Energy Efficiency Programs for Small and Medium Sized Industry

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ABSTRACT

Designing programs to address the small and medium industrial market segment has been a challenge, because of the large number of facilities, the limited staff resources within the plants, and the relatively small energy savings at any one plant. As a result, many utility and federal government programs have focused on the larger industrial plants, and provided only limited services to smaller plants. Many efficiency programs offer only prescriptive recommendations and rebates with little implementation assistance. While this approach may work well for a large facility with staff dedicated to energy issues, it may not be enough to guide the efficiency improvements for a smaller facility.

In this paper, we will address the concerns of small and medium industrial. We will present a review of existing energy efficiency programs geared toward these plants and analyze how well they address the concerns of the small/medium industrial manager. Finally, will look into some of the failures of the existing programs and suggest areas for improvement.

Introduction

A significant potential for efficiency improvement exists in all industrial sectors, with an abundant, low-cost efficiency opportunities exist in some of the least energy-intensive industries (Energy Innovations 1997). These industries tend to have a higher representation of small and medium sized manufacturing plants than the more energy-intensive industries (Bureau of the Census 1996). It is worth noting, that small and medium sized plants exist in all industries, both energy-intensive and non energy-intensive. In this paper, we will be focusing our discussion on industrial facilities with less than 500 employees and power requirements of less than 1 MW. We are also limiting our discussion to facilities that are not part of a large corporation with dedicated energy management staff.

The industrial sector encompasses more than two hundred fifty thousand establishments engaged in various types manufacturing. According to the 1994 Manufacturing Energy Consumption Survey (Energy Information Administration 1997), these establishments consumed 21,663 trillion Btus of energy in 1994, the most recent year for which data is available. In the U.S., over 25 percent of the energy use are by small plants with less than 250 employees, and almost half of the energy use is by medium plants with less than 500 employees. In fact, according to the 1992 Census of Manufacturers (Bureau of the Census 1996), over 80 percent of all manufacturing establishments have an average of 250 employees or fewer. Very small establishments, those with 1 to 19 employees, account for 67.9 percent of all manufacturing facilities but only 2.5 percent of the value added by manufacturer.

However, the experience from existing programs like the U.S. Department of Energy Industrial Assessment Centers and NYSERDA *FlexTech* indicates that 10% reduction in

energy use is readily achievable with limited effort, and more significant savings can be achieved with some additional effort (Muller 1995). Smaller industrial plants may have larger savings potential than larger facilities because these facilities have not yet taken advantage of many of the efficiency opportunities that have already been implemented at the more energy-intensive facilities. Small plants have more limited capabilities to identify and implement these savings opportunities because the internal technical staff must deal with a broad range of issues and may not have the time or resources to focus on energy use.

Smaller manufacturers often pay more for energy per unit of production than larger firms do. There are several reasons for this: smaller facilities do not qualify for the large volume discounts, they use less efficient equipment and processes, and they lack the capital and technical skills to invest in efficiency improvements. Small facilities also do not have the power to negotiate utility rates the way that larger ones do. Utilities are more likely to negotiate rates when they fear that a large customer may take their business elsewhere. It would seem that these issues would help to motivate the managers of small facilities to implement energy-efficient technologies and strategies, however as will be discussed later in this paper, the limitations on staff and finances frequently prevent thorough energy management. Fortunately, many of the opportunities for increasing energy efficiency and decreasing utility bills in the smaller manufacturing facilities are in areas such as motors, lighting, and compressed air systems. Improving the efficiency of these systems is more straightforward and replicable than at large process-intensive industrial plants. For example, the efficiency of a plant's lighting system can be readily improved by replacing incandescent bulbs with high-efficiency fluorescents. This type of improvement does not require special equipment or a shutdown of process lines. This type of improvement does not require special equipment or a shutdown of process lines. Improving the energy efficiency of a heat exchanging process may involve removal and replacement of an old and inefficient heat exchanger. Improvement such as this may require installing a custom-sized piece of equipment as well as a shutdown of the process, both of which may be too much of a burden on time and finances for a small facility.

