DSM Spotlight

The Newsletter of the International Energy Agency Demand-Side Management Programme July 2007

taskXV

Network-Driven DSM

Network-driven DSM provides measures to reduce the demand on the electricity network while maintaining system reliability in the immediate term and deferring the need for network augmentation over the longer term. In many situations, network-driven DSM can cost-effectively defer or even eliminate the requirement to build a 'poles and wires' solution.

IEA DSM Task XV was the first broad and systematic investigation of the potential for DSM to cost-effectively support electricity networks. Four countries – Australia, France, Spain and the United States – collaborated in this Task to:

- Identify a wide range of DSM measures which can be used to relieve electricity network constraints and/or provide network operational services;
- Further develop the identified network-driven DSM measures so that they will be successful in cost-effectively achieving network-related objectives;
- Investigate how existing network planning processes can be modified to incorporate the development and operation of DSM measures over the medium and long term;
- Develop 'best practice' principles, procedures and methodologies for the evaluation and acquisition of network-driven DSM resources; and
- Communicate and disseminate information about network-driven DSM to relevant audiences.

RESULTS

This Task proved that DSM can be successfully used to support electricity networks in two key ways 1) by relieving constraints on distribution and/or transmission networks at lower costs than building 'poles and wires' solutions, and 2) by providing services for electricity network system operators, achieving peak load reductions with various response times for network operational support. Results from the work are highlighted below.

Worldwide Survey of Network-Driven DSM Projects

A worldwide survey was conducted that identified 45 network-driven DSM projects undertaken over the past 10 years. The survey focused on projects in the four countries participating in the Task, but also included projects from other countries. Detailed case studies of the projects were prepared and included in an on-line database. Public access to the case studies database will be available in October 2007.

Technology Used in a Critical Peak Pricing Trial in Australia.

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PARTICIPATING COUNTRIES

Australia
Austria
Belgium
Canada
Denmark
European Commission
Finland
France
Greece
India
Italy
Japan
Korea
Netherlands
Norway
Spain
Sweden
United Kingdom
United States

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The survey showed that network-driven DSM options can effectively:

- achieve load reductions on electricity networks that can be targeted to relieve specific network constraints; and
- provide a range of network operational services, including: reactive supply and voltage control, regulation and frequency response, energy imbalances, spinning reserves, supplemental reserves, and generator imbalances

Another important survey finding was that all types of DSM measures can be used to relieve network constraints and/or provide network operational services. However, whether a particular DSM measures is appropriate or cost effective depends on the specific nature of the network problem being addressed and the availability and relative costs of demand-side resources in that situation.

Assessment and Development of Network-Driven DSM Measures

Task XV concluded that the value of a network-driven DSM project varies depending on the categories of stakeholders and can even vary among individual stakeholders (e.g., customers located in network-constrained areas versus customers located outside these areas). The distribution of the benefits from network-driven DSM projects among many different stakeholders means that the project promoter is unlikely to capture all the benefits from the project because the other parties that have not contributed to the cost of implementing it may well receive some of the benefits. To provide significant value to the project promoter, the total benefits from a network-driven DSM project must be quite large and the promoter must capture a significant proportion of these benefits.

The Task identified a number of external and internal factors that may contribute to the success of network-driven DSM projects. Network-driven DSM projects containing the same DSM measures (such as energy efficiency, load shifting, direct load control or pricing initiatives) tend to have a common set of factors that contribute to the project's success. The challenge in designing a successful network-driven DSM project is to clearly identify the success factors for each of the DSM measures included in the project and then concentrate on optimizing each of these factors.

Incorporation of DSM Measures into Network Planning

Based on information from the four participating countries, it was possible to identify a number of key areas where changes could be made to increase the use of demand-side resources as alternatives to network augmentation and to provide networks operational services.

The key areas where changes could and should be made are:

- Forecasting future electricity demand. Forecasting methodologies frequently reduce global load forecasts by an assumed (usually small) amount to take account of the potential contribution by DSM towards supporting electricity networks. Forecasting methodologies for network planning should be modified to more accurately account for the potential contribution of DSM.
- Developing options for relieving network constraints. Network businesses should provide information and formal opportunities for third parties with expertise in DSM to participate in the development of options that use demand-side resources to relieve network constraints.
- Establishing policy and regulatory regimes for network planning. Governments and regulators should change policy and regulatory regimes to reduce the disincentives faced by network businesses that use demand-side resources to support electricity networks. There are two ways this could be accomplished 1) by providing policy and regulatory incentives to network businesses and 2) by imposing policy and regulatory obligations on network businesses.

