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DISCUSSION PAPER

Private Sector Electricity in Developing Countries

Supply and Demand

Jack D. Glen

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The International Finance Corporation (IFC), an affiliate of the World Bank, promotes the economic development of its member countries through investment in the private sector. It is the world's largest multilateral organization providing financial assistance directly in the form of loan and equity to private enterprises in developing countries.

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Foreword

This discussion paper looks at the past and potential future role of the private sector in electricity generation in developing countries. It considers the supply of electricity by the private sector as well as the role of private sector demand for electricity in total investment needs. A case for private sector involvement in the sector is made, to some extent based on evidence from the deregulation and privatization that has taken place in countries around the world. The International Finance Corporation's historical and potential role in the sector is also examined.

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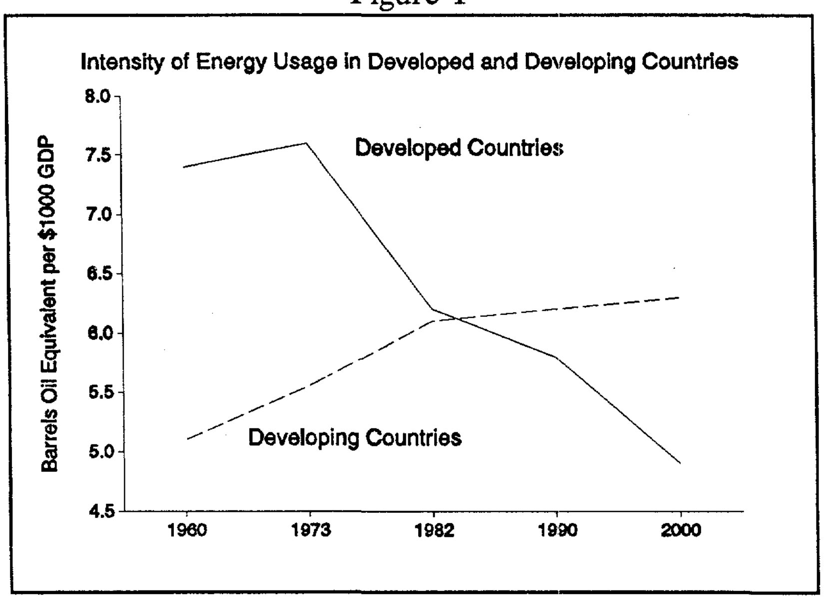
Market Outlook and Background

Historically, demand for electricity has been closely tied to economic growth. While oil shocks in the 1970s loosened that relationship for developed countries, it still appears to hold for developing countries; to the extent economic growth occurs, so, too, can growth be expected in the demand for electricity. The reasons are both simple and complex. The simple reason is that electricity usage in developing countries is extremely low by international standards. However, as general industrialization occurs and incomes rise, refrigerators and other electrical appliances are purchased. The more complex reason is that electricity demand seems to be very inelastic with respect to price; even with the oil-price-shock effect on electricity prices, demand surged.[1]

Electricity, of course is only one facet of overall energy usage. Figure 1 provides a striking portrayal of the difference in energy usage in developed and developing countries. The graph presents the intensity of energy usage--the amount of energy used to produce a unit of national product--for developing and developed countries, including forecasts, for the period 1960-2000.

Figure 1



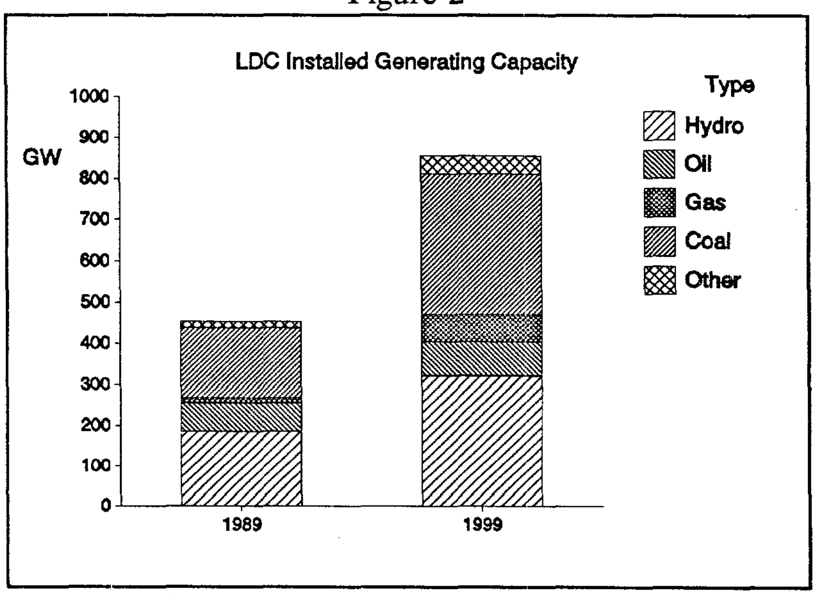
Source: World Bank

[1] This may not be so puzzling when the subsidies offered by developing country governments to consumers are considered. Some of the oil-price-shock effect was absorbed by governments when they refused to raise electricity prices.

Figure 1 clearly shows the effects of the increase in oil prices in the 1970s on energy consumption in the developed world. By contrast, starting from a relatively low base, the developing world has continued to increase its intensity of energy usage to the point that it currently employs more energy per unit of output than the developed world, and this disparity is expected to increase over the coming decade. The increase is due to two factors: economic development and inefficiency. As these countries develop industrially, they consume more energy than previously, but because they have not yet invested in energy-efficient technology and the service sector is not as important as in the developed countries, the amount of energy used per unit of output increases. These findings point out the importance of two factors: the expected additional amount of energy needed in the developing world, and the ways in which energy efficiency can influence that need. Both are dealt with in this paper, although only for electricity, not for energy more generally.

The World Bank estimates that developing country demand for electricity in the 1990s will increase on average 6.6 percent per year, varying from 2 percent or less for some African countries to about 12 percent for some Far Eastern countries. This compares to actual growth rates of about 7 percent during the 1980s and 10 percent in the 1970s.[2] In order to meet this demand, total installed generating capacity will need to increase about 82 percent during the 1990s from its current level of 471 GW to 855 GW.[3] Forecast capacity for 1989 and 1999, broken down by type of plant, is shown in Figure 2.

Figure 2



Source: World Bank

[2] Capital Expenditures for Electric Power in the Developing Countries in the 1990s, Industry and Energy Department (IENED), Energy Series Paper No. 21, The World Bank, 1990.

[3] GW = gigawatts = 10^9 watts.