In the industrial sector, the diversity of processes and ways in which energy is consumed makes it difficult to single out characteristics that drive energy consumption activities for all industries. At the two-digit SIC level, there are no consistent physical units that can be used to measure energy demand per unit of product output. For this reason, we have chosen to use certain monetary-based figures, as indicators for demand (EIA 1997).

Efficiency Programs for Small and Medium Sized Industry

Programs have been targeted toward small industries since energy efficiency programs began in the 1970s following the first energy price shocks. These programs became known as demand side management (DSM). The purpose of DSM was to attempt to balance customer demand with electricity supply (Pye and McKane 1999). In the 1980s, as new electricity generation began to provide more power that there was demand, the programs were de-emphasized by utilities. DSM programs became least plentiful in the early 1990s, but the dawn of electric market deregulation has renewed interest in recent years. Today, DSM programs (though not always referred to as such) manifest themselves in one of three ways (Elliott 2000):

1. *Public Benefit* – These programs are funded by ratepayers. An example of a public benefit program is the Northwest Energy Efficiency Alliance.
2. *Utility Marketing* – Utilities, especially those in deregulated markets, are seeking new ways in which to attract and retain customers. They are offering energy efficiency programs as part of a package of energy services. This makes the utility appear to care about the customer, and gives the customer the opportunity to take advantage of otherwise unavailable services.
3. *Energy Service Company (ESCOs) Business* – Energy service companies are seeing the concept of demand side management as a business opportunity. ESCOs may charge a fee for implementing electricity demand-reducing technologies and practices in a given facility.

The programs have met with mixed success. Some programs have been targeted toward large industrial energy users, where there are significant process uses, often with some major energy and operating cost savings potential. Often, these projects will start with some detailed process audit. Energy Service Companies (ESCOs), who would make improvements to these larger facilities on a performance-contract or shared-savings basis, have initiated some of these projects. In some cases, these services are bundled with power supply contracts, both in regulated and deregulated markets.

Some of these programs have also been offered to the small commercial and industrial sector. Most focused on crosscutting, low-cost/no-cost lighting, HVAC and hot water measures. In general, they are not targeted toward any specific processes or involved systems, such as compressed air, which may be in a given facility. In order to keep program costs reasonable, most of the programs for small companies have been prescriptive-based, where a similar set of technologies that are applicable to multiple industries are analyzed and presented in as customized a way as possible to the customers.

Services Currently Offered by Programs

Despite these caveats, several programs have been targeted specifically toward the small to medium industrial sector. These have evolved over the years. Programmatic activity for small industries generally falls into two areas: technology improvement opportunity identification (generally through energy and/or process audits or other technical assistance), and direct financing or other facilitation assistance to implement the identified opportunities. The most successful programs bring together both elements to maximize the chance that opportunities will not be missed. A description of some of these more successful programs along with promising new strategies is included later in this section.

The types of services offered to small manufacturers by these entities fall into the following general categories:

- on-site assessments
- specific recommendations
- referrals to technical resources
- rebates/grants/financing
- technology demonstration
- information dissemination and education
- manufacturing research

Most of the programs are dedicated to serving industry at little or no cost to the individual facility. The benefits and limitations of some of these services are outlined in the following sections.

Energy Audits

Energy audits or feasibility analyses are performed on industrial facilities as a way to determine the benefits of implementing energy efficiency improvements. Energy audits (especially when supplied free of charge) are generally looked favorably upon by industrial managers. In a recent survey of small industrial managers in Utah, 20% of respondents indicated that they would be in favor of having an energy audit performed on their facility (Case 2000). The audits can reveal many cost-effective opportunities that would otherwise be overlooked.

This method of analysis, however, does not take some of the non-energy related technical and economic barriers or risks into account. There is a movement in the energy management field to begin including some of these issues into audit analysis. Taking a cue from the insurance industry, actuarial tables and life-cycle analysis calculations are being developed for industrial facilities. The purpose of this type of 'real world' audit is to evaluate the conditions in a facility and reduce the level of uncertainty as to how proposed energy efficiency measures will really behave over time. Specific human factors must be weighed and converted to price tags. In this type of life-cycle analysis, monetized values are assigned not only to equipment purchases, installation costs, and equipment maintenance, but also to energy savings, improved worker safety, improved product quality, reduced production costs, and reduced waste disposal costs.

