The Impact of Power Sector Restructuring on Building Energy Efficiency: The Roles of IRP and DSM

Stephen Wiel, Lawrence Berkeley Laboratory

The power sector structures in England, Wales, Norway, New Zealand, Poland and other counties around the world are undergoing major overhaul. Increasing reliance is being placed on market forces in lieu of the traditional regulation of the electricity industry. In the U. S., such a shift has been happening for a decade and a half as a gradual transition. Some proponents of the market-force approach argue that integrated resource planning (IRP) and utility demand-side management (DSM) are incompatible with the new order. A review of a full range of restructuring possibilities reveals no incompatibility. In all cases, DSM enhances end-use efficiency. In all cases, cost-effective end-use efficiency is maximized by using a ratemaking process for franchise retail service which accommodates DSM and makes it profitable. In all cases, if a capacity planning function remains anywhere in the sector, it is best done using IRP.

Introduction

This paper specifically attempts to reconcile the potentially conflicting desires to (1) embrace competition and "light-handed" regulation and (2) capture the benefits of energy efficiency, especially those from utility demand-side management (DSM), in a framework of integrated resource planning (IRP). While power sector restructuring raises considerably more important issues than the fate of DSM and IRP, this paper focuses solely on a government policy perspective of these two topics.

The Introduction of Competition and IRP/DSM in the Utility Industry

Generation competition, DSM and IRP were all introduced in the U.S. in the 1970s. Competition in electricity generation in the U.S. was largely stimulated by federal law (most significantly, the Public Utility Regulatory Policy Act of 1978 and, more recently, the Energy Policy Act of 1992). Its spark and momentum have been largely provided by federal regulators at the Federal Energy Regulatory Commission (FERC) who were attending to major deregulation of the natural gas industry at the same time. Its initiation was the combination of a reaction to excessive construction of power plants in the late 1970s and early 1980s and a desire to stimulate efficiency and the development of renewable energy technology. Now about 15% of electricity in the U.S. is produced by independent power producers, often acquired by utility companies through formalized bidding processes. FERC still approves the price of all wholesale electricity transactions, but now allows either cost-based or market-based justification.

DSM and IRP, on the other hand, were introduced and fostered by state regulatory commissioners. Like generation competition, DSM and IRP were spawned partly by a reaction to excessive power plant development. In this case, the reaction of state commissioners was accompanied by a recognition that utilities were passing up newly emerging opportunities to beneficially help their customers use energy more efficiently. The two movements, inherently linked, grew gradually state-by-state in a dispersed manner. Some states were stimulated further by environmental concerns. Today, more than a decade after the initial seeds began to take root, well over half the states have mandated at least some key aspects of IRP in a variety of forms, and there is a rich diversity of DSM practiced by utilities throughout the U.S.

More dramatic structural change has recently been instituted in the electricity sector in England, Norway, New Zealand and several other countries. The aim has been to achieve a more efficient industry through increased competition and market forces. In England, for example, the primary functions of the utility industry have been separated into generation (by three separate companies), transmission (by a National Grid Company), and distribution (by Public Electricity Supply Companies controlled by separate area Boards).

Generation prices in England are now largely determined by the competitive forces of a spot market, despite concerns sometimes expressed over the market power of the big three generators. Transmission prices are set by regulatory approval of rates recommended by the National Grid Company. Retail rates are determined by a price-cap formula applied under regulatory supervision, with major review and potential resetting every five years. Such price-cap regulation is effectively, cost-of-service rate-making with a five year regulatory lag.

The competitive model as instituted in England strengthens traditional disincentives that inhibit utility DSM by increasing the link between profits and sales volume. Recognition of this has led the British regulatory body to institute changes in the price cap formula to accommodate DSM investments and there is discussion about possibly allowing lost revenue recovery in the near future.

Integrated Resource Planning

IRP has evolved in a variety of forms in a variety of states throughout the U.S. It is a regulatory tool used by state utility commissions to control the conduct of their regulated utility companies. Among regulators it may serve primarily as a process for selecting the most appropriate new power plants, as a mechanism for mandating DSM, as a process for fostering a local political agenda, or for some other purpose entirely. It began as a way regulators could have more control over utility investments and could ensure that utilities treat all options—supply, storage, delivery and demand-side-on a consistent basis using a systems approach without preconceptions or bias toward any particular option, fuel type or form of ownership. It is evolving into a mechanism for integrating considerations of natural gas, unregulated fuels, renewable energy sources, environmental externalities, transmission and distribution facilities, and regional issues into the utility business.