Figure 2 shows a situation in which installed generating capacity will nearly double in the next decade. Much of this increase will come from coal-fired plants, especially in China and India, but there will also be a substantial increase in the amount of hydroelectric and gas-fired capacity. Care should be taken in interpreting these forecasts, however, since technological changes can be expected to influence both the composition of the generating capacity, e.g. coal versus gas, as well as the overall level of demand. Economic growth will also influence demand, but even if growth is only half of the assumed rate a substantial amount of investment will be needed.

Such dramatic growth in the level of generating capacity raises two important questions. How much is this investment going to cost? And, especially relevant for IFC, who is going to finance it? Estimates on expected costs are presented in Table 1; the second question is dealt with later.

Table 1

Developing Country Capital Expenditures for Electricity in the 1990s

	1989 Dollars (Billions)	Percent
Generation	448	60.0
Transmission	81	10.9
Distribution	152	20.5
General	64	8.6
Total	745	100.0

Source: World Bank

As might have been suspected, generating capacity represents a majority of the overall cost. Generally, the local currency component of these costs is expected to be 62 percent (labor, etc.), leaving 38 percent that will require foreign currency financing.[4] Allowing for price escalation and cost overruns, nearly $1 trillion could be needed to finance expected capital expenditures for electricity in the coming decade, or nearly $38 billion

[4] World Bank experience in the decade 1979-88 resulted in a split between domestic and foreign costs of 52/48 percent (Analysis of Financing Sources for Power Development During the 10-Year Period (1979-88), December 1990, Industry and Energy Department Working Paper, Draft). The difference in the domestic component between IBRD's experience and the forecast can arise from several different sources, including the country mix involved.

annually in foreign currency financing needs.[5] Against these requirements, the World Bank is currently financing only about $2 billion annually. Even ignoring possible inflation and cost overruns, the projected investment needs are equal to 2.3 percent of 1989 developing country GDP, or 8.7 percent of investment.[6]

As costly as this investment appears, the lack of investment, with its resulting power shortages, will have economic effects that are also substantial. A study commissioned by U.S.A.I.D. estimated that annual costs to industry in India due to electricity shortages are currently 1-3 percent of GDP. For other countries included in the study, the estimates of national product lost due to power shortages span a broad range from $0.40 per kWh[7] in Egypt to $1.25/kWh in Jamaica.[8] By comparison, the average OECD price of electricity in 1988 was $0.08/kWh.[9] On a more microeconomic level, IFC projects sometimes require their own generation equipment when the local public utility is not capable of assuring an adequate supply of power. One project in Pakistan included capital costs of $5.9 million for power equipment out of total capital costs of $12.8 million. And IFC is not unique in this sense. Unofficial estimates indicate that half the electricity in Indonesia is generated in the private sector through captive power plants. While private sector advocates might applaud these market responses to the situation, economically they are second-best solutions since the captive plants are inevitably less efficient than well-run large generators. These examples, then, underline the idea that with such a heavy cost arising from underinvestment in generating capacity, governments will be required to address the problem somehow.

Historically, the response to additional need for electric power has been investment in public generating facilities. This particular response has occurred because in most countries, both developed and developing, public utilities in general and electric power in particular have been traditionally viewed as natural monopolies. Economically, a natural monopoly exists when consumers are most efficiently served by a single supplier; but because of the incentives that this arrangement implies for the supplier to earn what are often viewed as excess profits (or monopoly rents), monopoly suppliers have either been closely regulated or, more generally, publicly owned and operated.

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[5] In case this estimate seems unreasonable, independent sources estimate the capital needs for Brazil alone to be $6 billion annually until 2010 in order to meet the increased demand for electricity.

[6] World Bank, World Development Report, 1991.

[7] kWh = kilowatt hour = 10^3 watt hour

[8] Power Shortages in Developing Countries: Magnitude, Impacts, Solutions, and the Role of the Private Sector, A Report to Congress, U.S.A.I.D., 1988.

[9] Review of Electricity Tariffs in Developing Countries During the 1980s, IENED Working Paper, Energy Series Paper No. 32, The World Bank, 1990.

In the developing world, the power sector is largely publicly owned and operated. This implies that, unless there is substantial change, most of the financing described above will be sought by governments. It is possible that governments will not be able to raise the necessary capital, which may lead, given more readily available private financing, to privatization or to private participation in generation. Assisting in privatizations is one way in which IFC can become more involved in the electric power sector; actually investing in newly privatized companies is another; and setting up independently operating producers of power may be a third avenue for involvement. Before addressing these alternatives, however, a short introduction to the economics of electricity generation will be useful.

Economics of Electricity Generation

One thing that can be said about the oil price shocks of the 1970s is that it started a flurry of research into the technology of electric power generation. The results have been startling and, to some extent, have caused regulators and economists alike to question the very foundation of public ownership of power utilities: natural monopoly. Without the argument of natural monopoly, much has happened in the power sector, including the privatization of the whole industry in the U.K. and the generation of substantial amounts of power by unregulated independent power producers (IPP) in the U.S. A look at the technology will help to explain why this occurred.

Intuitively, it is not at all clear why the generation of power should be considered to be a natural monopoly. Unlike distribution, which entails a single network for delivering power to individual consumers, there is no obvious reason why independent producers should not be able to sell electricity to whomever distributes it to the public. Provided tariffs are sufficiently regulated so that monopoly profits are not received, no harm is done in having electricity produced in the private sector. Proponents of monopoly, however, argue that economies of scale make it more attractive for large producers to dominate generation as they believe that it ensures that consumers receive electricity at the lowest cost. They also believe that government ownership and regulation ensure that capacity is available when needed, i.e., that an appropriate level of investment takes place. According to this way of thinking, independent producers are viewed as unnecessary, uneconomical and bothersome. Recent experience, however, has shown that not only can independent producers produce energy at a lower cost than the large utilities, but that there are diversification benefits to having a number of small producers instead of one large plant.[10] Moreover, publicly-owned utilities have proven their inability to guarantee that appropriate levels of investment are, in fact, made.

The oil price shocks of the 1970s caused two things to occur. First, they made consumers much more aware of the amount of energy they were using and to think about

[10] In this case, diversification implies less likelihood that a significant part of generating capacity will be out of commission due to either failure or maintenance.

how energy use could be curtailed. And second, they made producers of energy, in this case electricity, aware of the importance of improving the efficiency of electricity generation. Combined, the two changed the sector dramatically.