Task Publications

- ***Worldwide Survey of Network-Driven DSM Projects***. Available on the IEA DSM web site in October 2007.
- ***Assessment and Development of Network-driven Demand-side Management Measures***. Available on the IEA DSM web site in October 2007.
- ***Incorporation of DSM Measures into Network Planning***. Available on IEA DSM web site in April 2008.
- ***Evaluation and Acquisition of Network-driven DSM Resources***. Available on the IEA DSM web site in April 2008.
- ***On-line Database: Case Studies of Network-Driven Demand Side Management Projects***. These 45 detailed case studies will be available on the IEA DSM web site in October 2007.

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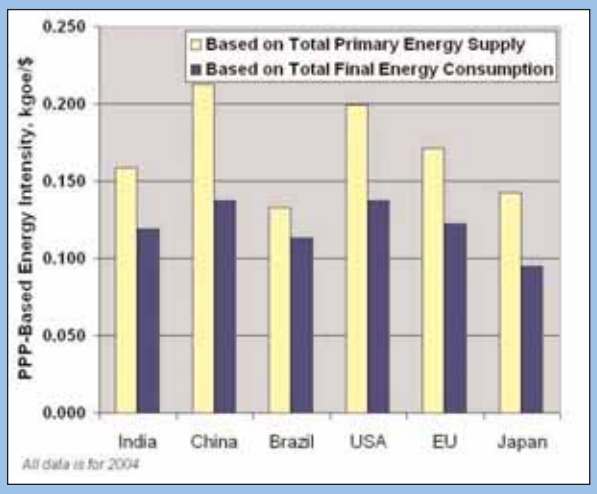
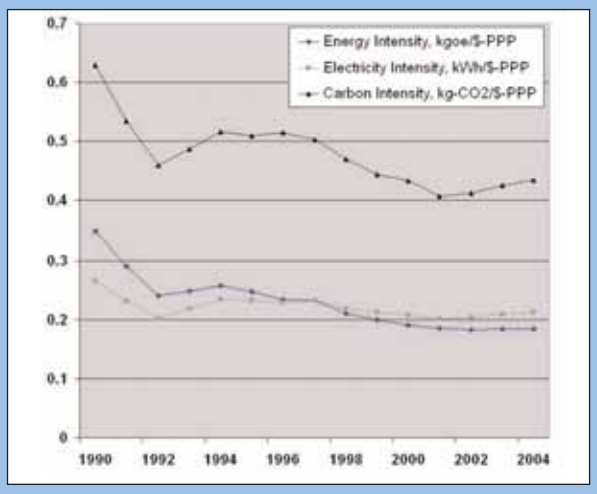
india

DSM Policies & Strategies

India has one of the fastest growing economies in the world. However, the country's energy intensity is decreasing at about 1.5% per year. This decrease is expected to continue due to the increasing energy efficiency in the industrial sector from global competitiveness and the increasing share of the lower energy-intensive services sector. The current energy intensity (at about 0.17 kilogram oil equivalent/GDP-Purchasing Power Parity) is the same as that of Germany, and among the lowest five in the world.



Energy Intensity of Six Large Economies



Intensity Trends in the Indian Economy

Despite decreases in India's energy intensity, the Government of India and the Bureau of Energy Efficiency is committed to promoting energy efficiency and conservation. The main driver for this is that the country faces persistent electricity shortages. With an installed capacity of over 130,000 MW, the peak and average energy shortage is still around 13% and 9% respectively. Of the many government interventions, Demand Side Management (DSM) is one of the most important policy tools.

The potential for achieving end-use efficiency through DSM.

Sector	Potential
Industry	10 – 25%
Lighting	30 – 35%
Commercial Buildings	50%
Agriculture	40 – 45%

Source: ADEE, Econeler, IREDA and TERI, Demand Side Management from a sustainable development perspective, 2003.

INDIA'S DSM ACTION PLAN

Industry

Energy efficiency in the industrial sector, especially in large industry, has increased steadily over the past decade. Large energy-intensive industrial users are employing DSM measures as well as being required to appoint energy managers, to carry out periodic energy audits, to report on energy usage and on the implementation of energy audit recommendations, and to conform to the specified energy consumption norms of the "Designated Consumer" provision of the Energy Conservation Act, 2001.