IRP is a decentralized process conducted independently by each utility company. Sometimes it is used to specify *outcomes* such as the acquisition of a 500 MW solar thermal power plant. Other times it results in specification of a *process* such as a bidding auction for 500 MW of power. IRP is distinguished from traditional planning by its emphasis on five characteristics:

1. IRP systematically examines the full range of energy and capacity resources, including options for increasing supply, reducing demand and operating the electricity system, in a way that avoids bias in all decision-making.
2. IRP ensures development of DSM to its full economic potential.
3. IRP facilitates extensive public participation in utility planning
4. IRP specifically addresses the control and management of uncertainty and risk
5. IRP gives specific consideration to a full range of environmental and other social factors

To varying degrees across the U. S., IRP has shifted investment risk. Before IRP, private utilities would come to state regulatory commissions after building a power plant and would only be allowed to recover their investment if the plant was “used and useful.” If the need for the plant didn’t materialize, the utility shareholders would absorb the loss. With review and, in some states, approval of integrated resource plans comes a sharing. of the responsibility for investment decisions by regulators on behalf of customers.

Utility Demand-Side Management

Some utilities over the past two decades have been learning to help their customers build/buy more efficient homes and offices, purchase more efficient appliances, and operate these buildings and appliances more efficiently, addressing every use that people have for electricity. They have done this by providing customers with information, engineering services, loans, and rebates. They have provided rebates to retailers and distributors of electrical appliances for selling more efficient products. They have provided information and rebates to builders to encourage more efficient homes and offices. And most recently they have provided a refrigerator manufacturer with a $30 million incentive payment to produce a more efficient product.

Utilities are in a unique position to help their customers with energy efficiency. They know who their customers are, know their energy consumption habits, communicate with them every month, and have an established mechanism for collecting money from them. Furthermore, the utility company usually has the expertise and the technical (if not always business) respect of the customer.

For purposes of discussion later in this paper of how DSM fits into a restructured power sector, it is useful to recognise the four separate phases of DSM program planning and implementation: 1) program analysis, 2) program design, 3) program implementation, and 4) program evaluation.

Incentive Regulation

Cost-of-service rate formulas urge electric utilities generally to over invest rather than under invest in facilities, and to oversell rather than undersell to their customers. The more electricity the utility and its customers waste, the greater the earnings of the utility. Regulatory oversight, competition with other fuels,. and increasingly more efficient end-use technology have served as the primary counterbalance.

These incentives served society well for the first eighty years of the electricity industry's existence. By the 1970's, these incentives began to fail us. Electric utilities in the U.S. became trapped in a world changing faster than they could respond. Technology, both in power generation and consumption, was developing at an accelerating pace.

Since 1988, a movement toward incentive regulation has developed in the United States (Wiel 1989; NARUC 1992; Nadel 1992). Now over half the state regulatory commissions have revised at least some aspect of the regulation of their regulated electric utilities to reward the utilities for improving customer efficiency. While there is great variety in the mechanisms that are in place, there are three fundamental elements to incentive regulation:

1. *Recovery of investment,* in which the utility's expenditure on cost-effective DSM is treated as a valid expense or long-term investment in the formulas used for setting rates.

2. *Compensation for lost revenue,* in which either (a) the revenue to cover fixed expenses which is lost from the reduction in sales induced by the utility's cost-effective DSM is treated as a valid expense of the company for rate setting purposes or (b) a mechanism to adjust earnings after they are earned is established so that net earnings are no longer affected by sales volume fluctuations (often called "decoupling").

3. *Profit sharing,* in which a bonus is earned by the utility for successful DSM either as a preset amount, an increase in allowed rate of return or, preferably, a percent of net benefits achieved.

Incentive regulation is attributed with inducing U.S. utilities to increase annual investments in DSM over the past three years from a few hundred million dollars to over $2 billion. The first two elements above are necessary for successful alignment of utility and consumer interests. The second, recovery of lost revenue, is generally considered to have the dominant influence. The third, profit sharing, should either be considered a temporary measure to overcome the inertia of tradition in the utility industry or a permanent measure in conjunction with similar incentives on the supply side. It can give DSM a financial advantage over supply side alternatives which is often seen as desirable in the short run and is generally undesirable in the long run. Profit sharing is believed to have been an important stimulant for the recent increase in DSM by utilities in California, New England and other parts of the U.S.

Reconciling Competition, IRP and DSM

The regulation of electric utility natural monopolies was introduced to expand the output of electricity, to control the transfer of income from customers to shareholders, to provide a recourse for grievances against monopolistic treatment of customers, to limit the social and political power of electric companies, to manage externalities in order to avoid economic waste, and to achieve several other lesser regulatory goals (Breyer 1982).

