So far, most demand side management (DSM) and energy efficiency programmes have largely focused on technology. This technocratic view of the issue of DSM, and its technology-based solutions, is valid and has proven to be fairly successful. However, there is still between 20-40% of wasted energy potential situated in the so-called ‘behavioural wedge’.

The new DSM project, Task XXIV Closing the Loop - Behaviour Change in DSM: From Theory to Practice, examines energy use from this different perspective - the human, behaviour-driven one. The two views are not mutually exclusive, they simply provide different but complementary starting points. In our view, energy use is very much a human issue, driven by the human need for a service that energy happens to provide (e.g., warmth, light, etc.).

NOTE FROM THE CHAIRMAN
DSM is a prerequisite for SMART

Nobody thinks of the Enigma machine when talking about computers. And, people would be offended if they received a copy of Alexander Graham Bell’s original invention instead of a smartphone with all its apps and the ability to listen to music and take pictures.

At the last IEA DSM Executive Committee meeting in Norway, members were confronted with the fact that not everything evolves in the human mind at the same pace. At a well organised workshop with our new IEA Desk Officer and a selection of excellent researchers and industry representatives from the Norwegian energy sector, we faced head-on our DSM “image” - an image that was formed before nano technology kicked in and before a clever salesman named ICT integrated networks and made meters “smart” thereby suggesting so much more than what is really going on.

Demand Side Management still has the 70’s and 80’s image of a technical solution to clip peaks and fill valleys in our load system by personnel behind control panels.

And, it is quite easy to explain that DSM is as evolved as the smartphone nowadays to a willing group of experts. But to show that DSM...
entertainment, mobility, etc.), and solutions to better energy management rely on changing current behaviours of consumption and interactions with the available technological solutions. Technological solutions provide many of the tools and mechanisms to support better energy use, but they will only truly work if the underlying behaviours are changed as well.

We understand behaviours to be the externalisation of a complex combination of our emotions, morals, habits, social and normative factors, and to be highly affected by the environments (‘contexts’) we are living in. These contexts encompass the political, socio-economic, infrastructural, technological, geographical and cultural aspects of our lives. Some of them foster good energy-using behaviours (e.g., great access to cheap, clean, fast public transport), and some of them make it harder to demonstrate sustainable behaviours (e.g., an old house with no floor or ceiling space to insulate).

Once-off behaviours, such as purchasing or installing energy efficient technology (efficiency behaviours) and habits and routine, for example, switching off the lights (curtailment behaviours) are both relevant to energy efficiency efforts and both will be addressed in this DSM Task.

Since prevailing social norms have a strong influence on the shape of behaviour, changing these norms is key to a more successful demand side management of energy behaviours. For example, in New Zealand, it seems to be a social norm to live in cold, under-insulated, damp homes and to put on another layer of clothing rather than install insulation or double-glazed windows. These prevailing social norms are strongly affected by our social networks. The more people in our social networks behave in a certain way, the more their behaviours will influence our own. This is why social media (the ‘new media’) has become such a huge, global success. It provides us with an amazing mechanism to engage with our social networks.

Social media facilitates interactions and collaborations among ourselves. It is driven from the bottom-up, from us, and not from the top-down, the way current hierarchies (government/policy, industry/advertising, academia/
This is the 12th 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
In the United States, the Bonneville Power Administration (BPA) owns and operates 75% of the Pacific Northwest’s electricity transmission system that includes more than 15,000 miles of high-voltage transmission lines and 285 substations. At peak usage, the system transports about 30,000 MW of electricity to customers in Oregon, Washington, Idaho and Montana, as well as to parts of Wyoming, Nevada, Utah and California.

In 2001, BPA started considering measures other than building new transmission lines to address load growth, constraints and congestion on the transmission system. BPA, along with others in the region, commenced exploring “non-wires solutions” as a way to defer large construction projects (see Figure 1).

BPA defines non-wires solutions as a broad array of alternatives, including demand response, distributed generation, energy efficiency measures, generation siting and pricing strategies that individually or in combination delay or eliminate the need for upgrades to the transmission system.

