White Paper

The Fundamentals of Linking Demand Side Management Strategies with Program Implementation Tactics

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There's a saying that is particularly relevant in today's energy environment: "Everything old is new again." This is especially true for energy services professionals as they struggle to balance the competing needs of increasing energy usage and increasing supply constraints.

This paper provides an overview of how the basic principles of Demand Side Management (DSM) strategies should link to the program tactics implemented. This paper should help energy services program managers implement effective programs to meet the needs of their customers.

Why DSM?

Traditionally, electric utilities planned their supply to meet all the needs of their customers with little regard to how or when customers use energy. But in the economic realities of the electric utility industry today, DSM really can be the least cost planning option. There are three major reasons that energy services program sponsors (usually utilities) are starting to reevaluate the need to implement DSM programs:

DSM programs benefit customers, the program sponsor and society. As a customer strategy, DSM programs encourage the installation and use of end-use technologies that will use less energy, thereby reducing and/or shifting the customers' overall electric bill. Energy efficient technologies also have higher efficiency operating characteristics; they tend to last longer, thus reducing the operation and maintenance costs. This is especially true for programs that encourage the use of high efficiency heating, cooling, and ventilation equipment (HVAC), energy efficient lighting, and process technologies, such as fans and motors. So DSM programs make sense for a customer perspective because the energy savings more than offsets the higher first costs of these technologies.

Utilities, however, can benefit from these reductions or shifts in customer energy use. For some utilities, DSM programs can help them reduce their peak power purchases on the wholesale market, thereby lowering their overall cost of operations. In the near term, DSM programs can reduce energy costs for utilities, and in the longer term, DSM programs can help limit the need for utilities to build new power plants, distribution, and transmission lines. In short, a DSM program can be much cheaper to implement than building a new generation plant.
Society benefits when DSM is green. Reduced or shifted energy usage can directly translate into less air pollution, less carbon emissions, and a way to lower the potential environmental threats associated with global warming. DSM programs are a promising alternative strategy to the increased concerns customers, utilities, and government agencies have now regarding global warming and carbon emissions. Moreover, a properly designed DSM program can actually track the program impacts and measure the amount of carbon reduced or saved based on program activities.

DSM Strategies

There are four basic DSM strategies that utilities use depending on their overall objectives and needs.

1. Energy Efficiency: Reduce energy use overall
2. Peak Load Reduction: Reduce peak load consumption
3. Load Shifting: Move load to cheaper times
4. Load Building: Increase consumption to off-peak hours or increase overall consumption

Figure 1 illustrates this concept.