The impacts of an energy audit can be limited by the lack of resources that are frequently required to implement recommendations. For example, a recommendation to replace an old piece of equipment with a newer, more efficient model requires capital, staff, and frequently the shutdown of a process. Small and medium facilities many times do not have the resources for these types of improvements.

Rebates and Financing Incentives

Rebates have been the most common strategy used by utilities to encourage the purchase of energy-efficient equipment. The rebate lowers the initial cost of a piece of equipment to make it more economically competitive on a first cost basis with the less efficient options. Financial incentives such as low-interest loans are also sometimes offered (Elliott, Pye and Nadel 1996).

One limitation of rebate programs is that equipment purchases will frequently revert to back to the lowest initial cost option once rebates are lifted. This well documented phenomenon is referred to as snapback. Rebates, however, may be valuable in introducing a market segment to an otherwise overlooked product, thereby building consumer trust. This trust can be used as a foundation upon which other programs can be built (Elliott and Pye 1997). However the long-term use of rebates alone has not proven a good strategy.

Manufacturing Research

Manufacturing research is generally offered by the federal government in an effort to encourage U.S. competitiveness and domestic security. These programs generally fund pre-competitive research that is cost-shared with universities and corporations. Many energy efficiency breakthroughs have come about from these programs, and these discoveries eventually benefit all segments of industry. However, only large corporations can afford to leverage with the government on basic research.

Information and Education

Almost all existing, industrial programs offer some form of information and education. This can take the form of informational pamphlets and brochures, as well as low-cost training. In a 1997 analysis of utility motor systems programs, it was found that more than two-thirds of the programs offered training, publications, or software tools (Elliott and Pye 1997).

Education is critical in establishing an increasingly energy-efficient industry. Managers of small and medium-sized facilities will not take advantage of efficiency opportunities if they are unaware of both the energy and non-energy benefits.

Availability of Programs

While the number of energy efficiency programs may be limited, numerous programs exist to assist small and medium sized firms in other ways. Over 300 government-sponsored manufacturing assistance programs and centers exist in the US, many specifically intended to serve the needs of small and medium industrial firms. The entities that administer the programs are the U.S. Department of Energy, U.S. Department of Commerce, state energy offices, public and private organizations, and utilities. Some of the programs are intended for this customer group. Some of the newer programs that), while they may not be designed specifically with smaller customers in mind, take a more innovative approach to energy efficiency programs.

ACEEE has profiled six of these programs in a new report (Shipley, Elliott, Hinge 2001):

- DOE's *Industrial Assessment Centers* (IACs)
- NYSERDA's *FlexTech*
- National Grid's *Industrial Optimization Services (ISOS)* program
- Energy Center of Wisconsin's industrial projects
- Wisconsin Focus on Energy, and
- PG&E's small business standards performance contract program.

Two of these programs, the IAC and *FlexTech* program, have been operated since the 1970's, developing proven track records. The National Grid program has evolved from long running programs run since the 1980s by the National Grid's predecessor company, the NEES Companies. Updated profiles of these programs are available in the new ACEEE report. We will now look at the other three, newer programs, which have been deployed in the past few years.

Program Descriptions

Energy Center of Wisconsin Industrial Projects

The Energy Center of Wisconsin (ECW), a private non-profit energy efficiency organization, has several activities aimed toward the small and medium industrial market. ECW has organized the Consortium for Industrial Efficiency, a group of private and public organizations that offer free and fee-based services to help Wisconsin industries improve their efficiency and competitiveness. This consortium has compiled, and regularly updates, a "Resource Guide for Wisconsin Industries," available at the ECW website (www.ecw.org). The focus of the program is primarily to educate industrial managers and disseminate information. The center also provides project demonstrations and fact sheets in areas such as compressed air, motors, and lighting.

