Incentives for DSM in Deregulated Markets

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1. SYNOPSIS

This paper surveys and evaluates alternative incentives for DSM in deregulated electricity markets.

2. ABSTRACT

Restructuring and deregulation of electric utilities to introduce competition is a rapidly growing international trend. The role of DSM in deregulated markets is not yet clear. A consequence of deregulation both in Norway and England has been reduced interest and activity by the governments and utilities in DSM. In the US major reductions in DSM program budgets have been proposed as utilities respond to the potential for a competitive market structure.

In this paper we identify and discuss the major mechanisms to provide incentives for DSM in deregulated markets. We discuss the rationale for DSM intervention in deregulated markets and the role of institutional frameworks in the design of DSM incentives. Using design criteria we develop, we evaluate the different types of incentives based on the experiences with DSM in the US, Norway and other countries. This paper provides both a conceptual framework for the design of DSM incentives and a practical guide to the different types of DSM incentives that have been proposed or implemented.

3. INTRODUCTION

There is a rapidly growing international trend towards deregulated, competitive electricity markets.1 Several nations, including the United Kingdom, Norway, New Zealand, Australia, Chile, and Argentina, have already deregulated their electric utility systems to a large degree. Similar initiatives are being implemented or considered around the world, including Sweden and several states within the US (e.g., California).

The role of demand-side management2 (DSM) in deregulated markets is not clear, although experiences suggest that DSM is likely to diminish in deregulated markets (Haaland and Wilhite 1994; York and Cohen 1994; Owen 1994).

It is not easy to distinguish exactly what is meant by a DSM incentive, which can be confusing. We define DSM incentives as any means taken by a firm, regulatory institution or other government body to encourage the implementation of DSM. Some DSM incentives are clearly driven by the free market. These may simply be marketing strategies for DSM products and services--a way to package and sell DSM absent any market intervention by regulators or governments. Others are clearly market interventions by governments or regulators designed to meet public policy objectives. There also is a grey area between these two poles. This grey area is where DSM incentives theoretically may be the domain of private enterprise, but for practical reasons might still require government intervention, possibly to foster the development of markets that do not exist or are immature.

A major focus of this paper is on DSM incentives that are driven by regulatory or government intervention in markets (which we refer to simply as "regulatory DSM incentives"), although we also include DSM incentives that are market-based. The question of how to promote energy efficiency as public policy within deregulated, competitive electricity markets is not easily answered. In this paper we lay out a framework for considering DSM incentives and discuss the types of DSM incentives that have been developed or proposed. Since a major focus of our paper is on regulatory DSM incentives, we discuss the rationale for DSM intervention in deregulated markets in the next section.

4. THE RATIONALE FOR DSM INTERVENTION IN DEREGULATED MARKETS

The impetus to deregulate electricity markets is to rely on customer choice and market forces to dictate energy resource allocation. This is the neoclassical model of markets: producers compete with each other to deliver goods and services at marginal costs; customers use prices to guide their purchases of goods and services based on their individual preferences and values. Absent any market intervention, DSM in such a deregulated, competitive market would exist solely as individual responses to the market. Consumers would purchase DSM based on its value to them like any other market good or service. Proponents of deregulated electricity markets argue that market-driven DSM will achieve economically efficient levels of DSM (Houston 1994).

The need for intervention in the form of DSM incentives in a deregulated electricity market is premised on the existence of market "failures" and "barriers" that prevent individual consumers from purchasing levels of DSM that are economically efficient.3 The existence of market "barriers" or "failures" is widely debated. These terms are not synonymous.

Market failure, as defined by economists, is, "The inability of a system of private markets to provide certain goods either at all or at the most desirable or 'optimal' level (Pearce 1992)." Sutherland (1991) argues that the only true market failures in energy markets are due to (1) environmental externalities (environmental costs that are not included in prices), (2) energy conservation research as a public good, and (3) national security aspects of energy supply. Sutherland further argues that certain widely cited market "barriers" are not market failures, but rather simply "benign characteristics of well-functioning markets." As Houston (1994) states, "Many market failure arguments made for DSM apply (or do not apply) equally as a rationale for broad-based regulation of other consumer markets, where we would not think of imposing them."

