DSM Spotlight

The Newsletter of the International Energy Agency Demand-Side Management Programme March 2011

XVIII

First to Tackle DSM and Climate Change

Electricity production is estimated to contribute about 25% of the human-induced increase in greenhouse gas (GHG) emissions worldwide. To reduce these emissions it is necessary to create sustainable energy systems using both renewable energy and other low emission technologies on the supply side and energy efficiency measures on the demand side.

As DSM and GHG emission mitigation measures are implemented quite independently, the experts of *IEA DSM Task, Demand Side Management and Climate Change* worked for two years on two fronts – to investigate the potential contribution to mitigating greenhouse gas (GHG) emissions that can be made by DSM measures and the extent to which emission mitigation measures can achieve benefits for electricity systems.

The works was divided into six subtasks and experts participated from Australia, France, India and Spain.

Subtask 1: Interactions Between DSM and Climate Change;
Subtask 2: Principles for Assessing Emissions Reductions from DSM Measures;
Subtask 3: Mitigating Emissions and Delivering Electricity System Benefits;
Subtask 4: Fungibility of DSM and GHG Emissions Trading;
Subtask 5: TOU Pricing and Emissions Mitigation;
Subtask 6: Communicating Information about DSM and Climate Change.

Key Results & Conclusions

Subtask 1 identified DSM projects in the participating countries that may have mitigated greenhouse emissions, and emissions mitigation projects that may have delivered benefits to the electricity system. Case studies for

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NOTE FROM THE CHAIRMAN

DSM Coming in From the Cold

It is interesting to find that the acronym DSM is coming back. For many years, it has in some parts of the world been a four-letter word that decent people did not use in public. There was a strong belief that the market automatically optimized the use of energy. However automatic it was to be, though, there was a lack of proper technologies to handle the day-to-day anomalies that excess demand and lack of supply created. Simply stated, there was not sufficient smartness to make DSM happen.

Today, we have information and communication technology that allows the supply to flow and to be measured and controlled with great accuracy. Today, we have smarter appliances that can sense disturbances in frequency and we have electric vehicles that can be charged cheaply during the night. Today, we have small-scale renewable generation from sun, wind, hydro and gas that when applied properly can produce close to the demand. And, we have load management that allows demand to follow supply availability.

All these new technologies provide opportunities for a reshaping of the power sector. A reshaping that is also benefitting from the aggregation of the technologies into a smart grid. And in this context, DSM emerges again! Almost keeping its old shape with load control and strategic energy savings.

That said, we have a task to ensure that this new interest in the Demand configuration serves the customers and does so in their best interest. Smartness could easily become a technology gadget, but it should be designed to have an enthusiastic reception by customers as a useful tool. That is DSM at its best.

Hans Nilsson
IEA DSM Chairman

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India
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South Korea
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United Kingdom
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Task XVIII *from page 1*

18 DSM projects and 13 emissions mitigation projects were prepared by the experts and the Operating Agent.

Subtask 2 devised an innovative methodology using marginal emissions factors to estimate emission reductions from four Australian DSM projects. Subtask 2 concluded that calculations of the GHG emissions reductions from individual DSM projects will always be estimates, the accuracy of which depends on the assumptions made about events in the electricity market and about how various DSM measures operate. The level of resources expended on carrying out such calculations should be appropriate to the level of accuracy required. The required accuracy level is ultimately determined by the purpose for which the emissions reduction are calculated, that is, how the estimates of emissions reductions are intended to be used.

> Previous to Task XVIII, the IEA DSM Programme had not undertaken any work on DSM and climate change. In fact, Task XVIII is the first broad and systematic investigation of this specific topic being carried out anywhere.
>
> **DAVID CROSSLEY**
> **Task Operating Agent**

Subtask 3 showed that changing DSM activities to better mitigate GHG emissions involves mainly electricity distributors, technically achievable outcomes and reasonably familiar applications. In contrast, modifying emissions reduction measures to achieve benefits for electricity systems comprises a plethora of activities, driven by a multitude of stakeholders, usually without a deep appreciation of the technical parameters. Reconciling the two approaches involves aligning differing business and institutional perspectives and approaches.