ECW has set up a cooperative relationship with the Wisconsin Manufacturing Extension Partnership (WMEP), a fee-based service provider whose activities are subsidized through the National Institute for Standards and Technology, and bills itself as "the manufacturers' resource for improving productivity, profitability and competitiveness." The WMEP has a cadre of manufacturing specialists with real world industrial experience who work with manufacturers to modernize their operations and effectively manage their business. In the cooperative relationship between ECW and WMEP, ECW supports the costs of an energy expert accompanying the WMEP manufacturing specialists during their visit at a facility. The recommendations of this energy expert are included in the overall package that the WMEP could recommend to the manufacturer, and then assist in whatever follow on work is needed to be sure that the recommendations are carried out. Additionally, representatives from the local utilities are brought in to explain any other assistance programs, such as financing.

The Energy Center of Wisconsin measures the success of its programs through the amount of interest and participation in demonstration events and through participant evaluations. The program is beginning to move towards serving several industry segments such as metal casting and metal finishing. It has been found that developing contacts and relationships within an industry segment can be very beneficial (Presney 2000).

Wisconsin Focus on Energy

Wisconsin Focus on Energy is a $16.75 million, two-year pilot energy efficiency program for northeastern Wisconsin whose main goal is to help prepare the market for a time when energy efficiency goods and services are no longer mandated by state governments. The program is a partnership, funded by a public utility and overseen by a state agency and delivered by private sector contractors. This program takes an integrated approach to delivering energy efficiency in commercial and industrial facilities. Focus on Energy aims to educate service contractors on energy efficiency in order to bring results to businesses. The contractors benefit through additional business, and the industrial facilities benefit through the implementation of efficient equipment and practices.

Each participant receives:

- Technical assistance in identifying energy opportunities and in completing action plans;
- Help in identifying technical opportunities and project financing sources;

- Forums and workshops for business-to-business exchanges on processes, technologies and management practices;
- Assistance in developing or furthering a corporate policy regarding energy efficiency and pollution prevention;
- Energy tracking software at no cost.

According to a preliminary evaluation of the program conducted by Hagler Bailly, "the key ingredient in overcoming the barriers to participation seems to be focused one-to-one attention provided by a technically competent, independent third party. What remains to be seen, however, is whether this third party expertise must always be provided free by the state or some publicly funded organization." (Wisconsin Department of Administration, 2000).

PG&E Small Business Standard Performance Contract Program

The Pacific Gas and Electric Standard Performance Contract Program began in 1998. In 1999, the program was divided into a small non-residential and large non-residential portion. The small non-residential program serves individual facilities with a demand of less than 500kW. The Small Business SPC (SBSPC) program is funded by California utility customers and administered by the state's investor-owned utilities, under the auspices of the California Public Utilities Commission. In this program, utility customers cannot directly apply for benefits, but rather service providers (ESCOs, contractors, etc.) act as sponsors and apply for the incentives. The program is intended to empower the third-party service providers to be the primary source of energy efficiency information and incentives, rather than the utility. It provides standard incentives for project sponsors to achieve energy savings. Rather than providing rebates, the SBSPC program pays project sponsors based on measured energy savings. This program is intended to: 1) encourage entrance of new participants in the energy efficiency marketplace; 2) stimulate transactions between project sponsors and customers; and 3) increase customer awareness and acceptance of the energy services industry. (Kelly, 2000)

In 1999, applications for over 200 projects were received. These projects were estimated to result in annual energy savings of 19.5 million kWh. The estimated utility incentive pay out for these savings is $1,928,000. (Sterret, et al, 2000) A review of the program's first year revealed that most small and medium-sized customers are unaware of the program. Many service providers also are unaware of the program or do not believe that the program is intended for their customers. Several changes are being implemented in 2000 to help streamline the program process. The program application and verification process is being simplified and the minimum project size is being reduced to 10,000 kWh per year to allow very small customers to participate. (Sterret, et al, 2000).

