

Viewpoint

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A Template for Power Reform

*David M.
Newbery*

In the electricity supply industry, high-tension transmission and low-tension distribution systems are natural monopolies, but generation is potentially competitive. Because competition is more effective than regulation in promoting efficiency, separating the potentially competitive parts of the electricity supply industry from the natural monopoly parts that must inevitably remain regulated is good public policy. But the potential for this kind of industry reform will vary by country—depending on whether the system is government owned, investor owned, or under mixed ownership. If a country can de-integrate its electricity supply industry in this way, however, it should do so, or at least keep the possibility open through continued public ownership of the transmission system. And to create effective competition, governments should privatize generation—and possibly distribution—to pave the way for a market in bulk power. This Note provides a template for such industry reform.

The regulatory problem

A natural monopoly arises when a single firm can provide a range of goods or services at lower cost than a set of firms. Electricity networks are natural monopolies in this sense. Moreover, their monopoly is in the supply of a necessity, and they have a direct connection to consumers. This combination of necessity and direct connection implies large potential exploitative power and ensures that regulation or public ownership is politically inevitable. Investors in the electricity industry must therefore expect limits on the prices they can charge and sometimes onerous obligations relating to safety, supply, and stability. In exchange, though, investors need reassurance that future prices will be set high enough

to justify their investment. Experience, however, shows that the politics of pricing are often heated. For social reasons, many governments have set unremunerative prices, and many have failed to index public utility prices adequately to offset the effects of inflation.

Therefore, to give investors the confidence to tie up money in an investment that might not pay off for years, governments must reassure them that the rule of law—specifically property law—is sufficiently strong to ensure property rights. And to reassure consumers and investors, a regulatory system must set rates satisfactory to both. Investors, in turn, must coordinate investment in transmission and generation to find least-cost ways to expand the system and to prevent system failures, fuel shortages, and price shocks. And because electricity is vital to production, they need to reassure governments that supplies will be available at all times. How to satisfy this set of objectives constitutes the regulatory problem.

What industrial countries have done

The history of the electricity supply industry in different countries illustrates the variety of solutions that have been found to the regulatory problem. The solutions are of three main types. The industry may be entirely publicly owned, and thus subject to direct political control; it may be entirely private, but regulated explicitly or implicitly; or it may be a mixed system in which the private sector is implicitly controlled by the potential of the remaining publicly owned system to take over its function.

The simplest structure is a publicly owned national monopoly such as exists in Belgium,





A GLOBAL FINANCING PROBLEM

Industrial countries' demand for electricity increased sharply after World War II. Improvements in reliability and high but falling electricity prices financed the huge investment programs needed to meet demand and to modernize generation and transmission. Until the oil shocks of the 1970s and growing fear about nuclear power, therefore, public criticism of the power sector was muted.

In developing countries, the electricity supply industry was almost invariably state-controlled, with international organizations such as the World Bank helping to meet investment requirements. In 1984–91, nearly 9 percent of official development finance went to the power sector, and power accounted for about 15 percent of World Bank lending until 1991. In the 1980s, infrastructure accounted for more than 55 percent of public investment in middle-income countries, and roughly 40 percent of that share—or a quarter of total public investment—went to power. Official development assistance financed about 10 percent of the annual power sector investment—roughly US\$80 billion—and the World Bank financed about 3 percent.

The performance of the state-run power sectors was frequently unimpressive—particularly when high inflation followed the oil shocks of the 1970s. Despite excess demand, prices hovered below long-run marginal costs, and the rate of return fell so that profits could not finance needed investments. In 1991, with only 60 percent of power sector costs covered by revenues, self-financing ratios fell to only 12 percent of investment requirements. In fact, by the late 1980s, continuing in this vein was no longer financially feasible for utilities or for governments, especially in Latin America. Fundamental sector reform (including privatization) was proposed as the solution. In 1978, Chile had begun radically restructuring its electricity industry as a prelude to privatization. Deregulation was on the agenda in the United States, with modest beginnings in the power sector under the Public Utilities Regulatory Policies Act of 1978. But the pace quickened with the simultaneous restructuring and privatization of the electricity supply industry in the United Kingdom in 1990–91. This reform demonstrated the importance and feasibility of restructuring the industry and changing the system of regulation, usually as preconditions for privatization (though, as Norway shows, this last step is not logically implied by the first two).

