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

VIII

Demand Side Bidding & Today's Electricity Markets

IEA DSM Programme Mission

To promote energy efficiency and DSM for global sustainable development and for business opportunities.

The move towards competitive electricity markets has changed how electricity is traded, and thereby opened the door for Demand Side Bidding (DSB). DSB offers consumers the opportunity to receive financial compensation for making short-term changes to their electricity consumption. By rescheduling loads or agreeing to load reductions, consumers help to maintain a balance between electricity supply and demand and to ensure the quality and security of supply. The result—an electricity network that operates more efficiently.

In practice, however, many DSB schemes fall short of their objectives, therefore, experts from seven countries are collaborating under the IEA DSM Task VIII, *Demand Side Bidding in a Competitive Electricity Market*, to evaluate existing DSB schemes and to create guidelines for the development and enhancement of new schemes.

The initial Task work has focused on evaluating the way electricity is traded and the opinions of market participants towards DSB. To gather information, market and system operators, transmission network companies, regulators and suppliers from the countries participating in the Task—Finland, Greece, the Netherlands, Norway, Sweden, Spain and the U.K—were surveyed. Overall, the survey results show that most market participants view DSB favorably, primarily due to the fact that it improves the choice of products in the electricity market and improves market liquidity. However, despite the fact that there are many different DSB products available, few schemes can be considered to be operating successfully. The most successful schemes at the time of the survey were for the provision of ancillary services to Systems Operators, that is, services that maintain the quality of the electricity supply, such as frequency response and standing reserve. Survey participants also noted that more work is needed on the development of cost effective communication technology that can activate and monitor demand changes for individuals or small groups of consumers.

Overview of Demand Side Bidding

Demand Side Bidding is any mechanism that enables the demand side to actively participate in the trading of electricity. DSB can fall into one of two areas:

- DSB for the purpose of price setting. This involves the bulk purchase of electricity.
- DSB where consumers are required to alter their electricity demand profile. This is done through the resale of electricity that they have secured the right to consume.

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COUNTRIES PARTICIPATING IN THE IEA DSM PROGRAMME

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Korea
Netherlands
Norway
Spain
Sweden
United Kingdom
United States

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There are seven broad types of DSB products, which are grouped below according to categories and characteristics.

Characteristics	DSB Category	DSB Products
DSB requiring consumers to alter their electricity of supply demand	DSB to maintain quality	Ancillary services (of various types,e.g., frequency response, standing reserve)
	DSB to solve network constraints	Distribution constraints Transmission constraints
	DSB for electricity balancing	Balancing market
	DSB for access to market prices	Spot markets
DSB involving the bulk purchase of electricity	DSB for price setting	Spot markets Bilateral contracts Supply contracts

The main difference between the categories is the length of time the consumer is given before they must change their load in the agreed upon manner as illustrated in Figure 1. As for the products, they can exist between consumers and almost any of the other market participants, as indicated in Figure 2.

Who can participate in DSB is only limited by a consumer's ability to be flexible to make changes to their normal electricity

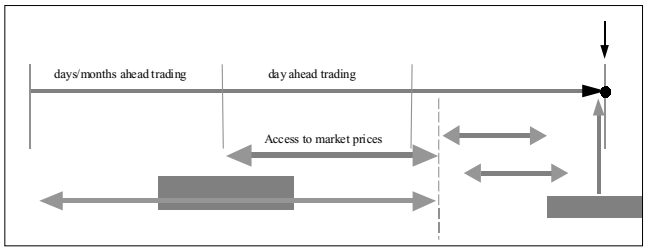

Figure 1. Timeframe for bids associated with different DSB categories.

demand profile and install the necessary control and monitoring technology to execute bids and demonstrate bid delivery. Bidding by an individual or a group is undertaken directly with the market or through an electricity retailer, a municipality or a trader acting as an "aggregator" of numerous bids. Consumers are rewarded for their offers to reschedule or reduce their electricity consumption either through direct payment or a reduced tariff. The direct payments can be in the form of an availability payment, an activation payment, or a combination of both. One of the difficulties associated with DSB is ensuring that consumers deliver their load reductions as promised. This is particularly important when the load reductions are offered to the System Operator for the purpose of maintaining the quality and security of supply.

Experiences with DSB

Of the seven possible types of DSB products, only one of them (demand side bids into a balancing market) was not being used in any of the surveyed countries. The most successful DSB products were those that involved maintaining the quality of supply through the provision of ancillary services to a System Operator. Such a provision is largely confined to a few consumers who have a high demand for electricity, and work within a set of well-defined rules imposed by a System Operator. The UK System Operator, the National Grid Company, for example, imposes a set of technical DSB rules to maintain the quality of supply.

