UTILITY/INDUSTRIAL PARTNERSHIPS: AN ALTERNATIVE PATH FOR THE DESIGN OF INDUSTRIAL DSM PROGRAMS

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INTRODUCTION

Demand-Side Management (DSM) programs by electric utilities are designed to provide energy savings for and/or demand reduction by electric customers. The residential sector has historically accounted for a disproportionate share of electricity savings from DSM programs, while the industrial sector (which the U.S. Department of Energy's Energy Information (EIA) administration defines as all manufacturing, construction, mining, agriculture, fishing, and forestry establishments) has dominated demand reductions. Recently utilities have shifted their focus on energy savings to the commercial sector and sharpened their focus on the industrial sector for demand reductions (Hirst, 1994). The industrial sector does continue to offer significant potential for electricity savings (Elliott, 1994) with well-designed programs, offering these savings at a comparatively low cost (Nadel and Jordan, 1993). A recent Electric Power Research Institute (EPRI) study projects that overall DSM impacts will increase through the end of the decade and that industrial sector programs' share of the energy savings will also continue to increase (Faruqui, et. al., 1994).

Nation-wide in 1992, 905 utilities offered DSM programs that resulted in energy savings or peak-demand reductions. Of these utilities, 189 offered programs that were available to industrial customers. It is estimated that those industrial programs offered by large utilities (those utilities with sales of greater than 120,000 megawatts [MW]) resulted in 8,417 terawatt hours (TWh) of energy savings in 1992 (Energy Information Administration, 1994a), which accounted for about one-quarter of the total DSM program savings by large utilities in 1992 (Figure 1). It is important to note that these totals include many agricultural programs, and that most programs are combined commercial/industrial programs (Blevins and B.A. Miller, 1993). The proportion of savings attributed to each sector in combined programs is often difficult to determine (Nadel and Jordan, 1993). These savings by industrial DSM programs represent less than 0.001% of the total national industrial electricity consumption of 973,000 TWh (Energy Information Administration, 1994b). Recent estimates of the electricity conservation potential in the industrial sector range from 9 – 45% of total industrial electricity consumption (Elliott, 1994), so significant potential for savings remains.

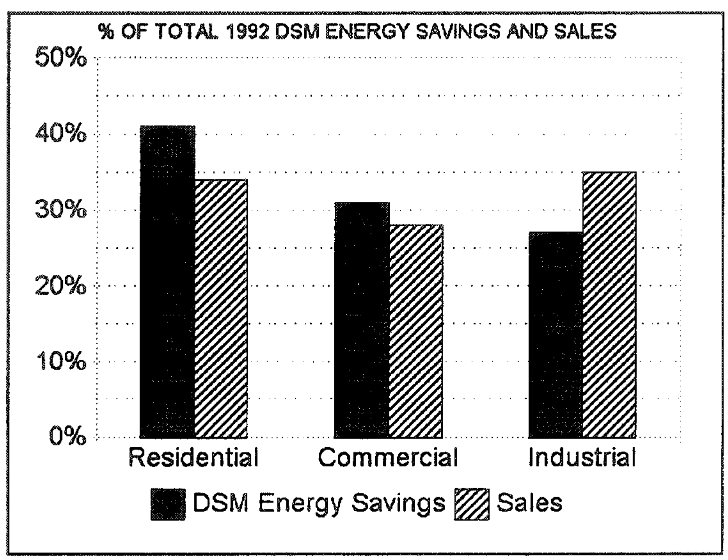

Figure 1 Shares of 1992 annual energy savings and retail sales by customer class (Source: Hirst, 1994).

Many of the industrial DSM programs offered are for peak reduction only. Industrial DSM programs by large utilities accounted for 4,920 MW or 28% of their total actual peak-demand reductions in

1992 (Energy Information Administration, 1994a). While the industrial share of peak demand in 1992 was estimated to be less than 30% of total demand, industrial DSM programs accounted for 42% of the potential demand reductions[1] (Figure 2) (Hirst, 1994).