Subtask 4 found that there are two types of legal instruments traded in carbon markets—allowances and project-based carbon credits. DSM projects may be eligible to create carbon credits. Emissions reductions from DSM projects must be subject to accreditation, measurement and verification (AM&V) processes before carbon credits can be created and traded in carbon markets. All carbon markets have rules about who may trade in the market and what may be sold; DSM projects must fit into these rules to be able to use carbon financing.

Subtask 5 concluded that time-varying electricity pricing is a blunt and not particularly effective mechanism to achieve GHG emissions reductions. The main purpose of time-varying pricing is to motivate customers to shift load from peak to off-peak periods; the effect on emissions depends critically on changes in the generation mix on the system at different times of the day. In designing time-varying pricing initiatives to achieve emissions reductions, attention should be given to the appropriate allocation of risk, social equity considerations and the inelastic nature of electricity pricing.

Through participating in Task XVIII, country experts and representatives were able to:

- understand the interactions between DSM and climate change;
- develop methodologies for assessing the GHG emissions reductions available from specific DSM measures;
- gain information about using DSM programs to mitigate GHG emissions, and about using GHG emission mitigation programs to deliver benefits to electricity systems;
- identify opportunities for funding DSM programs with revenue from GHG emissions trading schemes;
- explore whether use time of use pricing can be used to achieve mitigation of GHG emissions; and
- gather the information necessary to launch and participate in deployment programmes for demand-side technologies.

This article was contributed by David Crossley, the Operating Agent of DSM Task XVIII. David is Managing Director of Energy Futures Australia Pty. Ltd and Senior Advisor at the Regulatory Assistance Project, crossley@efa.com.au

Read more...

The following reports and databases are available on the DSM website.

Research Report No 1: Interactions between Demand Side Management and Climate Change
This report presents detailed case studies of DSM and GHG emissions mitigation projects as the first stage in identifying circumstances in which DSM may mitigate GHG emissions and emissions mitigation programmes may deliver benefits to the electricity system.

Research Report No 2: Principles for Assessing Emissions Reductions from DSM Measures
This report identifies the principles involved in assessing the GHG emission reductions available from implementing DSM measures. DSM measures are usually implemented as part of a specific DSM project.

Research Report No 3: Mitigating GHG Emissions and Delivering Electricity System Benefits
This report identifies circumstances in which DSM can better contribute to mitigating greenhouse gas emissions and emissions mitigation measures can achieve benefits for electricity systems.

Research Report No 4: Funding DSM Programs with Revenue from Carbon Trading
This report investigates options for funding DSM projects with revenue

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Read more *from page 2*

from carbon trading. The possibility of funding such projects in this way is based on the ability of DSM projects to reduce energy consumption and therefore achieve GHG emissions reductions.

Working Paper No 1: Preliminary Study of the Calculation of Time-Varying Greenhouse Gas Emissions Indices

The purpose of this preliminary study was to determine whether the variations between greenhouse gas emissions caused by time-varying changes in the electricity generation mix are material.

Working Paper No 2: Preliminary Study of Emissions Trading Schemes in the United Kingdom and Australia

This paper examines emissions trading schemes in the United Kingdom and Australia in order to assess the opportunities, benefits and threats involved in trading emission reductions achieved through DSM programmes.

Working Paper No 3: Time of Use Pricing and Emissions Mitigation

The purpose of this Working Paper is to explore whether time of use (TOU) pricing can be used to achieve mitigation of greenhouse gas (GHG) emissions.

Database: DSM Projects

Detailed case studies of 17 DSM projects from Australia, France, India and Spain. The list of case studies contains links to print hard copies of the text of each case study. Some case studies include figures and tables in an Appendix that can also be printed.