Program Successes

These existing programs for small and medium-sized industries have encouraged energy efficiency in a largely under-served sector of power users. The challenges that face these smaller manufacturers are large – the lack of dedicated staff and the lack of capital create a difficult environment for fostering efficiency. Regardless, these programs have achieved some success. The following strategies have proved efficacious:

- Plant energy efficiency assessments
- Development of network of energy efficiency providers
- Leveraging other market resources
- End-user education

Energy Audits and Energy Efficiency Assessments

Perhaps the most successfully implemented program strategy has been plant assessment. Free energy audits, such as those offered through the DOE funded IACs, allow the managers of small facilities to see how their facilities can be made more energy-efficient. Surveys of small facility managers have shown that many managers think that audits are valuable, and would like one conducted at his or her facility (Case 2000). The relatively high implementation rate of recommendations in the IAC program indicates that audits are a successful component in fostering energy efficiency. The energy audit is the first step in realizing energy-efficiency improvements in a facility.

Development of Network of Energy Efficiency Providers

In order to promote efficiency, it is important to educate service providers and vendors as well as customers (Case 2000). Small and medium manufacturing facilities are likely to hire a third party to update or repair a piece of equipment. This vendor or service provider is generally relied upon to install the proper type and size of equipment. It is important that the 3rd party be aware of energy-efficient equipment and be willing to present it as an option to the customer. Some of the performance contract and education programs have succeeded in making service providers aware of efficiency.

NYSERDA's *FlexTech* program has been particularly successful in establishing a circle of contractors and consultants that are intimately familiar both with the NYSERDA program, as well as the energy efficiency needs of the small and medium-sized manufacturers in New York State. This stable of consultants helps resolve some of the human-factor barriers to increasing efficiency in this portion of the industrial market. The managers of smaller facilities tend to be more risk averse than their larger and more heartily financed brethren, therefore a method of instilling trust is essential to the success of an energy-efficiency program. Many of the utility energy-efficiency performance contract programs such as the PG&E Small Business Standard Performance Contract Program, also excel in the area of trust-building. Where the PG&E program offers primarily a pool of contractors with a marked interest in improving the performance of a facility, the NYSERDA program takes the customer completely from the project identification stage all the way through to the contractor selection and project completion.

The more successful programs attempt to remove efficiency barriers by leveraging other funded activities and coordinating activities to keep costs down, while maximizing the credibility of the information delivered. They also seek to address all of the barriers to energy efficiency that manufacturer face, including financing. The PG&E performance contract program is one of the more successful of these programs. The manner in which PG&E stimulates efficiency improvements is by primarily offering incentives to the third-party energy efficiency consultant. This allows the utility to keep its program implementation costs low, since the services are offered not by the utility but by a third-

party energy efficiency consultant. This allows the utility to keep its program implementation costs low, since the services are offered not by the utility but by a third-party. As with *FlexTech*, the PG&E performance contract uses a stable pool of contractors. This engenders trust in the customer, and increases the credibility of the information being offered.

Leveraging of Market Resources

What is frequently the motivating factor in implementing an energy efficiency investment in a small or medium-sized industrial facility is first cost and rate of return. It is key for a small manufacturer to be able to keep costs low. These manufacturers typically have small capital budgets. Programs that offer cost-sharing or rebates succeed in helping lower first costs for efficiency investments. The Industrial Assessment Centers have been successful primarily because they can deliver a detailed plant assessment and technical recommendations at no cost to the customer.

End-User Education

Practically every energy efficiency program offers some sort of educational service (Elliott, Pye, and Nadel 1996). These services come in the forms of brochures and websites. What has been found through some of the utility programs, is that information can sometimes be disseminated more effectively from sources other than the customer's utility. Information coming from consultants, non-profits, and public benefit entities is frequently met with less resistance.

Program Failures

Despite many programmatic successes, what still exists is the "energy efficiency gap" – the gap between what is known to be economically viable and what is actually implemented. Existing programs have yet to surmount this barrier.

Education

Customer education is crucial to closing the gap, and while most efficiency programs offer this in some form, the customer often is unaware of its availability. This is primarily a marketing problem. In fact, most of the programs seem to suffer from a general lack of marketing.