The criticisms of this regulation we hear today are not new. They have grown apace with the regulation itself—criticisms of high cost; ineffectiveness and waste; procedural unfairness, complexity and delay; unresponsiveness to democratic control; and the inherent unpredictability of the end result. Of the many types of classical and alternative regulation that exist, only the methods of cost-of-service ratemaking and nationalization appropriately match the need for controlling natural monopolies.

Strong forces exist today for restructuring the electricity sector in many countries throughout the world, including the U.S. Predominantly, the electricity supply industry in many countries is changing to accommodate competition among power generators in an attempt to improve the economic efficiency with which we generate electricity. But generation efficiency is only one part of the electricity generation-transmission-distribution-sale-consumption cycle. Efficiency in the other parts of the cycle are equally important. There are compelling reasons for addressing *end-use* efficiency along with other aspects of efficiency while addressing all aspects of the restructuring deliberations, with careful consideration being given to the impact on end-use efficiency of nine aspects of restructuring listed in Table 1. This is done in a cursory manner in the following paragraphs.

The Effect of Industry Structure on Economic Efficiency

Many people believe that separation of the generation industry from the retail service industry creates a barrier to utility DSM. While it is true that changing the industry structure may change how DSM is regulated and practiced, there is no reason to believe it will fundamentally

Table 1. Aspects of Restructuring Which Might Affect End-Use Efficiency

- Industry Structure
- Rate Regulation of Generation
- Ownership
- Incentive Regulation
- Obligation to Connect
- Obligation to Supply
- Responsibility for Capacity Planning and Development
- Retail Competition
- Community Service Obligations

change the potential for what DSM can achieve. Nor is there reason to consider this a barrier to the introduction of new DSM.

Of the four elements of DSM, only program analysis is likely to be affected by separation of the generation and retail service institutions. There is no apparent reason why program design, program implementation or program evaluation would be affected at all. Nor would the rationale or methodology for benefit-cost analysis change. But program analysis might no longer be able to rely on the unified calculation of the supply costs avoided by implementation of any DSM measure as can be achieved in a vertically integrated utility. Depending on the degree of regulatory freedom in the new generation industry, new techniques might have to be developed for estimating the avoided costs necessary to conduct the benefit-cost analyses. This poses no conceptual problem and there is reason to expect DSM would be no more uncertain or risky because of it.

As for IRP, no impact in its applicability or outcome need occur because of separation of generation from the rest of the industry. Such a separation is evolving in the U.S. and IRP is accommodating that change. In their integrated plans, "U.S. utilities consider energy and power purchases as another resource option along with new utility generation, utility plant refurbishment and DSM. Southern California Edison, for example, through IRP is currently planning to purchase 37% of its power from independent power producers. IRP could be equally effective if *all* supply were acquired from a competitive generation pool or by contract through some form of competitive bidding. So long as the competitive generation market systematically accommodates all options for increasing supply and avoids bias in resource selection, none of the five principles if IRP would inherently be violated.

Functionally separating the elements of the utility system does not limit what can be achieved by IRP or DSM. IRP and DSM can function hand in hand with separated generation markets.

Free Competition or Rate Regulation for Generation Efficiency?

The prices at which electricity is sold by generators to transmission/distribution companies, retail service utilities or retail customers, including a fair and efficient price for wheeling wholesale electricity, may be determined by market mechanisms or they may be set or partially influenced by regulators. Since IRP is a flexible process which can specify either outcomes or processes, it can accommodate either of these worlds. It can effectively lead to efficiency improvements with either wholesale pricing approach. Likewise, there is no reason to expect the incentive for and effectiveness of utility DSM programs to be affected by the wholesale pricing mechanism. A government's decision of whether or not to regulate the wholesale price of electricity does not affect the potential benefits from IRP or DSM.

The Effect of Ownership on Economic Efficiency

While it is generally held that commercialization or corporatization may induce improvements in *operating* efficiency, ownership in a functionally separated utility system should not significantly affect *end-use* efficiency (assuming that an appropriate regulatory scheme would apply equally under any ownership). Incentives for end-use efficiency can be built into the regulatory scheme so they operate effectively under any ownership. The IRP process can be established and conducted either for public or for private utilities. Likewise, DSM can be accomplished equally by any owner.

Incentive Regulation

The roles of a regulated utility in achieving efficiency in all sectors of the electricity industry are strongly dependent on incentives within their cost-of-service regulation. Government can foster end-use efficiency by establishing incentive regulation of its monopoly retail service utilities and by exercising its authority to help the utility companies overcome market barriers to DSM.