Market "barriers" or "imperfections" are those factors that prevent customers from purchasing cost-effective4 levels of energy efficiency. The commonly identified market "barriers" or "imperfections" for investment in energy efficiency are the following:

> *Imperfect information.* Consumers may not have access to reliable information concerning their energy use and the costs and benefits of DSM technologies to affect their use. Alternatively, consumers may not be directly responsible for their energy-use behavior if another party bears responsibility for paying energy bills.
>
> *Imperfect decision-making.* Consumers may lack the expertise necessary to solve complex resource and utility optimization problems such as required to analyze life-cycle costs and benefits of energy-using technologies and DSM options. Rather, consumers may rely on "bounded rationality" that yields generally imperfect results (Simon 1987).
>
> *Capital market imperfections and accessibility.* Consumers may use discount rates to guide their purchase decisions that are much higher than a utility's cost of capital. This can result in under-investment in DSM and over-investment in new utility generation. Consumers also may have limited access to capital markets (due to any number of constraints, e.g., income, equity, or risk), which prevents them from making investments in energy-efficient equipment that would provide them net benefits.
>
> *Transaction or hidden costs.* Consumers may find that the costs of gathering and processing information, making decisions, and designing and enforcing contracts may be too high to make a DSM investment that otherwise would appear to be cost-effective (Levine et al. 1994).

Newlon and Weitzel (1991) review the evidence cited for market imperfections and conclude that there is a relative lack of solid evidence as to the reasons for market imperfections and their significance. Sanstad and Howarth (1994) reach a similar conclusion, and note that there are two polar positions on the issue of consumer rationality and energy demand behavior: (1) economists who argue that consumers' behavior is economically rational if analyzed correctly, and (2) behavioral researchers and technology analysts who argue that real-world decisions deviate from the ideals of preference maximization. Feldman (1986) and Wilhite (1994), who fall within this latter category, argue that consumers do not act economically rational. Levine et al. (1994) find sufficient evidence of market imperfections to justify market intervention to increase the adoption of cost-effective energy efficiency.

It is not our purpose to resolve this debate over the economic justification for public support of energy conservation and efficiency initiatives. Support for DSM initiatives through market intervention is a public policy choice, which is largely tied to concern for environmental protection and intergenerational equity. Like any public policy, this choice may or may not be economically efficient. The purpose of our paper is to examine DSM incentives in deregulated markets, including DSM incentives that result from public policy choices to support DSM beyond that which occurs "naturally" in deregulated electricity markets.

5. THE DESIGN OF DSM INCENTIVES IN DEREGULATED MARKETS

The success of DSM incentives depends on their ability to overcome the types of market barriers and failures discussed in Section 4 in order to increase investment in DSM. The relative success of DSM incentives also depends on how well they fit within the institutional framework.

The institutional framework is the context into which any DSM incentive measure is placed--the set of relationships or "rules and conventions that define choice sets from which individuals, firms, households, and other decision-making units choose courses of action" (Bromley 1989).5 Elements of the institutional framework that will affect the design of DSM incentives include electric utility industry structure and ownership, regulatory structure, and DSM industry structure. Public policy towards utilities, business, industry and the environment will affect the need, acceptability, and effectiveness of regulatory DSM incentives. Fitting the institutional framework should be a guiding principle for the design of DSM incentives.

There are a wide variety of DSM incentives that have been proposed and implemented throughout the world. We suggest the following criteria to evaluate alternative types of incentives:

> *Transparency*: They should address specific market barriers and/or clear policy objectives.
>
> *Market fit:* They should rely on market-based (competitive) mechanisms, which emphasize customer choice.
>
> *Fairness*: They should treat all market participants equitably and avoid or minimize cross-subsidization.
>
> *Ease of administration*: They should minimize regulatory intervention and decision-making.