BPA and its consultants developed a screening process and checklist to evaluate a transmission problem area to determine whether it is a candidate for a non-wires solution.

The Olympic Peninsula received particular attention since it is an environmentally sensitive area with increasing demand for electricity and limited transmission capacity. Forecasts showed that the capacity of the transmission lines on the Peninsula might

Social Media from page 2

expansion or solidification of social networks to support a given end, such as better demand side management and a reduction in energy use. In addition, technological solutions to DSM are increasingly implementing social media in their design.

DSM Task XXIV will utilise the idea of social networks and social media as a tool to engage DSM stakeholder and expert networks to disseminate, engage, collaborate and share learnings (Subtask 5 - Expert Platform). Social media requires an investment of time, an ability to trust the process and excellent communication skills and transparency. It also requires an understanding of how people are using it, and how comfortable they are with the use of ‘new media’.

Many people are using social media in their private lives, but are still a little uncomfortable to engage with it in a professional capacity. The fear of looking foolish, or embarrassing their company or institution, or sheer lack of time with the overwhelming potential and amount of applications that are out there, often stops academics, policymakers, and SMEs from engaging with these tools. However, times are a-changing and the IEA has an excellent twitter account, so does the European Commission, the US Department of Energy and many academics.

We hope that our social expert platform will be able to:
• Reach, connect and engage our ‘behaviour change experts’ from the research, government, industry and community sectors, and break down existing communication gaps between and within these sectors
• Foster collaboration and shared learning, discussions and open innovation to support the objectives of DSM Task XXIV
• ‘Matchmake’ experts with similar interests or goals and foster collaboration and social networks outside of DSM Task XXIV
• Test ideas and concepts within the safety of the expert platform before going ‘live’
• Utilise free, open-access tools to provide a more interactive, visual and creative experience for experts and end users of the research for DSM Task XXIV.

If you are interested in participating as a ‘behaviour change expert’ in our Task, please send an email to drsea@orcon.net.nz and you will receive an invitation to join our network.

This article was contributed by Dr. Sea Rotmann, the Operating Agent for DSM Task XXIV, Closing the Loop - Behaviour Change in DSM: From Theory to Practice.
become inadequate by December 2007, if there was a forced outage of one line during peak periods of cold weather. A significant transmission construction project, including a new 20-mile 230-kV line, was planned for construction on the Peninsula.

BPA carried out several pilot projects to determine whether it was possible to use non-wire solutions to defer the transmission construction project. A peak load reduction of 50 MW was required to achieve a five year deferral. All projects had to pass the total resource cost test before they could be implemented.

Non-Wires Solutions Pilot Projects

The following non-wires solutions pilot projects were carried out on the Olympic Peninsula:
• direct load control;
• demand response;
• voluntary load curtailments;
• networked distributed generation;
• energy efficiency.

Direct Load Control

The overall target for direct load control on the Olympic Peninsula was 20 MW.

The objectives of the pilot phase of the direct load control project were to demonstrate the reliability and technical feasibility and measure the peak load reduction impacts of direct load control.

To participate in the pilot phase, residential customers had to have an electric water heater and heat pump, forced air furnace or baseboard space heating.

The pilot phase aimed to obtain 5 MW (2500 sites x 2kW) of curtailable loads in the residential sector from one distribution utility or a combination of utilities.

Direct load control was accomplished through the use of a one-way radio pager network linked to a direct load control unit located in the dwelling (see Figure 2). The control unit communicated with appliances through power line carrier signals. Controlled end-uses included water heaters, pool pumps and space heating.

Demand Response

The target for demand response on the Olympic Peninsula was 16 MW.

The objectives of the pilot phase of the demand response project were:
• to demonstrate the reliability and technical feasibility and measure the peak load reduction impacts of demand response;
• to use incentives to test the value proposition of demand response for customers; and
• to test the use of Grid-Friendly™ appliance concepts, hardware and responses to automatically reduce load in response to stress on the grid.