Database: Emissions Reduction Projects

Descriptions of 13 greenhouse gas emissions reduction projects from Australia, India and Spain. The list of products contains links to print hard copies of the text of each description. Some descriptions include figures and tables in an Appendix that can also be printed.

new work

Smart Grids

The DSM Programme is in the midst of defining a new Task on the role of DSM in delivering effective Smart Grids. Experts from six countries met for two days to define the scope and work of this new Task.

The aim of this new work is to identify, and where possible, quantify the risks and rewards associated with Smart Grids and Smart Meters from the perspective of the consumer, both now and in the future. By identifying the potential risks and rewards the Task will seek to develop best practice guidelines to ensure the demand side contributes to the delivery of effective Smart Grids.

The objectives are to:

- Understand the impact of the structure of energy markets on the interactions of consumers with Smart Grids;
- Explore the impact of technologies on the ability of customers so that they are able (and willing) to contribute towards the successful implementation of Smart Grids;
- Identify the risks and rewards associated with Smart Grids from the perspective of customers;
- Understand the opportunity for stakeholders to influence these risks and rewards;
- Identify tools to minimise the risks and maximise the rewards associated with the Smart Grid from the point of view of the consumer, whilst still satisfying the needs of other stakeholders;
- Understand customer reactions and preferences to offers and opportunities that a smart grid might provide (including local supply)
- Map the technological opportunities to achieve services (how smart has the grid to be?); and
- Understand regulatory options, practice and consequences.

The scope of the project will be limited to customers connected to Smart Grids both now and in the future, and will include:

- Residential customers; and
- Small commercial, business and local authority customers, i.e. those that are treated in a similar way to residential customers (for example have similar metering arrangements, or have similar access to the energy market).

The Task results will benefit all organisations with an interest in understanding the factors that influence the way that customers may interact with Smart Grids – regulators, policymakers/ governments, customers/small business organizations, equipment developers/suppliers, other service providers, energy companies, and consumer advocates.

In essence, this project is likely to be of interest to any organization with an interest in the successful deployment of Smart Grids, including the Smart Grid industry itself.

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Why Participate?

- Understand the factors that influence customer reactions and attitudes towards Smart Grids.
- Identify the value propositions for customers and Smart Grid operators.
- Gain an independent view of the risks and rewards of Smart Grids from the perspective of customers.
- Understand how the needs of customers can be aligned with the needs of other industry stakeholders, thereby ensuring that Smart Grids can also deliver quantifiable benefits for customers.
- Identify key relationships between possible benefits and technologies.
- Understand how to develop offers and programmes that lead to effective technology-customer interfaces.
- Provide a risk-reward heuristic to help governments minimize resistance to Smart Grid and Smart Meter deployments.
- Identify measures and tools that could be used to help ensure that customers are willing and able to contribute to the successful deployment of Smart Grids.
- Understand the importance of the demand side in ensuring the effective delivering of Smart Grids; and
- Quantify the contribution of 'engaged' customers on the implementation of Smart Grids.
- Design customer offers that allow and enhance the use of the 'smartness' of a grid.

The proposed structure of the Task is:

Subtask 1: Impact of energy markets on the role of customers

This subtask will map the interactions of different stakeholders in a 'market map' for each participating country, with the consumer as the central focus. This could include power and information flows and responsibility (e.g. for billing and metering). Ownership of data may also be an important issue from the consumer perspective and so the current situation in each country will be shown on the map.

The 'market map' will provide an overview of the situation in each country to allow similarities and differences to be identified. The differences in markets between countries may influence the consumers' perspective and so identifying the differences will allow suitable measures to be recommended in each country.

Subtask 2: Interaction between technology and customers

This subtask will draw upon the wealth of information available on Smart Grid enabling technologies in order to consider the appropriateness of these technologies, both from the customer perspective and the Smart Grid industry perspective. This could draw upon other industry classification approaches, such as the use of Technology Readiness Levels and the Market Readiness levels.

Subtask 3: Identification of risks and rewards associated with Smart Grids

This subtask will identify the possible risks and rewards relating to the Smart Grid concept from the consumer perspective. Participants will seek to identify these risks and rewards in order to find solutions that satisfy the needs of customers as well as the needs of other Smart Grid stakeholders. This subtask will draw on specific experiences within the participating countries and form the basis of a 'risk-reward calculator'.

