its level of economic development and the extent of private-sector and capital-market development. Private-sector participation could be considered any activity that would increase involvement of the private sector in financing, developing, or operating facilities for the electric power sector. There are numerous options available for private sector participation—from collection, billing, construction, and maintenance services to options for generation, transmission, and local distribution—in a commercialization, corporatization, or privatization format. The available options were discussed briefly in chapter 4.

Essentially, the Bank will assist in bringing in international experience to help shape a plan that encourages those reforms that best suit a country's readiness for privatization. In countries that already have well-developed capital markets and stock exchanges (Argentina, Brazil, Chile, India, Korea, Malaysia, Mexico, Pakistan, Philippines, Thailand, and Venezuela, for example), the feasibility of listing on the stock exchange or using other mechanisms for tapping capital markets should be examined. Some of these countries are already progressing in this direction: Pakistan and India are issuing local bonds, and Malaysia has listed the public power utility on the stock exchange. In other countries, the Bank could require the commercialization and subsequent corporatization of utilities as regulated profit-oriented business enterprises so that eventually they would be able to access capital in local or international markets. In less developed or severely debt-ridden coun-

tries, the Bank could seek private-sector assistance in developing financial reconstruction plans through management contracts, contracting out, the use of consultants, and other approaches.

The key objective, whatever the means, should be for governments to reduce their role in funding and operating electric power facilities and to transfer these functions, to the extent possible, to other entities, including the private sector. World Bank assistance is likely to be required in reviewing and advising on governance issues, the legal and regulatory arrangements, and the legislative framework. Governments would have to act more like policymakers than managers, and the power sector would have to become accountable to its shareholders and the public.

Finally, commitment lending also means that the Bank, on its side, must change the perceptions of some of its borrowers. When the Bank is perceived as an institution that is driven by supply-side lending targets and is tolerant of noncompliance, its leverage is low. In contrast, if it is perceived as an institution requiring performance and compliance if resources are to be forthcoming, particularly when it can effectively coordinate cofinancing efforts with other bilateral and multilateral sources, then its leverage for policy change can become very effective.

Private Investment

Principle five

To encourage private investment in the power sector, the Bank will use some of its financial resources to support programs that facilitate the involvement of private investors.

The previous guiding principles are partly aimed at helping countries establish a framework of policies and institutions that will result in a competitive and more efficient commercial power sector. Such a sector should be able to attract private capital. But getting energy prices right and putting in place an accountable institutional framework may not be sufficient. Private investors still could be understandably reluctant to make significant financial commitments because of a lack of experience with the operation, stability, and reliability of the new policy framework. Governments, on the other hand, are concerned that investors will try to compensate for the perceived risks by seeking high rates of return that could require unpopular increases in electricity prices. Both parties thus have an interest in lowering the perceived risks.

Experience with BOO/BOOT projects indicates that many private investors are initially reluctant to undertake projects that are large relative to their capital base. Consequently, attempts to put together private

financing schemes for very large and complex power projects have sometimes proved difficult or impossible (for example, in Turkey and Pakistan). Nevertheless, there is considerable evidence that investors are interested in smaller, less complex power projects in which the risks are considered more manageable. Once investors gain experience and confidence, they will be willing to finance larger projects (box 22).

It is in the early stages of policy reform process that investors perceive the greatest risks. On the one hand, most investors are prepared to bear

Box 22. Example of a Successful Private Power Project in the Philippines

200-MW gas-turbine power plant was commissioned in the spring of 1990 at a site near Manila in the Philippines. The \$41 million project was built in twelve months with limited-recourse financing—without government guarantees to the project financiers—under BOOT arrangements. The plant is owned and operated by a private company, Hopewell Energy (Philippines) Corporation (HEPC), under a twelve-year contract to supply power to the state-owned National Power Corporation (NPC). NPC is providing the site, supplying fuel to the plant at no cost to HEPC, and is paying HEPC for all the energy that it takes. HEPC will pass full ownership and control of the plant over to the NPC at the end of the contract.

This project is a good illustration of how to minimize the risk exposure to debt obligations for private investors by controlling risks associated with the costs of inputs and the price of the output. This approach can attract investors to countries such as the Philippines that are short of capital, foreign exchange, and power-supply capacity. HEPC effectively transforms fuel oil into electricity for a low-risk processing fee that provides a reliable cash flow. Government and NEPC have been relieved of the task of raising capital, and they benefit from private-sector technical expertise in operating the plant. The success of this project has encouraged HEPC and NPC to negotiate another BOOT power project on a larger scale, which will provide 700 MW of coal-fired generating capacity at a cost of \$850 million. It is due for commissioning in 1995.