In industrial countries, energy price increases led to an increase in the efficiency of industrial processes generally. Perhaps equally important, however, was the development of more efficient cogeneration technologies, i.e. electricity generated from excess heat given off by an industrial process.[11] To some extent leapfrogging on these developments, technological advances allowed the incorporation of gas-fired turbines, originally from the aerospace industry, into relatively small, but efficient, electrical generators which combined aspects of the cogeneration technology.[12] Both developments resulted in new technologies that are able to produce lower-cost electricity. As a result, while the idea that larger power generators were inherently more efficient was not entirely dismissed, neither was it viewed as sufficient grounds for excluding independent producers, nor was it accepted as fact.

The results of the innovation in cogeneration are difficult to summarize because the costs of production depend on the industrial process involved and, since they must be customized to each application, are not standardized. Moreover, some of these technologies are not meant to produce large amounts of electricity, but rather to offset purchases of power by industrial users. Nonetheless, experience in the U.S. following the oil shocks provides some compelling evidence in favor of cogeneration as an economical form of electricity generation.

Prior to 1978, U.S. utilities were under no obligation to purchase electricity from IPPs at any price. In fact, little electricity was purchased from IPPs both because there was not much available and because utilities preferred to produce their own. After the oil shocks, however, the increase in energy costs induced Congress to pass legislation aimed at reducing the cost of energy. This legislation, known as PURPA,[13] requires utilities to purchase power from IPPs at the utilities' long-run marginal cost. Figure 3 shows the growth in non-utility electricity generation in the U.S. following the enactment of PURPA.

During the period 1979-89, non-utility generation increased from 1.8 percent of total U.S. output to nearly 5 percent, at the same time that total power generated increased by 26 percent. The amount of electricity produced by cogeneration increased roughly three times over the decade 1979-89, and the contribution that cogeneration made to total U.S.

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[11] Cogeneration can either use industrial heat to produce electricity, or alternatively, the exhaust heat from generation can be used in another industrial process.

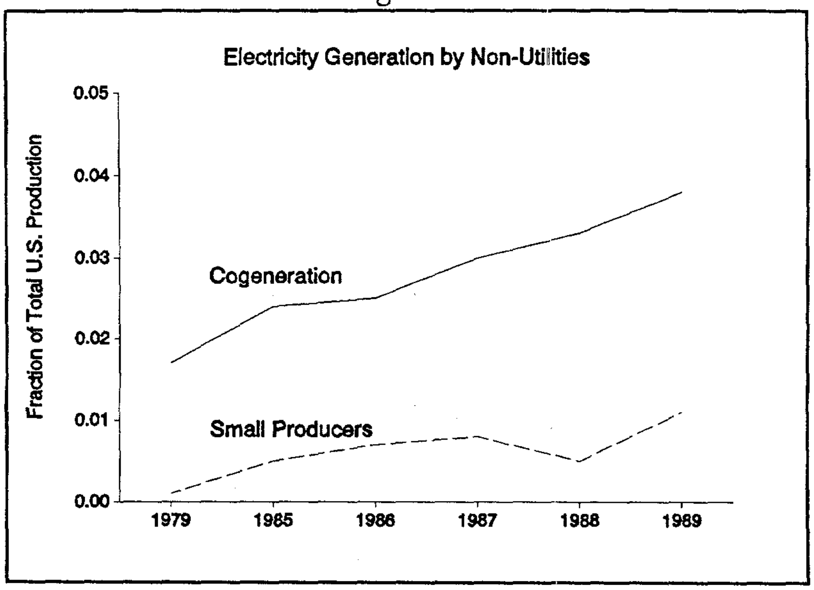
[12] While the use of gas turbines in power generation antedates the oil crisis, the development of gas-fired combined-cycle generators is a recent innovation that has become economically attractive only in the last few years. While commonly referred to as gas-fired turbines, in practice they can be run on many fuels.

[13] Public Utility Regulatory Policies Act of 1978.

production more than doubled. Small non-utility producers also made substantial headway over this period, increasing their contribution to total production by a factor of ten. Since the utilities produce electricity using mostly large conventional generators, the results provide evidence that independently-produced power, and cogeneration in particular, is competitive in terms of cost with the large-scale producers.

Another technology, combined-cycle gas turbines, also provides an interesting comparison to the economies of scale argument. Unlike cogeneration, it is a standardized technology that can be readily compared with other technologies, which is done in Figure 4.[14]

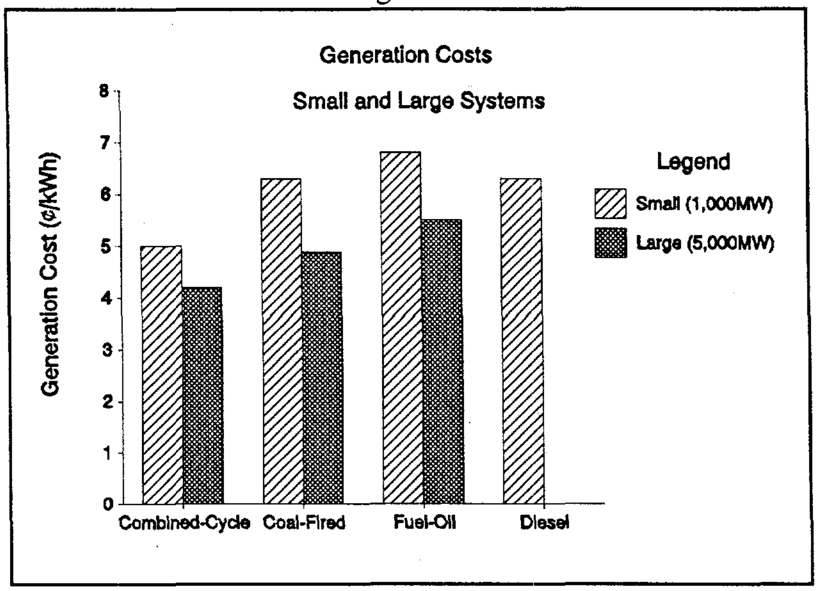
Figure 3



Source: Edison Institute

[14] Prospects for Gas-Fueled Combined-Cycle Power Generation in the Developing Countries, E. Moore and E. Crousillat, IENED Working Paper, Energy Series Paper No. 35, The World Bank, 1991. No costs are presented for hydro-electric systems since each system's cost are site specific. No large-scale system costs for diesel are presented since diesel fuel is not generally used in large-scale systems.

Figure 4



Source: World Bank

Figure 4 shows that, despite improvements in technology, the old economies-of-scale argument is still valid for conventional generating systems; larger systems are more economical than smaller systems. The same holds true for the newer technology gas-fired combined-cycle system. But the new technology did change one thing; contingent on the current relative price structure for fossil fuels, the small-scale gas-fired combined-cycle system is less costly than even the large-scale fuel oil-fired system, and nearly the same cost as the large-scale coal-fired system. Moreover, these systems can be installed in a much shorter time then a larger system and, since they are modular,[15] their capital costs are lower than for the other technologies, thereby eliminating some of the financing problems. With these additional advantages, they can be preferable to even large systems.

