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Restructuring the Power Sector: The Case of Small Systems

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New paradigm

The recent worldwide interest in power sector privatization and restructuring has focused on a few high-profile cases, such as Argentina, Chile, and the United Kingdom. As a result, the pattern of restructuring now taking shape in many power systems largely reflects the experience in these few countries. Consultants working in locations as diverse as Jamaica, Kenya, and Poland are applying a privatization model in which generation is separated from transmission, which in turn may be separated from distribution. The generation sector is then split into several competing firms. This model of restructuring, based on capturing the benefits of competition in the generation sector, is accompanied by regulation for those parts of the new system that cannot be competitive and that may therefore open up possibilities of monopoly exploitation.

Relevance to small systems

In small power systems, however, the balance of advantages and disadvantages from these changes may be quite different from that of systems in larger economies. When there is only a single generator, it can be more efficient to leave it joined to the transmission

system. But that is not the advice some countries are getting. For example, a consultant report for Kenya, which had net installed public capacity of 706 megawatts (MW) in 1990, said that there was no scope for competition between the *existing* generating plants. Yet consultants have still advised separating the single private generator from the transmission and distribution company.

The arguments for this vertical separation are quite different from those for horizontal separation and need to be individually addressed. Indeed, even when it is possible to introduce limited competition in generation and hence achieve some benefits, the costs of vertical separation may be so large as to offset the gains from competition. Therefore, any restructuring plan for a small system must take into account that it may be harder to achieve real competition in the generation sector.

This issue is relevant to many small countries contemplating power sector reform. In 1990, there were sixty countries with capacity of less than 150 MW, thirty with a total net public capacity of between 150 and 500 MW, and seventeen with between 500 and



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1,000 MW. The experience of countries that have already restructured their power sectors (United Kingdom, system size 70,000 MW; Argentina, 15,000 MW; and Chile, 3,000 MW) may be of very limited relevance to systems of, say, 1,000 MW or less.

The most efficient structure for a small system may be quite different from the fully disaggregated model. Reform proposals thus need to be flexible, and alternative systems under consideration need to be closely evaluated. This Note reviews the sources of the kinds of gains and losses from privatization and restructuring that need to be considered in any proposed power sector reform strategy. It also looks at the preconditions for effective competition—one of the main sources of gains—in the generation sector. Each of the issues raised relates to system size.

Costs and benefits of privatization

Comparing the performance of a vertically integrated public monopoly with that of a vertically integrated private monopoly exposes the gains and losses due to privatization alone. The key change that privatization introduces is the profit motive. The impact of this change should not be confused with the effect of restructuring. In fact, the benefits to society as a whole from ending state control of the power sector can be so large that the additional gains due to restructuring may be relatively unimportant.

Performance assessments of publicly owned entities should make a distinction between entities that have been *corporatized and commercialized* and those that have not been. Commercialization is possible only if the government removes itself from day-to-day interference in such issues as tariff setting and employment. Some countries that have not been ready to privatize their power sector have introduced commercialization (New Zealand, Portugal), an important intermediate step between the most interventionist form of state ownership and privatization. Commercialization may allow many of the potential gains in efficiency to be captured, especially where there is little scope for competition. Small systems may thus find it of little incremental benefit to privatize, provided that the government maintains an “arm’s length” relation-

ship with the company. Where this is more difficult, because of the political situation or because of the traditional approach to state companies, privatization may bring permanent benefits that would not be sustainable with a commercialized state entity.

The *allocative gain or loss* from a change in pricing due to a shift from a state monopoly to a private monopoly depends on the extent to which prices were being held below costs in the first case and the extent to which prices are limited by regulation in the second. With no subsidization, a move to unregulated pricing by a private monopoly produces a “deadweight” loss of consumer surplus as well as a *transfer of consumer surplus* to producer surplus. If the public sector were pricing below cost, the removal of this implicit subsidy would produce a “deadweight” gain, and a transfer back to taxpayers and away from power consumers. Because subsidies have been very large in many countries and the state has financed new investment, moving from public ownership to regulated private ownership (even if monopolistic) can produce large allocative net benefits for the economy.

This shift involves a potential gain in *productive efficiency* if private industry can cut costs. Public ownership tends to result in productive inefficiency, both because managers have little incentive to reduce costs and because politicians often are willing to increase costs to serve other purposes—for example, providing secure employment. The political incentive to collect revenues or prevent theft of power can also be low.

Whether a private monopoly will be productively efficient (that is, produce a given output at minimum cost) is uncertain. The few well-established private monopolies (Barbados, Bermuda) appear to work well. The poor performance of many state companies is more likely to be attributable to the nature of their ownership than to their structure.

Costs and benefits of vertical separation

Vertical separation—the separation of distribution, transmission, and generation into private monopolies—

has two important implications for private capital. It can increase monopoly power, but it can also lead to the loss of economies of coordination. When each stage is monopolistic and the technology is relatively fixed, a classic result is for an unregulated chain of vertical monopolies to sell at a higher price than an unregulated integrated monopoly (the “double wedge” problem). Regulation becomes more important in this case. But the fact that many private industries, even in competitive markets, show evidence of vertical integration indicates that there are gains to be made from unified ownership, as in the U.S. power sector.