As in the first Hopewell Project, World Bank Group participation is being sought through the IFC, which faces the task of mobilizing large additional private-sector resources. Based on the successful experience of the first BOOT project in the Philippines and a number of other loans to private-sector power companies in South Asia, IFC is now also exploring the financing of electric power projects in a number of other countries in Southeast Asia.

the commercial risks associated with building power plants. They are also prepared to accept some country risks. In particular, they are willing to take on debt obligations under satisfactory conditions for being paid for their services. In most countries where investors have some experience, only a few investors have expressed deep concern about governments ultimately living up to their commitments, provided there are suitable arrangements for arbitration.

On the other hand, in many instances investors do perceive a financial risk in conjunction with the reform process. They are concerned that unavoidable bureaucratic difficulties of implementing new ways of doing business could result in an uneven and unpredictable cash flow in the early years of their investment. In most cases, some of the most prominent concerns are about price and availability of fuels, timely payments for power purchased by the dominant state-owned public-sector power company, and delays in obtaining the agreed conversion of local currency into foreign exchange. An additional source of uncertainty is government bureaucratic inexperience in dealing with the disputes that will inevitably arise between power companies and private suppliers under complex power-purchase arrangements.

To compensate for risks such as these, commercial lenders either will require a larger equity investment from the project sponsors or will pursue a larger package of public guarantees for their loans. Both requirements raise the cost of projects, although this increase could be more than offset by quick construction and subsequent operational efficiencies of the privately-owned plants. Equity investors will require a higher rate of return than the interest rates on loans, to compensate for their higher exposure to risk, while public guarantees would divert the limited resources of the public sector from alternative uses.

Since some of the risks for private investors are linked to a government's timely implementation of its contractual obligations, a third party could help underwrite these risks. In many private financial transactions, one way in which these third-party guarantees can be obtained is by posting performance bonds, establishing escrow accounts, buying insurance policies, or using similar risk-coverage mechanisms. Governments, of course, could take the initiative in mitigating these risks and thus reducing the prices demanded by private producers, by arranging risk coverage for their own performance.

Although there are many ways the Bank can help countries develop their power sectors, the most common approaches do not always deal adequately with the concerns of private investors. One promising approach is for the Bank to lend through national financial intermediaries, such as a private-sector energy development fund (as in Pakistan) or a national power-sector financial corporation (as in India and Colombia). This approach has the advantage of moving power financing decisions

Box 23. IFC's Power Investment Program

The International Finance Corporation (IFC) has experienced a recent surge of investor interest in private power projects in developing countries. IFC's current portfolio includes investment of just under \$300 million in nine private power projects in India, Philippines, Chile, and Turkey.

More important, the corporation currently has some thirty-five proposals in varying stages of progress. These include large projects such as a 1,400-MW coal plant in Mexico, a 400-kV transmission line in Poland, the Endesa hydroelectric project in Chile, a 1,200-MW gas turbine plant in Malaysia, and a 700-MW follow-on investment by Hopewell in the Philippines (see Box 22). There are also smaller, several-million dollar ventures, such as wind-powered generators in Costa Rica, a 45-MW floating diesel plant in Jamaica, and a 24-MW hydro project in Belize. In addition, some, such as the 510-MW Berke hydroelectric project in Turkey, are being undertaken in conjunction with the World Bank. In such countries as India and the Philippines, IFC has become, or is rapidly becoming, a permanent partner in the development of the sector through incremental private sector investment.

Source: IFC.

closer to the standards of capital markets, but it does not deal with potential political or bureaucratic problems that increase the risks for private investors. The credit support programs developed by the Bank, IFC, and MIGA to promote private financing of infrastructure have focused on covering some risks through partial guarantees to private investors.

The Bank will continue to innovate and experiment with the wide range of private-sector financing tools and techniques currently at its disposal. The Bank group will be flexible and innovative in attempting to mobilize private capital for the power sector and, to the extent possible, address sovereign noncommercial private-investor risks. Such efforts will assist countries in developing or strengthening private capital markets and will be a positive force toward meeting the projected large capital shortfalls in the power sector during the next decade.

Endnotes

1. All dollar figures are U.S. dollars unless otherwise indicated.
2. This section draws heavily on *Energy Efficiency and Conservation in the Developing World: The World Bank's Role* (1993). This section may be skipped if the reader is familiar with that paper.



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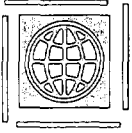
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