

DSM Spotlight

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

July 2006



DSM Gets a Makeover in the EU

Once upon a time, there was an EU directive on Least Cost Planning (LCP). In the 1980s DSM was the solution embraced by US Public Utility Commissions and implemented by utilities more or less enthusiastically in Europe and the US. Then came the liberalization of the energy market and the European LCP Directive fell by the wayside..

As investments in the supply side were reduced and demand continued to rise, new problems began to occur. The supply side reserve capacity was reduced, in some cases to a level where security of supply was in jeopardy and blackouts or close calls happened more frequently. For the supply side advocates, this was a call to increase supply and transmission. But for those thinking in terms of system function, it was another reminder that the demand side was in need of a profound "makeover."

Recognizing that the LCP Directive was not the answer for liberalized energy markets, the European Commission created a new Directive on Energy Efficiency and Energy Services. This Directive will take effect in 2008 in all 25 EU countries. Countries will be free to choose how to implement the Directive, but are to aim to achieve an overall indicative energy savings target of 9% in nine years. To meet this Directive, countries will need to deliver a measurable and verifiable savings above Business as Usual, and they will have to submit an Action Plan every third year to be assessed by the Commission.

Under this Directive, the public sector is charged with a leading role in the delivery of energy efficiency, and by their actions will be pioneers in the transformation of markets. Public procurement, in particular, will be relied on as there are requirements to develop and use

procurement specifications and to perform audits. These activities will create a link to the existing EU Buildings Directive that requires auditing to help the building owner find out what measures they can undertake and their consequences.

For energy distributors, distribution system operators and retail energy sales companies, there are requirements to provide more comprehensive statistical information and support so that meaningful energy efficiency services can be offered to customers. They also are to participate in funding measures and to refrain from hampering incentives to improve energy efficiency. There are many solutions for meeting these requirements, and no doubt there will be quite a debate over the best solutions as countries choose different solutions.

With this increase in demand for DSM and energy efficiency, opportunity knocks at the door of the IEA Demand Side Management Programme. This Programme has valuable resources and experiences that can help countries find the right solutions. Products from current projects, such as Market Mechanisms for White Certificates Trading, Demand Response Resources, Network Driven DSM, and Time of Use Pricing and Energy Use for Demand Side Management Delivery as well as earlier work on ESCOs, are available and can be customized if needed.

This article was contributed by the IEA DSM Programme Chairman, Hans Nilsson, nosslinh@telia.com.

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R&D Focus on Market Based Demand Response

Market challenges – ICT opportunities

Denmark, Finland, Norway and Sweden form a common Nordic whole-sale power market. The Nord Pool Elspot price is a trusted price reference and the financial markets have substantial volumes of trade. The Nordic market is fully deregulated in the sense that production and power supply are competitive entities, separated from the monopoly regulated distribution and transmission companies. Threatening shadows of forecasted shortage in both peak load capacity and energy in the coming 5-10 years will challenge the efficiency of this market structure. Increased demand side participation in the spot and balancing markets are among the main issues that will need to be addressed.

Early warnings of coming periods of shortages were the generation capacity shortage in 2001 and the high price period during the 2002/03 winter caused by low precipitation. After the 2002/03 winter, the Norwegian Ministry of Petroleum and Energy issued a White Paper on the security of supply. Improved end-user contracts and efficient use of Automated Meter Reading (AMR) and Load Control (LC) were among the various measures to mitigate a tight future energy situation. Statnett, the Norwegian Transmission System Operator (TSO), was encouraged to enhance demand response, and as a consequence now has a growing focus on the retail market.

In Norway, distribution companies, according to authority regulations, undertake hourly metering of larger customers (annual consumption above 100,000 kWh). Residential consumption (above 8,000 kWh/year) is to be metered four times a year at a minimum. Hourly metered data is read by AMR systems, while most of the Norwegian residential consumption is manually read by the customers. Presently, there is discussion on whether all end-users should have AMR. So far it has been hard to justify the implementation and operational costs of AMR to smaller customers, and only 10 Norwegian distribution companies have undertaken full-scale residential deployment.

Norway's Demand Response Project

The "Market Based Demand Response" project was started last year. This project includes Norway's participation in the IEA

DSM Programme's Task XIII, *Demand Response Resources*, and previous R&D efforts on AMR and LC technology in Norway. The main project goal is to improve power market efficiency by increasing the demand side price elasticity. The scope of the work is to take advantage of possibilities given by new Information and Communication Technology (ICT) in the interplay between the main stakeholders—customers, power suppliers, distribution companies, the TSO and the authorities.