Incentive Mechanisms to Motivate Utilities. Τηε strongest and most direct influence on consumptive efficiency in a functionally separated utility system (actually, in

any utility system) is whether regulatory price-setting formulas reward or penalize the utility for selling more electricity than is economically efficient. That link is most important in the retail service utility because the company has a direct relationship with the customer. Experience in the U.S. shows that incentives for utilities to improve customer efficiency can be effectively established in the electricity retail service industry. This can be accomplished without compromising supply efficiency through the mechanisms described in the Incentive Regulation section.

Incentive Mechanisms to Assist Utilities. Once a government has committed to fostering substantial utility DSM, there are several things it can do to facilitate DSM success. A long list comes to mind: set energy efficiency standards and labeling requirements for appliances and buildings, mandate energy efficient mortgage mechanisms, mandate or establish home energy rating systems, make capital available for utility DSM, secure utility investments in customers' facilities, remove tax disincentives, provide tax incentives, conduct information campaigns through the media, emphasize energy efficiency in the public education system. This list is only representative of things the government could do itself or could help the utility industry and private industry to do on their own.

Providing mechanisms to help secure utility investments in a customer's home or business, through liens, contracts or repayment rules which follow a departing customer anywhere in the country or accrue to a new customer, is especially important if competition is allowed in retail service. Also, making capital available on a performance sharing basis (customer borrows 100% of the cost and repays it out of bill savings) to all customers for all cost-effective DSM overcomes the most significant market barriers to end-use efficiency making it easier and less costly for utilities to get customers to participate (Wiel 1991). Avoiding tax treatment of DSM that provides disincentive to either utility or customer is also important.

The Obligation to Connect

In a functionally separated utility system, there will still be monopoly service providers with an obligation to connect new franchise customers within the service territory. If other retail service providers are allowed to compete for some of the basic provider's customers, and these customers retain a right to be served by the basic provider, supply inefficiencies are likely to result from this unsymmetrical competition. However, the obligation to connect (or provide remote area power supply) does not affect end-use efficiency.

The Obligation to Supply

The obligation of utility companies to provide all the electricity anyone within their service territory wants is often referred to as the "obligation to serve". It traditionally refers to the provision of electricity (although it may better refer to provision of energy services) and encompasses obligations to forecast, to choose a planning reserve margin, to select reliable supply resources, to accept the investment risk for new resources, and to be accountable for any failure of the system. As such, it provides a powerful incentive to over invest in traditional (and, therefore, known-to-be-reliable) generation technology.

There is no need in a functionally separated utility system for the traditional service obligation to survive as a single obligation. The obligations for 1) forecasting capacity requirements (planning), 2) selection and acquisition of new resources, 3) accepting investment risk, and 4) shouldering accountability for continuous service must necessarily be separated. A government's practical choices for the location of any or all of these functions are 1) assignment to the transmission utility, 2) assignment to the retail service utility, or 3) reliance on competitive markets. Poland, for example, is seriously considering a central transmission utility which would conduct IRP to determine resource needs and then ensure that the needed resources are acquired. The New England Electricity Pool in the U.S. is a voluntary consortium that forecasts generation needs which then must be provided by the member generation companies.

Retail service companies are the entities that customers look to for electricity. It is likely that they will retain a significant share of the obligation to serve responsibilities. However, where the responsibility lies is unlikely to affect the provision of DSM services. It will affect IRP by dictating the focal point and type of regulation that will exist and hence the location and degree of any IRP.

Planning and Development of New Resources

The functions of planning and development of new resources have sometimes resided together in the same company and sometimes not. For example, in local distribution companies which don't own generation, the local company forecasts its long range need for capacity and energy and contracts with a generation company for it. Through the contract, the investment risk is shared with the generation company.

Two locations for the resource planning responsibility in a separated electricity sector are more logical than other alternatives. The forecasting and needs assessment for new resources can be performed by each retail service utility much as it is in much of the world today or it can be centralized in regional transmission centers or generation pools as sometimes occurs.

Furthermore, the level of regulatory oversight may vary over a wide range. The utility company forecast and resource acquisition may not be seen by the regulators at all, it may receive perfunctory review, or at the other end of the spectrum it may receive careful scrutiny and formal approval. Where regulatory scrutiny occurs, IRP may be used.

Retail Competition

It is generally accepted that if retail service companies can compete for customers and customers are allowed to obtain service from any such company they select, the potential for cost-effective DSM is diminished. This is true simply because the utility's ability to provide customer incentives is constrained; a utility company in this situation must be cautious about charging one customer a portion of the cost of improving the efficiency of another customer. There are two primary potential impacts on DSM providers from retail competition (sometimes inappropriately referred to as retail wheeling because nondiscriminatory access to the distribution network is required for retail competition to fully function): 1) nonparticipating customers harmed by any rate increases from DSM could switch to another electricity provider, and 2) participating customers in DSM might be tempted afier investments are made in their homes or businesses to leave the DSM provider for another provider without remaining as customer long enough to repay the investments.

