Exporting Integrated Resource Planning to Poland

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Utility IRP and DSM are products of the American regulatory environment. The ability to export this approach to improving energy efficiency depends on the institutional and regulatory environment to which it will be adapted. In Poland, the legacy of the communist period has been mixed for IRP, and the similarity of IRP to central planning both helps and hinders its acceptance.

In the electric power sector, Poland, supported by the World Bank, has adopted most of the British model of industry structure and regulation, and is in the process of developing details of a regulatory system to accompany the restructuring of the industry. The ability to implement utility IRP and DSM will depend on Poland's pursuing some converging trends in British and American regulation. Convergence on eliminating disincentives for utility energy efficiency is appearing, even though the trends come out of two different industry structures and two different views of the appropriate role of regulation, which are often seen as incompatible. This examination offers some insights into utility industry conditions that appear to be developing in the U.S.

In other Polish energy sectors, less tied to the model of the highly disaggregated British electric industry, there appear to be better prospects for IRP. Examples are presented and the institutional context supporting them is briefly described.

Introduction

Utility integrated resource planning (IRP) and its essential innovation, demand-side management (DSM) programs funded by utilities, have come to be mainstays of improved energy efficiency in the United States. They were, however, developed in a particular electric industry structure and regulatory regime. The ability to export IRP and DSM to other countries depends heavily on both the structure of the industry and the method of regulation.

Brown and Mickle (1991), in a review of the electric industry in the European Union, have suggested that vertical integration and monopoly are necessary characteristics of an industry in which IRP is to be successful. This paper argues that vertical integration is probably not necessary, but some degree of utility monopoly and supportive price regulation probably are. In the absence of either one, it is unlikely that conventional utility IRP and DSM will be successful. In Britain, and potentially in Poland, the problem is price regulation. In the U.S., the emerging problem is eroding monopoly status.

Most regulators in the U.S. have adopted the total resource cost test for choosing DSM measures. The total resource cost test examines the direct costs (labor, materials, financing) and the utility overhead costs of DSM measures, whether they are paid by the participating customer or the utility. The combined direct and overhead costs are compared to the same set of costs for supply-side measures, and the cheaper measure is chosen for meeting the utility's load. This cost test specifically excludes consideration of the contribution to the margin above variable costs included in the customer's rate, that will not be recovered, or must be recovered from other customers, when the customer reduces loads due to the DSM measure. This unrecovered portion is usually referred to as the utility's "lost revenue."

The resolution of the issue of lost revenue, which either shows up as lost profits or increased prices, depending on the regulatory approach, is very important in determining the success of traditional IRP and DSM. The absence of monopoly at the retail level limits the regulator's ability to impose a form of regulation that supports the ability to implement utility-funded DSM programs.

Poland's electric industry is being restructured, on the model of the British industry's restructuring, into one in which generation will be competitive and some degree of retail wheeling will likely exist in the future, though not initially. Regulatory support for utility DSM will depend on Poland's decisions to follow the original details of the British regulatory scheme or to modify it based on U.S. experience and current reforms in Britain. If this restructuring goes forward as originally planned, there will be serious difficulties implementing the kind of utility IRP and DSM seen in the U.S.

This paper gives some background about the Polish energy industry, then describes the restructuring of the British electric industry and the regulatory scheme that applies to the part of the industry that remains monopolistic. Following that, the target structure for the Polish electric industry, based generally on the British model, is described. Current modifications to the British regulatory model, which are similar to some current reforms of U.S. regulatory practice, and their importance for utility IRP and DSM are discussed. The paper argues that the presence of monopoly power in at least one segment of the industry (transmission or distribution) remains key for these modifications to support utility DSM.

Current uncertainty about the extent of structural changes in the U.S. electric industry may make the difficulties in maintaining utility DSM in the U.S. worse than the difficulties in introducing it in Britain or in Poland. If retail wheeling is introduced in the U. S., while utilities maintain ownership of both the generation and the transmission and distribution assets, it will likely make decoupling regulatory strategies irrelevant to utility decision-making. The paper closes with some observations about the introduction of IRP in other Polish energy industries that are not subject to the same kind of restructuring as the electric industry.