Subtask 4: Designing offers and programmes to help ensure Smart Grids meet needs of customers

This subtask will seek to identify tools and measures that could be deployed to ensure that Smart Grids meet the needs of customers while meeting the needs of other industry stakeholders who stand to benefit from Smart Grids. These tools may be related to technology (e.g., additional features of design), market or price incentives (e.g., tariffs to assist certain customer groups achieve lower bills), and communication/marketing or government policy.

Subtask 5: Ensuring customers actively engage with Smart Grids – synthesis of findings

This subtask will identify the key issues that impact the way customers interact and view Smart Grids. Participants will focus on the factors that need to be addressed to ensure Smart Grids are able to achieve their full potential by ensuring that all industry stakeholders, including customers, benefit from their deployment.

To learn more about this project, please contact the project coordinator, Linda Hull of EA Technology, United Kingdom, Linda.Hull@eatechnology.com

XXI

Energy Savings Calculations Update

Experts in DSM Task XXI are focusing on standardization, but not on standard setting. They are collaborating to identify basic concepts, calculation rules and systems that can be used for standards and thus ease the work of standardization bodies like ISO, CEN or ANSI.

Preliminary Results

Since 2009, *Task XXI* experts from France, Korea, Netherlands, Norway, Spain, Switzerland and the USA have been working together to identify basic concepts, rules and systems for Energy Savings Calculations (ESC) and ways to harmonise such calculations. One method they are using to consolidate this information is the analysis of case studies in the following technologies:

- Wall and window insulation
- Lighting
- Heat pumps
- High efficiency boilers
- Air conditioners
- High efficiency motors and/or variable speed drives

> The challenge is to be as practical as possible – striving not for a universal harmonised protocol, but for sound procedures to help countries increase the efficiency of their energy savings calculations and evaluations and to create a solid base that standardization organisations can use to take the next step.
>
> **HARRY VREULS**
> **Task Operating Agent**

The case studies are country specific and include information on:

- Formula(s) used to calculate the annual energy savings
- Specification of the parameters
- Baseline used
- Normalisation for annual weather variation
- Energy savings corrections
- Input data to the calculation
- Lifetime savings
- Greenhouse gas emissions

The provisional outcomes from these case studies show that most countries are using an energy savings formula with the same structure and parameters. In addition, comparable default values are being used for several of the parameters. That noted, there are sometimes discrepancies in other values used, for example, the range for the annual burning hours for lighting in houses is 548, 700, 800 and 2771.

Questions being answered are:

- Can we define terms in the same way and use the same language? If this is possible then it will be easier to understand energy savings calculations and to simplify international comparison.
- Can we agree on how the different approaches for monitoring and verifications are defined and on the key elements that should be included in each approach?
- Will it be possible to group baselines needed to calculate energy efficiency improvements in such a way that projects and governmental/utility programmes can be better compared?
- Once we have all these elements, will it be possible to develop common reporting formats to make the verification process less costly?

In conclusion, the possibility to introduce a harmonised structure for energy savings calculations is positive in countries with more or less official formulas that are regularly reviewed, and if needed, updated or improved. In countries without a formula, standardization will ease the implementation of ESC formulas.

Korean ESC Workshop

On 21 April 2011, the Korean Energy Management Corporation, KEMCO, will organize a DSM Task XXI workshop on the "Harmonization In Energy Savings Calculation: How To Fit International Experiences With Korean Practice, Now And In The Near Future". DSM Task experts will present country specific case studies for lighting, high efficiency motors and retrofitting houses. Korean energy experts will then work in small groups using the DSM Task XXI format to identify possible energy savings in Korean programs. The results from this workshop will be used to modify the template for the information on ESC used in the case studies and improve the explanations and descriptions of the template as a next step in finalizing the Task. Final case studies for the participating countries and reports are scheduled to be available by the end of 2011 on the DSM website, www.ieadsm.org

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united states

Utility Customer-Funded Energy Efficiency Programs Growing Significantly

Energy efficiency programs paid for by customers of electric and gas utilities are showing a sharp rise in the United States.

