



TVA's Demand-Side Management Overview

Overview

This document outlines TVA's strategy and the initial steps to reducing peak demand and total energy through Demand-Side Management (DSM) measures. As directed by TVA's 2007 Strategic Plan, TVA strives to be a leader in energy efficiency improvement and peak demand reduction. Improving energy efficiency and peak demand reduction are significant actions that help slow demand growth in a cost-effective manner while addressing air pollution and global climate change. TVA believes this goal can be realized through a broad cooperative effort with strong support from TVA's customers and stakeholders.

About TVA and Power Delivery Structure

The Tennessee Valley Authority is the nation's largest public power provider and a wholly owned subsidiary of the U.S. government. TVA makes the electricity used across a seven-state region that covers 80,000 square miles, and has more than 9 million consumers. Established by Congress in 1933, TVA's mission includes management of river navigation, flood control, agricultural and industrial development, and promotion of the use of electric power in the Tennessee Valley region. TVA's service territory includes most of Tennessee and parts of Alabama, Georgia, Kentucky, Mississippi, North Carolina and Virginia. Initially, all TVA operations were funded by federal appropriations. However, appropriations for the TVA power program ended in 1959, and those for TVA's environmental stewardship and economic-development activities were phased out in 1999. TVA now funds all of its operations entirely from the sale of electricity and the proceeds from issuing debt securities.

As a wholesale provider of electricity, TVA's operational structure presents some unique distinctions when compared to other providers, such as, vertically-integrated utilities prevalent in other parts of the country. TVA does not have direct interaction with the majority of end-use consumers. TVA sells the power it produces to 158 municipal and cooperative power distributors who in turn sell that power to end-use consumers – both residential and commercial. The distributor community is made up of independently operated companies. TVA also directly serves 59 large industries and federal agencies across its service territory.

TVA's Past DSM Efforts

End-user and demand-side management programs have been a part of TVA's energy supply resource mix since the late 1970s. These programs promoted energy conservation and the efficient use of electricity. They were initiated in response to the rising cost of energy and the rising cost of building new electric generating units. Between 1975 and 1988, TVA's efforts delivered a 1,200 MW reduction in peak demand and more than 3,200 GWh of annual energy savings. In the 1990s, TVA's emphasis shifted toward the promotion of energy efficient electro-technologies. The aim was for end-users to adopt these technologies when it made economic sense in terms of their total energy cost. These programs also delivered demand reduction benefits.



From 1996 to 2008, TVA programs offered in conjunction with distributors of TVA power resulted in a cumulative demand reduction of over 545 megawatts. Nearly 90 percent of this total was derived from TVA's *energy right*® residential program, which provides items such as low-interest heat pump loans, and incentives for energy efficient new home construction. The remaining 10 to 12 percent of the reduction was attributed to residential direct load control programs for water heating and large commercial and industrial programs.

DSM Strategy

In May 2007, the TVA Board of Directors adopted a Strategic Plan which recognized the need for a comprehensive approach to meet the Valley's future electrical power needs including increased DSM initiatives. On May 19, 2008, the TVA Board approved the guiding principles in the Energy Efficiency and Demand Response Plan, but did not approve the plan itself. The recommendations of the proposed plan called for reducing the growth in peak demand by up to 1,400 MW by the end of 2012.

The plan recognized that improving peak demand reduction can help slow demand growth in a cost-effective manner while addressing air pollution and global climate change. TVA recognized this goal can only be realized through a broad cooperative effort with strong support from TVA's customers and stakeholders. TVA's DSM program efforts are targeted to achieve the maximum power demand reductions during the periods of highest demand on the TVA system. This objective is a departure from those of many utilities across the country that may have greater focus on energy reduction rather than demand reduction. TVA does not have an energy reduction goal at this time. Energy efficiency programs in place will reduce energy consumption over all hours of the day, but are targeted for maximum effect on the peak periods in the early years of the plan.