A key challenge in programs aimed toward small and medium manufacturers is how to effectively communicate the value of efficiency improvements at a reasonable programmatic cost. Plant managers and operators need to be convinced of the benefits of energy efficiency improvements, and the education process needs to overcome objections that these improvements may disrupt their critical manufacturing processes. At the same time, the scale of the savings is not as great as with a large, energy intensive industry, so it is critical to keep the delivery costs of the program low enough so that the costs do not outweigh the potential savings.

Rebates

The effectiveness of rebate programs is much more difficult to evaluate. Some researchers have shown that most have very little long-term effect on customer behavior, while others have shown that they can be effective in some instances. Using the example of utility motor-system programs, some prescriptive rebates have been found to be advantageous because they are easy to understand, administer and promote. However, the disadvantage of prescriptive rebates is that they oversimplify complex systems and can encourage installation of technologies in inappropriate applications (Elliott and Pye 1997). Another disadvantage to rebate programs is that their cost is an issue of contention between industrial consumer groups and within utilities attempting to reduce program costs applications (Elliott and Pye 1997).

Potential Programmatic Strategies

Creating a program or programs for improving energy efficiency in small and medium sized manufacturing establishments is quite challenging. Some of the previously discussed issues facing the managers of these facilities, such as lack of capital and limited staff resources, indicate that external program support must truly be all-encompassing. The program must include energy assessment services as well as implementation support, all of which needs to have credibility in the given industry sector. The changes that are instituted in a facility must then be properly operated and maintained.

An effective energy efficiency program must include all of these components. This combination of services would be quite challenging for any one federal or state entity to provide, but given enough funding, cost-leveraging, and partnerships, such a program could become a reality.

What we have learned from some of the existing programs that are targeted to the small manufacturer is that educational and prescriptive rebate programs are usually not enough to encourage the implementation of energy saving strategies. Small facility managers require much more guidance and support than is currently available through existing programs. Service providers and equipment vendors must also be educated and willing to provide energy-efficient services and information to their customers. New program models that take into account the individual needs of the facility are needed to help fill this gap. Follow on work to this paper will suggest some specific models to address this challenge.

Conclusions

In this study, we examined the concerns of small and medium industrial managers and explored the ways in which industrial decisions are made in small and medium-sized facilities. The technical areas for potential savings in plants as well as specific industries that hold a great opportunity for energy savings were outlined. We presented a review of existing, energy efficiency programs geared toward these plants and analyzed how well they address the concerns of the small/medium industrial manager. We also looked into some of the failures of the existing programs and suggested areas for improvement.

We have found that energy is just one of many concerns of the industrial manager. For peak environmental, energy, and production efficiency, the processes and operations in a

plant must be optimized. No single factor should be optimized to the detriment of the others. This task is more readily accomplished at the design phase of a project rather during later retrofits and process improvements. Most current programs for energy efficiency focus on offering prescriptive recommendations or rebates for retrofit energy improvements. It is evident that small and medium firms require much more assistance in order to implement economically viable efficiency improvements. In order to bridge this energy gap we believe that a more comprehensive program that involves a combination of education, prescriptive recommendations, and implementation assistance is needed. A program option that includes design advice for new product lines and plants should also be included in order to take advantage of the full economic and efficiency potential that a truly optimized facility offers.

The key services that must be included in a successful program targeted at small and medium-sized manufacturers:

- Opportunity identification;
- Technology identification and project design;
- Financial analysis;
- Purchasing and procurement;
- Financing;
- Installation; and
- Startup and training.

These elements are all necessary for a program to be successful (and by successful we mean that a small industrial facility implements and maintains efficiency improvements that result in energy savings and decreased utility costs per unit of product). Inherent to this type program of program would be recognition by and trust of the customer. All of the proceeding seven factors combined will not result in savings if the industrial customer is not aware of their availability, or if the perceived risk of participating in this type of program is too high. The entity or entities that administer the program must reach out to the customer and establish a relationship first and foremost.