Last year, the Consortium for Energy Efficiency (a U.S./Canadian not-for-profit group whose members are electric, gas and water utilities; research and development organizations; state energy offices; and regional energy programs) released its annual survey, which found that energy efficiency budgets for programs funded by U.S. utility customers have increased significantly in recent years – US$ 4.4 billion in 2009 compared to US$ 1.6 billion in 2005. A 2009 study by the U.S. Department of Energy's Lawrence Berkeley National Laboratory looked at existing state and national laws and policies, utility resource plans, and other sources to project that with no changed policies overall spending on utility customer-funded programs will double, possibly quadruple to US$ 12 billon by 2020.

The U.S. also has a sizable private sector Energy Services Company (ESCO) market. ESCOs estimated that energy efficiency projects and measures account for about US$ 3 billion of their US$ 4.1 billion in annual revenues in 2008. To add to these efforts, the American Recovery and Reinvestment Act of 2009, the U.S. economic "stimulus" effort, provided a massive influx of funding for local and state energy efficiency programs (approximately US$ 16 billion) to be spent over 3-4 years.

In the last decade, 15 states have consistently spent more than 1% of annual revenues from retail electricity sales and achieved at least 0.5% savings per year on retail sales. These energy-efficiency leaders – California, New York, Connecticut, Massachusetts, Wisconsin, Vermont, and others – generally have stringent efficiency targets in regulation, portfolio standards, or law. Ten of these states currently account for nearly 80% of national spending on utility customer-funded energy efficiency.

These 15 states are somewhat centered on the East and West coasts, but what is notable is that a number of states concentrated in the Midwest and Mid-Atlantic regions recently launched efficiency programs or adopted energy efficiency resource standards (EERS) or targets (about 18 U.S. states have these resource standards currently) that explicitly or implicitly will require substantial investments in efficiency. Some of these states (e.g., Pennsylvania, Maryland, and Illinois) had significant utility customer-funded programs in the 1980s and/or early 1990s, but regulatory support for these activities waned during electricity restructuring. In the last several years, legislative and political support for energy efficiency has increased. In some cases, energy-savings targets in several of these up-and-coming states will nearly match efforts in the leading states by 2020. Efficiency spending among these states is projected to rise faster than spending by leading states, accounting for the largest share of projected increases over the next decade.

This article was contributed by the U.S. Executive Committee member, Lawrence Mansueti, Director, State and Regional Assistance, Office of Electricity Delivery and Energy Reliability, U.S. Department of Energy, Lawrence.Mansueti@hq.doe.gov.

case study

LIPAedge Direct Load Control Program - USA

This is the eighth article in a series highlighting the case studies of DSM Task XV, Network Driven DSM. This Task demonstrated that DSM can be successfully used to support electricity networks in two main 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.

Introduction

The LIPAedge Direct Load Control Program was developed by the Long Island Power Authority (LIPA) to use central control of residential and small commercial air-conditioning thermostats to achieve peak load reduction. The program commenced in early 2001 and closed to new participants in July 2003 because LIPA had enough air-conditioner load under direct load control.

Technology

The LIPAedge program uses the programmable ComfortChoice thermostat (see Figure 1). This was designed by the Carrier Corporation with associated communication infrastructure provided by Silicon Energy to provide emergency peak reduction for utilities.

The system operator uses an internet-based system provided by Silicon Energy to control a demand-side resource comprising about 20,000 thermostat controlled air-conditioners. Skytel two-way pagers are used to transmit a curtailment order to the thermostat and to receive acknowledgment and monitoring information. One or more pager signals are generated and transferred to the SkyTel pager network (see Figure 2). Commands go via satellite to pager towers, where they are broadcast to the thermostats.

