



Turn on to turning off

Forward-thinking organisations are adopting Automated Demand Response to ease the burden on their businesses and to access a new revenue stream. **Roger Woodward** explains the benefits of ADR

One of the main tools used by National Grid to help smooth fluctuations in supply and demand is the Balancing Mechanism. This is a market, dominated by coal and gas-fired power stations, in which participants are paid to increase or decrease electricity production as required. This market is worth around £1bn per year in the UK. It is therefore a costly tool - and a polluting one too, making power stations operate more inefficiently, so adding to the UK's CO₂ output.

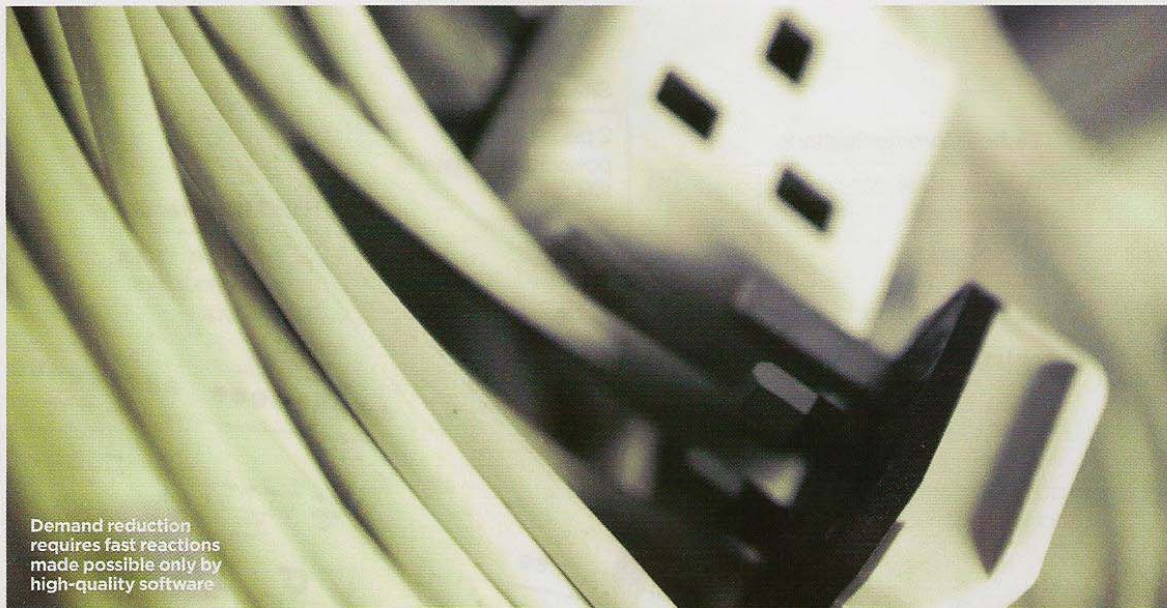
Much of Government policy on dealing with energy shortages has focused on finding alternatives to the old coal-fired power stations that are now closing. However, Demand response (DR) is one important approach that not only offers benefits of saved energy to the National Grid, but also offers an opportunity for businesses to gain revenue. Demand Response services can participate in the Balancing Mechanism and generate revenue from that market. The upcoming Energy Bill includes a Capacity Mechanism which is designed to deal with our diminishing supplies. Within this, legislation on Demand Response is being included.

Shifting the timing

DR means reducing demand at times when supply is also constrained. DR shifts the timing of a user's energy consumption, or temporarily reduces it, to match the available supply. Energy users who offer this service receive a payment from the National Grid. It is a cheaper and far less polluting approach than paying the power stations, and it benefits both National Grid and business energy users.

DR is not currently widely used in the UK or Europe, but it is well established in the USA where it can be accessed by consumers as well as businesses. In 2012, US households and businesses using DR earned over US\$2.5bn.

Ged Holmes, commercial director of demand response specialist Open Energi, says: "The US grid is set up differently than here in the



Demand reduction requires fast reactions made possible only by high-quality software

UK, emitting a signal rather than a frequency. But technology is now available here that makes ADR more available to UK businesses."

There are two types of Demand Response in the UK: reserve services and response services. The aim of both is to maintain the grid frequency between 49.5Hz and 50.5Hz at all times.

Reserve services rely on a control signal from National Grid asking them to reduce electricity consumption (or increase generation). Depending on the exact type of reserve service, response times are generally between five to 20 minutes after the signal and must run for up to two hours, though the time is usually around one hour.

Response services, on the other hand, react automatically to changes in the grid frequency (so do not require a signal from the Grid itself). Loads respond within a matter of seconds and deliver service for thirty minutes (though the typical service time for Demand Response loads is 2-3 minutes). This fast response is important since payments from the National Grid are related to response times, so response services can potentially generate more revenue than reserve services. Response services also generate revenue by consuming power when there is

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too much energy on the grid at any given moment. This form of revenue generation is not open to Reserve services.

Since response services require such a fast reaction, they must be based on high-quality software that is specifically designed to do the job. One example of this is Dynamic Demand, which has been developed by Open Energi, and is based on Tridium's Niagara Framework.

Monitor every half second

Holmes says: "We worked with Tridium because their Niagara Framework can handle very rapidly the large amounts of data we are tracking. We need to monitor data from equipment every half second to see when it might be called upon to reduce or increase energy use.

"That is important for potential demand response clients to understand - that their equipment will not be suddenly powered up or

down if the capacity is not there."

Subtle changes to the demand for electricity are made by automatically adjusting the timing of an appliance's electrical consumption. Users of Dynamic Demand do not have to adjust their operating procedures at all: it is a service that operates without any noticeable effect on business operation, whether that is a production facility or retail property portfolio.

Dynamic Demand can work with a wide range of devices: refrigerators; heating and ventilation systems; air conditioning units; water heaters; or industrial processes. The consumption of electricity of these types of appliances is not time-critical because as long as they operate between expected limits (e.g. temperature set points) it does not matter precisely when that energy is used.

Significantly, it is also possible to use this particular technology to respond to periods of excess electricity supply by switching loads on. Payments from National Grid are based on availability of the service, so whether the response is to an excess or a shortage does not matter in terms of revenue to the end-user.

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