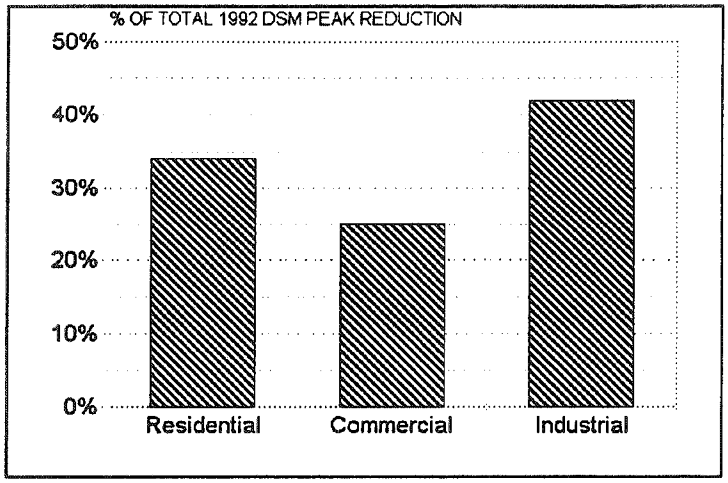

Figure 2 Shares of 1992 annual peak-demand reductions by customer class (Source: Hirst, 1994).

Utility DSM programs have an important role to play in capturing the energy savings potential in industries. However, of the 1,018 DSM programs available to industrial customers[2] in 1991 (Figure 3) (706 to manufacturing and 312 to agriculture), most were combined commercial and industrial (C/I) with only 167 targeted exclusively at industry (116 to manufacturing and 51 to agriculture) (Blevins and Miller, 1994). An ACEEE survey of over 70 industrial DSM programs in 1993 found that most programs had low participation and savings rates (Nadel and Jordan, 1993).

ACEEE's reviews of industrial DSM programs have identified characteristic attributes of successful programs (Nadel and Jordan, 1993 and Jordan and Nadel, 1993):

- *understanding of the customer's perspective* — It is important that programs are structured so that they can address the unique needs of each individual industrial customer. The driving force for each project will be different with each customer because the technical, market

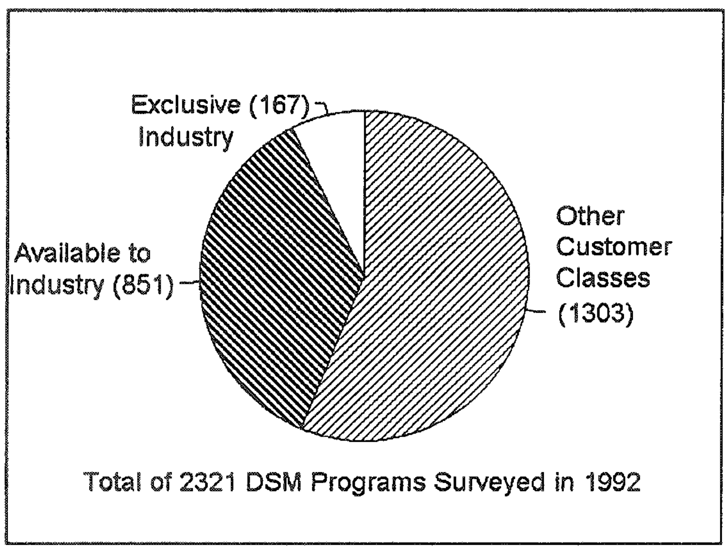

Figure 3 Distribution of DSM Programs by Customer Class (Source: Blevins and Miller, 1993).

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[1] Reflects the installed, contractually available, peak-demand reduction excluding energy efficiency programs.

[2] Data from EPRI are reported separately for industrial and agricultural customers. Sectors are combined for consistency with EIA reporting conventions.

and financial situations of each facility will be different. This aspect goes beyond providing flexibility in the program's design, and attempts to understand the particular needs of the industrial customers in the service territory. These needs go beyond energy cost reduction and include such issues as process efficiency, product quality and environmental compliance (Kyricopoulos, et al., 1994). Each industry and each company is faced with different issues at different times. By understanding the companies and the changing markets within which they work, the utility can better design a program to meet the needs of the customer. For example, changes in environmental regulations that occurred in Southern California prompted the utility to develop and implement DSM programs that provided technical assistance to industries that use inks, paint, adhesives and coatings. By assisting the customers with alternative technologies, they enable them to stay in business while improving their energy efficiency (Delaney, 1994). By being attuned to the changes affecting their customers, utility programs may be able t respond to opportunities such as plant retooling or periods of capital availability when customers are most receptive to efficiency improvement ideas (Price, 1993).