TVA's strategy is to ensure DSM programs move toward a self-sustaining future by:

- Stimulating and transforming the marketplace instead of "buying the market" with incentives
- Supporting development of efficiency standards and regulations
- Providing incentives for demand reduction in conjunction with proper pricing signals
- Enabling automated metering and direct load control
- Expanding and supporting clean end-use generation (including combined heat and power)

DSM Program Development

TVA retained the services of PA Consulting to identify potential DSM programs that could be implemented to reduce summer peak demand by 1,400 MW in 2012. The recommendations PA provided were culled from a review of industry programs and selected based on economic capability. TVA reviewed PA's designs for applicability to the TVA market and prioritized programs to be further customized to the demographic and climatic parameters of the Valley. Programs were prioritized based on qualitative factors to select candidates for design that were highly likely to succeed. At this time, no options have been screened or eliminated from contention.

Because TVA does not serve the majority of end-users directly, its program design process includes not only consumer research but close involvement by the power distributor community. TVA and distributors coordinate these design activities through the Tennessee Valley Public Power Association's



(TVPPA) Energy Services Committee. TVPPA represents 158 distributors of TVA power across the seven-state service territory.

TVA's development process is driven by customer insight gained through primary market research conducted with distributors and their customers. Initial program hypotheses derived from Valley market segment data and secondary research on successful programs from across the country are tested and refined through qualitative and quantitative market research to craft program concepts that best fit TVA's unique relationship with distributors and their customers. Once program concepts have been refined, TVA works with distributors and TVPPA to develop program delivery mechanics. The programs are further refined through market testing prior to system-wide expansion. This process greatly enhances TVA's potential for success and helps keep costs lower.

TVA has been working with its distributors to develop the delivery mechanisms needed to successfully offer new DSM programs for residential, commercial and industrial customers, as well as education and outreach initiatives. TVA is currently engaged in evaluating these new programs and their delivery process as they are test marketed this year, and programs will continue to evolve in response to new assumptions, influences, research, and market test results. This first set of programs will be expanded as TVA retools its existing *energy right* offerings and develops additional designs during the coming year. TVA is also establishing measurement and verification protocols to evaluate programs, validate assumptions in program design, document verifiable program impacts, and influence new program development.

Using energy more efficiently will help reduce the amount of electricity TVA generates to meet the power needs of the nearly 9 million consumers in the TVA region. When fully implemented, these programs will help reduce reliance on power purchased from other suppliers; help reduce the impact of power production on the environment; and help mitigate rate pressures by providing direct benefits to the TVA system and consumers alike. The current portfolio of programs is on track to deliver 1,400 MW summer peak demand reduction and 2,800 GWh annual energy savings by 2012. Further, the portfolio is projected to achieve 3,790 MW summer peak demand reduction and 6,800 GWh annual energy savings by 2030.

Time-of-Use Rates

TVA further recognizes that to make energy efficiency and demand reduction initiatives successful, new rate structures must be developed to provide appropriate price signals. TVA is proposing to implement a time-of-use rate with customers which will provide the incentives to shift load (from on-peak to off-peak) while minimizing adverse bill impacts which often accompany energy intensive customers' transitions from flat rates to time-of-use rates. This work is being carried out within the processes that govern rate development at TVA. TVA's distributors, represented by TVPPA, and directly served customers, the majority of which are represented by the Tennessee Valley Industrial Committee (TVIC), will play central roles in the development of these new rate structures. Advanced metering technology will likely also be required along with the rate structures.



Long-Term Plan

TVA's view is that energy efficiency and demand reduction improvement over the long-term ultimately must be accomplished through a transformation in the marketplace that increases consumer demand for energy-efficient products and services and provides the delivery channels to meet their needs.

Transformation will not be made through TVA purchasing the marketplace, but rather accomplishing important supporting mechanisms, including:

- Educating the public to make educated choices about their energy use and energy-related purchases
- Electricity rates that send appropriate price signals to encourage consumers to reduce usage during periods of high demand
- Advanced electric metering and other technologies that allow communication between end-users and their power provider
- Support for uniform building codes and enforcement that require energy efficient new construction
- A strong, vibrant infrastructure for end-use generation technologies
- A robust network of commercial providers offering a wide array of energy-efficient products and services

TVA's current demand-side programs are part of a continuously evolving portfolio intended to cost-effectively provide demand-side impacts to meet system needs. Future iterations of the DSM portfolio will advance TVA's progress in capturing the reasonable, cost-effective potential demand and energy reductions in the Valley.