Background

Poland's electricity industry, once vertically integrated and part of the centralized communist state apparatus, is being transformed into a disaggregate set of companies, most of which will be privatized. The model for this transformation is the electricity industry in Britain, the site of what is probably the most radical, at least in theory, of the industry restructuring exercises in the world today. The British model is being supported by the World Bank in Poland and elsewhere as its preferred model to increase competition and economic efficiency in national electric industries.

The Polish government has been preparing, with the assistance of a number of international consulting firms supported by various U.S. and European aid agencies, to apply to the World Bank for a $1 billion electric sector loan. This loan will be used to support a number of activities, ranging from load dispatching hardware to transmission system upgrades and development to implementation of DSM pilot programs. Part of the preparation for this loan application has been an evaluation of Poland's electric industry DSM potential.

This is happening in the setting of an obsolete supply system and very inefficient end uses of energy, due to the influence of heavily subsidized energy prices on both suppliers and consumers. The artificially low level of energy prices made it unreasonable for consumers and designers to be concerned about improving the energy efficiency of equipment, appliances and dwellings. Since 1989, as part of the World Bank's loan requirement that energy prices be raised to world levels, prices have risen dramatically, although the World Bank's benchmark has not yet been attained.

Moreover, due to a combination of available national resources and the former government's policy, Poland's economy is strongly dependent on coal. The share of hard coal and lignite in the primary energy supply is among the largest in the world. Poland is dominated by coal in the electric power sector; in district, local apartment and residential heating; and in industrial applications. [1] While this coal use means Poland can rely on secure national resources, it has major economic and environmental consequences for the country.

These consequences start with significant air pollution problems from burning coal. Poland's best coal is reserved for the export market, leaving the lower quality coal for domestic consumption. While all power plants have some particulate controls, they are mostly inadequate by current standards, except those at the newest plants. No plants have SO_2 controls, though this is offset in part by some of the coal being relatively low in sulfur. In 1992, about half of the total plant capacity was estimated to be in non-compliance with the newest sulfur dioxide standards and about two-thirds in non-compliance with the newest particulate standards. The cost of retrofitting to meet these standards, as well as the NOx standard, has been estimated at $6.1 billion.[2] Coal mining itself is the source of major pollution, either directly through high saline water discharges or indirectly through its high and increasing requirements for energy and steel inputs. These requirements are increasing because much of the expansion and marginal production occur in deep mines under very severe conditions (Sitnicki et al. 1990). The latter problem should be self-limiting as market prices are introduced into the economy and the mining sector is restructured.

There are a number of political problems associated with the economic and environmental issues. The most important one is the rise in unemployment with the creation of a new labor market. One of the prominent sources of unemployment is diminished activity in the energy sector, particularly coal mining, driven in large part by reduced production in heavy industry. While the unemployment is not caused by energy efficiency efforts, it remains a short-term political reason for the government to be less interested in improvements in energy efficiency, which are perceived to only make the unemployment problem worse. Long-term conditions, such as international competitiveness of the Polish economy or environmental issues, will require acceleration of energy efficiency improvements, among other production and service factors. Some balance between improvement of economic competitiveness and current labor market protection may need to be achieved before large-scale interest in energy efficiency occurs.

IRP and Central Planning

People in the Polish electric industry frequently commented on the similarity between IRP and Soviet-style central planning. Depending on the degree of commitment of the individual to a market economy, the similarity could be either an aid or a hindrance in adopting the ideas. Among the populace as a whole, Poland's revolution in 1989 was probably more driven by the twin goals of national independence and an economy that worked, than by abstract interest in market economic principles. Thus, for many, this meant that IRP was akin to something familiar, but was a Western, and probably better working, version of what had been done before.

On the other hand, for many in positions of influence in the government during most of 1993[3] and in the utility industry, IRP was viewed unfavorably in light of its similarity to central planning. Issues of spending money to cut sales, perceptions of subsidies in DSM payments, the effect of DSM on the ability to make profits and the definition of the utility industry's business were frequently raised. These concerns were underscored by the absence of a regulatory agency or a final energy law specifying the agency's role and by the focus on competitive markets in the British restructuring model being implemented in Poland.