The first general reason for the success of vertical integration is the existence of *economies of scope*. Certain activities need to be undertaken by both parts of the industry, but there is the possibility of sharing some inputs. A typical example would be the need to have an accounting department in each company. The activities of these departments would include handling the transactions between the two companies. Integration would not do away with such transactions, although they become internalized, but they would be accounted for just once rather than twice. Related to this would be an *economy of scale*. An accounting department would not need to be twice as large to deal with a company double the size. Some basic setup costs (computers) could be shared. A very important aspect of this argument is the existence of economies of scale to top management. Good managers often are scarce (especially in small economies), and integration will likely save on this resource. There can also be financial economies of scale, which can be achieved when the component firms combine their borrowing needs, reducing the cost of borrowing money.

A separate argument concerning vertical separation, or de-integration, relates to the decisionmaking process itself and *economies of coordination*. This issue affects both day-to-day working of the system (dispatch) and its longer-term size (investment). In an integrated company, coordination takes place through physical commands and, to be effective, requires complete information about all

parts of the system. In a de-integrated structure, the coordinating mechanisms are the prices and contracts agreed between the two parties. Since each firm is trying to gain more of the profit for itself, there is a strong incentive in bargaining not to divulge information to the other, leading to contracts that are suboptimal for the system as a whole. In addition, there are transactions costs in negotiating and contracting.

A key argument in favor of separation is that it increases *transparency* and allows the responsibilities of managers to become more focused. The larger the firm, the more difficult it is for a manager to have oversight of all its component parts and their interrelationships.

Costs and benefits of horizontal separation in generation

The possibility of introducing competition into generation is critical to a power restructuring strategy. The key issue is the mechanism by which competition takes place. If it is not possible to introduce effective competition through vertical separation, on balance it may be better to leave the industry integrated even though it has been privatized. Nor does the existence of several generating companies by itself necessarily introduce competition. So, breaking up the state company into several private generators could lead to the loss of some benefits of scale or scope, yet without producing any benefits through competitive downward pressure on prices.

In large privatized power systems (Argentina, Chile, England, and Wales), *repeated bidding*, in which the generators bid to supply power on a daily or even half-hourly basis, allows competition to be effective. If costs can be cut, then prices can immediately reflect this, forcing a higher-priced rival out of the way. This bidding system is too complex for most smaller power systems and for economies at lower levels of development, which instead use a contract system. With a long-run contract system, opportunities for generators to use cost reductions to gain market share are much more infrequent.

A second condition for effective competition is that there be a *sufficient number of firms to avoid implicit collusion* and gaming in the system. A two-generator industry, for example, may be susceptible to each firm's tacitly allowing its rival to behave in their mutual interest. The arrangement in England and Wales, with two large private generators (plus a smaller, subsidized public nuclear company), has already demonstrated that a larger number of companies is required to induce truly competitive behavior. In small systems, the market can be too small to support enough firms to achieve competitive conditions—unless the firms are so small that they lose economies of scale.

A third condition for effective competition is that the *size and cost structure* of the generating firms must be fairly similar. If they are not, there would be no possibility of using cost saving to increase market share (by altering the “merit order” with respect to a rival). A related issue in determining the competitiveness of rival generators is the “strength” of the transmission system. A system with very high transmission costs per unit of distance can allow some generators to be virtual monopolies, since the extra costs of delivering supply across the transmission system to meet demand at a given node effectively prevents competition from more “remote” sites.

In an existing industry, there must be *excess capacity* for competition to be successful in the short run. If all plants are needed on a regular basis, there is no incentive to cut costs. The force of competition must come from new entry (such as independent power

producers). If entry is easy and rapid, the threat of entry may be sufficient to induce existing firms to become cost-efficient. But where entry is difficult (because of problems in obtaining licenses and constructing the plants, for example), the threat of entry may be too small to affect the behavior of established firms. Where existing firms have some cost advantage not available to new entrants, there is an “intrinsic margin” that may not be competed away. Common intrinsic advantages are privileged access to local fuel supplies (especially hydro) that cannot be bid away by higher contract prices for the fuel, proximity to fuel source or to market, and environmental suitability of existing sites or even the non-availability of new sites.

In existing systems, de-integration may bring about some losses of *economies of scale*. One factor in such losses is the need to maintain a “reserve margin” against uncertainties. The experience of U.S. power pools has shown that pooling has enabled individual firms to reduce reserve margins, and thus to reduce costs. In developing countries, it is unlikely that such sophisticated devices can be made to work, so a de-integrated system will incur the extra cost of maintaining reserve margins. Similarly, separation will increase the demand for managers, who may be in scarce supply in many small and less developed economies.

A more detailed version of this Note will be produced in the Industry and Energy Department's Occasional Papers series.

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