6. A SURVEY AND EVALUATION OF DSM INCENTIVES

In this section we discuss DSM incentives that can be implemented in a deregulated electricity market. We do not include a few types of DSM incentives that are well established and already accepted as a part of many countries' energy policies and electric utility systems. These types of incentives include:

> *Information campaigns* by utilities or government agencies to educate energy users about their choices with respect to economics, comfort, the environment, and other factors; and to encourage implementation of energy-efficient technologies.
>
> *Codes and standards* that set minimal standards for building performance, processes or equipment. *Labeling* that identifies the equipment as satisfying a certain energy or environmental standard.
>
> *Pilot or demonstration projects* to promote energy and environmentally friendly technologies or solutions.

We group the incentives in the following discussion according to the actors they target: (1) regulated utilities (2) competitive energy services merchants (3) customers (4) equipment/appliance manufacturers and vendors. Figure 1 illustrates the relationships between DSM incentives and the various actors within energy markets.

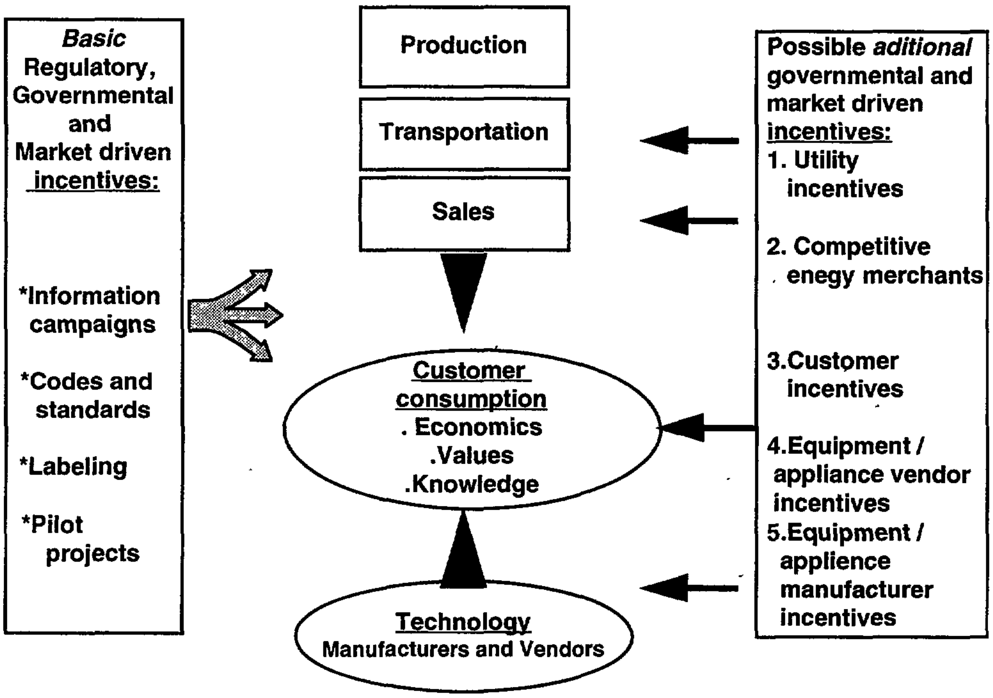

Figure 1: Electricity supply and DSM-incentives.

We define and provide examples of each type of incentive. We also evaluate each incentive according to its qualities in a deregulated market according to criteria we discussed in Section 5, namely: (1) transparency, (2) market fit, (3) fairness, and (4) ease of administration.

6.1. Regulated utility incentives

"Deregulation" does not necessarily mean "unregulated." Major elements of the electric industry are likely to remain regulated, such as the distribution and transmission networks. Those elements of the industry that remain regulated can be targeted for implementation of regulatory DSM incentives.