The project is organized in two main work packages: *Increased Demand Side Price Elasticity and Improvement of Technology*.

■ *Increased Demand Side Price Elasticity*

Most customers consider some of their electricity consumption as a lower priority. Based on this assumption, one of the main activities in the first work package is to categorize Low Priority Appliances that are suitable for load reduction for specific periods. Larger customers with hourly metering will be analyzed to uncover loads for possible reduction. The overall outcome is to be a toolkit for decisions makers, based on practical experiences.

Another area to be addressed in the first work package is monitoring residential customers' behavior and their acceptance of new power contracts and tariffs.

■ *Improvement of Technology*

The second work package will focus on quality improvements of metered data and standardization in AMR and billing systems. Accurate meter data and meeting the requirements from the power market become crucial when new contracts are introduced. And for customers, it is important for them to know that they will benefit economically from Demand Response and their deliberate load reductions during high priced periods.

Test pilots

The pilot automatic load reduction when spot price exceeds a predefined limit is based on technology from two Norwegian vendors and includes both electricity distribution and market aspects. The "Spot Price Criterion" used in this pilot, is illus-

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denmark

Energy Efficiency the Danish Way

The Danish government's policy on energy efficiency is unusual. In Denmark, the promotion of energy efficiency is the responsibility of electricity distribution companies, the direction of these efforts is controlled by legislation, and all this is conducted in a process of discussion with the Government.

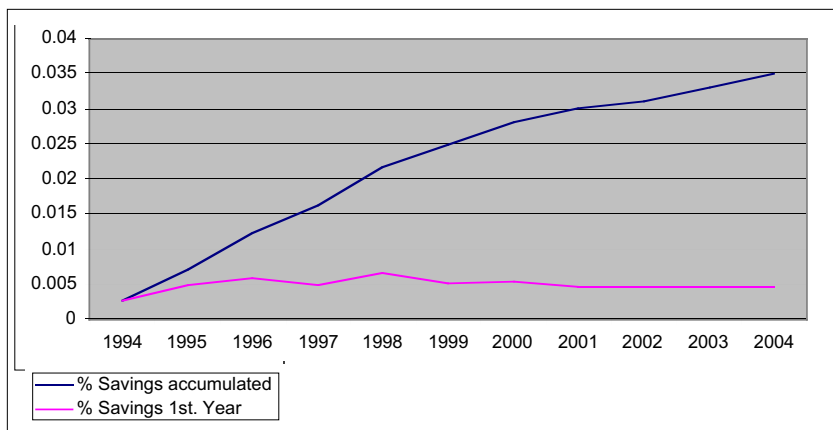
The way the electricity distribution companies promote energy efficiency, however, is about to change. New measures have been set creating a far more ambitious energy efficiency policy. A quota system coupled with the introduction of freedom of choice for energy companies to determine how they will achieve reductions are key factors in these new measures.

Since 1994 Danish electricity distribution companies, that is the companies responsible for maintaining the low voltage distribution net, have had a public service obligation (PSO) to

Increased Savings

An agreement reached between the Danish Government and opposition parties in June 2005 set the target of reducing energy consumption. To achieve this, the Government demands measurable savings of 1% per year from energy efficiency activities. This represents a saving of 7.5 PJ per year during the period 2006-2013.

The electricity distribution companies will be expected to find 2.5 times the level of savings they have previously achieved – for the same money. There is no extra funding for this new initiative, rather the Government expects greater efficiencies in energy savings to be delivered by market mechanisms. The IEA DSM Programme work on market-based mechanism, such as energy efficiency certificates (white certificates), has demonstrated what is possible, providing sound examples for Danish authorities.



promote energy efficiency. This commitment brought measurable savings in consumption of 0.5% per year, and without this effort, Danish electricity consumption would be 3.5% higher than it is today (see graph). The actual saving is even greater than these figures suggest as they do not take into account the effects of promotional activities since they cannot be measured, for example, the effects of public information campaigns. Despite economic growth of close to 3% per year since the mid 1990s, Danish energy consumption has remained static since 1980.

Market Mechanisms

Negotiations about how a market in white certificates will work are ongoing and new rules are expected to take effect in July 2006. The principle however, is clear—network companies can buy savings on the market or initiate them themselves, whichever is most profitable.