The potential for these effects arises out of an inherent divergence within our natural electricity monopolies between average prices and long-run avoided costs. Our regulation of electric utility monopolies often sets higher prices that allow recovery of investment costs when incremental cost pricing or market pricing would not allow it. Prior investment in inefficient power plants, excess capacity, management inefficiency, and internalization of externalities all can increase this divergence. So can some payments of DSM incentives to customers.

The two inhibiting effects of retail competition on DSM can be mitigated but not eliminated. The first, impact on nonparticipants, is a controversial issue even in the absence of retail competition and can be somewhat limited by special attention to two prescriptions which are desirable in any event: 1) design DSM measures to minimize the extent that incentive payments to customers need to exceed utility company savings (i.e., need to include system savings from other customers), and 2) minimize interclass transfers of DSM costs (and supply investments too).

Experience shows it is impossible to capture all cost-effective DSM without an impact on average rates. This is always the case for DSM measures in the common situation in which the long-run avoided costs are below the revenues of the avoided sales. It is sometimes the case when these avoided costs exceed the avoided revenues. If avoided costs are below rates or customer incentives are high, then net lost revenues and utility DSM program costs (customer incentives and administrative costs) are absorbed by nonparticipants. Net lost revenues often are the dominate cost to nonparticipants.

What is important is not *whether* the rates to nonparticipants in the DSM measure go up or down but *how much* they go up or down. So long as rates don't increase enough to cause a significant loss of customers to a competing retail service provider because that competitor doesn't impose a DSM penalty in its rates, no significant loss of DSM should occur because of the retail competition. If cost-effective DSM is forgone because of potential rate impacts, retail competition will have had a detrimental effect on consumption efficiency. Whether gains in economic efficiency elsewhere in the electricity sector will more than offset such a loss of consumptive efficiency will have to be judged before proceeding with retail competition.

The second effect of retail competition on DSM, customers walking with the utility company's investment, can be mitigated and perhaps eliminated by government provisions to secure the utility company investment. For example, cost-based entrance and exit fees can be established. Or a customer could provide collateral in the form of a lien on the home or business in which the DSM measure is installed. Or government could provide that an unaffixed investment in DSM becomes a lien on the customer's utility bill no matter what retail service company that customer chooses. Then only customers no longer wanting electricity service anywhere in the country could "leave the system" and retail competition would no longer cause a difference.

We have no experience to tell is whether such mitigation would be adequately effective. Open retail competition is only now being implemented and so far only in England, Norway and New Zealand.

Community Service Obligations

Electricity authorities in Australia have coined a phrase for internalizing social objectives into a utility company's economics: Community Service Obligations or CSOs. The issue of investment in DSM beyond its utility industry cost-effectiveness to achieve additional environmental benefits is a contentious issue. Utilities in some jurisdictions in the U.S. include monitized values for residual pollution from power plants in their investment decisions to reflect their customers' willingness to pay more for clean electricity. The benefits from such additional costs accrue partly as external economic gains in other sectors of the economy (e.g., lower medical costs) and partly as non-financial improvements in lifestyle (e.g., better visibility) which don't materialize directly in the economy.

The decision of whether or not to incorporate environmental CSOs into utility resource acquisition or system operation does not affect the efficacy of IRP. More DSM becomes cost-effective when the cost of damage from power plant environmental externalities is recognized. If government wants to invest in an environmentally cleaner electricity sector, introducing CSOs to bring less polluting power generation (through an IRP process or otherwise) and achieving additional savings through the enhanced DSM appears to be an effective mechanism.

Regulatory Options for End-Use Efficiency

Restructuring of the electricity sector may or may not be desirable for any country. This paper makes no judgment on the subject. However, if restructuring does occur, there are many possibilities for including mandates or incentives for end-use efficiency in any regulatory reform. These are explored in this final section of the paper.

Three general approaches to restructuring will be explored here. Before examining these opportunities, it is useful to specify some important common assumptions upon which they are all based. These assumptions all accommodate the general provision that whatever restructuring occurs will be done well. They are listed in Table 2.