The Evolving British Model

In 1990, the British electric industry was restructured from a relatively vertically integrated set of state-owned companies to a privatized, deregulated and vertically disaggregate industry. (Details that follow will refer to the major part of the industry, that of England and Wales, and exclude Scotland and Northern Ireland, unless noted.) Four of the major functions of a traditional vertically integrated utility were separated from each other.

The generation assets of the Central Electricity Generating Board were split into three major companies: two that owned the fossil fuel plants, primarily coal, and a third, which the government was unable to sell, that retained the nuclear plants. Together, these three companies still provided over 84 percent of the total generation in mid-1993, with National Power and PowerGen, the two non-nuclear companies, having a market share of about 61 percent. The independent power sector has grown from about 6 percent to almost 16 percent since privatization. The nuclear plants are subsidized by a tax (the Fossil Fuel Levy) on customers' final bills.

The transmission system was privatized into the single National Grid Company, which, in addition to the grid, operates the system's pumped storage plants as a separate business. The 12 Area Boards that formerly distributed electricity were privatized into 12 regional electricity companies (RECs). The RECs, through a holding company, are the owners of the National Grid Company.

Contracting and brokering were also established as a separate business. Called the supply business, it is a separately regulated part of each of the RECs, and is required to keep separate accounts. It is a business that other companies can enter as well. Supply, which is a high-turnover, low-margin business, currently accounts for somewhat more than 10 percent of the profits of the RECs.

Competition was introduced at both the top and the bottom of the British industry. Generation is generally a competitive business, with freedom of entry and without direct price regulation, albeit still with two participants large enough to warrant intermittent reviews of pricing and market power. Transmission and distribution are, and are expected to remain, monopolies with regulated prices. The supply business is a transitional monopoly with regulated prices for some customers. Customers for whom supply is deregulated are able to choose their supply company from any of the RECs or from several other companies holding what are called secondary supply licenses; these customers are receiving what is known in the U.S. as retail wheeling. Originally, the supply business was deregulated for customers with loads larger than 1 megawatt, representing about 30 percent of the sales. Customers larger than 100 kilowatts have been able to choose their supplier since April 1994, without regulation of those prices, and as of April 1998, price regulation of the supply business is scheduled to be eliminated for all customers. The complete transition will have taken eight years from the time the new legal entities were set up in Britain.

All generators are required to participate in a power pool, which is the mechanism ensuring economic dispatch. Generators bid into the pool one day ahead, and the dispatch is calculated by computer, based on the bid information. Generators receive payments based on short-run marginal cost from the pool, calculated on a half-hourly basis, which is in turn charged by the pool to purchasers, both supply businesses and non-franchise customers who wish to buy directly from the pool. Buyers also are able to contract directly with generators, using hedging contracts that, in effect, turn pool purchases into fixed-price contracts. Most supply business purchases use hedging contracts, while a number of non-franchise customers have turned directly to the pool, as pool prices were below contract prices for several years after privatization.

There is no longer a central resource planning function in the British system. While the RECs are required by their licenses to purchase in the market to maintain specified reliability standards, there is nothing that requires the. market to supply resources to purchase. Entry into the generation market is intended to be encouraged by the pool's payment of short-run marginal cost, including a shortage cost component, to generators (OFFER 1992b, p. 5). The short-run marginal cost contains this shortage cost component in those half-hours in which the system's loss of load probability exceeds system standards. The value of lost load upon which this component is based was set at £2/kWh in 1991, and is updated by the retail price index. This mechanism has not been put to a major test yet because the British system has a capacity surplus. The surplus comes primarily from the entry of new natural gas plants into the market, drawn by the high variable costs of coal plants, which are burdened by subsidizing the British coal industry.