Views and Opinions towards DSB

As part of the survey, the market participants were questioned on their general views and opinions towards DSB. In general, the responses received were positive. DSB is seen as a good way to introduce new products into the market place, particularly those that encourage greater consumer involvement. DSB also is seen as a very important mechanism for improving the efficient operation of the electricity network. A good example of this comes from Sweden.

The Swedish Electricity Act, which came into force on 1 January 1996, opened up the network to all players, but this Act did not include any specific provisions for the security of the supply because the expanding Nordic electricity market was expected to eliminate the risk of any shortages. Prior to this 1996 reform, there was about 2500MW of reserve capacity, mainly from oil condensation plants. This reserve capacity was used as peak load capacity in dry years when insufficient hydropower was available as well as for slow disturbance reserves/standing reserves. However, during 1996, which was a dry year, electricity imported from coal-fired power stations in Denmark proved to be less expensive than electricity generated from Sweden's oil condensation plants. This trend of importing cheap electricity continued for several years and eventually led to the mothballing of most of Sweden's reserve capacity. Sweden then was left with insufficient generating capacity to meet its maximum demand without importing electricity. In 1998, the Swedish National Energy Administration began to address this generation shortfall by investigating the potential for load reduction during peak hours. DSB proved to be a natural option as it not only would improve the efficient operation of the network, but also have a positive impact on the environment through the avoided use of fossil fuel fired generation.

While increased market efficiency, improved network operation and the possibility of environmental benefits are important, the

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Field Trials for New FlexGate Technology

The participants in DSM Task II, *Communication Technologies for Demand Side Management*, have achieved a major milestone by demonstrating that the new FlexGate technology. This technology is a first step in providing customers and service providers with a cost effective and future-proofed delivery platform. (A description of the FlexGate can be found in the January 2001 issue of the DSM Spotlight.) Now that the communication technology has been developed, the Task participants would like to demonstrate this cost effective technology inside and outside customer homes.

Communications manufacturers, building energy and services providers and managers, utilities, and research and development organizations will combine their expertise and resources to conduct this next phase of work. The Field Trials will begin by defining the objectives and benefits of the trial in each country and then coordinate the trials. This will involve defining numbers and types of customers, the services to be developed and offered, and the methodology and technology used in the trials. Once the work has been defined later this year, the Field Trials will begin testing and evaluating the flexible gateways as well as optimally bundled services and communications technologies in customer buildings. The aim of this work is to identify the most viable markets and services from the perspectives of energy providers, customers and building owners' as well as customer acceptance and business viability.

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main driver for DSB as far as consumers are concerned is the ability to earn additional income or reduce market exposure costs. Not only does this additional income offset energy costs, but it can also be used to fund more traditional energy savings measures. For example, one company in the UK has used the income derived from participation in DSB to invest in high efficiency motors and drives, which will lead to savings in energy costs in the long-term.

However for the consumers who are manufacturers, any income derived from DSB is of secondary importance to the production process. Manufacturers are generally of the opinion that the 'process is king,' and participation in DSB is only possible if it does not have a significant impact on production rates. For example, in the case of cement manufacturing, interruptions to the crushing and milling operations will not have an impact on production because the crushed materials are stored prior to use. Similarly, a short interruption to the supply of an arc furnace does not have a significant impact on production rates. These industries are therefore ideal applications for frequency control schemes that assist System Operators with maintaining the quality of supply.

Other processes cannot be interrupted once started, and therefore, have a much more limited potential for DSB schemes. For example, the start of batch processes can often be delayed to avoid use of high cost electricity. However, many processes are run on a 24 hours per day, 7 days per week basis to minimize costs and maximize production, thus providing only limited potential to participate in DSB. Thus consumers with these types of processes are largely restricted to participation in DSB