While technological advances may have blunted the economies-of-scale argument somewhat, there still remains the possibility that public ownership will guarantee an optimal level of investment in generating capacity. The evidence does not support this claim either. While most developing countries have public ownership of generating facilities, they are also experiencing brownouts due to underinvestment. Examples of the associated costs were given above. At the other extreme, in some cases, publicly-owned utilities have overinvested, with similarly damaging effects. For example, in Colombia where generation is publicly owned, substantial overinvestment in generating capacity took place in the early 1980s. In 1985 Colombia's installed generating capacity exceeded peak demand by about

[15] In this case modular means that they are mass produced and require minimal site preparation. By comparison, larger systems are site specific.

50 percent, with excess capacity expected to remain through at least 1993. The cost of this excess capacity is estimated to be about 1.2 percent of GNP. By comparison, power shortages in Colombia in the early 1980s are estimated to have cost the economy less than one-third that amount. Since the capital invested in excess capacity could have been used for more productive purposes, this example shows how the dependence on large-scale projects and central planning can offset any potential gains from monopolization.

Unlike generation, technological advances in transmission and distribution have not offset the economies-of-scale argument in favor of monopoly. That is not to say, however, that these aspects of the sector are efficiently operated. In fact, inefficiency in both distribution and transmission is commonplace in developing countries. To underscore this point, ESMAP,[16] a joint effort by the World Bank and the United Nations Development Programme to improve energy efficiency in developing countries, estimates that distribution and transmission losses in developing countries average 20 percent of power generated, compared to 10 percent in developed countries. These losses result from theft, unmetered use, and inefficient transmission and distribution equipment, and contribute directly to the cost of electricity and the cost of electricity shortages. While in some cases substantial capital investment is needed to curb the losses, in other cases the incentive to maximize profits alone would suffice.

In sum, gas-fired combined-cycle turbines, cogeneration and other small-scale independent producers have dramatically changed the power sector in the U.S. The lesson to be learned from all of this is that, provided a regulatory framework is in place which will allow electricity tariffs to be set at market-determined rates, independent power producers are not only capable of competing with utilities, but can actually thrive. Financing independent power producers is one area in which IFC can play an important role.

Role of the Private Sector in the Electric Power Sector

Even for those who take the evidence from the U.S. as proof that the economies-of-scale argument may no longer be valid, it is important to provide additional motivation for power generation by the private sector. After all, one could argue that it is more efficient to have one large well-regulated publicly-owned utility, than to have a myriad of small independent producers, no matter how well regulated they may be or what technology they employ.

If there is to be a role for the private sector, its justification must be based on one of three roles: mobilization of private capital for power development, development of new sources of power generation, or improved economic efficiency.

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[16] Energy Strategy, Management and Assessment Program.

Given the desperate need for investments in the energy sector described above and the shortage of public capital, the idea of private capital flowing into the sector is attractive. One must be careful, however, and examine closely such investment to ensure that there is in fact an element of additionality involved. If private capital is only siphoned from one investment to be placed in the energy sector due to the existence, for example, of government guarantees, then the country may be no better off with private capital than with public capital. By investing without government guarantees, IFC may bring about the desired additionality.

Another possible advantage of private involvement in the power sector is the possible new sources of power that can be opened up. For example, some power projects may be considered too small to be developed effectively by a large public utility. Alternatively, industry or agriculture may be able to employ cogeneration technologies that are not available for traditional power plants. In both of these cases, private sector involvement can bring additional capacity into production from sources which are economically efficient, but not readily available to publicly-owned utilities. For IFC, cogeneration technologies may be particularly important given the industrial orientation of many of its investments.

Perhaps the most persuasive argument in favor of private participation in the power sector is that of improved economic efficiencies. This argument is also the one most likely to induce IFC participation. Such efficiencies might come about when improved maintenance results in physical capital being more efficient or longer lived. Alternatively, overhead may be somewhat lower in the private sector. Either way, to the extent that the profit motive induces the private sector to improve efficiency, the economy benefits.

The economic-efficiency argument is sufficiently important that an attempt will be made to convince the reader that those efficiencies do in fact exist. Of course, for the believer in the benefits of the private sector, the experience of the U.S. provides evidence that small independent producers are more efficient than large utilities. In order to convince skeptics, however, it would be helpful to find evidence that a generating facility, regardless of size, can be more efficiently run by the private sector than by the public sector. Fortunately, some evidence on this question does exist.

A recent study by the World Bank evaluates the efficiency of a sample of small diesel-fired electric power plants around the world.[17] The study compares the total cost of all variable inputs to total electricity output in order to arrive at an estimate of the overall efficiency of a (subset of the) plant(s) compared to the rest of the plants in the sample. While various comparisons are made, the one that is most important for this paper is a comparison between the efficiency of power plants in the private and public sectors. The finding is that the cost per unit of output (kWh) is 38 percent less in the private sector than in the public sector. The implication is that a similar amount of electricity can be

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[17] Efficiency Measures for Diesel Electric Power Plants, W.E. Diewert, IENED, The World Bank, Draft.

produced in the private sector with substantially less capital than the public sector uses. Moreover, even though private capital is somewhat more expensive than government-guaranteed capital, the capital required by the private sector is sufficiently less that the country's economy benefits when electricity is generated in the private sector.

This finding does need to be interpreted with caution. The sample consists of plants located in a broad cross-section of countries with an equally broad set of regulatory frameworks and plant characteristics. It may not make much sense, for example, to compare private sector plants in the U.S. with publicly-owned plants in Tanzania, or vice versa. Moreover, the plants included in the sample are of a variety of sizes. In fact, the average size of a private plant in the study is slightly larger than the average size in a publicly-owned plant. While this size difference is not large enough to account for the cost advantage, the difference is discomforting given the known size effects on cost. Fortunately, additional evidence is available which avoids these pitfalls, but which does not permit actual calculation of the efficiency gained through private ownership.

Over the last decade, Chile privatized a substantial share of its electric power sector. Included in that privatization effort was one generating company, Chilgener, which operated with essentially the same generating equipment and under the same regulatory environment both before and after privatization. To some extent, this company provides a controlled experiment on the effects of private ownership on efficiency. In the context of an investigation of the effects of privatizations more generally, the World Bank looked at the performance of this company in some detail.[18] The company's profitability increased after the company was privatized. Moreover, to verify that this was not due to price increases, the study shows that total factor productivity also increased under private ownership, compared to the public-ownership period. This increase in efficiency shows up in such factors as plant load (the fraction of time the plant is in operation)–which was higher under private ownership–and consumption of coal per kilowatt hour–which decreased under private ownership. Overall, the study concludes that Chile benefitted from the privatization owing to the improved efficiency of the company; but the study also emphasizes the importance of the regulatory framework, established prior to the privatization, which encouraged the firm to operate in an efficient manner.