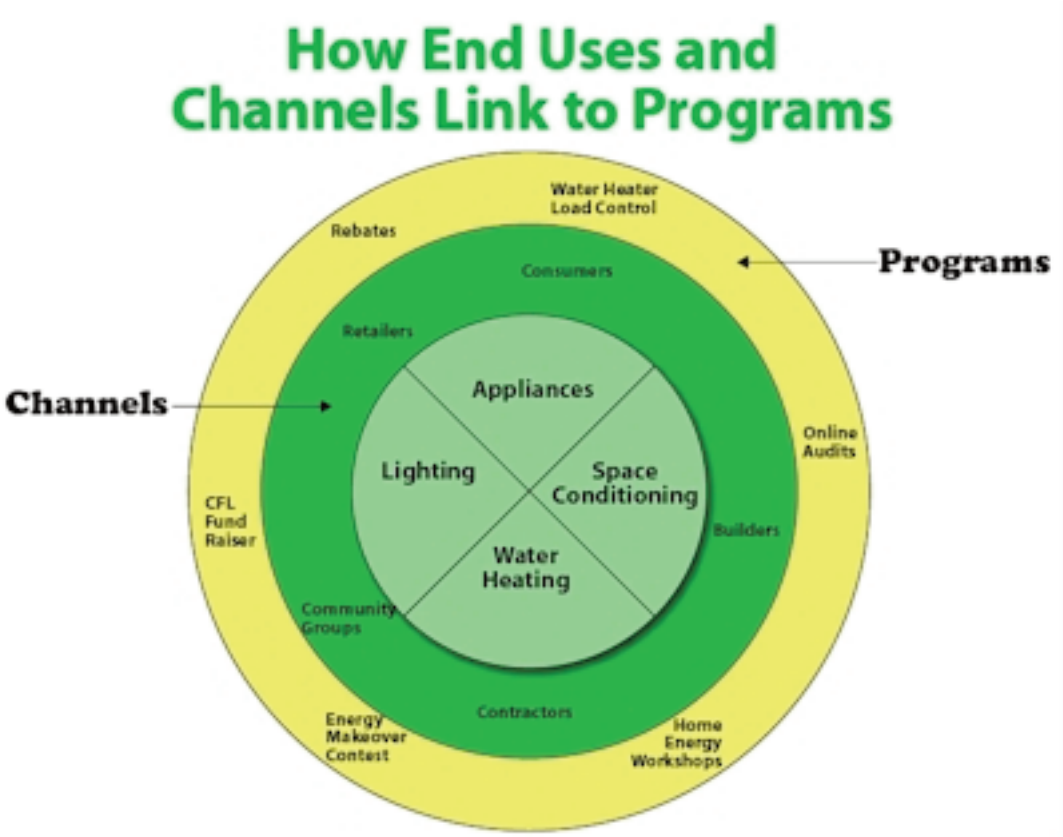


Figure 1: Linking Load Strategies to Program Tactics

In Figure 1, this is summarized by looking at the wheel in the following way:

- **Load Strategy:** Energy Efficiency
- **Challenge:** Lower all customer bills with electric technologies
- **End-Use Tactic:** CFL Lighting replacement program

Energy efficiency programs focus on reducing the overall use of specific technologies. In this example, the focus would be to reduce residential customer bills by encouraging customers to replace existing standard light bulbs with Compact Fluorescent Lamps (CFLs). But lighting is just one of many end uses that are targeted in DSM programs.

The second "spoke' of this wheel illustrates the same approach to determine an effective strategy for peak load reduction programs. Instead of focusing on reducing overall energy usage, these programs take a more narrow approach to reduce energy used during the utility's critical peak periods, the periods of highest customer demand.

- **Load Strategy: Peak load reduction**
- **Challenge:** Lower energy usage during periods of peak demand
- **End-Use Tactic:** Water heater load control program

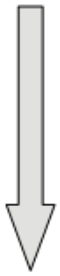
The third "spoke' addresses load shifting, in which customer usage is moved from one time period to another These are often accomplished through utility pricing signals, or rates, in which customers are rewarded for using energy in the off-periods. Some of these rate designs include variations of critical peak pricing, in which customers are rewarded for moving loads to cheaper times and "economically punished" for high usage during peak demand. This strategy also includes developing other rate designs such as time-of-use rates which charging more for electricity during periods of peak demand, and interruptible rates providing rate discounts in exchange for the right to reduce customers' electricity allocation during the few hours each year with the highest electricity demand.

- **Load Strategy: Load Shifting**
- **Challenge:** Convince customers to move usage to cheaper times
- **End-Use Tactic:** Critical Peak Pricing

- **Load Strategy: Load Building**
- **Challenge:** Encourage customers to use off-peak energy technologies
- **End-Use Tactic:** Heat pump program.

The final "spoke" addresses load building programs, which is also a necessary component of a balanced DSM strategy. These programs increase energy use during some periods by promoting cost-effective electrical technologies that operate primarily during periods of low electricity demand. These load building programs are particularly appropriate when the utility is looking to increase its overall load factor, or perhaps encourage customers to switch to electricity from an alternative fuel source. Many rural electric utilities, facing population declines, have developed successful load building programs as a cost-effective way to manage overall utility costs and improve operational efficiencies.

Utilities must also determine how much they are willing to commit to implement these DSM programs. As Figure 2 illustrates, utilities can do a minimum level of effort, such as provide general information, or expend a maximum level of effort in which utilities are involved in actually owning, installing, or maintaining the energy efficient technologies that they are encouraging.



Maximum
Own the technology
Install the technology
Offer service and maintenance support
Ongoing rate incentives
Unit financing (leasing)
Cash incentives (rebates)
Channel Partner promotional activities
Active consumer marketing
Passive consumer education
Minimum

Figure 2: Utility Participation: Range of Utility Activities/Responsibilities

A lighting DSM program, for example, a DSM program could include just providing general information to residential customers about the benefits of using CFLs. However, that level of commitment could escalate to include programs that involve rebates, giveways, and equipment financing for facility change outs for large customers.

continued

The critical issue for utilities to address is how much they want to be involved in these programs. The way to answer that question is to address the following steps of a DSM program planning process summarized in
Table 1:

Table 1. The DSM Program Planning Process

Step 1: Determine Market Potential
- Identify load objectives
- Identify sectors, end-uses and efficiency measures to target
- Understand the market for targeted sectors and measures

Step 2: Develop Program Designs
- Conduct cost-effectiveness screening

Step 3: Implement programs
- Determine in-house vs. out-source approach

Step 4: Evaluate
- Build metric measurement into program design

Step 1: Determine Market Potential

A good DSM program requires developing a thorough knowledge of the utility's operational profile and customer needs. So the first step is to gather information in order to help determine the market potential for a specific DSM technology. The market potential analysis provides a way to estimate the number of customers interested in adopting a specific end-use technology. It is based on gathering information from primary and secondary sources and is necessary to determine program benchmarks and success factors.