- *personal contact between customer and utility* — A personal relationship needs to be developed between the individual responsible for energy projects at the industrial facility and the utility representative. This relationship is required for the utility to gain the trust of the customer and build an understanding of the unique needs of the customer. This will allow them to identify together the opportunities that will lead to projects that meet both the utility's and the customer's needs.

- *program flexibility* — Because each facility's needs and situation are different, programs should have the flexibility to address the barriers that exist for a project. The utility may need to play a facilitating role at several points within a project:

    - opportunity identification,
    - technology identification and project design,
    - purchasing and procurement,
    - financing, and
    - startup and training.

- *financial incentives* — All programs with high participation and savings rates offered financial incentives to customers. These incentives can take the form of subsidies covering some or most of the cost of the measures. The incentives can also take the form of payment or provision of services, such as engineering fees. In some cases, provision of services may result in less administrative costs for the customer than direct cash incentives.

Likewise, there are some approaches that have not proven successful. A recent ACEEE study (Nadel and Jordan, 1993) identified four less successful approaches:

- *combined commercial/industrial programs* — Most DSM programs available to industrial customers are combined commercial/industrial programs (Blevins and Miller, 1993). The motivating factors driving project decisions in the industrial sector are profoundly different from those in the commercial sector, so it is unlikely that a program can be designed to appeal to both the commercial sector and the industrial sector.

- *information-only programs* — Information-only programs range from simple educational brochures to detailed energy audits. The limited program results data indicate that while the programs can have a positive impact, participation rates and savings are usually low. However, when information programs are combined with incentives, the programs can be very effective.

- *loan programs* — While loans can be effective for those customers without the resources necessary to implement efficiency improvements, rebates have proven more effective. Where customers have been given the choice between a loan and a rebate they have almost always chosen the rebate. In addition the rebates have proved simpler and less expensive to administer.

- *shared savings* — In these programs the utility implements measures and the customer then repays all or a portion of the cost from the resulting savings. The programs have had modest success, but have been burdened with contractual complexities that have limited participation and savings.

EXAMPLES OF EXISTING PARTNERSHIP PROGRAMS

A number of programs embody successful concepts in a partnership framework. The following examples can be used as templates for the design of successful programs if the industries differing needs are kept in mind.

BC Hydro's Power Smart: Bonus Partners Program

BC Hydro's Bonus Partners Program is a customized program for industrial customers that was initiated in mid-1990. BC Hydro offers financing options or cash grants for qualifying energy-conserving projects proposed by industrial customers. If an approved project saves less than 200 MWh annually, the participant generally receives an incentive that lessens the project's payback period to two years. On larger projects, the utility meets with the customer and negotiates the investment criteria that the customer would need to proceed with the project. Factors other than energy savings (e.g., maintenance costs, productivity, product quality, equipment reliability) are considered when determining the incentive payment.

Although this process is more time consuming, the extra effort usually enhances program participation. Incentives generally cover 15 – 30% of project costs. Participants are generally energy-intensive industries, such as paper and pulp, mining and food processing, and are therefore more interested in improving energy efficiency than the average industrial firm (Nadel and Jordan, 1993).

BC Hydro markets the program by making a variety of literature on efficient technologies and case studies available to prospective participants. In addition, the utility co-sponsors energy forums for particular industries. The key to success for this approach is that the industry association leads the forum and the utility plays a supportive role by offering materials, partial financing and marketing assistance (Nadel and Jordan, 1993).

BC Hydro's Industrial Power Smart: Power Plays/Employee Involvement Component

BC Hydro's Power Plays pilot, initiated in 1991, offered incentives ($0.005/kilowatt hours (kWh) saved) to industrial customers' equipment operators who submitted suggestions for electricity-saving measures that were subsequently implemented. Most of the viable ideas fell within the guidelines of Power Smart program, meaning the customer was also eligible for an incentive. Industrial customers implemented and paid for more than two-thirds of the proposed projects themselves without applying for additional incentives. The utility promoted the program for six months within each facility, holding workshops and soliciting ideas. Response to the pilot was good, achieving a 2.5 gigawatt (GW) load reduction. Installation of sensors and timers for motors, lights, fans and pumps were the most common retrofits performed (Nadel and Jordan, 1993).