The thermostats take immediate action or adjust their schedules for future action, depending on what the system operator ordered. The thermostats log the order and respond via pager, enabling LIPA to monitor the response to the event. The thermostats also collect data every minute on temperature, set point, and power consumption (hourly duty cycle). They retain this information as hourly averages and report it to the utility. The thermostat itself holds 7 days of hourly data.

Figure 1. ComfortChoice Thermostat Used in the LIPAedge Program

For a summer load curtailment, the system operator might send a command at 9:00 am directing all thermostats to move their set points up four degrees, starting at 2:00 pm and ending at 6:00 pm. Alternatively, the system operator could send a command directing all thermostats to completely curtail immediately. The command would be received and acted upon by all loads, providing full response within about 90 seconds. This is far faster than generator response, which typically requires a 10-minute ramp time.

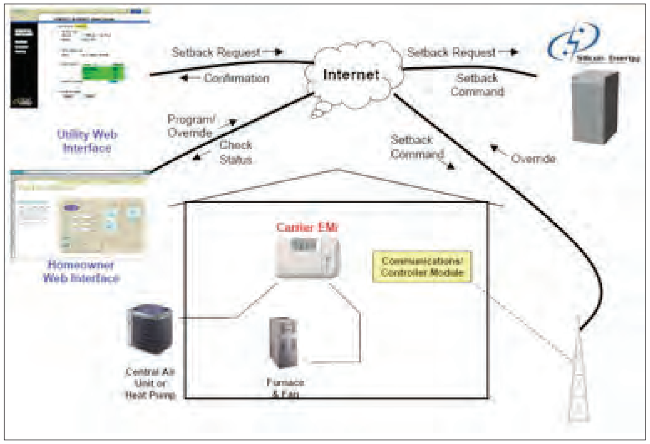

Figure 2. The Carrier/ Silicon Energy Direct Load Control System

Thermostats can be addressed individually, in groups, or in total. This important advantage provides both flexibility and speed. System operator commands that are addressed to the entire resource are implemented through a single page that all thermostats receive. Similarly, 15 subgroups can be addressed if response is required in a specific area to alleviate a transmission constraint. Thermostats can be addressed individually as well. This capability is useful for

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monitoring the performance of the system (each thermostat is checked weekly for a “heartbeat”).

The customer also receives benefits. The thermostat is fully programmable and remotely accessible, with all of the associated energy savings and convenience benefits. A web-based remote interface is provided for customer interaction. Customers can also override curtailment events. The override feature appears to be important to gain customer acceptance and it probably increases the reliability benefit. The system operator can block overrides if necessary.

Typically. this is not done for demand curtailment events, but it may be useful for spinning reserve events. Two-way paging communication enables the utility to monitor load performance both during response events and under normal conditions. Response from the thermostats is staggered over a time period set by the utility to avoid overwhelming the paging system. It typically requires 90 minutes for 20,000 thermostats to respond. Thus the system provides for performance monitoring but not in the 2 to 8 second intervals typical for large generators.

Communication is more reliable from the system operator to the thermostat than from the thermostat to the system operator. The pager tower has a 500-watt transmitter, while the thermostat's transmitter is only one watt. The thermostat makes four attempts to report back if the pager tower fails to receive any of its signals. The thermostat continues to take control actions and respond to new commands even if return communication is lost. Hence the system is more reliable than would be indicated by the list of “failed” units generated by the "heartbeat" report. About 4% to 5% of the thermostats fail to report back.

The LIPAedge Program

The LIPAedge program is the largest residential direct load control program using two-way communication in the United States. Two-way communication allows LIPA to monitor capability and response. It also enables customers to control their individual thermostats via the internet, a benefit that motivates participation.

The LIPAedge program is available for residential customers with central air-conditioning and for small business customers, though the program is now closed to new participants. There are about 20,000 residential customers and 3,000 small business customers participating in the program. Customers who sign up for the LIPAedge program receive a ComfortChoice thermostat and installation free of charge. Customers also receive a one-time bonus payment of USD 25 (residential customers) or USD 50 (small business customers). During 2001, when the program commenced, LIPAedge customers were offered an opportunity to earn a USD 20 cash reward for each LIPA customer referral they provided who installed a LIPAedge thermostat.