The DSM measures being used in the entire sector include:

- Introducing and promoting time-of-day tariffs and power factor incentives.
- Providing incentives for the purchase of electricity from captive generation by the grid for energy efficient units, which also provide incentives to decrease in-house energy consumption. At present a barrier for these transactions is a surcharge levy. The full implementation of this measure

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would provide the incentive for spare captive capacity to go to the grid, which is not done now.

Lighting

Lighting (domestic, commercial and street) represents a large percentage of the peak loads, thus making it attractive for utilities to offer consumers incentives for efficient lighting practices in order to reduce their costly peak-load power procurement.

Measures that utilities are taking include:

- Promoting CFLs to consumers through bulk purchase price reductions.
- Reducing taxes/duties on CFLs to lower their price.
- Issuing notifications/orders by central authorities/states for government agencies to use CFLs and energy efficient equipment.

Greenhouse Gas Emissions

India's per-capita GHG emissions are only 23% of the global average. That is 4% of the US, 12% of EU, and 15% of Japan.

Overall, India accounts for 1.8% of the world's GDP, and 4% of the global GHG emissions, a figure that is not expected to increase even as India's share in the world GDP rises.

Commercial Buildings

The building sector also offers tremendous potential for the efficient use of energy and its conservation. Simulation studies have indicated a potential of reducing energy use by as much as 30 - 40% simply by following India's proposed Energy Conservation Building Code (ECBC). ECBC is to be introduced soon and will initially be a voluntary measure that targets large buildings, those having a connected load of 500 kW.

As far as existing buildings are concerned, the Government has initiated a program to promote energy conservation through the Public Private Partnership model of performance contracting with an Energy Service Company (ESCO). Measures being taken are:

- Central and state entities adopting ECBC.
- Sustaining the awareness and information campaigns to ensure that the long-term benefits of energy costs are taken into consideration by the consumers.
- Incentives for adopting ECBC on a voluntary basis.
- Promoting, by way of incentives, performance contracting Public Private Partnership model for existing buildings through ESCOs.
- Providing adequate financial resources and models to limit risks of ESCO performance contracts. This could be done by providing venture capital, access to a risk guarantee fund and/or a robust payment security mechanism.

Agriculture

Agriculture accounts for about 27% of the country's electricity consumption, a figure which is increasing due to the growth in rural electrification, primarily for agricultural pumping. In most states, electricity for agriculture is free or is charged at a much lower rate than its cost. This results in a huge subsidy burden and no incentives for farmers to improve the efficiency of their pumps.

In this sector, the types of DSM measures being employed are:

- Separating agricultural feeders by utilities from others and 100% metering.
- Providing farmers with information on the need to conserve energy and water.
- Providing incentives to farmers and utilities to replace their pumpsets with energy efficient ones. Studies have indicated that the potential of electricity savings is to the tune of 40-50% just by implementing this measure.
- Providing utilities regulatory incentives to promote energy efficiency on agricultural feeders.
- Mitigating the risk of ESCOs by monitoring properly and creating verification protocols, binding contracts and a robust payment security mechanism.
- Ring fencing the risk of such Agricultural DSM (Ag DSM) by linking it to the reduction in the overall subsidy burden of states. The states are presently subsidizing such inefficient energy use in agriculture. Savings in electricity, by Ag DSM will directly benefit the states by not only reducing their subsidy bill but also unlock wasted electricity for use elsewhere.

THE FUTURE OF DSM

DSM holds immense promise in an energy starved country like India. With the economy growing at 9% and expected to sustain this growth for the near future, the efficient use of energy is essential for India's sustainable development and its quest for energy security.

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taskXIII

Demand Response Resources

Demand Response Resources (DRR) can be compared to the Strategic Petroleum Reserve (SPR) as both serve as a "shock absorber" for their industry. DRR provide the long-term risk management insurance that is needed if competitive electricity markets are to work. The ability to call upon thousands of megawatts contractually, on short notice and in specific locations provides a virtual storage asset that can be used for short duration demand peaks, facilitate power restoration, and provide a means of transition to, or possibly prevent, new power system upgrades.

Recognizing the urgent need for demand side participation in electricity markets to ensure energy security and mitigate price volatility in liberalized electricity markets, the DSM Programme initiated Task XIII, Demand Response Resources. In keeping with the IEA-DSM "toolbox" concept, Task XIII set out to develop methodologies and tools to facilitate the inclusion of demand response into liberalized markets.