There generally has been little DSM activity by the electric utility industry in Britain since privatization. Instances where utility-funded energy efficiency measures are substituted for generation, as is most common in the U. S., are particularly rare. Utility funded activity has focused on areas in which there is competition with gas or where distribution upgrades can be delayed or prevented through DSM activities.[4]

Even though there is no vertically integrated utility in Britain, the supply businesses, which purchase resources to meet customer loads, do face market prices for generation through the operation of the pool and/or the hedging contracts. The lack of vertical integration in itself is not an impediment to IRP and utility DSM. The problem posed for implementation of IRP and DSM by the British industry as it was originally set up, which was in turn the model upon which Poland intended to base its industry, lay in the mechanics of regulation rather than in the vertical structure of the industry.

Regulation of the Monopoly Sectors in Britain

Price regulation in Britain takes a different form than in the U.S., an important factor bearing on the success of utility DSM programs. Traditional U.S. regulation in the energy industry has taken a bottom-up approach, calculating allowed revenue and individual prices from detailed reviews of capital invested and operating costs incurred. Its incentives for economic efficiency lie in prices that are fixed between rate cases and, in particular, by regulatory prudence reviews that can disallow costs from recovery in rates. Rate of return regulation, as it is known, is widely viewed outside the U.S. (and sometimes inside it) as an inefficient, cost-plus form of regulation, characterized by heavy administrative burdens and micro-management of utilities. [5]

Britain takes what can be characterized as a top-down, incentive-oriented approach to price regulation of the monopoly businesses, that is, transmission, distribution and supply (for some consumers). Called "price cap" regulation, or sometimes "RPI minus X" regulation, this approach focuses on total allowed revenue, with changes through time capped by the combination of the retail price index (RPI) and a pre-set productivity improvement factor (the "X" factor). The X factor is intended to maintain overall pressure on the company's management to cut costs and improve operating efficiency. In practice, it can be either be positive or negative depending on the regulator's[6] estimate of the capital needs of the company when the price control will be in place.

All regulatory requirements, including price control formulas, are set in the companies' licenses, which amount to extensive and elaborate contracts with the government. Price controls are set for indefinite periods, until either the regulator or the company proposes a change, allowing time for the companies to profit from any efficiency improvements they have instituted in their operations. Individual prices and tariff components are left largely to the discretion of the company, within the overall revenue cap and subject to general non-discrimination standards.

In the initial British price controls that were set up in 1990, there was no place for U.S.-style utility DSM. There was no provision for recovery of DSM costs in the price control formula. Maximum revenue levels were tied in the price controls directly to levels of kilowatt-hour sales. This was done deliberately so the utilities would not be able to compete with other companies to provide DSM services unless the services were provided on a strictly competitive and commercial basis, that is, the recipient of the services reimbursed the company completely. This was consistent with the British government's highly

disaggregating approach to the restructuring of the industry, as well as a general sense that DSM was properly the customer's responsibility, as long as the prices were correct.

An example of the form of an overall price control for a supply business (prior to April 1994) follows, minus some notational detail. This is the control on total revenue to be generated by retail prices. In each year:

where

1. M is the maximum average charge per kilowatt-hour;
2. G is the average cost per kilowatt-hour of electricity purchases;
3. T is the average cost per kilowatt-hour of transmission services;
4. D is the average cost per kilowatt-hour of distribution services;
5. S is the allowed charge per kilowatt-hour to cover supply business (contracting and brokering) costs, and is related by an RPI-X formula to the previous year's level of S; and
6. K is a correction factor per kilowatt-hour that allows adjustment of the cap for over- or under-collection of the allowable maximum revenue in the previous year.

In the overall supply price control, generation, transmission and distribution costs are passed through. The pass-through of generation costs contrasts sharply with the lack of provision for DSM cost recovery (which will be taken up again below, in the discussion of the changes that were put in place in April 1994 for the S factor in the above equation). Generation costs are not subject to direct regulatory control, while transmission and distribution costs for their respective businesses are each subject to a control like that applied to supply business costs. The correction factor is primarily to adjust for failures to correctly forecast elements such as the retail price index.