Performance-based ratemaking
While performance based-ratemaking (PBR) generally is developed relative to a performance measure of the entire industry, energy efficiency also can be incorporated into performance-based rates. Utilities that can document energy efficiency improvements in customer facilities may be allowed to earn a higher profit for the owners.

PBR could take a number of forms. In the US, Wisconsin Electric Power Company, a large investor-owned utility was given a DSM goal (in MW savings due to its DSM programs) by the Wisconsin Public Service Commission (the regulatory body). If WEPCO succeeded in meeting this goal, it could earn a higher "rate-of-return" (rate of earnings) on its ratebase (entire capital stock or investment). Another form of PBR is to include an energy efficiency term in the formula used to establish allowable revenues Such a term could establish a DSM performance goal. If the utility succeeded in meeting the goal, it could be allowed to earn additional revenues. In the design of DSM incentives within a PBR system, it also is important that the DSM incentive is not offset by a rate formula that rewards increased sales. PBR mechanisms as DSM incentives may only work where revenues, not rates, are subject to regulated caps.

This type of incentive is highly transparent--it is directly related to a clear purpose and could include all energy types. It has excellent market fit because the actors must succeed with enterprises in the market that are dependent on customer choice. Fairness depends on how the utility reaches its goals. The ease of administration could vary widely, largely depending on the protocols to verify performance. Simple protocols may be easy to administer, but may reward utilities for performance not intended, such as cross-subsidization and unfair treatment of certain customers. Conversely, developing PBR mechanisms that emphasize accurate documentation of cost-effectiveness, minimize cross-subsidization and promote fairness may lead to administration systems that are overly bureaucratic and cumbersome.

Decoupling of sales from revenues and profits
Regulatory rate structures often link energy sales (kWh) with utility revenues and profits, which is a clear disincentive for the utility to engage in any DSM that reduces sales. As a means to overcome this disincentive, regulatory authorities can design the rate structure such that the income to the utility is not dependent on sales volume (in kWh), but on some other measure of service (Moskovitz 1989).

Decoupling has been applied mainly in the US. The states of California and Maine are two examples. In each case the regulatory authority created a mechanism to assure that the utilities received adequate revenues independent of energy sales, and that utility profits also were independent of sales. Under a more deregulated structure, such as the UK, another decoupling approach would be to have the distribution utilities charge a flat access fee on a per customer basis (different types of customers could pay different fees), rather than charge a rate tied to kilowatt-hour sales.

This means is not as transparent as PBR since DSM goals are not specific. It could affect the market quite fairly if all customers are handled alike, although this would not necessarily be required. A negative feature of decoupling is that such a structure is little market-based and customers' choices may receive little weight. Decoupling also may not be easy to administer by the regulatory authorities, depending on the decoupling mechanism. If complex protocols are required, decoupling could easily lead to a large bureaucracy.

License requirements
To promote DSM, regulatory authorities could impose a condition that to allow a firm to operate the distribution/transmission network or distribute electricity, a given DSM activity must be implemented.

For example, the Norwegian distribution utilities must implement a certain information activity about the electricity product and possibilities and economics for implementation of DSM. This requirement for information is combined with a DSM tax on all kilowatt-hour sales, which funds this activity either by the utility or by a utility-sponsored DSM information center (Haaland and Wilhite 1994).

This type of DSM incentive could be quite transparent, although this depends on how specific the requirements are. This mechanism could be problematic with respect to transparency and market fit if it depends on documentation of the enterprise based on what is implemented and not what results are attained. DSM incentives as part of license requirements should be harmonious with economic incentives, otherwise the desired results may not be obtained. For example, regulated distribution utilities in Norway are required to perform a certain amount of DSM activities, mainly education. However, as a means to fulfill this obligation, Norwegian utilities have defined all public/customer relations as DSM, which may or may not be related to promoting energy-efficiency as intended by this license requirement. The means of enforcement is to deprive the concession, but normally the authorities would avoid this. Detailed requirements may be a solution, but once again, this would require complicated documentation and monitoring. The license requirements can be designed such that all customers are treated fairly.