The main objectives of the work were to:

- Identify and develop the country-specific information needed to establish the potential for demand response,
- Perform the market and institutional assessment needed to set realistic goals for the contribution of DRR to sector objectives, and
- Mobilize technical and analytic resources needed to support the implementation of DRR programs and track their performance.

Twelve countries – Australia, Canada (joined in 2005), Denmark, Finland, Italy, Japan (withdrew in 2005), Korea, Netherlands, Norway, Spain, Sweden and the USA – worked together for more than two years to develop action-oriented tools that markets and regulators can use to incorporate DR in their daily operating practices.

The tools are designed to provide methodologies and research resources to use when evaluating the best business case structure for DR in a market. All of the project tools are organized into the book, Task XIII Project Guidebook, which provides a roadmap for assessing DR integration into the market. In addition to the tools, the book can be used as a teaching guide for a DR professional certification program.

RESULTS

The Task was structured in a way so that each participant was able to go through a step-by-step process to assess strategies for including DR in their market. The following is a summary of the main outcomes.

> In Australia, we followed the DSM Task XIII derived methodology to arrive at a realistic target for market based DRR. As expected, each country used the tools appropriate to its country and came to a robust conclusion about the value of DRR. Our Task XIII Demand Response Stakeholder Team was able to assess the benefit of DR and develop a Demand Response Roadmap for the market. The DR Roadmap will be useful for potential demand aggregators, retailers with DR programs, and policy advisors as they develop the market rules and business models.
>
> Terry Jones
> *CSIRO - Director, Centre for Distributed Energy and Power DSM Task XIII Australian Country Expert*

Project Guidebook

The main product of this Task is the Project Guidebook, which will be available on the web portal. This guide can be used either as a tool to create a regional, national or local DR strategy or as a training guide to educate energy industry professionals on demand response. Each of the project tools described in the Guidebook are designed as stand-alone tools.

Web Portal

This portal houses all project related information and research data including Expert Meeting presentations. It also houses all the tools created in the Task (e.g., research library, Potential Calculator, and the product and technology

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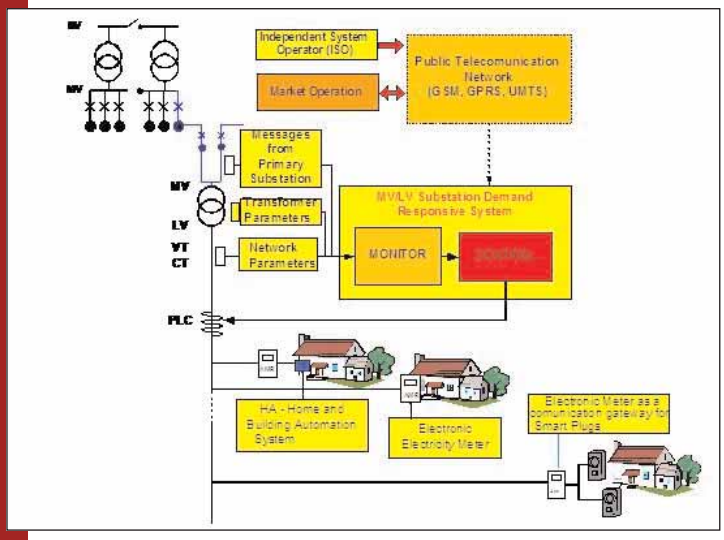
databases). Access to the portal is available to anyone by subscription (US $200/year) at http://www.demandresponseresources.com/

In-Country Stakeholder Groups
Experts created their own in-country stakeholder groups as a means for developing working relationships with others working in this field to help develop and promote a DR implementation strategy.

Marketplace Overview Survey
Task participants had a solid understanding of their market situation, but were not very familiar with the markets of others. To establish a baseline understanding, experts completed a "Marketplace Overview Survey." The survey provided a structured method for gathering information on the market environment as it relates to DR, including the market actors (i.e., energy suppliers, distribution companies, TSO, power exchange, DR aggregators, regulators, etc), whether the market is liberalized or not, and general market design. This survey is included at the end of Chapter 3 in Guidebook.

DR Market Potential Calculator (DR Calculator)
After understanding the market environment, it was necessary for the participants to understand the market potential for DR in that market. Given that DR is ultimately provided by the consumer, the market potential in any given market is tied to the customer mix in that market.