To participate in the pilot phase of the demand response project, residential customers had to have an electric water heater, heat pump or forced air furnace, a minimum of three people in the dwelling, and a fibre or cable high-speed Internet connection.

The pilot phase aimed to install 250 two-way Internet gateways in the residential sector (see Figure 3). The gateways enabled automatic control of space heating, air conditioning, water heating and pool pumps in participating dwellings. The gateways also measured the load from individual end-uses in the dwelling.

Demand response was accomplished through the use of two-way broadband to communicate with the Internet gateways. Customers could use the internet to set price levels at which automatic load switching occurred and also to override the

Figure 2. Olympic Peninsula direct load control.

Figure 3. Olympic Peninsula demand response system.

continued on page 5
automatic settings. This enabled customers to lower energy use and reduce electricity costs.

In addition, 250 Grid-Friendly™ appliances (200 clothes dryers and 50 water heaters) were installed in 200 participating dwellings. Controllers installed in each Grid-Friendly™ appliance sensed frequency disturbances in the electricity network and controlled the appliances to act as spinning reserve – no communications technology was required beyond the network itself.

The Grid-Friendly™ appliance controller developed at Pacific Northwest National Laboratory is a simple computer chip that senses network conditions by monitoring the frequency of the system and provides automatic demand response in times of disruption. The controller can be installed in appliances that regularly cycle on and off during normal use, so that consumers do not notice when the Grid-Friendly™ device is in operation.

Grid-Friendly™ appliances allow customers to become an integral part of electricity network operations. Grid-Friendly™ controllers can be programmed to autonomously react in fractions of a second when a disturbance is detected. Demand can be rebalanced to match available supply almost instantaneously (within a half-second). This is an improvement over the approximately 30 seconds it currently takes for power plants kept on standby to come up to speed. Grid-Friendly™ controllers can also be programmed to delay restart instead of all coming on at once after a power outage.

Voluntary Load Curtailments
BPA operated a Demand Exchange (DEMX) program that provided commercial and industrial customers with the ability to curtail their load during system emergencies and volatile market conditions.

Under the DEMX program, BPA worked with customers to define their load curtailment capability and determine the benefits of participation. DEMX aggregated customers’ curtailment potential and represented the aggregated load in the wholesale energy market as a reliability option. DEMX built an internet-based auction site where participants were alerted to hourly, one day-, and two day-ahead price signals associated with peak load events, and were able to post their willingness to participate at a set price.

In March 2004, BPA ran a successful test using DEMX to reduce congestion on transmission lines on the Olympic Peninsula. A local utility, two paper manufacturing companies and the US Navy voluntarily reduced their transmission loads during a simulated period of severe weather and critical peak demand.

The test occurred over four days. During the test, BPA posted an hourly price per megawatt, giving test participants the chance to accept, reject or counter the offer. Participants then bid to reduce their demand by using backup generation or by shifting load to other hours. BPA was able to purchase an average of 22 MW of peak demand reduction during each hour of the simulated event. This is about one year’s load growth on the Olympic Peninsula.

Networked Distributed Generation
The target for distributed generation on the Olympic Peninsula was 4 MW. This was achieved with 12 units in 10 locations.

In the pilot phase of the distributed generation project, backup generators were used at one commercial and one industrial site:

- Sequim Marine Sciences Lab - 0.5 MW backup generators for load shed and transactive control demand response integrated with the generators;
- Port Angeles municipal water supply system - 0.9 MW backup generators in parallel with 0.9 MW demand response from pumps.

Energy Efficiency
The target for energy efficiency on the Olympic Peninsula was 15 MW.

As a general policy, BPA ensures development of all cost-effective energy efficiency in the electrical loads BPA serves across the Pacific Northwest. BPA treats energy efficiency as a resource and defines goals in terms of megawatts of energy efficiency acquired. The bulk of the energy efficiency acquired by BPA is pursued and achieved at the local level in association with local distribution utilities.

BPA applied these general principles to acquiring peak load reductions on the Olympic Peninsula through energy efficiency programs across the residential, commercial and industrial sectors developed in association with local distribution utilities.