Besides energy efficiency counselling, an option being actively considered by network companies involves paying builders to build and maintain structures with that include

energy efficiency measures. Similarly, distribution companies are looking at persuading local government to designate new housing areas as energy efficient housing-stock. An alternative involves supporting retailers in marketing energy efficient products, for example electrical appliances.

The new measures have been well received in the industry. Danish distribution companies, accounting for 94% of turnover in the market, support the new proposals.

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new work

Task XVII – Integration of Demand Side Management, Energy Efficiency, Distributed Generation and Renewable Energy Sources

This new IEA DSM Task on Integration will decrease economic barriers related distributed generation and renewables in electric energy systems by using demand response and energy storages to decrease the problems caused by intermittent type distributed generation at local and transmission system levels.

As countries implement energy policies that promote energy efficiency, distributed generation and renewable energy resources, the share of distributed energy increases, particularly the intermittent type such as wind, solar, small hydro and combined heat and power (small and micro-CHP). Due to the fact that intermittent types of electricity generation are difficult to predict, electrical networks—both local and transmission—are turning to integrated distributed energy resource. By combining distributed generation with energy storage and demand response, countries can decrease problems caused by distributed generation and increase the value of intermittent energy in the market.

While integrating these components is not easy, this new IEA DSM Task will try. Participants will begin by conducting a scoping study to collect information from other IEA Programmes, participating countries and other sources (e.g., research programs, field experience, etc.) on the characteristics, potential and use of intermittent distributed energy, energy storage technologies, demand response and energy efficiency as well as on business models for the use of

distributed energy resources. The study will include distributed energy resources at both the local level (distribution network and customer) and at the transmission system level, for example, where large wind farms are connected.

Benefits of participating

Share and learn from others the newest knowledge on the integration of distributed generation, energy storage and demand response to use when planning and operating energy systems as well as developing new businesses.

At the end of the scoping study, a workshop will be held with the stakeholders to discuss the study's conclusions and possible new work. Based on the workshop's outcomes, Task participants will then provide the stakeholders with integration-based solutions and examples of best practices.

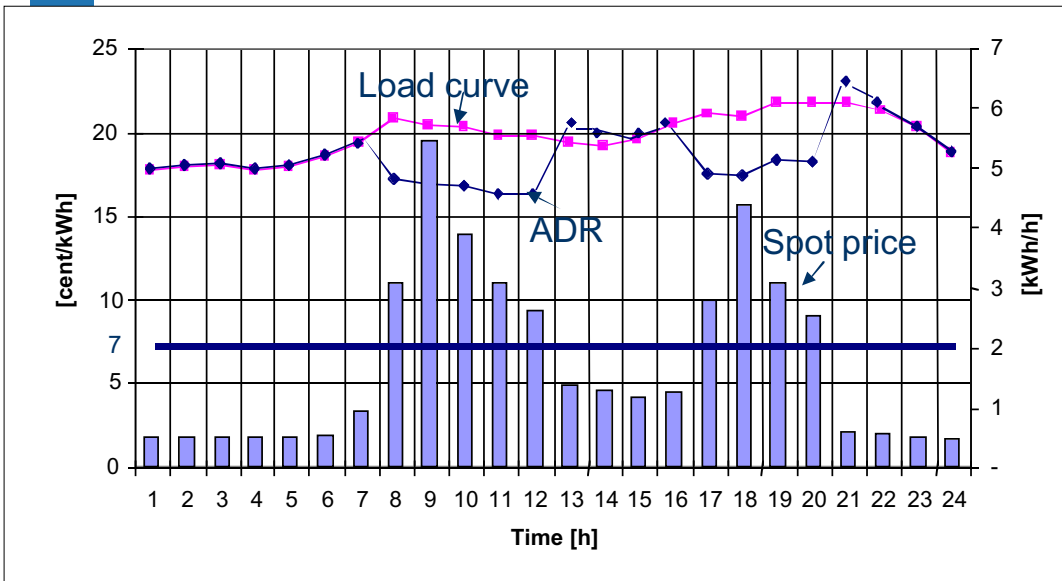
Countries are welcome to join this new work. The first meeting will be held in September 2006. For more information contact the Operating Agent, Seppo Käekäinen of VTT Technical Research Centre of Finland, seppo.karkkainen@vtt.fi



<http://dsm.iea.org>

Visit the IEA DSM web site for more information on Programme activities, publications and contact names.