The incentives and disincentives for end-use electrical efficiency are less affected by some of the issues discussed in the section on Reconciling Competition, IRP and DSM than by others. Resolving such issues as the ownership of any company, specification of the obligation to connect, and the selection of the mechanism for brokering future demand reduction or supply doesn't significantly affect the potential for end-use electrical efficiency. Nor does the mechanism by which the wholesale price of electricity is determined. These certainly affect the *mechanics* of conducting IRP or DSM, and they deserve detailed attention once major policy decisions have been made. However, two more fundamental issues should be addressed first, ones that more significantly affect incentives for the end-use efficiency of electricity and for the role of IRP and DSM. These are:

Table 2. Common Assumptions for All Scenarios

1. The electricity industry will be *functionally* separated into generation, transmission, distribution and retail services.
2. There will exist appropriate mechanisms for acquiring a future supply of electricity.
3. Access to and prices for use of the national grid will be non-discriminatory.
4. The prices of transmission access and carriage will be regulated and set to reflect time-differentiated, reliability-differentiated marginal costs.
5. Even if retail competition is allowed, some franchise retail customers will remain effectively captive to their local retail service provider.
6. The prices of franchise retail electricity will be regulated and set to reflect time-differentiated, reliability-differentiated marginal costs.
7. The regulatory regimes and market mechanisms that are instituted will ensure the financial viability of the electricity system.
8. A taxation policy will not be adopted which completely supplants the need for utility DSM.

1. Where within the electricity sector the responsibilities for forecasting, capacity planning and service continuity are located. [Possibilities range from a) within a single transmission utility under regulatory oversight, to b) within each of many regulated retail service providers under regulatory oversight, to c) within many retail service providers in an unreviewed fashion.]

2. The degree to which competition among retail service providers for retail customers is allowed or whether it remains prohibited.

The three scenarios shown in Table 3 are discussed below, structured over the range of possibilities identified for the first of the above two issues. They are discussed with and without retail competition allowed.

Practically speaking, a government does not have three or six scenarios to choose among any more than an artist has three or six colors to choose among; these scenarios are illustrative of the continuum of choices available and provide a framework for discussing how a completed canvass might appear.

Table 3. Three Future Scenarios

	Scenario 1 - Maximum competition	Scenario 2 - A National Grid Company Responsible for Centralized Planning	Scenario 3- Retail Service Companies Responsible for Decentralized Planning
Generation	An unregulated competitive generation industry	A generation industry (regulated or not) with non-discriminatory access to the transmission and distribution grid	A generation industry (regulated or not) with non-discriminatory access to the transmission and distribution grid
Transmission/ Distribution	A transmission and distribution industry which does nothing more than provide for the common carriage of electricity at non-discriminatory rates based on marginal costs	A transmission and distribution industry which not only provides for the common carriage of electricity at non-discriminatory rates based on long-run marginal costs, but also has a mandate to forecast and ensure future capacity	A transmission and distribution industry which does nothing more than provide for the common carriage of electricity at non-discriminatory rates based on marginal costs
Retail Service	A minimally constrained non-exclusive retail service industry with only enough regulation to protect the rates and rights of those customers in the service territory who chose to remain franchise customers	Either retention of the current exclusionary retail service market or a non-exclusive retail service industry with regulation to protect the rates and rights of those customers in the service territory who chose to remain franchise customers	A retail service industry which not only provides electricity and energy services to customers, but also has a regulatory mandate to forecast and ensure future capacity (with or without retail competition as in Scenario 2
Planning	No government requirement for forecasting capacity needs or for any other planning	(See Transmission/Distribution)	(See Retail Service)

Scenario 1 - Maximum Competition

If we place maximum reliance on competition and minimum reliance on regulation, how can end-use efficiency be maximized? Is DSM an effective option in this scenario?

In this and each other scenario, cost-effective end-use efficiency is maximized by both the efforts of utilities (through DSM) and the efforts of independent energy service companies to deliver energy services to customers. And in this and the other scenarios, cost-effective end-use efficiency is maximized by using a ratemaking formula for retail service which makes DSM profitable. The methods of implementation, degree of achievement and other factors will vary among the scenarios as discussed below.

The extreme light-handedness of Scenario 1 precludes IRP as a regulatory tool. Rather, reliance may be placed on the development of a robust energy service market with both utilities and non-utility energy service companies competing to help utility customers implement cost-effective energy efficiency improvements. Each of the many retail service providers will be accountable for system failure and will likely take advantage of all mechanisms available to hedge the future supply of energy services. End-use efficiency will be maximized by allowing retail service utilities to provide DSM profitably as described in previous sections. Without such a provision or a regulatory mandate, little improvement in efficiency would be expected.