Many of the elements of a successful program are already embodied in some form in existing programs targeted to the small and medium-sized industrial customer. What will separate a new program from the others will be a more holistic approach, one in which all the elements of the energy-efficiency improvement process are taken into account. We believe that this approach would perhaps be too costly and/or difficult for any one entity to provide alone. Partnerships between utilities, public benefit programs, state energy offices, and private contractors may be the method in which the elusive goal of efficiency can be delivered to the small and medium-sized manufacturer.

The potential for energy efficiency improvements in small and medium sized manufacturing facilities is quite large, and may prove to be larger as more and more specialty products enter the marketplace. The road to efficiency is quite difficult, but well worth the trouble.

References

Case, Patti. (Etc. Inc.). 2000. Personal communication to author. June 26.

[DOC] Bureau of the Census. 1996. 1992 Census of Manufacturers. Washington, D.C.: U.S. Department of Commerce.

[DOE] Department of Energy. 1998. *Office of Industrial Technologies Information Resources Catalog*. Washington, D.C.: U.S. Department of Energy.

[EIA] Energy Information Administration. 1997. Manufacturing Energy Consumption Survey 1994. Washington, D.C.: U.S. Department of Energy, Energy Information Administration.

Elliott, R. Neal. 2000. Personal communication to author. July 7.

Elliott, R. Neal and Miriam Pye 1997. *Analysis of Motor-Systems Programs*. American Council for an Energy-Efficient Economy, Washington, D.C.

Elliott, R. Neal, Miriam Pye and Steven Nadel. 1996. *Partnerships: A Path for the Design of Utility/Industry Energy Efficiency Programs*. American Council for an Energy-Efficient Economy, Washington, D.C.

Energy Innovations. 1997. Energy Innovations: A Prosperous Path to a Clean Environment. Washington D.C.: Alliance to Save Energy, American Council for an Energy-Efficient Economy, Natural Resources Defense Council, Tellus Institute, and Union of Concerned Scientists.

Hopkins, Mark, and Ted Jones. 1995. "Getting in Gear: How Energy Efficiency Can Help Smaller Manufacturers Compete in the Global Marketplace." Washington, D.C.: Alliance to Save Energy.

Kelly, Ann. 2000. Personal communication to author. June 28.

Muller, Michael R., Michael Simek, and Jennifer Mak. 1995. "Modern Industrial Assessments: A Training Manual." Piscataway, NJ.: Rutgers, The State University of New Jersey.

Muller, Mike. (Rutgers University). 2000. E-mail correspondence to author. June 12, 2000.

[NEES] NEES Companies. 1997. *1998-2002 Energy Efficiency Plan for Massachusetts Electric Company*. Westboro, MA: NEES Companies.

[NYSERDA] New York State Energy Research and Development Authority. 2000a. "New York Energy Smart Loan" brochure. Albany, N.Y.

[NYSERDA] New York State Energy Research and Development Authority. 2000b. Albany, N.Y.

Presny, Douglas (Energy Center of Wisconsin). 2000. Personal communication to author. February 2000.

Pye, Miriam, and Aimee McKane. 1999. "Enhancing Shareholder Value: Making a More Compelling Energy Efficiency Case to Industry by Quantifying Non-Energy Benefits," in *Proceedings of the 1999 ACEEE Summer Study on Energy Efficiency in Industry*, June X-X, Saratoga Springs, N.Y., pp. 325-336.

Shipley, Anna Monis, R. Neal Elliott and Adam Hinge. 2001. *Energy Efficiency Programs for Small and Medium-Sized Industry.* American Council for an Energy-Efficient Economy, Washington, D.C.

Sterret, Richard H., David Bruder, Linda Linderman, and Ann Kelly. 2000. "California's Small Business Standard Performance Contract Program, The First Year" In the proceedings of the *2000 ACEEE Summer Study on Energy Efficiency in Buildings*, August 20-25, Asilomar, Calf.

Wisconsin Department of Administration. 2000. "Wisconsin Focus on Energy – First Interim Report". Prepared by Hagler Bailly Services Inc. Madison: Wisconsin Department of Administration.