France, Italy, and Portugal and used to exist in England before 1990. Austria, the Netherlands, and Spain have de-integrated their industries to varying degrees and formed cooperative power pools that dispatch in order of cost. In the Netherlands, four regional generation companies own the grid and the dispatch company, and the industry draws up plans subject to government approval. In Spain, the grid is under public control, and the government determines the investment plan. And in Austria, the national power company owns the grid and also has ultimate responsibility for ensuring supply, but coordination of power sector investment is decentralized.

Unlike most other European electricity supply industries, those in Germany and Switzerland are complex and fragmented. This reflects the federal structures of these countries and the fact that, because their power sectors were not nationalized, they have not been restructured. The Scandinavian electricity supply industries are under mixed public and private ownership and are largely self-regulating, coordinating electricity supply through cooperation and negotiation.

Structural choices and the design of regulation

Reforming the electricity supply industry in countries with nationalized industries (owned and controlled by the central rather than the local government) raises different problems than in those with private (investor-owned) industries or mixed systems. Governments without direct control over assets will be constrained in regulatory reform by the rights of the existing owners. Radical restructuring is far easier under public ownership, although in countries with unclear or overlapping property rights (of workers, local municipalities, and ministries), it may require clarifying the state's control over the industry. For countries undertaking reform, advisers will need to answer the following questions: How should the industry be structured? Which parts should be public and which private? And which parts should be regulated and how?

Industry structure

Since generation is potentially competitive and transmission is a natural monopoly, separating

the ownership of the two systems might allow competition to effectively take the place of regulation in generation. But for competition to be effective, there must be enough independent generators actively competing in setting the price. This active competition may be difficult to achieve if new power stations are large relative to the total capacity of the country or if the transmission system is unable to ensure adequate competition in each region. If competition fails to keep prices low, regulation may be necessary.

When generation and transmission are integrated, only the delivered power price needs regulation. But if transmission is separate, charges for access to and use of the transmission system will need to be regulated to ensure efficient generation in the short run and efficient choices in plant type and location in the long run—a challenging task.

Some of the considerable benefits of competition in generation can be achieved by inviting competitive tenders for the construction of new plant, built and operated under long-term contracts with the transmission company. But vertical de-integration offers potentially greater benefits. It creates competitive pressure at stages where entry is feasible, and it may result in overall improvements in efficiency sufficient to offset the inefficiencies of transactions through the network. Vertical de-integration also hinders cross-subsidization and makes pricing more transparent.

Given these considerations, what course should be taken by a government contemplating a potentially radical restructuring of the industry? Such opportunities are rare and should not be wasted. The guiding principle should be whether the proposed reform forecloses options or keeps them open. If de-integration is possible, a government should choose that course—or at least keep that option open through continued public ownership of the transmission system. Continued, centralized public ownership keeps most options open, but municipal ownership appears to create obstacles to further reform, at least in some political systems. Reforming a privately owned, vertically integrated generation system appears most difficult, because it requires over-

riding private property rights or paying expensive compensation. If generation is to be transferred to private ownership, transmission should be kept separate, perhaps initially in public ownership, or as a separate company with restrictions on control by generators or by large users or distributors.

Public or private ownership?

Most studies comparing the performance of private electric utilities with that of publicly owned utilities conclude that there is little difference in technical or cost efficiency, though very recent studies indicate better performance under private ownership.