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.
Introduction
Finland is part of the Nordic power system and the Nordic electricity market. In the Nordic electricity market, there are many price areas (bidding areas) separated by transmission bottlenecks. Finland forms a price area. In addition, Finland has rather strong connections with the Russian power system both directly and via Estonia. Depending on the market situation, Finland primarily imports its electricity from Russia or the Nordic countries.

The electricity market had gradually opened to competition by 1998 when small customers could also buy their electrical energy from whomever they wanted. Electricity distribution is a regulated monopoly and includes the responsibility of consumption metering and provision of settlement data to all relevant actors. By 2014 at least 80% of all customer connection points in each distribution company must be hourly metered and settled. In practice, that means that practically all consumption relevant to demand response will have hourly settlement starting in 2014.

The electricity wholesale market is harmonised with the other Nordic countries. Efforts to gradually harmonise the retail market continues, but there is still a long way to go before demand response based electricity retail products can, without adjustments and parallel systems, be offered and sold across country borders.

Electricity Networks
Both transmission and distribution networks have adequate capacity and good reliability records. However, investments in the transmission network are needed for planned and expected changes in the power generation, and to a lesser extent for new locations of consumption.

In the forested rural areas where trees grow tall, storms and snow have caused long and wide supply interruptions. Such adverse weather conditions are expected to become stronger and more frequent due to climate change. According to both climate models and weather history data, climate change also will have a relatively strong impact on Finland’s average temperatures. In the critical rural areas, overhead networks will gradually be replaced by cables, but this will take some decades. In troubled distribution areas, the distribution system operators have improved their situation awareness, network fault repair management and customer communication by using advanced distribution automation supported by smart metering.

Most distribution networks have been built strong enough for the application of Time of Use tariffs thus being strong enough for dynamic real time demand response. Therefore demand response can be mainly market based. Network based demand response is now needed only in exceptional situations, but in the future the situation could change as the penetration of small distributed generation and new controllable loads, such as charging of electrical vehicles, increases.

Energy Demand
According to the Energy Statistics Yearbook, electricity consumption in 2010 was about 88 TWh and industry consumed 47% of this total. Electric heating took about 16 TWh, of which 13 TWh was household heating, with the remaining electricity consumption of the household sector about 10,5 TWh.
The national peak power is in winter when heating and lighting are needed most – about 14 GW. During the winter over 1 GW of controllable storage heating loads are controlled by Time of Use Tariffs. The use of heat pumps for heating is increasing, which significantly reduces the total end use energy consumption but has little impact on the annual consumption of electric energy because forms of heating other than electricity are also being replaced by heat pumps. It seems now that with the growing penetration of air-to-air heat pumps, the national peak demand will increase because during very cold weather air-to-air heat pumps stop operation and the house changes to direct electric heating.

At this time, heat pumps are installed without the possibility to use them for demand response. And, time of use controlled storage for heating houses is increasingly using heat pumps either as the primary or additional heating system and stopping the use of heat storage. The overall impact of this trend seems to be that both demand response and peak power generation and transmission capacity will be increasingly needed in the future. The need to require that heat pumps be more controllable is also evident from system stability and market optimization viewpoints.

**DSM Already Playing Important Role**

The climate in Finland is cold and there are many energy intensive industries, therefore, the dependence on a reliable supply of electricity and heat is high. Despite the country’s many lakes, the hydropower potential is rather small due to the terrain’s low elevations.

Electricity generation is based on a versatile mixture of resources, including district heating and industrial CHP, some nuclear power and a high dependence on imported electricity and fossil fuels. Thanks to the forests and the forest industry an exceptionally high proportion of electricity generation is based on renewables. The shares of wind power and solar power are still very small, but feed-in tariffs have been introduced to boost investments in wind power. And, it has already been necessary to apply DSM on a large scale in Finland.