This type of information required for a complete market potential analysis is available from a variety of sources, both internally and externally, including:

- External Sources
- National Studies
- Trade Associations/Engineering Societies
- Public Service Commissions
- Neighboring Utilities
- Internal Sources
- Other Utility Departments (engineering/marketing)
- Professional judgment

Step 2: Develop Program Designs

The first step identifies the overall strategic objectives for implementing a successful DSM program. This step focuses on developing program designs based on what approaches will be most effective in meeting those load objectives. At thisstage, utilities conduct a cost-effectiveness screening, in which the likely program scenarios are compared based on

different cost options, rebate and incentive levels, and differing levels of utility commitment. These cost-effectiveness tests may include:

- Total Resource Cost (TRC)
- All quantifiable costs and benefits regardless of who accrues them. Includes participant and others' costs
- Utility Cost Test (UTC)
- Quantifiable costs and benefits that accrue only to the utility system. Specifically excludes participant costs
- Participant Cost Test (P C)
- Costs and benefits to the program participant
- Rate Impact Measure (RIM)
- Net change in electricity utility revenue requirements.
- Attempts to measure rate impact on all utility customers especially those that do not directly participate in the conservation program
- Treats "lost revenues" (lower participant bills) as a cost

Step 3. Implement Programs

The next step in developing and implementing a DSM program is to identify the role that third-party channel partners will play in program activities. While the target customers may be residential home owners or small business owners, in order for these programs to succeed, they must often be delivered, or "channeled" through a third-party.

These third-parties are can be critical to ultimate success of the program, since they have a different set of motives and challenges compared to the utility or program sponsor. Further complicating this is that there are often multiple and conflicting channel partners that should all be addressed in order for a DSM program to succeed. Figure 3 illustrates this inter-dependence.