Because of the retail competition which is embodied in this scenario, government stimulation of the energy service market is especially important. The number of homes and small businesses trapped for whatever reason as franchise customers with no reasonable market choices may be reasonably small. The smaller the group, the larger the detrimental impact on each franchise customer from the market clout of the large customers. All of the

methods discussed in the section on Incentive Mechanisms for government to help overcome market barriers to end-use efficiency, including government financing of DSM programs, would be useful. Government pump-priming of the energy service industry (both utility and non-utility) would be helpful, as would government support for development of an appropriate skill base for it. The vision of this competitive retail energy service market includes such things as 1) utilities purchasing DSM services from customers and from independent energy service companies through bidding processes, 2) customers being approached regularly by competing energy service providers (both utility and non-utility) competing to be the customers client, 3) non-utility energy service companies or others acting as efficiency sales brokers representing groups of small customers, and 4) retail service companies offering DSM services as a competitive marketing tool to attract customers.

Also, the existence of retail competition would require protection of the investments of retail service companies in their customers' facilities. This would be necessary to prevent customers leaving the utility for a competing utility with unpaid improvements in hand. Likewise, DSM would have to be designed to contain the impact on non-participating customers within acceptable limits. Both could be done using the mechanisms discussed in the section on Retail Competition. Without retail competition, this would not be as important.

Scenario 2 - A National Grid Company Responsible for Centralized Planning

Placing less reliance on competition than in Scenario 1 and imposing planning oversight of the industry through regulation of the transmission grid is the most heavy-handed of the three scenarios. How can end-use efficiency be maximized in this scenario? Is DSM an effective option?

Like in the other scenarios, cost-effective end-use efficiency is maximized by making DSM profitable for retail service utility companies. In Scenario 2, because of the regulatory pressure that may be applied through the transmission grid, more reliance may be placed on stimulation of utility DSM and less government attention need be focused on private energy service providers. The Bonneville Power Authority (BPA) experience in the U.S. provides a representative model here. BPA, through a combination of economic incentives and control of the grid, stimulates a significant level of DSM by the local retail providers to which it supplies electricity.

Direct government stimulation of the energy service market is useful but less important in this scenario than in Scenario 1. All of the methods discussed in the section on Incentive Mechanisms for government to help overcome market barriers to end-use efficiency would still be useful.

In Scenario 2, IRP becomes a useful regulatory tool. The planning function specified for the transmission and distribution industry provides a centralized mechanism for identifying future capacity requirements. With it would come the authority to influence the amount of new capacity developed. The designated transmission organization might actually purchase and resell the electricity or it might only establish the rules for a wholesale market. Again BPA serves as a useful example. BPA participates in a multi-state IRP process conducted by the Northwest Power Planning Council (NPPC), a quasi-governmental agency established by federal law. NPPC's and BPA's influence over new capacity comes largely through BPA's role as supplier of inexpensive federal hydropower; as a purchaser of power from independent suppliers for resale to distributors; and through general regulatory. control over generation by many state and local authorities throughout the region. Even in the absence of generation regulation, transmission authorities could still influence new generation through their influence on retail service utility contracting for future capacity. (Since most independent power producers need assurance of future sales to procure financing, they are significantly dependent on long-term contracts they sign with retail providers.)

Even if an effective market mechanism exists for stimulating economically efficient generation without the need for IRP, IRP can still be beneficial for enhancing the efficiency of the rest of the electricity sector. Even if the first IRP principle listed in the Integrated Resource Planning section discussed earlier (consider all resources) is already satisfied, the other four principles can be useful: develop DSM, manage risk and uncertainty, consider environmental effects, and involve the public.

If IRP is pursued, an organization must be selected or created to oversee the process. Study of the existing and possible agencies to regulate the IRP process at both the national and state levels is necessary once the decision is made to pursue IRP and the appropriate utilities are selected to conduct it. The degree of regulatory review and approval of IRP plans is another important implementation decision. The more extensive the review and the more official the approval, the greater the government will end up sharing (on behalf of customers) the industry's investment risk.

If retail competition is allowed, protection of the investments of retail service companies in their customers' facilities would be necessary as in Scenario 1 to prevent customers leaving the utility for a competing utility with

unpaid improvements in hand. Likewise, DSM would have to be designed to contain the impact on nonparticipating customers within acceptable limits. Both could be done using the mechanisms discussed in the Retail Competition section. The extent of the protections needed would depend on the scope of retail competition and degree of competitive freedom allowed.

Scenario 2, which places planning authority in the transmission sector, allows for conducting centralized IRP and for the imposition of DSM on retail service utilities. Government stimulation of the energy service market is useful but not as important in this scenario. As in the other scenarios, if retail competition is allowed, care must be taken to secure the investments of retail service companies in their customer's facilities and to design DSM measures to limit the impact on nonparticipants. If IRP is pursued, an organization must be selected or created to oversee the process. Scenario 2 is more heavy-handed than Scenario 1 with greater likelihood of improved end-use efficiency.