Energy intensive industries have, even from the opening of the wholesale electricity market, applied demand response in the electricity markets and in the provision of system reserves. Almost all the demand response potential in large industry will be moved to system reserves when the new 1.6 GW nuclear power plant starts operation. Thus much demand response will disappear from the day ahead and intra-day markets.

There are pieces of information suggesting that demand response implementation in the service sector and medium size industries has been increasing quite rapidly, but there are no new reliable statistics on the consumption and demand response of these sectors. For example, supermarket chains seem to internally collect this information to develop their demand response capability, but keep the results private to prevent their competitors from getting or using their information.

The application of Time Of Use tariffs has continued in Finland since their introduction in 1964. Without it, the daily load curves would have much higher peaks and deeper valleys. Legislation requires that the distribution system operators provide Time Of Use tariffs and metering. The large scale application of direct load control stopped quickly once the electricity market was opened to competition because the systems could not divide the responses per retail supplier.

**Revival and Further Development of DSM Is Underway**

The need to develop DSM further is increasing as energy efficiency improvements and demand response are needed to reduce:

- CO2 emissions according to European targets
- Dependence on imported fossil fuels as there are no domestic fossil fuels in Finland
- Supply side investments to balance and prepare reserve power plants for the expected increases in wind power generation and large nuclear power units
- Network based barriers for distributed generation and plug-in electrical vehicles
- Vulnerabilities of the market and the power system caused by insufficient demand response and concentration of key supply side assets and import channels to a small number of market actors
- Costs

The present situation would be much worse without the Time Of Use tariffs, but their improvement could increase the benefits. The regular price variations between day and night are rather small in the electricity market thanks to the market and to the Time Of Use loads. Very high price peaks exceeding 1000 €/MWh have occasionally occurred.
Due to the dependence on electricity imported from Russia, high morning price peaks have sometimes started before the day Time of Use tariffs and controls. The different market structures of Russia and the Nordic countries also cause market-interfacing conflicts when energy and capacity drivers on different sides of the border clash. Both these problems are expected to become more common if new flexible resources are not added to the system.

When the weather is very cold the heat storage capacity of many houses is not adequate to cover the whole daytime heat demand. Consequently, some direct and storage heating loads turn on just during the evening price peak. Increasing the flexibility of these loads and making use of the available heat storage capacity in a dynamic way would benefit both the customer and the electricity market or system.

**Dynamic Smart Metering Based Load Control**

A research and development project to replace clock-based Time Of Use with a smart metering system based on dynamic load control continues [2]. Helsinki Electricity Network Ltd. together with its partners developed, implemented and installed this system. Field tests are set for over 500 houses with heat storage tanks. They comprise over 10 MW of controllable power. The following has already been completed: 1) a study of network impacts, 2) a simulation based comparison of benefits for alternative control methods, 3) design of an operating model and system, 4) definition of the message exchange between the actors, 5) implementation of the operating model in the systems of two smart metering system vendors, 6) laboratory tests, small scale field tests with about 5 houses, 7) completing the installation to over 500 houses and providing hourly metered data when Time Of Use controls are applied, and 8) a study on improving the accuracy of the prediction of energy demand based on hourly metered data of 185 of the houses.

The system is designed to be used also with other types of controllable loads and can be considered a market based direct load control. The electricity retailer determines the control signals to be sent to the controlled loads based on the situation in the market and its own balance management. The control signals are typically sent the previous evening after the spot market closes and well before the start of the typical night heating period. But also overriding control signals at short notice are possible. The default control profile is stored in the meter and used if the sending of the control signals fails.

**Direct Load Control Field Tests**

Before the electricity market was opened to competition, direct load control was widely applied in Finland because the monopoly wholesale tariffs gave utilities high incentives to limit their annual peak power. When the electricity market opened, electricity retail and distribution were unbundled and as a result the distribution monopolies owned the load control systems. The use of these systems soon stopped and they were later completely removed. From 1996-1997 there were large-scale field tests on the load control of direct electrical heating. These tests included about 7000 houses having over 20 MW of controllable power. VTT developed models of the responses to outdoor temperature and control actions from the data measured from the substations.