Figure 1. Automatic Demand Response (ADR) referred to spot price level



disconnects the water heaters via the AMR system in the peak morning and afternoon hours on work days. Customer acceptance is the prime measure of this test. The potential accumulated load reduction for Norway by disconnecting water heaters during the Nordic peak hour, from 8 to 9 o'clock in the morning, is estimated to be 600 MW.

Fixed price contract with return option is offered to residential customers from one of the power suppliers participating in the project. The contract secures a predictable electricity cost for a

trated in Figure 1. The figure shows the spot prices for a winter day where the prices in the morning and afternoon hours were much higher than the average spot price. Under this pilot project, the customer has a contract with a supplier for the automatic disconnection of selected appliances when spot price exceeds a certain level. In this example, it is 7 euro-cent/hour, and the impact of the Automatic Demand Response (ADR) can be seen on the load curves. This concept was tested as a part of Norway's contribution to the IEA DSM Programme's Demand Response Resources project, and now it is being offered to a few commercial customers as a trial.

certain volume to the customer and guarantees a buy-back price equal to the spot price. This means that the customer has a strong incentive to reduce load in high price periods.

Remotely controlled load shifting is a pilot involving 40 residential customers where the distribution company remotely

This article was contributed by Ove S. Grande (Ove.S.Grande@sintef.no) of SINTEF Energy Research in Trondheim and Inge Vognild, of Statnett SF in Oslo. Norway's Market Based Demand Response project will run from 2005-2008, and is partly financed by the Norwegian Research Council. The Norwegian TSO, Statnett, is conducting the project, which also involves governmental bodies, distribution companies, market players and technology vendors. The operating agent is SINTEF Energy Research.

Measuring Savings

Three methods for the measuring savings are proposed:

1. *Documentable reduction* in energy use based on calculations relating to a particular installation.
2. *Standard values* will be set for certain alterations. Changing to an energy efficient refrigerator, for example, would be given a particular standard value.
3. *Information and marketing campaigns* will be rewarded if they can be evaluated. The guidelines for this approach have not been finalized.

What's New?

New laws affecting building regulations and making demands of public sector energy use also have recently been introduced in an attempt to reduce energy consumption. These, however, merely represent tightening of existing measures. What is radically different about the new legislation is the introduction of market forces to reduce energy demand.

This article was contributed by Michael Iven of the danskeneginet, miv@danskenergi.dk.

special session

DSM Programme Identifies Challenges Facing DSM and EE

Challenges facing DSM and energy efficiency in the electricity sector were discussed by the members of the IEA DSM Programme at their most recent meeting. The international membership of the Programme offers an unique opportunity for members to stay abreast of trends impacting countries and regions. Special meeting sessions provide time for participants to identify areas of “need” and discuss ideas for new collaborative projects for the Programme to undertake.

Common DSM or EE related problems facing the electricity sector in countries that were identified at this last special session were:

- There is no clear owner of DSM issues
- There is a need for developing white certificates
- Energy use per capita is high
- The cost of electricity is rising and people are finding it harder to pay the bill
- A link needs to be shown how DSM and EE can reduce growing energy prices
- There is a lack of awareness of successful DSM programs
- DSM and EE are not used to the extent they could or should be
- How to link DSM and EE to the EU Buildings Directive

Understanding the problems is only the start. If the DSM Programme is to develop a successful project then those responsible for solving the problems will need to be involved at some level. The following stakeholders were identified:

- National and local governments
- Regulatory organizations
- Trade associations
- Utilities
- Energy supply companies
- Energy distribution companies
- ESCOs
- Electricity system operators
- Environmental organizations
- Consumers and housing owners organizations sure
- Energy intensive industries, such as cement and aluminum

To learn about the current and proposed work of the DSM Programme visit the website at dsm.iea.org.

Contributions Welcome

A special issue of the journal, *Energy Policy*, will focus on demand side management and how it can stimulate and accelerate energy efficiency improvements.

Articles will cover:

- Global and regional activities
- Technologies
- Institutional aspects
- Programs and measures and their application

Articles and peer reviewers are welcome. If interested please contact Hans Nilsson, Chairman of the IEA DSM Programme, nosslinh@telia.com. One-page abstracts are due by October 1, 2006, and if selected then full articles are due February 15, 2006 for peer review.

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. The viewpoints or policies expressed in this newsletter do not necessarily reflect those of the International Energy Agency, the IEA Demand-Side Management Programme member countries, or the participating researchers.

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

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