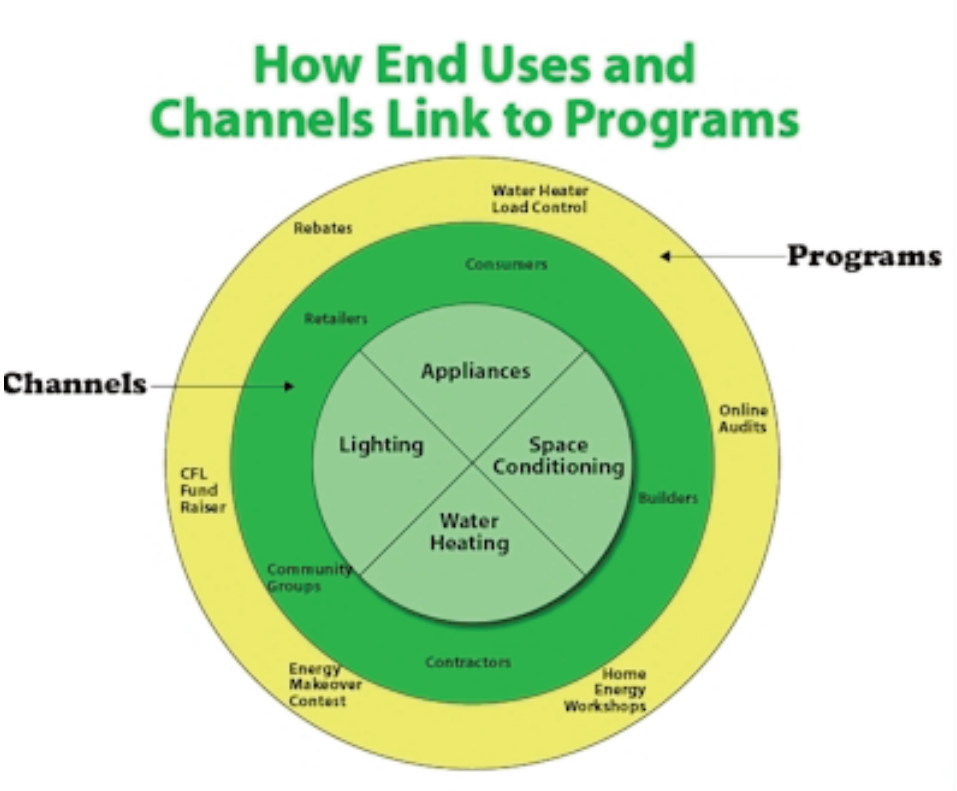


Figure 3: How End Uses and Channel Partners Drive Program Development

A good way to understand the channel partner implications is to focus on the energy use to be addressed by the program tactic to be implemented once an energy load strategy is determined. For example, in implementing a residential lighting program, the channel partners may be retailers that want to sell high-margin energy efficient lighting products, as well as community groups that want to sell light bulbs as a fund raiser. In this scenario, it is critical that the retailers are aware of the community group efforts, and coordinate instead of compete with these groups. The prudent program implementer will include informational materials aimed at educating both retailers about the fund raiser, and community groups about the benefits of seeking out retailers as a resource for energy efficient lighting products not offered through the fund raiser. In this way, the utility or program sponsor becomes a valuable part of the team by integrating these activities.

Program implementers need to consider their current or desired core competencies when choosing to "staff up" to create and maintain infrastructure to implement and manage DSM programs versus the option to outsource the program implementation aspects on a turnkey basis.

4. Evaluate

Program evaluation measures how well the program achieved its goals, both from a process and impact side. The process evaluation identifies areas for program improvement by conducting surveys and interviews with program staff, customers, channel partners, and other critical decision-makers involved with the initial program design and implementation.

The impact analysis provides objective measures of program success quantified in terms of savings achieved in reductions in both kilowatts (kW) and kilowatt hours (kWh). These savings are tracked against program objectives and are used to identify the net savings attributable to program activities. These net savings are calculated after accounting for both:

- Free ridership rate is how many participants would have purchased energy efficient equipment without the program

- Free drivership rate is how many participants will install the rebated energy efficient equipment, outside the utility's service territory

Program implementers are also starting to measure program impacts in terms of carbon reductions attributed as a result of these DSM activities. The Greenhouse Gas Equivalencies Calculator is designed to translate greenhouse gas (GHG) reductions from (e.g., metric tons of carbon dioxide equivalent) into terms that are easier to understand (e.g., equivalent number of cars not driven for one year). http://www.usctcgateway.net/tool/

Table 2 illustrates an example in which a DSM program reduces consumption by 1,000,000 kWh, which is equivalent to 632 metric tons of carbon. Alternatively, these savings are also equivalent to:

1,000,000 kWh savings are equivalent to:
- 137 Passenger cars not driven for one year- reducing from the highways
- OR 71,982 Gallons of gasoline (using less gas)
- OR 16,205 Number of tree seedlings grown for 10 years (planting trees)

It can be invaluable to integrate the collection and aggregation of data requirement for program metric measurement into the program design. For example, customer-generated forms for inquiries, orders, and incentive payments are excellent vehicles for capturing program participant contact data for follow-up in telephone and email surveys as well as data related to customer motivations and the type of technology being replaced.

Where to Get More Information

This paper provides just an overview of the basic steps that energy professionals need to consider when implementing effective DSM programs. For additional information to help energy services professionals develop and implement effective DSM programs, consider participating in the activities of the Association of Energy Services Professionals such as its upcoming The Secrets to Successful Program Implementation" conference to be presented May 8-9, 2007 in Dallas, Texas. For details, visit www.aesp.org. Another resource is an online proceedings of a "How to Develop and Implement DSM Programs" workshop presented by AESP in February 2007. The proceedings are available at www.marketdevelop.com.
About the Authors

Katherine Johnson is a Partner with Market Development Group, a woman-owned strategic marketing firm specializing in the energy efficiency field. For more than 15 years, Katherine has conducted marketing analysis activities to determine technical and market potential for a variety of energy efficient technologies. She has also designed, launched, implemented, and evaluated marketing and program activities for energy organizations throughout the United States. As the Marketing and Finance Manager for the Geothermal Heat Pump Consortium, Katherine managed a $3 million initiative to develop and implement a national branding strategy for an energy efficient technology.

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Most recently, he has been assisting Performance Systems Development in a statewide contractor training and outreach initiative for Maine's Home Performance with ENERGY STAR®. Among the innovative marketing activities deployed have been a "Whole House" television program co-produced with the Portland CW network that included a Home Energy Makeover Contest that leverage the ENERGY STAR's "Energy Yardstick" online benchmarking tool to select the winning home. For details, visit www.mainehomeperformance.org.
Ed is also active in AESP, most recently editing the award-winning monthly newsletter, Strategies. Ed can be reached at ethomas@marketdevelop.com, (970) 209-8347.

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