6.2. Competitive energy services merchant incentives

In principle, competitive energy services merchants (unregulated retail electricity merchants and energy services companies) may not require regulatory DSM incentives. In practice, however, if the DSM market and infrastructure is immature, regulatory DSM incentives may be necessary to foster the development of such an industry.

DSM bidding
The traditional solution to the need for increased generation capacity is to expand the network and/or secure new capacity resources through new construction or contracting with a new supplier. DSM bidding is an alternative to this. An bidding competition is arranged where a utility or other large energy user requests to obtain DSM services (usually in terms of MW and/or GWH) that meet the user's needs as an alternative to new energy supply. The bidding competition may include only DSM, or it may include both demand-side and supply-side options.

Bidding has been used across the US in a number of forms. According to Goldman and Kito (1994), since 1987 about 30 utilities in 14 states have solicited DSM services through bidding. Their review of these programs found mixed levels of success, with several of the programs being "only marginally cost-effective from a societal perspective." Their analysis suggests that bidding can be an effective approach, but that its success is highly dependent on design details of the bidding mechanism.

This incentive mechanism is especially transparent since it relies on a contract to secure a given amount of energy and/or demand resources. This is based on pure market principles of competition and customer choice. DSM bidding should be relatively easy to administer since the parties agree to contract terms before services are provided.

DSM bidding should not be unfair when there is an agreement between a buyer and a seller without consequences for others. On the negative side, the success of this mechanism is dependent on eliminating or minimizing some of the general barriers for DSM in a free market structure.

Performance contracting
Performance contracting is a means for packaging and delivering DSM services to an energy user or utility from an energy services company (ESCO). An energy user who can implement profitable energy conservation measures writes a contract with an ESCO that implements the measures and is paid from the savings. Another form of performance contracting is between an ESCO and a utility to deliver DSM services, often used in conjunction with DSM bidding. Rouse (1994) proposes "DSM performance annuities" as a variation of performance contracting in which the rights and terms of payments are tradeable within financial markets.

Performance contracting, as the principal method of operation for ESCOs, has been developed and applied mostly in North America (the US and Canada). The advent of bidding programs has greatly accelerated the growth of this industry. It is not clear how the industry will fare in a deregulated market.

The evaluation is the same as for DSM bidding.

Energy service pricing
A central barrier that hinders energy conservation is that electricity is an intermediate good. The customer's need for energy services is met by the use of and payment for electricity. Energy service pricing means that a contract is developed based on supply of primary needs, such as heating or lighting. A provider of such services then has a clear incentive to supply such services as efficiently as possible since they are paid for that end service, not the intermediate good.

The idea of energy service pricing dates all the way back to Thomas Edison, although it has yet to be put into practice. LeBlanc (1994) develops the concept and discusses how it could be applied. Energy service pricing would provide a strong incentive for the service provider to be as efficient as possible. It seems possible that ESCOs, operating in a deregulated market, could apply this principle. In this situation, the ESCO would have an incentive to secure the cheapest supplier of kWh and to deliver the end-use energy service as efficiently as would be cost-effective.

This mechanism is fairly transparent--the ESCO has a clear incentive to be efficient, but this incentive could be offset by an incentive to promote sales of additional energy services. This may still fit the definition of promoting DSM, but if conservation is an objective, this may not be readily achieved. Energy service pricing has an excellent market fit and shouldn't require any regulatory intervention or administration once the appropriate means are established to allow this type of enterprise. Generally, it should be a very fair approach, since each customer would be free to develop a suitable contract. However, there is some danger that small customers would not participate effectively in this market because of the small potential profits to the ESCOs from small energy users.

6.3. Customer incentives

As for competitive energy merchants, regulatory DSM incentives directed at customers may not be necessary if there is a mature, competitive DSM industry. Predicates for an economically efficient electricity market are rates and rate structures that accurately reflect costs and customer information that provides adequate feed-back on energy-use. Consequently, we do not classify rate structures as a specific DSM incentive mechanism. Time-of-use rates are the primary example of using rate structures to affect energy use and already have been implemented in many countries.