While subject to debate, the evidence suggests that private ownership and management of generating facilities is indeed more efficient than public ownership. While this supports further activity by IFC in the sector, it must be pointed out that in some countries the sector is one which is sometimes viewed as sacrosanct. Mexico provides an illuminating example; despite strong demand for additional generating capacity, an apparent belief in the importance of the private sector generally, and a shortage of capital in the public sector, for years the Mexican constitution had dictated that all power generators must

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[18] CHILGENER, by Ahmad Galal, in Welfare Consequences of Selling Public Enterprises: Case Studies from Mexico, Malaysia, U.K. and Chile, by Galal, Jones, Tandon and Vogelsang, Country Economics Department, The World Bank, forthcoming.

be operated by the state power utility. Needless to say, little private investment occurred there. Recently, however, legislation was passed that paves the way for private power generation and some interest by private capital is now being expressed.

In the power sector, regulation is both to be expected and welcomed. Expected because of the monopoly arguments and visions of foreign ownership of what are sometimes viewed as assets vital to national security. If well drafted, however, regulations can also ensure stability in the environment. In Chile, for example, Chilgener thrived in a regulated environment; however, it was a regulatory framework that rewarded efficiency at the same time that it guaranteed reasonable pricing. The next section discusses regulation in the context of how it can be an obstacle to private sector participation in electricity generation.

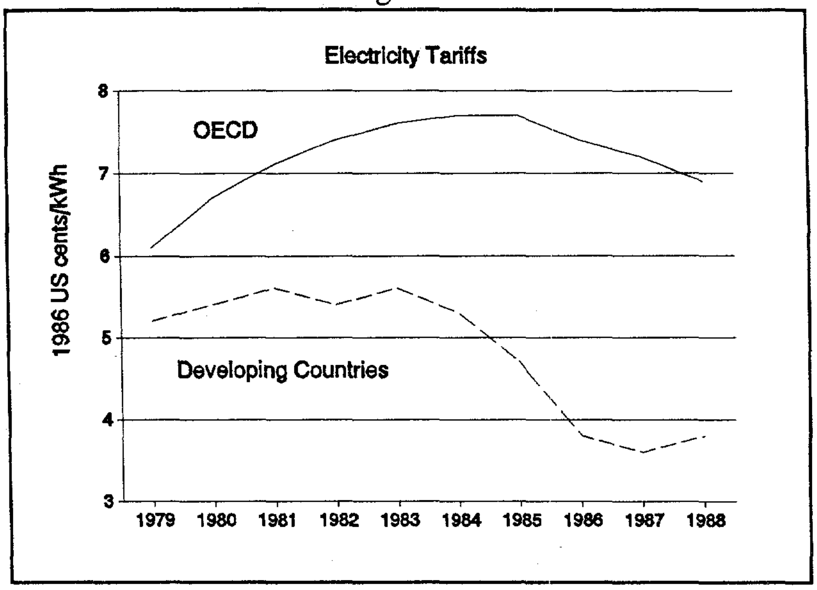
Obstacles to Private Sector Participation

While the evidence indicates that there are gains to be had from turning at least the generation aspects of electricity over to the private sector, there has been no obvious rush to do so. This may be expected from the government side since many employees of publicly-owned utilities are fearful of losing their jobs in the face of private sector competition. What is somewhat more puzzling is the lack of interest displayed by the private sector in this seemingly profitable area. This section looks at the most obvious factor influencing this apparent reluctance by the private sector: regulation.

The regulatory framework dictates who can generate, transmit and sell electricity, and at what price. When done properly, it can be a first-rate opportunity for the private sector; the U.S. is a good example. More likely in developing countries, however, it can be a nightmare. In between those two extremes, of course, lies a broad cross section of different regulatory frameworks. Even in those situations where private sector involvement is encouraged, the regulatory environment is critical to the profitability of any private sector generation project because it usually dictates two important elements: price and quantity. Both are of vital importance. First, consider the price element.

Under U.S. PURPA legislation, private producers are guaranteed to receive the utilities' long-run marginal cost for generated power. Since this usually rises with the general rate of inflation, and reflects the cost of fuel, private producers are assured a reasonable rate of return on their investments. In many developing countries, however, pricing is made on a political rather than an economical basis. Utilities and private investors alike have to fight with regulators for any rate adjustments, even in the face of high rates of inflation. The result, presented in Figure 5, provides perhaps the main reason for the reluctance on the part of the private sector to get involved in generation in developing countries. As seen in the figure, electricity tariffs in developing countries are substantially below the levels in the OECD countries. While some of this difference may be explained by the generating facilities, e.g. low-cost hydropower facilities in some developing countries versus high cost nuclear facilities in OECD countries, the most likely source of difference is the social objectives of regulators in developing countries who view low tariffs as a wealth transfer to electricity users. Until tariffs paid to producers reflect the actual cost of production, there will be little incentive for private generation. Moreover, with consumers paying such low tariffs, the increase in energy intensity pictured in Figure 1 is assured since users do not have market-determined prices to guide them in making decisions on the appropriate level of technology to install. Thus, reform in the pricing of electricity is fundamental to resolving the situation in developing countries.

Figure 5



Source: World Bank

Quantity restrictions represent another point of contention between private generators and regulating bodies. Even if prices are determined economically, fixed costs cannot be covered unless generators are allowed to sell sufficient quantities. Similarly, the regulators sometimes control access to raw materials, especially water in the case of hydroelectric projects. Without guarantees from the authorities that such resources will be forthcoming or that available capacity of generation will be compensated, investment in generating capacity may be perceived as too risky.

Removing these obstacles will be difficult because of reluctance on the part of regulators and politicians alike to give up something that has served them so well in the past. While marginal-cost pricing is a necessary ingredient to induce private sector involvement, it requires that tariff decisions be made on economic rather than political grounds, which usually implies higher tariffs for previously-subsidized users. Similarly, agreeing to buy from all providers on an equal basis may be viewed as snubbing the public-sector utility, which may be politically well-connected. Ultimately, then, the regulatory reform necessary to bring about more private involvement in any segment of the sector will require a healthy dose of political willpower, most likely influenced by the high economic and political costs associated with electricity shortages.