Scenario 3 - Retail Service Companies Responsible for Decentralized Planning

If we place the same level of reliance on competition as in Scenario 2 and provide planning oversight of the industry through decentralized regulation of the retail service companies rather than centralized regulation of the transmission industry, how can end-use efficiency be maximized? Is DSM an effective option in this scenario?

Like in the other scenarios, cost-effective end-use efficiency is maximized by making DSM profitable for retail service utility companies. In Scenario 3, direct regulatory pressure may be applied to the stimulation of utility DSM. This is analogous to most U.S. utility company situations. The difference is the absence of the unifying function of vertical integration, but, as described in the section on The Effect of Industry Structure, this should not be a limiting factor. All other considerations of DSM in Scenario 3 are the same as for Scenario 2, including the impact of retail competition.

In Scenario 3, IRP also can be a useful regulatory tool, although without the regional integration provided by the more centralized IRP in Scenario 2. Presumably, IRP would be regulated by the state agencies which currently set local rates. Plans would be optimized for the local area, with market mechanisms such as power pools providing the regional integrating function.

The potential benefits of IRP are similar for Scenario 3 as for Scenario 2. The main differences are in the organizational structure and the administrative procedures. Here there are big differences. Scenario 2 implies more centralized governmental involvement. Regulatory power would be spread more in Scenario 3. Which is best for any country depends not only on political philosophy and existing government structures, but on those individuals already within the existing structures and those available to government from elsewhere. From an outsider's point of view and without knowing the individuals who would implement IRP, it appears that the more centralized process of Scenario 2 implemented by fewer regulators would have a more likely chance of providing relatively rapid change in the way the electricity sector conducts its business. Likewise, it appears that the decentralization of Scenario 3 would provide a more locally sensitive and equitable outcome.

In summary: Scenario 3, which places planning authority in the retail service sector, allows for conducting IRP in a decentralized manner and for the direct imposition of DSM on retail service utilities. All other considerations of DSM in Scenario 3 are the same as for Scenario 2, including the impact of retail competition. The potential benefits of IRP are similar for Scenario 3 as for Scenario 2. The main differences are in the organizational structure and the administrative procedures. IRP would presumably be regulated by the state agencies which currently set local rates. Plans would be optimized for the local area, with market mechanisms such as power pools providing the regional integrating function. It is likely that such decentralized IRP would provide less of an integrating function for the transmission grid. Scenario 3 would be more regulated than Scenario 1 and more decentralized than Scenario 2. Expected improvements in end-use efficiency would be greater than in Scenario 1 and about the same as in Scenario 2.

All Scenarios

One final observation remains. It applies to all scenarios and addresses human motivation and political will. It is based on eight years of regulatory experience during which much that was required did not get done and much that was not required, much that was even close to prohibited, did get done. People generally were capable of imaginatively and creatively accomplishing what they truly wanted to accomplish. The final observation follows.

If one is disinclined to do IRP or DSM, then functional separation, structural separation, competition or privatization can become the excuse. If one is inclined to do IRP or DSM, there is nothing inherent in structural separation, functional separation, competition or privatization that limits it.

Robust and effective utility DSM can be implemented in any industry structure. Nor would DSM diminish any supply-side gains in economic efficiency. Likewise, there

is nothing to prevent a government from imposing IRP on a functionally and/or structurally separated electricity industry in a way which would enhance the overall efficiency of the industry. Furthermore, introducing competition into the generation or the retail supply sector need not prevent a government from improving the overall efficiency of the industry through IRP and/or DSM.

Acknowledgment

This paper is based on work commissioned by the Australian and New Zealand Minerals and Energy Council (ANZMEC) under management of an IRP Management Committee comprised of representatives of ANZMEC and the Electricity Supply Association of Australia (ESAA).

References

Breyer, Stephen, *Regulation and Its Reform,* Harvard University Press, Cambridge, Massachusetts, 1982.

Nadel, Steven M., et al., ed. *Regulatory Incentives for Demand-Side Management*. American Coucil for an Energy Efficient Economy, Washington D.C., 1992.

National Association of Regulatory Utility Commissioners (NARUC) *Incentives for Demand-Side Management*. NARUC, Washington D.C., January 1992.

Wiel, Stephen, "Making Utility Efficiency Profitable," *Public Utilities Fortnightly.* July 6, 1989.

Wiel, Stephen, "The Electric Utility as Investment Bank for Energy Efficiency," *The Electricity Journal.* May, 1991.