LIPAedge customers agree to have their central air-conditioning system adjusted between the hours of 2 pm and 6 pm for a maximum of seven days throughout the four-month summer season. Customers have access to a dedicated web page for their thermostat and are able to remotely change the set point of their air-conditioner whenever they want.

LIPA initiates curtailment events by either increasing the set point on LIPAedge thermostats by 3 to 4 degrees, or by cycling air-conditioner compressors off for a portion of each hour (see Figure 3).

Customers can override curtailment messages sent to their thermostat, though LIPA encourages its customers not to override during a curtailment event. If the customer decides to override the curtailment, the change is recorded by the thermostat and a wireless message is then sent back to the central server.

Results Achieved

LIPA collected name-plate power consumption information on the air-conditioning equipment being controlled when it installed the ComfortChoice thermostats for the LIPAedge program. It also directly measured the power consumption of a subset of those loads to estimate the actual load of the aggregation. LIPA determined that the average capacity of

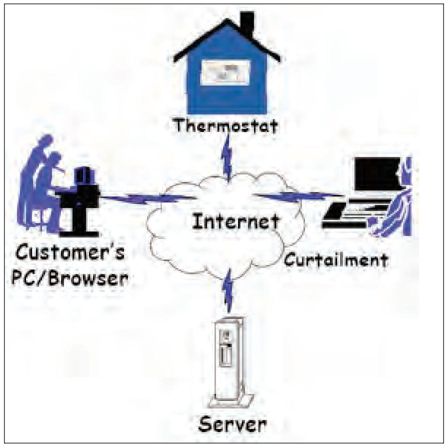

Figure 3. The Curtailment Process in the LIPAedge Program

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residential air-conditioning units being controlled was 3.84 kW, while the average capacity of small commercial units was 6.38 kW. The total 23,400 individual loads had a peak capacity of 97.4 MW if all the units were on at 100% duty cycle.

LIPA monitored the performance of 400 units from 1 May 2002 through 29 September 2002. Hourly data were collected from each unit for duty cycle and facility temperature. Those data were used to estimate the performance of all 23,400 responsive loads. LIPA found that each controlled load provided an average of 1.06 kW of demand reduction (1.03 kW per residential air-conditioner and 1.35 kW per small commercial air-conditioner). LIPA expected 24.9 MW of peak reduction response from the full 23,400 controlled air-conditioners.

LIPA tested the actual performance of the system to reduce energy demand during peak hours on three days during the summer of 2002. It also monitored performance on seven other days to provide baseline data. The results are shown in Tables 1 and 2. Table 2 shows that an increasing number of residential thermostats were overridden as the 14 August curtailment event continued; the proportion of units overridden increased from 5.7% at 3 pm to 20.8% at 6 pm.

The LIPAedge program cost was USD 515 per residential customer and USD 545 per commercial customer. This yielded a combined average cost of USD 487/kW of demand reduction. LIPA paid all costs.

This article was contributed by David Crossley, Managing Director of Energy Futures Australia Pty. Ltd and Senior Advisor at The Regulatory Assistance Project. For more information on this case study and others, visit Task XV, Network Driven DSM at: http://www.ieadsm.org/ViewTask.aspx?ID=17&Task=15&Sort=1.

Table 1. Performance During Curtailment Events in Summer 2002

	3 July	30 July	14 August
Participation (units)	15,943	17,051	17,474
Load reduction at 5 pm (MW)	15,852	16,076	16,273
Total energy saving over curtailment event (MWh)	65,883	66,493	67,463

Table 2. Performance of Residential Units on 14 August 2002

Hour ending	Units overridden at hour end	Adjusted net kW reduction per unit	Total kW reduction
3 pm	5.7%	1.05	16,119
4 pm	11.5%	0.98	14,942
5 pm	17.2%	0.92	14,060
6 pm	20.8%	0.78	11,883

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