The British Model in Poland

The Polish electric power industry is being restructured and privatized in a manner similar to the British industry. The hard-coal plants are being aggregated into four companies, with roughly equal endowments of old and new, large and small plants. The five lignite plants and the associated surface mines are being combined into one holding company. These five companies are to be privatized, and any uneconomic generators are expected to be closed following this. What would otherwise be considered stranded investment in the generation sector will be appropriately valued and accounted for in the purchase price of the companies. Poland's industry is moving toward a central, market-oriented dispatch pool, similar to that of Britain.

The national transmission grid is to be partially privatized, with the government retaining a 51-percent share. In Poland, the grid company will play a more active role than it does in Britain. It will operate the dispatch pool as well as the transmission system. Initially, it also will play a central role in buying from the generators and reselling to the distribution companies at a uniform bulk supply tariff, a role that does not exist in the British system. This role is intended to be phased out over time, as the generation sector becomes financially stable, and the transactions will ultimately take place without the intermediary role of the grid company's purchases and bulk tariff sales. The 33 distribution companies are to be privatized as local monopolies, at least initially, with franchised service territories. There will not be separate supply businesses as in Britain.

The transition has already started with the transformation of the national transmission grid into a joint-stock company owned by the government. The entire transition, which will be accomplished in three phases, is expected to take up to an additional 15 years. The three phases are designed to ease the transition to a competitive generation sector, allowing sufficient time and financial stability for surviving generating plants to upgrade their operating efficiency and environmental controls, and for the remaining ones-to be shut down. The three phases also will gradually extend the scope of retail competition. Following a period of purchase from distribution companies, large, high-voltage customers will gain access to the grid company through its bulk power tariff. Later, when the grid company's bulk tariff and intermediary role are phased out, both distributors and these large customers will have access directly to the generators and the pool. Whether this degree of retail access to generators will eventually extend to all customers, as in Britain, has not yet been decided.

The draft Polish energy law sets out the general requirements for and content of licenses for energy companies and the administrative structure of the regulatory agency. It does not contain any details of the regulatory regime or the manner in which prices or revenue caps will be set or structured. The last draft version of the energy law did, however, provide that the regulatory authority will formulate rules for pricing to secure, among other things, energy companies' co-financing of activities leading to reductions in consumer energy and fuel consumption, as an alternative to increasing their generating capacity.

This was a major step forward in enabling Polish utilities to support IRP and DSM, particularly when coupled with two other factors. The first factor was a less far-reaching implementation of the electric industry's restructuring than occurred in Britain. The second factor is the fact, mentioned earlier, that the government has not yet been able to raise retail prices to the unsubsidized levels being sought by the World Bank. As long as this condition, persists, the argument for utility IRP remains stronger than it would be in a case where prices are close to marginal costs. It remains, however, only a first step since lost revenues are a potential problem whenever the marginal price is above variable cost. Inclusion of this provision in the draft energy law, which had not been in earlier versions, was largely due to efforts to explain the benefits that the U.S. has seen from DSM and IRP and to the recognition that the British system itself was undergoing changes to accommodate utility DSM expenditures. These changes are described below.

Decoupling

The regulatory link between utility profits and sales creates a substantial disincentive for utilities to pursue DSM programs. Decoupling profits from sales has received increased regulatory attention in the U.S. in the last several years. This has occurred through various mechanisms, such as California's Electric Revenue Adjustment Mechanism (ERAM), the revenue-per-customer mechanism used for Puget Sound Power and Light in Washington, and others.'

Decoupling is also receiving attention in Britain, although not under that name, and in a somewhat backhanded manner. In his consultation paper on energy efficiency, the regulator has described his objectives in setting price controls as including the following: "To avoid distortions and the inefficient use of electricity, the price control should allow companies to collect extra revenue from extra sales *to the extent that they incur extra costs from those sales"* (OFFER 1991, p. 17, emphasis added). He has also, however, tended to embed his interest in energy efficiency in the context of supporting competitive markets and getting prices correct.

The regulator set out four criteria for considering energy efficiency options:

1. give the companies real incentives to promote the efficient use of electricity;

2. be compatible with competition in generation and supply and with an efficient and profitable industry;

3. protect the interests of customers and avoid undue discrimination among customers; and

4. not cause any undue distortions in competition in the energy efficiency industry (OFFER 1992a, p. 3).