DSM rate surcharges
This is a rate mechanism designed specifically to encourage DSM by adding a surcharge to the base rate for electricity. The principle of the DSM surcharge is to account for environmental externalities or other social costs. DSM surcharges have two possible effects: (1) they provide a price signal to encourage DSM, and (2) if the revenues from the surcharge are targeted to DSM, they provide a source of funding for DSM investment. Norway has instituted this approach for operation of the transmission and distribution network.

DSM surcharges fit well within markets. They may not be transparent to consumers, especially if the surcharge is small. They are very fair if applied uniformly. The potential disadvantages is poor public acceptance of a tax, and the difficulty setting the rate at a level that will significantly affect behavior and raise sufficient revenues to fund DSM initiatives. Administration of the revenues could be difficult, requiring a great deal of regulatory or government oversight.

Efficiency-based rates
This is another approach to a rate structure designed to encourage energy efficiency. The concept is relatively simple: an energy user receives a rate discount (or penalty) if the efficiency of energy use is relatively better or worse than a given standard (Mendl 1994).

In 1994 this concept was introduced in New York for large industrial customers of regulated utilities. To receive a rate discount, customers must have independent and comprehensive process and building energy audits performed to measure the customer's level of energy efficiency. The utility must use these results to develop a "least-cost" package of energy-efficiency programs and discounts.

This mechanism is fairly transparent--performance is directly related to the goal. Efficiency-based rates could be designed in an especially equitable manner. Free-riders would be a small problem if the energy-efficiency standard is defined clearly for the target group. On the negative side, efficiency based rates may be poorly suited to the free market structure since the customer has little choice. Such a measure could be difficult to manage by the regulatory authorities and may lead to an extensive bureaucracy with corresponding high expenditures.

Improved feedback information
Rate structure will only serve to motivate customers to change energy use patterns if they receive the proper signals regarding such patterns. In many countries customers receive very poor information regarding their energy use. In such cases, improving feedback information about their energy use in relationship to their electricity bill can be a DSM incentive.

For example, Oslo Energi, Norway's largest utility, conducted a research project in which the customers received improved feedback information on their electricity bill (Wilhite and Ling 1992). Customers in Norway usually are billed for their electricity use four times per year in even payments based on the previous year's consumption. Actual use is only measured once per year, at which time the payments are adjusted to actual use. In the research the meter was read every second month and the customers received a bill on actual electricity use. The electricity bill also was revised such that it became easier to understand; for example, graphs were included that compared energy use to the same period in the previous year. The experimental group reduced their energy use 10% compared with a control group.

This mechanism is especially advantageous with respect to transparency, market fit, and fairness among customer groups. It could be somewhat complicated to manage for utilities that have accounting and billing practices based on traditional technology with manual reading and lengthy billing periods. With today's more advanced technology (remote metering), it may be much easier to adapt to such a system. It will then only be a question whether the utility's service to a larger degree than today is decoupled from increased sales or that the competition among small customers is effective.

Customer financial incentives
Customer financial incentives include rebates, grants, "soft" loans and leasing. These types of DSM incentives are well-known. A customer who procures a technology that has a given energy efficiency better than the norm, average or similar, receives a price discount, subsidized loan or leasing arrangement for this technology.

A typical example of this is Oslo Energi's energy conservation system where all types of customers receive grants or subsidized loans based on the amount of saved energy from energy efficiency investments in buildings and industrial processes. In Germany, RWE Energy, Essen, the largest German utility, is conducting a residential energy saving program called KesS (Client Energy Saving Service). Customers receive 100 DM per old appliance they exchange with a new one. The energy consumption of the appliances must be less than a defined limit. KesS includes refrigerators, freezers, washing machines and dish washers (UNIPEDE 1994).