The promotional period for the full-scale version of the program was shortened to two months based on the pilot program experience. Following the promotional period, the utility does an initial survey of the technical feasibility of proposed projects. In addition, key decision-makers meet to determine which of the suggestions are most viable in terms of production and safety considerations. BC Hydro is offering a "two-tiered" incentive which gives a $250 reward to the employee whose idea is deemed viable and an additional $0.0025/kWh saved, up to a maximum of $2,500. Team submissions collect 20% more incentive. This approach has proven to be very low cost with a levelized utility cost[3] of $0.001/kWh saved. Because the program is oversubscribed, it is no longer actively promoted (Nadel and Jordan, 1993).

Boston Edison's Energy Efficiency Partnership/ Large Commercial/Industrial Retrofit Program

Boston Edison's (BECO) Retrofit program begins with an initial walk-through during which BECO staff evaluates all electrical end-uses within the facility. If opportunities for energy

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[3] Levelized cost is average cost (in 1992 $/kWh) saved over a measure's lifetime, where future energy savings are discounted at 5%/year.

efficiency are found, BECO recommends a comprehensive audit. The customer solicits three audit proposals from a list of engineering firms approved by BECO, choosing the lowest qualifying bid. BECO analyzes the audit's suggested energy conservation opportunities for cost-effectiveness. If the customer agrees to undertake all of the cost-effective energy conservation opportunities, BECO pays the entire audit cost. If the customer does not select all eligible measures, it must pay half of the audit cost associated with the measures that were not selected (Crowley and Donoghue, 1993).

To implement the project, the customer solicits proposals from design firms and contractors. Using actual contractor bids, BECO analyzes the project's eligibility one last time before beginning the project. BECO then works with the customer and design team in scheduling, construction oversight, developing operation and maintenance procedures, commissioning and verification. BECO pays for implementation of all eligible energy conservation measures, but keeps the first year and a half's estimated energy savings (Crowley and Donoghue, 1993).

With little direct marketing (most customer information about the program has come by word-of-mouth), the program has seen an annual participation rate of 7% and cumulative savings of 0.7% of industrial sales. Individual customer bills have been reduced an average of 20% (Nadel and Jordan, 1993). By 1991, 424 customers had participated in the retrofit program, with energy savings of more than 68 gigawatt hours (GWh), which was 104% of the program's energy savings goal. Perhaps the most successful program participant has been Kraft General Foods' ice cream plant, which decreased kWh/gallon of ice cream by 25% and decreased electric costs/gallon by $0.02 (Crowley and Donoghue, 1993).

Southern California Edison's ENVEST^{SCE}

Southern California Edison's (SCE) ENVEST^{SCE} program, approved on a pilot basis in October 1993, is a new approach to providing energy services. The program will create custom-designed energy solution packages of proven, cost-effective energy-efficient products and services for commercial, industrial and public sector customers by bringing together experts, technology, equipment and support services. The goal of the program is to overcome barriers to large-scale customer investment in energy efficiency, including lack of affordability, complexity of assembling comprehensive energy-efficiency solutions and diffused accountability for the quality of energy-efficiency solution packages (Southern California Edison, 1994).

ENVEST^{SCE} provides a single point of contact and accountability by coordinating the design, implementation and warranty of the energy solutions (equipment and services) through its network of third-party energy-service providers and manufacturers. The program provides customers with a complete energy analysis, engineering and design, pre-monitoring, installation of solutions, training, on-going monitoring/reporting, operation and maintenance contracts and wrap-around solution warranty. The program finances 100% of the project in one of two ways: 1) SCE owns the energy-efficiency upgrades and charges the customer a service charge, or 2) SCE lends the customer the necessary money, as with a conventional loan. Under both options, repayment is made through the customer's monthly SCE bill (Southern California Edison, 1994).

Niagara Mohawk's Subscription Service Program

In 1993, approval was granted for Niagara Mohawk's subscription service offering, which permits large commercial and industrial customers, who remain eligible for a shared-savings program, to choose to be ineligible for rebate programs and to avoid being allocated some costs of the utility's DSM programs. Customers choosing to opt-out of the rebate programs would continue to share in the recovery of lost revenues and DSM administration costs to the extent those costs had been included in base rates for their service classification. The program was proposed for a three-year trial period and extended to customers accounting for more than 27% of the company's sales. The program was approved with the understanding that Niagara Mohawk was committed to increasing its savings goals by 20% for customers choosing the subscription service, and agreed to make $1 million in performance incentives dependent on achieving these savings (Centolella, 1994).