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In the United Kingdom, privatizing the generators and forcing them to compete in the bulk electricity market doubled labor productivity in three years and improved control over investment costs. The publicly owned Nuclear Electric and British Coal, both forced to sell in markets where there was competition from private firms or imports, also improved their productivity dramatically. In Argentina, generation availability improved within a short period after privatization, with Central Costanera increasing availability from 20 percent to 50 percent and doubling its output. Norway introduced competition in the bulk electricity market and in 1993 created Statnett Marked (as a subsidiary of the state-owned owner of the transmission system, Statnett) to operate the power pool, without altering the ownership structure of the industry. The result has been substantial trade across former franchise boundaries and decreased dispersion of prices. In due course, the Norwegian reform should provide a good test of whether, in creating contestable power markets, it is more important to restructure the industry or to privatize it. Note, however, that the Norwegian system allows private generators to



compete with state and municipally owned systems. In the United Kingdom, as in Argentina and Chile, distribution companies remain natural monopolies, and the rate of improvement in their performance has not changed markedly since privatization—although neither has it deteriorated. Altogether, this experience suggests that efficiency depends more on the form of regulation than on the form of ownership.

Criteria for regulation

A good system of regulation should do two things. It should enable a utility to raise finance for investment at an acceptable cost. And it should provide incentives for efficiency in operation, pricing (and thus use), investment (in choice of type, location, size, and cost), and innovation. These requirements may conflict, however. Rate-of-return regulation guarantees an adequate return on capital and thus enables a utility to finance investment cheaply, but it gives little incentive to increase efficiency. Price cap regulation does provide good incentives to reduce costs. But by increasing profits, it ends up creating pressure to tighten price regulation, which increases regulatory risk and raises the cost of investment. Regulatory reviews must be carefully designed to ensure investor confidence and continued political support. The U.K. solution is to grant licenses to the utilities that clearly specify their rights and obligations and can be defended or enforced in the courts.

Creating competition

Creating effective competition requires separating transmission from generation and privatizing generation (and possibly also distribution) in order to create a market for bulk electricity. This restructuring has far-reaching effects on the relative price structure, reducing the ability to cross-subsidize and putting competitive pressure on fuel supply industries, making subsidies harder to justify. Paradoxically, when costs fall as efficiency increases, labor is shed, and costly fuels such as coal and nuclear are replaced by gas, prices may rise as subsidies to capital and fuel are removed. If demand growth resumes

and new investment in transmission and generation is required, prices will need to be adequate to reward private investors.

The major challenge in designing regulation for a de-integrated industry is to provide adequate assurances of investor protection, so that the necessary expansion will take place, while preserving the benefits of market competition. Policymakers must ensure that the bulk electricity market is adequately competitive to avoid a need for the burdensome regulation that undermines investor confidence.

Priorities in developing and transition countries

In developing countries, the main problem is to improve the financial and economic performance of the industry—by rebalancing tariffs, eliminating costly interruptions in supply, reducing construction and operating costs, and avoiding construction delays. Private investment in generation—and possibly in transmission and distribution as well—looks attractive on all scores, as long as entry is competitive and the regulatory environment keeps risks and costs low. The evidence from Chile in particular—where regulatory reform and the restructuring of state enterprises occurred first and privatization proceeded quite slowly—shows the importance of creating a sound, independent system of regulation, commercialization, and competition, even for state-owned utilities, and the relative unimportance of rushing into privatization. In Eastern Europe, efforts to privatize utilities to reduce public debt have been hampered by low tariffs and unsatisfactory regulation. Solving these problems would remove the financial urgency of privatization.

This Note is based on a chapter by the author in Claudio Frischtak, ed., "Regulatory Policies and Reform: A Comparative Perspective" (World Bank, Private Sector Development Department, Washington, D.C., forthcoming). To order, contact Cindy Wong at (202) 473-3606 or by email (cwong@worldbank.org).

David M. Newbery, Department of Applied Economics, Cambridge University, Cambridge, England

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