In England and Wales, the price control formula for the franchise supply business was recently revised by the regulator so that approximately 75 percent of the total revenue cap will be independent of sales levels. This was based on the assumption that only 25 percent of the supply business costs varied with sales levels, and 75 percent of the costs varied with the number of customers. (The specific tariff changes are described below.) He has, however, not indicated whether he believes that supply price controls will be continued at all after 1998. If he judges that sufficient supply competition has developed, it is likely that the price controls for the supply business will be eliminated for all customers along with the elimination of the supply franchise.

The supply business license also includes a requirement for economic purchasing of electricity. The regulator considered the possibility of including a requirement that companies demonstrate that they have considered demand-side measures as well as power purchase contracts in a revised economic purchase obligation. In his final supply price control decision, however, he included an "E" factor to allow the companies to recover energy efficiency expenditures. He proposed to examine additional requirements in the licenses' standards of service regarding such expenditures. The E factor, at £1 per customer per year, will make approximately £100 million available for energy efficiency improvements through 1998, the tentative expiration of the new price control.

While the change that was made in the supply price control in England and Wales was important, it is unlikely to affect the overall climate for DSM because, as noted above, the supply business is only a part of the average REC's business, involving few assets and a little over 10 percent of the company's profits. The largest portion of the company's business is the distribution business, where a similar change would have a far greater impact. The regulator currently is reviewing the distribution price control formula. One of the issues he is examining is whether there is excessive reliance for total distribution revenues on sales levels. He is examining this issue both from the perspective of disincentives to energy efficiency expenditures and from the perspective of the connection between changes in sales and changes in distribution costs.

The change in one REC's supply business price control components is shown below (in 1991/92 prices). The control components are similar for all RECs except for the constant term, which varies between f 10 million and f 16 million. Note that the supply price control was eliminated in April 1994 for non-franchise customers.

Old values:
1. 0.4 pence/kWh (franchise customers), *or*
2. 0.03 pence/kWh (non-franchise customer),
3. subject to RPI-X indexing, with X=0 percent.

New values:
1. £11 million per year, and
2. £15.84/franchise customer per year, and
3. 0.09 pence/kWh (franchise customers), and
4. £l/customer per year for energy efficiency measures,
5. all subject to RPI-X indexing, with X=2 percent.

This revision to the price control formulas is consistent with the findings of Moskovitz and Swofford (1992) that for some U.S. utilities changes in total non-generation costs are explained as well, if not better, by changes in number of customers as by changes in kilowatt-hour sales. A similar price control was put in place for the combined transmission and distribution business of Northern Ireland Electricity (Plummer and Rowlatt 1993).

While changes such as these will not provide positive incentives for utility-sponsored DSM, they will go far toward eliminating the almost absolute disincentive to DSM that existed in the original price control formulas. Because the distribution businesses of the RECs are monopolies, restriction or elimination of incentives to increase sales would support the ability of the RECs to fund DSM.

U.S. Electric Industry Restructuring and DSM

Are there any implications for the U.S. in these developments abroad? The progress that has been achieved in the U.S. through utility energy efficiency programs has relied heavily on regulatory support. This support has come from requirements for integrated resource planning, and from several mechanisms on the financial side. The most basic and widespread of these mechanisms is provision for the recovery of utility direct and overhead costs of DSM. Beyond that, provision for lost revenue recovery, either through some direct calculation or through decoupling profits from sales, has eliminated the major remaining disincentive toward DSM expenditures. Finally, provision of positive incentives in some states, such as shared-savings schemes, for DSM expenditures has increased the regulatory support for energy efficiency.

These financial mechanisms may be reaching the end of their usefulness, however. The changes that the U.S. electric industry now faces, or perceives that it faces, will put heavy weight on price levels. Financial incentives that raise prices will be unattractive to utilities facing or expecting to face loss of the local monopoly through retail competition, either in the form of retail wheeling, or the more immediate form of self-generation. One of the most far-reaching proposals was released in April 1994 by the California Public Utilities Commission, and envisions full retail wheeling available to residential customers by 2002.