The World Bank, which has played a significant role in the financing of power projects in the developing countries, is making great efforts to induce governments to adopt regulatory reforms like those mentioned above. To date, few governments have subscribed, but pressure is building and those countries that have adopted more market-oriented regulatory frameworks have proven to be good models to follow. With an increasing commitment on the part of the World Bank to regulatory reform, it is likely that the 1990s will see an improvement in the environment for IFC and its clients. The next section looks more closely at the role that the IFC has played in the sector and what opportunities may exist.

The Role of IFC in the Electric Power Sector

Historically, the electric power sector in most developing countries has followed the tradition of public ownership and management observed in most developed countries. While there are reasons to believe that the situation will change, at this point in time the number of countries where IFC, and the private sector more generally, can invest in generating capacity (and/or transmission/distribution) is limited by regulatory constraints. To some extent, this is reflected in IFC's history in this sector, which is presented in Table 3.

The table shows that, until recently, IFC's experience in this sector has been quite limited in the number of projects that it has undertaken, even though the total portfolio is reasonably large in value given the size of a typical project. A majority of the projects have involved generation, but both transmission and distribution aspects of the sector are represented as well. The surge in activity that began in 1988 may reflect the increasing distress that governments are facing owing to the large capital costs associated with building generating facilities. Given the expected demand cited above, and the increase in interest in private sector involvement in the sector, it is likely that more projects will be proposed as additional countries are forced to improve their regulatory environment.

Table 2

IFC Financed Electricity Projects

Country	Project	Type	Total	IFC	Date
Philippines	MECO	gen/trans/dist	NA	12	1966
Peru	CONENHUA	trans/dist	$18	5	1981
Philippines	MERALCO	trans	275	32	1988
Philippines	HEPC	200MW gas turbine (BOT)*	41	4	1989
India	TATA	trans/dist	80	35	1989
India	Ahmedabad	100MW gas combined cycle	80	20	1989
Turkey	Karacaoren	42MW Hydro/ trans	48	20	1990
India	TATA 2	gen/dist 180MW gas combined cycle	274	60	1990
India	CESC	dist/gen	92	20	1990
India	BSES	500MW Coal/ trans	653	50	1991
Chile	Aconcagua	72.6MW Hydro	72	18	1991
Total			$1575	$306	

Source: IFC

* Build, Operate and Transfer

Since the bulk of IFC's exposure is relatively new, there is little experience to guide the corporation on the nature of the returns and riskiness of the sector. Generally, the projects use standard technology and excess demand exists, and thus no major problems are expected; however, unlike a free market where prices are set to equate supply and demand, in this market government regulators generally determine the price. Herein lies the most obvious risk to the viability of the projects.

As noted, IFC has been involved in power generation through its projects in other industrial sectors as well. It is not uncommon for industrial users to produce their own power in countries where power supplies cannot be guaranteed by the public utility. As the overall demand/supply situation deteriorates according to the forecasts, more captive plants can be expected. While these plants may not be especially efficient, they have the advantage of dedicated supply and can be installed without having to worry about pricing agreements.

While past IFC experience is of practical interest, also important is the perceived future role for IFC in electricity generation. Beyond the projects mentioned above, it is difficult to predict where future projects may lie, but a number of possibilities exist. Chile, of course, is an obvious candidate since much of its generating capacity is privately owned and operated, and the regulatory environment is well-disposed toward private sector ventures. A few states in India have privately-owned power utilities and, given the expected needs in that country and IFC's experience there, it is likely that future projects will at least be considered. While there was initially much interest by the Turkish government in large-scale BOT projects, none of these have yet taken place, perhaps because of the complexity of the legal arrangements involved. Nonetheless, Turkey has some promising alternatives in smaller privately-owned regional utilities with which projects may be possible.

After these three countries, however, the scale of things drops sharply. Barbados is entirely private in its electricity generation, and while no projects have yet been done there, forecast investment is high and may provide future possibilities. In Dominica private shareholders own 60 percent of the national utility. Investment demand is high, with possible opportunities for additional small-scale hydro projects. That leaves a few privately-owned regional utilities scattered about the globe: for example, Manila Electric (Philippines - distribution only), COBEE (La Paz, Bolivia), CAEC (Caracas, Venezuela), and EMELEC (Guayaquil, Ecuador).

Indications are, however, that the situation may be improving for the private sector. Malaysia is in the process of privatizing their Tenaga Nasional (the national electric utility), with expectations of a first tranche of shares to be offered in 1992. In Latin America, IFC has begun initial discussions with Colombia over privatization of one of their regional utilities, with an expansion project expected after privatization occurs. Elsewhere, much talk has taken place about privatization of regional utilities in Argentina, Brazil and other smaller countries. While things are still unsettled in Eastern Europe, eventual privatization there is a distinct possibility. In all cases, of course, privatization needs to coincide with regulatory reform as discussed above. At a minimum, reasonable tariffs must be in place before any private sector initiatives can be expected. Agreements by the authorities to guarantee purchase of minimum amounts of output will further reduce risk and induce additional interest by investors.

In some countries, private sector participation may be permitted, but without the wholesale privatization of public utilities being considered elsewhere. For example, Costa Rica has recently changed its regulatory framework to allow for private generation projects up to 20MW in size, but details on the pricing and purchase agreements will require substantial negotiation before private investment is likely to begin. Pakistan has also agreed to the concept of private power and several projects are possible. All investment is apparently on hold at this time while interested parties wait to see how the World Bank's first privately-funded project there comes together. Panama is discussing the possibility of leasing a publicly-owned plant to the private sector for an initial 10 year period. The details are still being worked out but, if successful, could lead to further private sector activity.

Investigations into an alternative means for private sector involvement in private sector energy projects are under way in the form of a mutual fund for equity investment in private sector power projects in Latin America. Some twenty projects may qualify to receive funds. To the extent that the fund is successful, it could provide a model for future funds in other regions. The concept of a mutual fund of this type is especially useful in the energy sector because it allows IFC to attract additional equity capital for the projects and allows individual investors, as well as IFC, to jointly diversify their holdings of energy projects.

IFC experience in both transmission and distribution has been limited, but so far successful in the sense that projects have been completed and debt repaid. While governments appear more reluctant to allow private sector involvement in distribution, generation projects are sometimes coupled with transmission projects and so future projects in that aspect of the sector are likely.

All told, the situation is quite encouraging. While it will take some time, indications are that the private sector will be given an opportunity to prove itself. Of course, as with any private investment, investors will demand an appropriate rate of return to compensate them adequately for the risk borne. This leads one to ask an important question: what is an appropriate rate of return for equity investments in public utilities, or power generation projects, in developing countries? While the answer is uncertain, a look at related statistical evidence is informative.