The DR Market Potential Calculator (DR Calculator) was created to provide a quick and inexpensive first level potential estimation tool. The DR Calculator helps translate the market potential benchmark generated from the survey to another market by utilizing market demographic data. While the DR Calculator is extremely simple to use, it does seem to provide a reasonable first level DR market potential estimate – and it does so with just a few hours of work.



Automation architecture for Demand Response in a low voltage network.

Demand Response Valuation
Demand Response Valuation was the most complex issue confronting the Task participants. The goal was to identify or develop a methodology for estimating the DR value in a given market, including future market dynamics. This was necessary so that the value could be used in making regulatory and business decisions.

Previous DR valuation efforts estimated the value DR provided during some defined past event. While evaluating whether the DR resource provided a value greater than its operational cost is both reasonable and prudent, it does help in predicting the future value of DR for a given market.

To address the future value a probabilistic modeling technique was developed that allows the modeler to test a variety of "what if' scenarios. Questions such as:

- What is the optimum amount of DR for the market?
- What types of DR products should be used in the market?
- What is the optimal amount of DR for each product?
- Which market variables have the greatest impact on DR value?
- How frequently would DR be needed?

Technology Case Studies
Advances in communication and information technologies have Demand Response a powerful tool by knowing when, where and how much to load shed. Correlating how much energy can be shed with the market cost for that energy each hour allows the consumer to manage its costs and, depending on the DR product, earn revenue for doing so.

The technology case studies prepared vary from new meters and AMR equipment, to advanced load control equipments and new systems which aggregate and manage distributed generation resources. And, the technology applications cover all customer class types (residential, commercial and industrial).

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DRR Task Results

- Task XIII DRR Tool Box
- Task XIII Project Guidebook
- Task XIII Project Portal
- Market Characterization Guide
- Country Marketplace Overview Surveys
- Country Comparison – Final Report
- DR Reference Library
- Communication Toolkit
- Final DR Market Potential Report and Appendices
- Online DR Market Potential Calculator
- DR Valuation Market Analysis Volumes 1 & 2
- DR Technology Database

In-Country DR Implementation Strategy
From the start of the Task, participants recognized that simply creating tools and reports was not enough. It was also necessary to develop country specific DR implementation strategies.

An example of such a strategy is the Demand Response Roadmap for Australia. This roadmap assesses the market environment, estimates the market potential, calculates the value of DR and describes some of the challenges to be overcome. The Australian DR road map is available on the Task XIII project portal for review.

Regional Workshops
Workshops were and will be held to share information with stakeholders. The workshops provide an opportunity to describe the tools developed and how they can be used. Three regional workshops have been held – Denmark and Australia in November 2006 and a web conference in the United States in February 2007. The presentations from the seminars can be found on the web portal.

CONCLUSION
Task XIII experts have done what no others have – created a process and methodology for assessing ways to incorporate demand response into liberalized markets. Actual implementation strategies will vary depending on the market structure and economic influences, but the tools and methods that have been developed for assessing those strategies are applicable to all.

For more information visit the IEA DSM web site, dsm.iea.org. To subscribe to the web portal and access all the tools go to www.demandresponseresources.com.

united states

Report to Congress Calls for More Utility-Delivered Energy Efficiency

In the United States, regulation of wholesale electricity purchases, including transmission pricing, is handled by the Federal Energy Regulatory Commission. However, most decisions concerning the planning, building and operation of electric grid infrastructure (including central and distributed generation, construction and permitting of transmission, distribution, and energy efficiency/demand response) are under the jurisdiction of state legislators and regulators and state Governors' offices. The Federal government thus has little jurisdiction, absent Congressional action in some limited areas and influence on state-level decisions. As a result there are 50 different sets of electricity policies, including on energy efficiency/demand response and little uniformity.

In March 2007, the U.S. Department of Energy (DOE) issued a report to the U.S. Congress calling for the regulators of the nation's electric and gas utilities to develop policies "to use low-cost energy efficiency, as delivered by electric and gas utilities with allied organizations, as a means to meet growing energy demands and enhance system reliability."

This report, "State and Regional Policies That Promote Energy Efficiency Programs Carried Out by Electric and Gas Utilities," was required by the Energy Policy Act of 2005 and makes 10 recommendations for State and regional policies to increase the delivery of energy efficiency by electric and gas utilities and affiliated groups. These recommendations are based on a DOE study of utility-delivered energy efficiency with input from the nation's State energy regulators and State legislators.