Appendix

Program Offerings and Initiatives

TVA continues to expand the *energy right* program beyond the residential market to also include commercial, renewable, education/outreach and demand response initiatives. Below is an overview of existing and new energy efficiency and demand response program offerings now available in select areas across TVA's service territory:

Energy Efficiency

- New Homes Plan - Promotes all-electric, energy-efficient new homes. All homes built *energy right*® must meet a minimum rating in overall energy efficiency
- Heat Pump Plan - Promotes the installation of high efficiency heat pumps in homes and small businesses
- Water Heater Plan - Promotes the installation of energy-efficient electric water heaters in homes and small businesses. This program will undergo changes when other program changes are made for FY 10
- New Manufactured Homes Plan - Promotes the installation of high efficiency 13 SEER heat pumps in new manufactured homes and currently has over 40 percent of the market share in the Valley
- Do-It-Yourself Home Energy Evaluation - This program allows homeowners to receive a free energy efficiency kit from TVA after completing an online or paper home energy survey. Residents also receive personalized reports on their homes' annual energy usage and energy saving recommendations
- In-Home Energy Evaluation Program (new) - This program offers financing options and incentives to help homeowners make investments in significant energy efficiency improvements identified through onsite evaluation by an energy efficiency professional
- Commercial Efficiency Advice and Incentives Program (new) - This program offers businesses an opportunity to receive an energy assessment of their facilities to help them identify energy-saving opportunities. Financial incentives are also available for projects that help reduce power consumption during TVA's peak period
- Major Industrial Program (new) - This program encourages reductions in electric energy intensity in large industrial facilities that have a contract demand greater than five megawatts. Financial incentives are available for projects' resulting in reductions during TVA's critical peak period

End Use Generation

- Generation Partners Expansion - This pilot purchases 100 percent of the qualifying renewable generation from residential, commercial, and industrial customers. The expansion increases both the maximum size of the allowable facility as well as the renewable sources that qualify. In addition, the overall pilot capacity has increased. Buyback rates have also been modified to include the retail rate plus a fixed premium



- Green Power Switch (GPS) - GPS is a renewable energy initiative that offers consumers and businesses a choice in the type of power they buy by giving them an option to purchase “blocks” of renewable power. Each block is sold in 150-kilowatt-hour increments (about 12 percent of a typical household’s monthly energy use). Consumers can buy as many blocks as they like

Demand Response

- Commercial and Industrial Demand Response Pilot - Under this pilot, businesses receive payments in exchange for shifting energy-intensive operations from periods of high power demand to periods of lower demand
- Direct Load Control Program - These pilot programs are designed to help TVA momentarily curtail and monitor water heater and air-conditioning energy usage among customers of the Tennessee Valley
- Conservation Voltage Reduction - These pilot programs enable TVA and its distributors to optimize voltage delivery and help reduce energy consumption both year-round and during peak load periods

Education and Outreach

- National Theatre for Children (K-12) - TVA and power distributors have partnered with the National Theatre for Children to conduct LIVE theater performances in over 700 schools that promoted energy efficiency to over 250,000 students this year. The program has been approved for FY 2010 and the goal is to do 700 additional performances
- Alliance to Save Energy Green Schools Program - TVA and power distributors are also piloting the Alliance to Save Energy's Green Schools Program in 21 Tennessee schools (K-12) starting in fall semester 2009
- Trade Ally Network - This program provides distributors with master lists, maintained by TVA, of trade allies that meet a set of criteria demonstrating commitment to the design, installation, servicing, and promotion of high quality energy efficiency and demand response technologies and equipment
- Internal Energy Management Program (IEMP) - This program is responsible for planning and coordination of regulatory reviews, performance analysis and reporting, oversight of energy related audits and sustainable design for TVA facilities