Advantages with this incentive are that it can be designed to target specific DSM objectives and it can easily be introduced in a market system where customer choice is important. They also can be designed such that there is no cross-subsidization, although to date this has not been a priority in many applications, such as in the US. On the negative side, rebates and loans are not as goal driven with respect to desired levels of energy and demand impacts. Rebates and loans are more application driven and may therefore not achieve the intended results and may not be directed at the most cost-effective application. They may not be easy to administer if they require extensive documentation. Free riders are difficult to avoid.

Tax credits and penalties
Tax credits or penalties can be used to encourage DSM investment. Customers are given tax credits, such as a deduction from taxable income, for investments in certain energy-efficient technologies or must pay a tax penalty with the purchase of certain energy-inefficient technologies.

In the US this mechanism was used for the introduction of solar energy technologies, where customers could receive a significant cost advantage from the tax credit. An example of a tax penalty is a "gas guzzler tax," which requires buyers of large, energy-inefficient automobile models to pay an additional tax. This same type of penalty could be applied to equipment that uses electricity.

Generally tax credits and penalties share the same advantages and disadvantages as for customer financial incentives. An additional lesson from solar tax credits used in the US is that while administration is easier if based strictly on purchase price, the desired effect in terms of energy performance may not be achieved. Conversely, if based on performance, it creates difficulties with measurement and verification. A disadvantage with tax credits is that they could be somewhat unfair, since they both would likely be used by wealthier households. Tax credits generally will require the buyer to have the capital necessary to make the initial investment; the tax advantage rewards such investment later. Tax penalties may not be very effective, since they are likely to be attached only to top-of-the-line goods (which have the most luxury features). In this case, wealthy households that want luxury models aren't likely to be deterred from making a purchase due to an energy tax.

6.4. Equipment/appliance manufacturer and vendor incentives

Vendor rebates
This incentive is the same as described under customer rebates with one exception. In this instance the objective is to motivate the vendors to promote the energy-efficient alternatives such that the business receives an economic reward with the appropriate documentation and results.

The evaluation is the same as for customer rebates, although there may it may be more effective to motivate equipment vendors to sell large numbers of efficient appliances rather than to motivate equipment buyers to purchase the same type of equipment.

Innovative technology procurement
Innovative technology procurement is a principle strategy within "market transformation" programs. "Market transformation" is an approach to DSM incentives in which the objective is to accelerate the rate of market penetration of energy-efficient technologies and to expand the market for such products (Goldstein 1994; Nilsson 1992). Market transformation programs may target equipment vendors or manufacturers, although to date most market transformation programs have targeted both groups. The market transformation model works to implement incentives at key "leverage points," i.e., points where they are likely to produce the greatest impact. For example, market transformation programs have been developed to promote the manufacturing and market availability of energy-efficient technologies directly rather than the more indirect means of promoting these technologies to individual customers.

Innovative technology procurement may take many forms. In Sweden NUTEK (the Swedish National Board for Industrial and Technical Development) used this approach in conjunction with a design competition to accelerate the development and market penetration of an energy-efficient refrigerator (Nilsson 1992). The innovative procurement strategy was for the government to guarantee a market for the product by specifying its use within renovation of a large number of housing units. The ability to influence a large purchasing group is necessary for innovative technology procurement.

A similar competition was held in the US--a "golden carrot" program--to develop a "super efficient refrigerator" suitable for the US market (L'Ecuyer et al. 1992). A group of several private and public organizations (government agencies, environmental groups, energy-efficiency advocacy groups and utilities) created the Consortium for Energy Efficiency (CEE) to accelerate the adoption of energy-efficient technologies. CEE raised about $30 million in utility market incentive commitments from associated utilities to be awarded to the winning entry in the competition. The Whirlpool Corporation won the competition with a CFC-free refrigerator that uses 29.5 percent less energy than the 1993 US Department of Energy standards in 1994. CEE has developed similar competitions for residential clothes washers and commercial packaged air conditioners.