The focus of this report is actions that State and other non-Federal regulators of electric and gas utilities can take to encourage energy efficiency. This is important because in the U.S. all decisions concerning the retail delivery of electricity are left to the States. The U.S. Federal government has no ability to enact regulations or requirements on the retail delivery of electricity, including energy efficiency.

State public utility commissions, and sometimes State legislatures or governors, determine the appropriate level of energy efficiency for the privately-owned electric and gas utilities they regulate. Most State laws delegate to locally elected or appointed governing boards or city councils the regulation of the nation's approximately 3,000 publicly-owned and rural electric cooperative utilities that collectively serve 25% of the U.S. population. Privately-owned electric utilities, of which there are about 200, serve 75% of the U.S. population.

Recommended Actions
Regulators should consider:

- Making a strong, long-term commitment to cost-effective energy efficiency as a resource.
- Implementing electric and gas utility energy efficiency programs through a combination of infrastructure planning that includes energy efficiency programs as a part of utility resource planning, regional planning and rate cases; establishing dedicated program funding sources and ensuring that utilities receive appropriate compensation for programs; energy efficiency performance requirements for utilities; and reporting resulting costs, savings, and other program performance indicators that lead to program improvements.
- Recognizing energy efficiency as a high-priority energy resource. Regulators and utilities should consider integrating energy efficiency and demand response into electric and natural gas system planning and resource procurement.
- Establishing a formal evaluation framework for utility energy efficiency programs.
- Adopting an energy efficiency performance requirement or minimum energy savings targets for electric and natural gas utility end-use energy efficiency programs.
- Promoting sufficient, timely, and stable program funding to deliver energy efficiency where cost-effective by selecting funding mechanisms for energy efficiency from the available options: rate-basing, rate surcharges, and emerging alternative funding sources; and establishing funding commitments for multiple-year periods.
- Modifying policies to align utility incentives with the delivery of cost-effective energy efficiency by: addressing the typical utility throughput incentive and removing other regulatory and management disincentives to energy efficiency; providing incentives for the successful

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management of energy efficiency programs; providing sufficient certainty of cost recovery; and, entertaining the option of creating independent or State-administered energy efficiency programs.
- Integrating customer education programs with utility energy efficiency programs.
- Modifying ratemaking practices to promote energy efficiency among consumers, while recognizing that this goal must be balanced with other ratemaking objectives.

(It should be noted that regulators may already be implementing some of these.)

For a copy of the DOE report to Congress: click on "Sec. 139 Report" at http://www.oe.energy.gov/energy_policy_act.htm.

For more information on the National Action Plan for Energy Efficiency: http://www.epa.gov/cleanenergy/actionplan/eeactionplan.htm

This article was contributed by the US Executive Committee member, Mr. Larry Mansueti of the US Department of Energy

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Evaluation and Acquisition of Network-Driven DSM Resources

A survey of practices in Australia, France, Spain and the United States identified a range of processes for evaluating, acquiring and implementing DSM resources to provide support for electricity networks.

Good DSM resource acquisition processes include the following stages:

- Assessing the need for DSM resources.
- Identifying and evaluating available DSM resources.
- Contacting potential providers of DSM resources.
- Negotiating the provision of DSM resources.
- Acquiring and implementing the DSM resources.

NEW WORK

The work described above has been completed, but new work on load control and smart metering for electricity networks is to begin later this year. Load control is important because its use is increasing as a means to defer network augmentation and to provide network operational services. The use of smart metering technology for network purposes is also rapidly increasing and large-scale smart metering projects are being implemented throughout the world.

Benefits of Participating

- Learn how load control and smart metering can be used to defer network augmentation and to provide network operational services.
- Gain information about the functionalities and capabilities of load control and smart metering devices.
- Gain information about load control and smart metering projects currently being implemented and projects' effectiveness.
- Identify best practice in the use of load control and smart metering.

To learn more or to participate in the new work, contact the Operating Agent, Dr David Crossley, Energy Futures Australia Pty Ltd, e-mail: crossley@efa.com.au.

The DSM Spotlight is published several times a year to keep readers abreast of recent results of the IEA Demand-Side Management Programme and of related DSM issues. IEA-DSM, also known as the IEA Implementing Agreement on Demand Side Management, functions within a framework created by the International Energy Agency (IEA). Views, findings and publications produced by IEA-DSM do not necessarily represent the views or policies of the IEA Secretariat or of the IEA's individual member countries.

For more information on the Programme, its work and contact addresses, please visit our website at ***http://dsm.iea.org***

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