Large-scale field tests on direct load control are once again being conducting, this time by E.ON Kainuu Electricity Network. The initial field tests were implemented in 2010 and early 2012, and systematic field tests are scheduled for winter 2012-2013. One of the purposes for these tests is to provide demand response for the system operator Fingrid. Hourly measurements of loads and responses are recorded by the smart metering system and substations provide response data with minute level resolution. The response models will be developed from the data with the help of VTT. Summaries of the field tests on developing response models are included in the report, Measurements and Models of Electricity Demand Responses [3].

**DSM in District Heating Networks**

Demand side management of district heating has also been studied and experimented with in Finland. The benefits proved to be rather marginal as a larger scale activity would be needed to obtain meaningful benefits. As far as we know, this application has not yet been implemented. For now, the network’s storage capacity and the heat storage at power plant sites are typically utilised as heat buffers and they provide better return on investment. Once the communication and automation systems become adequate for this purpose then utilising the heat buffers on the demand side will be profitable.

The goal is to use the heat storage capacity at the consumer level and in the distribution network to enable CHP generation during higher electricity market prices, to increase the efficiency of heat generation and to avoid start up and shut down costs.

**Demand Side Energy Efficiency**

According to Motiva, the shares of heating fuels for the household sector are 37% district heating, 22% small-scale wood combustion, 18% electricity, 17% oil, 5% heat pumps and 1% other.
A study by Adato Energy Oy and TTS Research Electricity of household electricity consumption in 2006 compared it with a similar study in 1993 [4]. The study showed that electricity use for cold appliances had reduced significantly – the share now is 13% of the total electricity consumption - while lighting increased from 21% of the total 7.5 TWh electricity in 1993 to 22% of the total 11 TWh in 2006. In addition, holiday houses consume about 0.5 TWh of electricity annually. A similar study was repeated in 2011 and the results will be available in the third quarter of 2012.

The driving forces for energy efficiency improvements and energy saving include:

- Economic reasons
- Security of energy supply
- Environmental considerations and abatement of climate change
- Common EU objectives and Directives

A long-term climate and energy strategy approved by the Finnish parliament defines the main policy actions aiming to cap the continuous increase of energy consumption [5]. As part of this strategy, building codes and regulations now set minimum requirements for new buildings and renovations. And, as part of the implementation of European Directive on the Energy Performance of Buildings (EDBP) new requirements have been launched and the latest version will enter into force in the second quarter of 2012. In addition to the stricter requirements, the overall structure of the regulations will be changing as well. Besides minimum requirements for U-values, etc. there will be a shift towards overall energy assessment, which will take into consideration the way in which energy is produced.

Energy performance certificates for buildings required by EDBP represent the information measures aiming to improve the energy efficiency of new and existing buildings. Certificates are becoming mandatory for most of the buildings and stricter legislation is under review at the moment. The other measures are mainly voluntary, such as energy audits and energy efficiency agreements. Positive developments include the following:

- Many distribution system operators and district heat suppliers offer online energy reports to help households monitor their electricity consumption.
- Several new players offer energy efficiency services including new technology start-ups, consultancies, facility management companies, and local authorities as well as local and nationwide non-governmental organizations.

The main actors studying demand side energy efficiency include the National Consumer Research Centre (Kuluttajatutkimuskeskus), Adato, universities and VTT. Other actors, such as Motiva, also are promoting and disseminating demand side energy efficiency. Under national and EU programmes there are many R&D projects going on in the field of building energy efficiency. For example, VTT is studying and developing systems to monitor energy performance by combining information from several sources such as smart metering systems, building automation systems and authority databases on building properties. In connection with this work, VTT participates in the work of the IEA Energy Conservation in Buildings and Community Systems Programme on Total Energy Use in Buildings: Analysis & Evaluation Methods.

Research and Development Frameworks in DSM

Most of the national public funding for the research and development of smart grids is channelled through the research project, Smart Grids and Energy Markets (SGEM), managed by CLEEN Ltd. - Cluster for Energy and Environment, which is part of the national Strategic Centres for Science, Technology and Innovation. The majority of the research and development related to demand response is either included in SGEM or closely collaborated with it.