NEW PARTNERSHIP IDEAS

As is clear from the above examples, successful industrial DSM programs have been designed. The first step for any utility is to look at the characteristics of successful programs and use them as models for designing programs for their service territory. It is however also clear that significant unrealized energy savings potential exists, and that new ideas will be required if the potential is to be realized. Where do we go from here?

As a start, the following elements should be incorporated into the design process for industrial DSM programs:

- *involve customers in the program design* — It is important that industrial customers be involved at the earliest stages of the utility DSM programs' design. Industrial customers are frequently enthusiastic about advising a utility on how to structure a DSM program that will benefit them *if* they are involved before a program is proposed. No one better understands the unique needs and procedural restrictions of a plant than engineers who must contend with it on a daily basis. They can help design a program that will be structured to provide the greatest benefit to the plant, and that can most easily move through the corporate approval process. Once the utility proposes a program, however, the energy managers may no longer be allowed to participate in a dialog with the utility. The matter is normally transferred to the company's regulatory affairs staff or to a trade association, frequently proceeding in an adversarial manner (Hendicks, 1994).

- *have patience and persistence* — The window in which industrial programs are offered is frequently too brief for the industrial-decision making process to respond. An industry may take several years to commit to an efficiency project, so the program must continue long enough to allow for this decision making. The program planning must also allow for the fact that significant savings may not occur for three to five years (Geller and Elliott, 1994 and Aldridge and Elliott, 1994).

In addition to the proven program designs discussed in the section above, three new ideas are presented below. These strategies are as yet unproven, but are built upon the foundation of creating a partnership between industrial customers and utilities. By structuring a win-win program, the likelihood of receiving a favorable reception from industry is increased.

Large Industrial Customers as Program Allies

Many utilities have made their large industrial customers the primary targets of their industrial DSM programs. Some of these customers are not interested or do not see a need for the services offered. This lack of interest may result from the fact that for many industries, such as automobile manufacturers, energy is a very small portion of their production costs (Elliott, 1994). Many large industrial companies also have internal financing structures in place for projects, and cannot make easy use of external sources of financing. These situations, however, do not apply to many suppliers for large manufacturing companies. Many large manufacturers, such as Ford Motor Company, suppliers contribute a much greater share to the total energy required to make the product than is contributed by the final assembler. Companies like Ford are very much aware of the potential for improving energy efficiency within their suppliers (Price, 1993). These suppliers are frequently in a better position to benefit from the services and incentives that a utility can provide than the large company. Many of these suppliers lack the technical resources to identify and implement energy-efficiency improvements. They are also frequently in need of financial assistance to implement these changes.

An alternative approach to designing industrial DSM programs would be to view large customers as allies in providing programs to their suppliers. Many large manufacturers will have significant motivation for assisting utilities in improving the efficiency of their suppliers. Reduced energy expenditures by suppliers will translate into reduced costs for the suppliers, which can then result in reduced cost to the large integrator companies. Energy-efficiency improvements are frequently accompanied by productivity and product quality improvements (Elliott, 1994). These improvements can also translate into reduced costs for the large integrator.

The utility benefits from this alliance when the large company encourages its suppliers to participate in DSM programs. Obtaining the attention of industrial management is one of the most difficult aspects of industrial DSM programs, and the assistance of the large companies in promoting these programs will certainly help. Moreover, since more energy consumption is usually associated with these suppliers than the integrating companies, the utility is often targeting a larger energy savings potential.

The supplier benefits by reducing its energy costs. Since many of these efficiency improvements result in modernization and increased production capacity, these improvements strengthen the supplier's competitive position with its client company(s), thus insuring a more secure future.

Energy Manager Promotion

In a recent ACEEE study, electric utilities guaranteeing the salary of a full- or part-time energy manager for industrial plants was proposed. The concept is based on a North Carolina Alternative Energy Corporation (AEC) program from the 1980s that guaranteed the salary of energy managers for local governments. If the manager was unable to produce energy savings in excess of his or her salary, the salary was subsidized by the AEC (Nadel and Jordan, 1993). The goal of the program was to make an employee, who was in a good position to identify energy-efficiency opportunities, responsible for and empowered to seek efficiency improvements. Internal programs, such as the Louisiana Division of the Dow Chemical Company's, have produced impressive energy savings. As Ken Nelson in a recent presentation cautioned, this process needs to take place within existing corporate structures if it is to be accepted (or at least tolerated) by management (Nelson, 1993).