Ironically, the tie to generation construction decisions—the original focus of "integration" in integrated resource planning-is likely to become a barrier to continued utility DSM in the U.S. The problem for utility DSM in the U.S. is, in the first instance, that the U.S. industry may not be restructured enough. The looming financial disincentive, writing off uneconomic generating assets, is simply too large for most utilities to ignore.[8] Competition is likely to focus first on rates and generating costs. Retail wheeling to a utility's larger customers first affects use of the utility's generating assets. Self-generation, for instance for industrial and larger commercial customers, also affects use of distribution assets, although these are likely to be a smaller component of the rate for larger customers. The longer these generation assets sit in limbo, temporarily protected by regulators from the competitive threat, the more likely their owners may be disinclined toward traditional, utility-supported DSM programs.

This barrier does not exist in a system like that of Britain or Poland, where the generation assets are or will be independent of the transmission, distribution and supply businesses. On the contrary, the local monopoly that the separate distribution businesses have in these two countries will enable them to support U.S.-style utility DSM, if their regulators will create the right pricing conditions, which they appear to be moving toward. In particular, in Poland, where self-generation and local heat supply through cogeneration by large industries is a major component of the energy supply system already (as it once was in the U.S.), this barrier will be 'minimal.

IRP in Other Polish Energy Industries

As described above, the structure of the Polish energy sector is quite different from that of the U.S. About 45 percent of primary energy in Poland is devoted to providing hot water and steam for residential and commercial heating needs. Many district heat systems are supplied from central heat-only boilers along with some cogeneration plants. District heat systems have both advantages and disadvantages. The main advantage is the potential to increase the efficiency of primary energy transformation through cogeneration. The main problems arise from the high costs of extensive network maintenance (poor quality materials and low water quality add to this problem), low flexibility of operation and high transmission losses due to leaks.

There are interesting opportunities for multisector resource analysis in Poland. For instance, the mutual relationship of the electricity and heating subsystems can be seen in two areas, cogeneration and DSM. The most thermally efficient use for coal is to convert it simultaneously to heat and electricity. However, such cogeneration production in Poland is not as common as it could be. Poland's newer power plants are large, driven by economies of scale. However, the plants' lack of adequate emission controls meant they were sources of heavy pollution and were very burdensome on local environments, so these units were located away from potential heat consumers. The combination of low local demand and high heat transmission cost militated against heat production from cogeneration. Moreover, there are problems with matching seasonal relationships between heat and power demands. Finally, the presence of many local heat-only boilers for residential needs and of existing industrial sources of heat for both industrial needs and for residential demand reduced the potential for cogeneration from the newer large power plants.

Because Poland now has better equipment for environmental protection, such as precipitators, scrubbers and so on, the problem of distance to heat loads can be minimized in future units. Denmark, for instance, which is another country that has invested heavily in district heating, has shown this solution will work with large coal-fired boilers. But matching these two subsystems-heat and power—is still a big challenge, especially because of load issues. Each subsystem has different features, such as different peak demand hours and flexibility requirements.

There are many opportunities to implement DSM in Poland to improve overall efficiency. One example is the case of interrelated demands. During peak electric load periods (cold winter working days between 5 p.m. and 6 p.m.), many additional electric space heaters are used because of poor building insulation and design of building heat distribution, coupled with the inflexibility and lack of adequate automatic temperature response characterizing many district heating systems. These are generally not problems of system undercapacity. Improvements to district heat systems and to building thermal qualities could improve the power system's efficiency and reduce costs for both the electric system and the heat system. In Poland, higher, short-duration loads, except for the highest peaks, tend to be met with inefficiently operated coal plants, rather than the gas or oil plants used in the U.S. or Western Europe. This produces significant environmental effects, primarily through degraded air quality. According to a preliminary assessment, reduction of the peak load could be brought about for 10 percent to 15 percent of long-run marginal cost.