Energy efficiency research, however, is not included in SGEM and does not belong to any similar coordinating project. The main source of funding for SGEM and for all DSM research is the Finnish Funding Agency for Technology and Innovation (TEKES). The Pool for Electricity Research provides some research and development funding for separate projects that it finds important and useful for its members within a relatively short time horizon.

To capitalize on DSM work being conducted in other countries, Finland is active in many of the IEA DSM projects and the IEA DSM wok has been part of national smart grid projects, such as SGEM. Finland is currently leading IEA DSM Task XVII: Integration of Demand Side Management, Energy Efficiency, Distributed Generation and Renewable Energy Sources.

This article was contributed by Pekka Koponen of VTT Technical Research Centre of Finland and the Finnish DSM Executive Committee member, Pekka.Koponen@vtt.fi.

References

The IEA Demand Side Management Programme has published a new report identifying best practices in designing and implementing energy efficiency obligation (EEO) schemes. EEO schemes require energy providers, such as electricity and gas companies, to meet quantitative energy saving targets through assisting their customers to implement energy efficiency measures. Governments in various jurisdictions around the world have endeavored to improve end-use energy efficiency, and in some cases also achieve other objectives, by designing and implementing EEO schemes.

The study of EEO schemes was initiated by India’s Bureau of Energy Efficiency and was carried out by the Regulatory Assistance Project (RAP). RAP is a global, non-profit team of experts that focuses on the long-term economic and environmental sustainability of the electricity and natural gas sectors, providing technical and policy assistance to government officials on a broad range of energy and environmental issues.

Energy efficiency obligation schemes share three key features:
• a quantitative target for energy efficiency improvement;
• obligated parties that must meet the target;
• a system that: defines the energy saving activities that can be implemented to meet the target; measures, verifies and reports the energy savings achieved through these activities; and confirms that the activities actually took place.

Typically, obligations in EEO schemes are placed on providers of networked energy (e.g., electricity and natural gas). Obligations can also be placed on providers of other fuels (e.g., LPG, heating oil, transport fuels, district heating), and even on end users of energy. The new report considers only EEO schemes that place obligations on energy providers, that is entities that supply energy to end-users.

The report includes detailed case studies and a unique comparative analysis of 19 different energy efficiency obligation schemes implemented in a range of jurisdictions around the world. The case studies demonstrate that there are many different ways to design and implement such schemes. Despite this diversity, it is possible to identify three broad types of energy efficiency obligation schemes:
• Schemes with quantitative energy saving targets that have been established relatively independently, often with their own enabling legislation. Energy saving targets are specific to each scheme and are not related to resource planning and acquisition by the obligated energy providers. Governments will usually set the targets, but the schemes can be administered by government or by a body (often the energy regulator) that is independent of both government and the obligated energy providers. Schemes in Australia and Europe generally follow this model.

• Schemes with quantitative energy saving targets that are integral components of resource planning and acquisition by the obligated energy providers. Governments will usually set the targets, but the schemes can be administered by government or by a body (often the energy regulator) that is independent of both government and the obligated energy providers. Schemes in North America generally follow this model.

• Schemes with quantitative energy saving targets that have been established principally by governments as integral components of government policies. Energy saving targets for these schemes are set by the government and a government agency acts as the scheme administrator. Schemes in China and Korea generally follow this model.

For the first time, the study systematically classified information about the three different types of schemes into categories that apply to all the schemes. Through a comparative analysis of this information, the study identified a range of best practices in designing and implementing an EEO scheme. Each of the three types of schemes is the product of quite different ways of thinking about how to use energy providers to deliver energy efficiency, yet the study shows that the following best practices apply to all three types of schemes.

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Energy Efficiency Obligations  from page 10

Policy Objectives. Keep the policy objectives of the EEO scheme simple and clear, and focussed on achieving energy savings. If the scheme has multiple objectives, ensure that the achievement of any non-energy-related objectives does not hinder pursuit of the primary objective to achieve energy savings.