Over the last two decades, the average return on the stock markets of the developed countries has been slightly more than 12 percent per annum in nominal terms. By comparison, privately held utilities in those same countries have averaged 9.5 percent per annum over the same time period. In this case, as expected, the higher return for the market overall was a reward for its somewhat higher level of riskiness.

Unlike the developed countries, there are currently few privately held utilities in developing countries, far too few to take as representative of what future investors could expect from investments in that sector. However, a reasonable alternative is to assume that the relationship between the returns to utilities and the overall market in the developed countries will characterize that same relationship in developing countries. This assumes, of course, that regulators in the developing countries permit tariff increases sufficiently high to generate the postulated returns; but, then, without such an assumption on the part of investors as well, no foreign investment is likely.

Unfortunately, stock market returns for the emerging markets are not available for nearly as long a period of time as for the developed countries, but IFC's Capital Markets Group has been compiling an IFC Emerging Markets Composite Index since December, 1984. The average return on that index has been 21.5 percent per annum. From the relationship between utilities and the market for the developed countries described above, this implies a 16.8 percent average return for utilities in the emerging markets. Two points need to be borne in mind when interpreting this forecast. First, this is a return on equity.

Much investment by utilities is undertaken with debt capital and returns to debt will likely be somewhat lower. Second, the average return on the emerging markets is calculated over a relatively short period of time. If this period is not representative of the behavior of those markets in the longer run, then average returns could be either higher or lower than predicted using this approach.[19] [20]

Given its track record and its knowledge of the regional markets, it is likely that IFC will be asked to either assist in many of the privatization efforts or in future expansions. While those efforts should prove to be valuable in offsetting the supply shortages that developing countries are likely to experience in the future, there is another role that IFC can play as well. The next section looks at the effects of IFC projects on the demand for electricity.

Demand Side Considerations

This section uses IFC's own experience to illustrate how appropriate technology can help to reduce energy supply/demand imbalances. Historically, IFC's role has been related more closely to users than to suppliers of electricity, and it is unlikely that this relationship will change substantially in the near future. Some IFC projects, for example, an aluminum smelter, consume large amounts of electricity. Others, for example, a sugar mill, may be electrically self-reliant (or even produce a surplus). In between lies a range of industrial and service sector users, all of whom influence the demand for electricity and, thereby, the needed supply.

The decrease in the energy intensity of the developing countries displayed in Figure 1 highlights the importance of demand management. Through the use of energy-efficient technology it is possible to decrease energy demand without sacrificing economic growth.

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[19] Some historical evidence is informative on this point. Much foreign investment was undertaken by the British during the opening years of the current century. In Industrial Structure, Capital Markets and the Origins of British Economic Decline (1987), the author, W. P. Kennedy, presents returns on both foreign and domestic investments. For the period 1907-08, investments in foreign providers of electric lighting and power produced returns of 4.2 percent per annum. By comparison, the return on all foreign investments averaged 5.2 percent and the average return on domestic investments was estimated to be 10.7 percent. Thus, while the relationship between utilities and the market (4.2/5.2) has been roughly preserved in recent years, returns on foreign investments were substantially lower than domestic investments in the early part of the century. Two clarifications help to explain this. First, more of the foreign investment was debt than is the case for the domestic investments. Second, neither currency risk nor political risk were very important factors in the early part of the century since the gold standard was in operation and most of the foreign investment was in either the U.S. or British colonies. According to Kennedy, default rates on foreign investments were so low that they were perceived to be less risky than domestic investments, hence the lower observed rate of return.

[20] The forecast is not substantially different from one made by an independent consultant to a proposed mutual fund of developing country power generation projects. That consultant foresaw returns on those projects of about 20 percent.

Japan provides an interesting example: over the decade 1974-83, Japan managed to decrease energy consumption per capita by 20 percent, while income per capita increased by more than 30 percent. Given the level of technology being used in many developing countries, it is likely that even more energy savings are possible in those countries. For example, much of the technology put in place during India's initial round of industrialization that occurred following independence is still in place. Generally, that technology is now outdated and energy inefficient. In some cases, retrofitting may be a viable option; in other cases replacing existing facilities may be required. Either requires capital expenditures, which presumably will be done only if sufficient financial rates of return on the investment can be expected. From a macro-perspective, however, the cost of a kilowatt hour gained through efficiency investments is typically less than the cost of additional generating capacity. This leads once again to the argument in favor of regulators imposing economically-determined electricity pricing.[21]

While actual electricity usage by end user is not available on a global basis, the case of the Latin American countries is illustrative. While Latin America may be more industrialized than some other developing country regions, an examination of its electricity usage does provide perspective.

Table 3

Electricity Use in LAC - 1988[22]

User	TWh[23]	Percent
Residential	104.2	23.9
Commercial & Public	108.3	24.9
Industrial	222.5	51.1
Total	435.1	100.0

Table 3 decomposes electricity usage in the Latin American and Caribbean countries by end user. What is striking is the importance of the industrial sector, which absorbed half of total electricity consumed in 1988. By comparison, in the OECD countries, industrial users consumed only 42 percent of total electricity, while commercial and public services consumed 26 percent and residential demand consumed 32 percent.

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[21] It also leads one to argue that import tariffs on imported energy-efficient capital equipment should be reduced.

[22] The Evolution, Situation, and Prospects of the Electric Power Sector in the Latin American and Caribbean Countries, Infrastructure and Energy Division Report No. 7, The World Bank, 1991.

[23] TWh = terawatt hour = 10^9 kWh.

To some extent, IFC finances projects in the commercial sector, but it is in the industrial sector where IFC has the greatest impact on electricity demand. As an example of how industry uses electricity, Table 4 decomposes Brazil's industrial demand for electricity by end-user type. The noticeable thing in this table is the extraordinarily large amount of total industrial usage attributed to motors. Advocates of energy efficiency use this to promote investment in more efficient motors, which may be possible in some IFC investments. Another interesting aspect of the table is that even though some industrial processes, like aluminum smelting (electrochemical), are very electricity intensive, they still constitute only a small part of total industrial demand.

Table 4

Electricity Use in Brazil[24]

Industrial Use	TWh	Percent
Motors	54	49
Direct Heat	36	32
Process Heat	11	10
Electrochemical	8	7
Other	2	2
Total	111	100

Total industrial use by sector is presented in Table 5. Here, the importance of metals and chemicals is underlined, as is the intensity with which some sectors, such as cement, utilize electricity. Collectively, these three tables provide insight into how IFC-type industrial projects affect electricity demand.