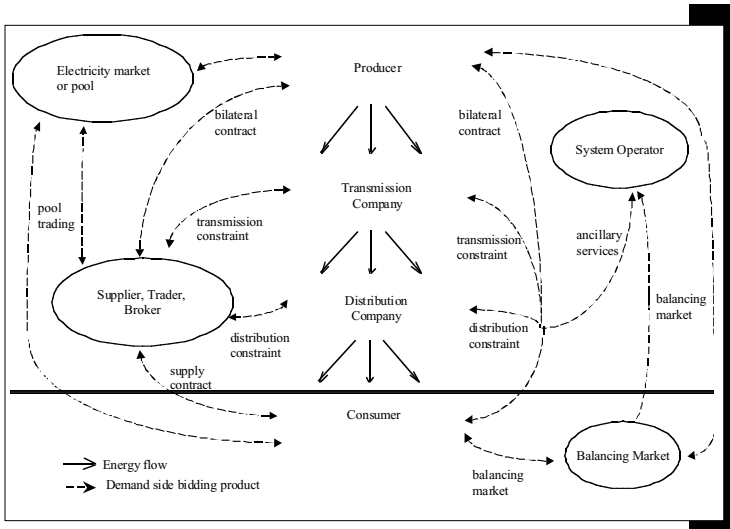

Figure 2. Possible DSB products in the marketplace.

categories that allow access to market prices.

For those cases where it is impossible to interrupt the electrical supply under any circumstances without causing significant production losses, DSB can still be an option if the manufacturers use their standby generation capacity.

Developing DSB

In recent years, DSB has been restricted primarily to large consumers, for example those of energy intensive industries. However, participation in DSB is not, and should not be restricted to these consumers. For example, a study in Sweden showed that the potential for load reduction in the Swedish industry was estimated to be at least 500MW, which represents only about 2% of the annual maximum demand (typically 24GW to 26GW). The largest potential for load reduction is

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electrically heated homes, which account for at least 10GW of the peak demand. Short interruptions to the hot water heating and space heating of about 30 minutes, would have little impact on a home's comfort. However, when the load is switched back on, there is a risk that demand would peak if all the heaters switched on simultaneously thus causing demand to double or even triple in an affected area.

Encouraging wider participation from all consumers is seen as the next step for DSB, but this will be challenging. In a fully liberalized market, consumers are free to choose their electricity supplier and are rarely 'tied-in' to their supplier for a fixed period of time. Instead, consumers are able to move between suppliers at relatively short notice, for example, after giving one month's notice. This makes it unattractive for suppliers to install control and monitoring equipment at individual homes. To overcome this obstacle, third party agents, who are not necessarily the electricity supplier for that consumer, are being contracted to provide demand side bidding services. This is the approach used by Yorkshire Electricity who offers various DSB products to large consumers in the UK. Another option is for the meter owner to act as a 'third party' agent or aggregator, which may be particularly beneficial in the case of domestic consumers. Such 'third party' agents can be regarded in much the same way as suppliers, and can sell DSB products to the System Operator or the Market Operator.

New Work

The current work under DSM Task VIII will continue until the end of 2001. The Task participants plan to propose another phase of work to establish methods that would widen the scope of DSB, to increase the number of consumers participating in DSB, and to encourage the participation of smaller consumers to the DSM Executive Committee.

For more information contact the Task VII Operating Agent, Linda Roberts of EA Technology, United Kingdom, e-mail: Linda.Roberts@eatechnology.com and fax: +44-151-347-2570 or visit the IEA DSM website.

Canon Copier wins IEA DSM Award of Excellence

The fourth IEA DSM Award of Excellence was given to Canon Inc. for its iR3300/imageRUNNER 3300 copier. The Copier of the Future award is presented to manufacturers of prototype photocopiers that are equipped with innovative energy efficient technologies. To be considered for the award, the copier must meet stringent performance and energy-consumption criteria. These performance specifications required that the copier be network compatible, produce 30 or more copies per minute, consume 10W or less of energy when in Sleep Mode (or "Zero-Energy Standby Mode"), and realize a recovery time from Sleep Mode of 10 seconds or less.

What makes the Canon copier unique, aside from meeting the performance requirements, is its On-Demand system or RAPID Fusing System. This innovative approach to fixing toner to paper uses a thin fixing film, rather than a thick roller, and an efficient ceramic heating system, rather than a halogen heater. The use of this technology reduces the energy consumed during warm-up and sleep modes to less than 25% of conventional copiers.

For more information on this copier and other IEA DSM Award of Excellence winners visit the IEA DSM website.

The DSM Spotlight is published four 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.

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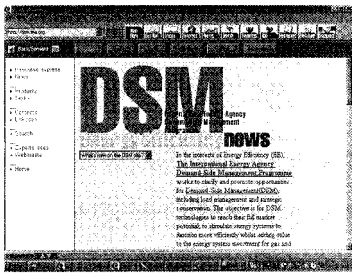

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