Energy managers within companies have proven successful in generating energy savings in the past, but recent corporate staff reductions at companies have resulted in many of these positions being eliminated (Nadel and Jordan, 1993). Italy has recently enacted legislation requiring the designation of energy managers at major energy-using facilities (Mebane, 1994). Programmatically, not only does the presence of an energy manager increase the attention given to energy use, but also provides a contact point for the delivery of programs and services, thus enhancing the impact of other programs. By offering to guarantee the salary of an energy manager, the utility forms a continuing partnership with the facility and establishes a channel of communication that can lead to more effective programs.

Value-Added Energy Services

Another new approach to industrial DSM programs is for the utility to view itself as a value-added energy provider. This strategy plays upon many companies' desire to focus on their core business and contract for other services. Scott Paper Company's recent plans to sell the power plants at two of its paper mills to utilities reflect this desire (Baker, 1994). Some utilities have already responded to this desire of their large industrial customers. Virginia Power, for example, has investigated setting up structures to allow it to build, own and operate power plants for its large customers (Virginia Electric and Power Company, 1993). As was suggested in testimony presented in the Virginia Power rate case, these structures could be extended to provide end-use energy-efficiency services that would reduce the required size of the power plant (Calahan Klein, 1993). This approach would position the utility as the "lowest cost" provider of the energy services required to operate the plant, whether they come as part of the supply- or demand-side service.

The North Carolina Power division of Virginia Power has recently proposed a similar agreement with the Weyehaeuser Co.'s Plymouth, N.C. pulp and paper mill. As part of an agreement with Weyerhaeusar to not expand self-generation, the utility will offer a reduced electric rate and provide "energy audits, technical support and financial incentives" to help the maximize energy efficiency. The plant "shall implement any energy-efficiency measure that meets its investment criteria" and that is "consistent with maintaining the efficiency and safety" of production process (Demand Side Report, 1995).

A more modest manifestation of this idea would be for a utility to contract to provide a single energy service such as compressed air. Wisconsin Electric Power Company (WEPCO) has begun to consider this type of program with its value-based, End-Use Pricing Service (EUP]. Under EUP, WEPCO designs, installs, owns and operates end-use systems on the customers' premises in return for a flat fee. A long-term contract (ten to fifteen years) for the end-use service is negotiated, with the customer paying a flat fee subject to renegotiation at intervals during the contract. An option for customer purchase of the equipment is also included. This program has begun with pilots of HVAC and refrigeration services, and WEPCO is now considering extending this program to the generation of compressed air (Gandi and DiGiacomo, 1994). Much of the potential for energy savings, however, has been identified as being in the uses of compressed air. Easton Consultants, in their study of compressed air systems, suggests that this type of service could be extended to the point of use. Such a program would look at all aspects of the compressed air system and insure that the most efficient generation and use strategies are implemented and maintained (Easton Consultants, 1994).

These type of energy service arrangements would force utilities to assume new roles, and change the way industrial customers view them. Utilities must gain their customers' trust, which is necessary to allow the utilities to become intimately involved in manufacturing plants' operations. The customers will need to view the utility as a critical supplier of energy services. This new interdependent relationship will become a partnership where both parties' success depends on their cooperation.

CONCLUSIONS

A significant potential for energy savings from industrial DSM programs clearly exists. Partnerships will need to play an increasingly important role in the design of industrial DSM programs if future goals for DSM energy savings are to be achieved.

Successful models exist for industrial DSM programs. The lessons learned from these successful programs provide a foundation upon which other programs can be designed. However, because only a small portion of the energy-efficiency potential has been realized, new ideas are also required to capture this savings. This paper presents three new ideas that stemmed from the partnership concept. While these ideas have yet to be proven, it is hoped that they will inspire discussion between utilities and their industrial customers that will lead to new, successful program designs. Partnership needs to be not only an aspect of the programs, but also of the design process. When utilities and industries act as partners, they can work to develop win-win programs that meet everyone's needs, and offer an alternative to the current confrontational environment surrounding industrial DSM.

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