Opportunities for beneficial investments in the energy efficiency of district heated buildings are abundant. This could be especially valuable for electricity sub-districts with distribution network capacity shortages and for areas with expensive heat network construction requirements (such as central city areas). Based on the results of pilot projects, it appears that for one of the most common existing building types, it is possible to save 15 percent to 30 percent of the energy using low investment activities with short pay-back times (2-4 years). An association of cities interested in making their energy use more efficient has been organized to share experience, tools and a common approach to solve these problems. Projects such as these, that could involve several energy sectors in mutually beneficial investments, suffer some additional problems, however. Questions of ownership of buildings are often unresolved, when there are claims by pre-communist period owners on the buildings or the land. The methods of sharing investments risks and future benefits will need to be carefully worked out.

The advantage that DSM in the district heating systems will have is that the institutional context in which they will operate will likely be different from that of the electric power system. The Western government recommendations regarding structural and tariff issues in the district heat sector were based on practices in the Danish district heating system, which has a strong orientation toward energy efficiency and integrated planning. The detailed regulation of the prices for the country's district heat systems will be vested in the Ministry of Physical Planning and Construction, together with province-level governments, rather than in the utility regulatory agency that is being created in Poland's umbrella energy law. The Ministry is currently the supporter of much of the shell retrofit activity going on in large municipal and cooperative residential apartment buildings.

Conclusions

The choice of a structural and regulatory model for the utility industry is made based on a number of criteria. The ability to support utility energy efficiency actions is often only secondary. Particularly in countries like Poland, where the dominant goal is to restructure state-owned industries, establishing competition, ensuring economically efficient behavior over time, limiting government regulatory intervention, and eliminating cross subsidies tend to be the foremost interests. The British system, which is being endorsed by the World Bank in power sector restructuring around the world, can be made to work to support utility investment in DSM, although it did not as it was originally designed.

The U.S. and British regulatory models are often contrasted, based on the degree of intervention in the business of the company, the kinds of incentives each provides or does not provide for economically efficient investment and operation by the company and the amount of regulatory overhead. In addition, each model was designed (or in the U.S. case, evolved) for a differently structured industry. Nonetheless, some common elements are emerging around the issue of utility involvement in DSM spending at the customer level.

The most basic of these is provision for cost recovery. While well established in the U. S., cost recovery was only a recent addition in the British industry and in Poland's draft energy law. Beyond that, full or partial decoupling of profits from sales has made headway in the U.S. and has begun to do so in Britain. In Poland, it is too soon to see how well this idea will be taken up, since the detailed regulations have not been issued. Ultimately, the decoupling approach to eliminating disincentives for utility energy efficiency investment may prove easier to sustain in a fully disaggregated industry like Britain's or Poland's than in the partially disaggregated U.S. industry. In the latter, with mixed monopoly and competitive sectors, the existence of currently uneconomic generating assets will likely act as a drag on the ability and willingness of utilities to take actions that raise rates.

The likelihood of successful implementation of IRP and DSM is perhaps even stronger in such sectors of the Polish energy industry as district heating than it is in the electric sector. To the extent it will be easier, it will be due in large part to the application of a different national model to the industry.

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Endnotes

1. Meyers et al. 1993 contains an excellent account of Poland's energy use.

2. Estimates from RCG/Hagler, Bailly 1993, Appendix 3.1, based on data of the Polish Power Grid Company.

3. Prior to the September 1993 election, the government supported market principles. That election was won by two post-communist parties, whose leadership disavowed any intentions of derailing market reforms, but many of whose members were clearly nostalgic for the former system.

4. See Mickle 1993, and particularly Smith 1994, on the focus of REC energy efficiency activities on competition with gas.

5. See, for instance, Brown, L. et al. 1989.

6. The Director General of Electricity Supply is the head of the Office of Electricity Regulation (OFFER). He makes regulatory decisions about license conditions, including price control formulas, that are subject to appeal to the Monopolies and Mergers Commission if not acceptable to the regulated utility companies.

7. Nadel et al. 1992 provides an extensive discussion of this subject.

8. See, for example, Studness 1994 and Wall Street Journal 1993.

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