This mechanism is highly transparent--specific targets are created for specific end-uses and technologies. It fits well within a market structure if competitive means are used to award the contracts for the product. Its fairness depends on what technologies and customer groups are targeted. Certain customer groups and customers within a group may be excluded from the initial program, but the intent of the market transformation is to affect the entire market so that all customers could benefit in the long-term. Administration should be fairly easy.

7. CONCLUSIONS

Table 1 summarizes the survey and evaluation of DSM incentives presented in Section 6. We include two additional criteria in this table to distinguish additional features of the DSM incentives that we survey and discuss. These two criteria are (1) "net"--incentives that are only or in most cases suitable for regulated transmission and distribution network operators, and (2) "barrier"--incentives that are highly dependent on the removal of general DSM barriers.

Table 1: Overview of DSM-incentives and a simplified illustration of the qualities according to the four selected criteria.

\Guiding principles Incentives \	Trans-parency	Market fit	Fairness	Ease of adm.	Net *)	Barrier **)
Regulated utility incentives						
Performance- based ratemaking		+			N	
Decoupling of sales from revenues and profits					N	
License requirements					N	
Competing energy sevices merchant incentives						
DSM bidding						B•
Performance contracting						B
Energy service pricing						
Customer incentives						
DSM rate surcharges					N	
Efficiency based rates					N	
Improved feedback information						
Customer financial incentives						
Tax credits and penalties						
Equipment/appliance manufacturer and vendor incentives						
Vendor rebates						
Innovative technology procurement						B

Codes:

Exellent	
Good	
Fair	
Poor	

*) **N** means : Only or in most cases suitable towards regulated Net operators.
) **B means: Highly dependent on the removal of general DSM Barriers.

DSM has been developed and implemented in predominantly regulated energy markets, such as electricity. As governments move to deregulate energy industries, there is a significant risk that DSM initiatives may be abandoned in the belief that competitive forces will achieve equal, or even superior, results with respect to the objectives of regulatory DSM. The ability of deregulated markets to produce such results is widely debated. There is little direct experience upon which to base such arguments--what experience exists with deregulated electricity markets suggests DSM may greatly diminish as the result of deregulation initiatives.

DSM incentives can be targeted to any actor within energy markets: (1) regulated utilities, (2) competitive energy services merchants, (3) customers, (4) equipment/appliance manufacturers and vendors.

We suggest four criteria to evaluate alternative DSM incentives: (1) transparency, (2) market fit, (3) fairness, and (4) ease of administration. In our evaluation of alternative DSM incentives, we observe that market fit and ease of administration are complementary, i.e., those DSM incentives that have the best fit within deregulated markets are generally easiest to administer. However, those incentives that are most free-market based depend on the elimination of market barriers to be effective. Fairness can be achieved absent regulatory incentives, but regulatory intervention may be needed to assure fairness. Regulation of the network is a condition to implement several types of DSM incentives, including PBR, decoupling, license requirements, DSM surcharges and efficiency-based rates. There are clear trade-offs between regulatory DSM incentives and market-based DSM incentives. The challenge to policy makers is to find the best balance of these two approaches for the institutional framework in which they operate.

8. ENDNOTES

1. "Deregulated, competitive" markets may be more accurately described as "restructured" electricity markets. However, "deregulated" is commonly used, a convention we retain in this paper.

2. We define "demand-side management" as any measure taken by an individual, household, or firm to change the end-use of energy towards a specific objective, including conservation, improved energy-efficiency, load management, and strategic load building.

3. "Economic efficiency" is often misused. Economists define economic efficiency as "The state of an economy in which no one can be made better off without someone being made worse off" (Bannock et al. 1987).

4. "Cost-effective" is any measure in which the benefits are greater than costs. Cost-effective is not synonymous with economic efficiency.

5. Our definition of "institutional framework" is largely synonymous with "institutions" as defined by institutional economists. The citation by Bromley is such a definition of "institutions."

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