Legal Authority. Use a carefully selected combination of legislation, regulation, and Ministerial and administrative processes to establish and operate the EEO scheme.

Fuel Coverage. Decide the fuel coverage of the EEO scheme according to the overall policy objectives for the scheme and estimates of energy efficiency potentials for the different fuels. Start by covering one or two fuels and then expand the scheme to other fuels as experience is gained.

Sector and Facility Coverage. Decide the end-use sector and facility coverage of the EEO scheme according to the overall policy objectives for the scheme and estimates of energy efficiency potentials for the different sectors and facilities. If it is intended to tightly restrict sector and facility coverage, consider whether assessing compliance will become too onerous.

Energy Saving Target. Set the level of the energy saving target for the EEO scheme according to the overall policy objectives for the scheme and estimates of energy efficiency potentials for the different fuels. Start by covering one or two fuels and then expand the scheme to other fuels as experience is gained.

Eligible Energy Savings. Enable non-obligated parties in the EEO scheme to implement energy efficiency projects to produce eligible energy savings. Do not place unnecessary restrictions on the energy efficiency projects or measures that can be implemented to produce eligible energy savings, provided that the energy savings can be verified.

Performance Incentives. Consider whether to include performance incentives in the EEO scheme to be awarded to obligated parties that exceed their energy saving targets.

Obligated Parties. Determine the obligated parties in the EEO scheme according to the fuel coverage of the scheme and the type of energy provider that has the infrastructure and capability to manage the delivery and/or procurement of eligible energy savings. Consider restricting the obligation to larger energy providers. Allocate individual energy saving targets to each obligated party on the basis of that party’s market share of energy sales. Consider whether to implement carve-outs for energy-intensive, trade exposed industries and/or other specified groups of end-users.

Compliance Regime. As an integral component of the EEO scheme, establish a procedure for obligated parties to report claimed eligible energy savings to an appropriate authority and a process for checking and verifying these savings. Establish a penalty to be imposed on obligated parties that fail to meet their individual energy saving targets. Set the level of the penalty high enough to mobilize energy providers to meet their targets.

For more information:
• DSM Task website
• Report download
• IEA DSM Programme
• RAP

This article was contributed by David Crossley, Managing Director of Energy Futures Australia Pty Ltd and Senior Advisor at The Regulatory Assistance Project, crossley@efa.com.au.
Chairman’s Note from page 1

is a board coalition of sciences and technologies that reach out to both the demand side and the supply side to mine the energy efficiency options available still needs work in the public arena.

Yes, the load shape is still important, but with the emerging “prosumers”, the increasing share and variety of renewables and the economic impact of rising energy prices has caused the scope of DSM to broaden immensely. It is now a quest for all options (both in integration of latest technologies and a smart participation of end-sers) that can be used to optimize the demand resources. This 21st century population expects more response to their ideas then management of them. The public wants to play its own role, be responsible for itself.

And, this is what the DSM Programme is working on. Not a world where everything is “left to the public”; the energy industry will keep playing a major role. However, with the right use of DSM, in it’s broad definition, selling energy services will become a major business the moment the public realises that they don’t want energy just the service it provides. A new business model reflecting this change is already emerging in a number of companies.

Another look at the public is key in this approach. There is the need to look beyond the concept of Homo economicus to Homo ludens, the playing man. Are you that type of person who is very happy if a live weather forecast app or other clever app is included on your new phone? Why not develop apps that connect people to energy efficacy in a similar way?

The people that separate their trash without any other incentive than that it makes them feel good is a phenomenon that can never be explained by considering them to be “rational economic thinkers”. New approaches, aiming more on the real triggers of sustainable behavior, are surfacing in social R&D these days, and need to be supported so that they can mature in near future.

The different projects of the IEA DSM Programme will keep working on these broad aspects of DSM, but our outreach will change. As we must also evolve in this rapidly change world that keeps calling every complicated piece of equipment “Smart”.

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