Some specific examples will show how the type of projects that IFC has been involved with can influence electricity demand. The smelting of aluminum, which actually involves electrolysis, consumes large amounts of electricity, even though it is a relatively efficient process in the sense that little energy is released. IFC is currently involved in a number of aluminum projects, one of which, Tovarna Glinice in Aluminija (Yugoslavia), illustrates the importance of technological innovation in this industry. In 1986, IFC invested in an expansion and retrofit of the company's existing facilities. The old facilities consisted of two production lines, both of which used technology that was old and energy inefficient. The older of these was deemed unacceptable for upgrading, but the other was fitted with new, more efficient equipment. In addition, a new line, which employed even more efficient technology, was installed. The resulting facility required 20 percent less electricity per ton of aluminum produced than was previously used. Of course, enough capacity was added that the net demand for electricity was increased, but the energy intensity of the economy was reduced.

[24] Efficient Electricity Use: A Development Strategy for Brazil, Howard Geller, American Council for an Energy Efficient Economy, Washington, D.C., 1991.

Table 5
Industrial Electricity Use in Brazil in 1988

Sector	Consumption TWh	Consumption percent	Intensity kWh/$
Nonferrous Metals	24.0	21.4	12.0
Iron & Steel	13.8	12.4	4.3
Chemicals	13.5	12.0	1.1
Food & Beverage	9.9	8.8	0.8
Paper & Pulp	7.3	6.5	2.0
Steel Alloys	6.2	5.5	21.4
Textile	6.0	5.4	0.7
Mining	5.9	5.2	1.0
Ceramic	4.2	3.7	NA
Cement	2.8	2.5	5.3
Other	18.5	16.5	0.3
Total	112.1	100.0	NA

Source: Geller (1991)

Agriculture represents one area of comparative advantage for many developing countries and is an area in which IFC has made many investments. Despite barriers to trade, sugarcane is an important crop in many tropical countries and the refining of sugar is an energy-intensive process. A project appraised in Guyana for a sugar refinery investigated the installation of electricity cogeneration equipment. Cogeneration of electricity in sugar refining is commonplace with many operations more or less self-sufficient in their electricity needs; but this project was considering equipment that would have been more efficient than the norm. If installed, there would have been sufficient electricity produced to allow the facility to sell electricity offsite. IFC appraised the project, but there were sufficient difficulties, not with the cogeneration technology but with the quality of the bagasse, that the project was deferred. Ultimately, installation of the cogeneration equipment may become economically viable.

Cement is another important part of IFC's portfolio. It also requires large amounts of energy, mostly in the form of heat, but also some electricity which is used to drive motors. While great strides have been made in reducing the amount of energy required to produce cement, further gains in the form of electricity cogeneration are now possible. A cement project was appraised in Korea that included the installation of cogeneration equipment that would allow the project to utilize waste heat in order to produce approximately 25 percent of its total electricity needs. The technology is proven and the project was economically attractive. The project was financed and completed with the cogeneration facility. Apparently, the project has been quite successful, which may encourage the consideration of similar technology in the future.

Activity by the World Bank in demand management is also increasing both in size and scope. While projects in the past often included efficiency objectives as part of a larger undertaking, entire projects now are targeted toward efficiency in industrial use of electricity specifically, and energy more generally. A proposed project in India, for example, will provide technical assistance to government agencies and fund demonstration projects to convince industrial users of the viability of energy-saving technology. The project appraisal estimates that the scope for energy savings in Indian industry is immense–on the order of 20 percent-30 percent of current energy use. In just six energy-intensive industrial sectors, potential energy savings of $1 billion annually may be achievable. And many of these savings have quite rapid payback periods–roughly two years on average. Sectors targeted include iron and steel, sugar, fertilizer, aluminum, refineries, cement, textiles, and pulp and paper. ESMAP is also involved in demand-management services, providing, for example, funds to local businesses for energy audits. To the extent that the efforts of the World Bank and ESMAP are successful in convincing local industry of the advantages of investments in efficiency, demand for IFC services and financing in this area may be forthcoming.

Collectively, these examples illustrate the important role that IFC can play in electricity demand management in developing countries. As long as energy tariffs properly reflect the economic cost of energy, then by making investments on the basis of sound economic principals, IFC helps to decrease the energy intensity of the countries in which it invests by applying energy-efficient technology.

Summary

Electricity has come to play an increasingly important role in the economies of the developing countries. Forecasts indicate that its role will continue to increase in importance, with the consequence that enormous amounts of capital will be needed to meet expected future electricity demand. With governments unable to fund all of that need, it is likely that the private sector will begin to play an important role in at least the generation aspects of the sector. IFC expects opportunities to present themselves in a number of countries. Given the importance of this sector to the development needs of these economies, and the relative attractiveness of such projects if they are done under a reasonable set of regulations, attempts should be made to fund such projects.

IFC plays another important role in this sector. Given the nature of its investments, IFC can have an important impact on the demand for electricity in the countries in which it invests. As the experience in the developed countries has shown, modern technology can be a very economical alternative to additional generating capacity, and IFC seeks to incorporate such technologies into projects whenever it is economically reasonable to do so.

References

Galal, Jones, Tandon and Vogelsang, Welfare Consequences of Selling Public Enterprises: Case Studies from Mexico, Malaysia, U.K. and Chile, Country Economics Department, The World Bank, forthcoming.

Geller, Howard, Efficient Electricity Use: A Development Strategy for Brazil, American Council for an Energy Efficient Economy, Washington, D.C., 1991.

Kennedy, W.P., Industrial Structure, Capital Markets and the Origins of British Economic Decline, 1987.

U.S.A.I.D., Power Shortages in Developing Countries: Magnitude, Impacts, Solutions, and the Role of the Private Sector, A Report to Congress, 1988.

The World Bank, Analysis of Financing Sources for Power Development During the 10-Year Period (1979-88), December 1990, Industry and Energy Department Working Paper, Draft.

The World Bank, Capital Expenditures for Electric Power in the Developing Countries in the 1990s, Industry and Energy Department (IENED), Energy Series Paper No. 21, 1990.

The World Bank, Efficiency Measures for Diesel Electric Power Plants, W.E. Diewert, IENED, Draft.

The World Bank, The Evolution, Situation, and Prospects of the Electric Power Sector in the Latin American and Caribbean Countries, Infrastructure and Energy Division Report No. 7, 1991.

The World Bank, Prospects for Gas-Fueled Combined-Cycle Power Generation in the Developing Countries, E. Moore and E. Crousillat, IENED Working Paper, Energy Series Paper No. 35, 1991.

The World Bank, Review of Electricity Tariffs in Developing Countries During the 1980s, IENED Working Paper, Energy Series Paper No. 32, 1990.

The World Bank, World Development Report, 1991.

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