



## Demand side management

Demand side management sees energy users changing their patterns of electricity usage in order to help balance supply and demand on the power system.

### Background

Preserving the stability of the power system requires that electricity demand and supply always remains in balance. Historically, this has been achieved through generating plants delivering more or less power onto the system as required.

However, owing to increasingly challenging market conditions and stringent environmental policies, a number of the UK’s thermal power stations have closed in recent years, with more set to follow. At the same time, there has been a marked increase in the installed capacity of renewable energy generation, including the likes of wind and solar power.

Current projections suggest that these renewable technologies will deliver around 24% of the UK’s overall electricity mix by 2020. But, while necessary to meet the UK’s long-term climate objectives, these sources are far more intermittent and unpredictable than the capacity that is coming offline in the same period.

This combination - the closure of reliable generation and the volatility caused by more renewables coming on stream – makes it likely that demand side management will take on greater importance in the UK energy system over the coming years.

### How demand side response is provided

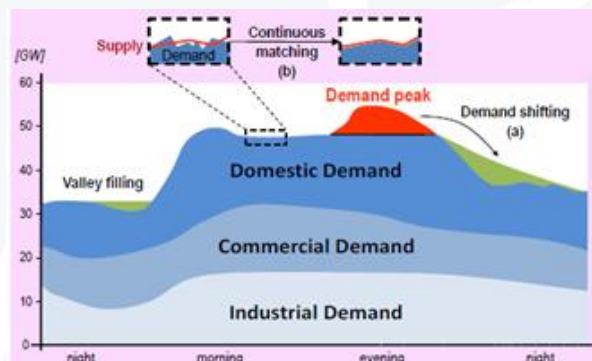
Businesses and other non-domestic electricity customers account for roughly half of peak electricity demand in Britain. This means that they offer significant scope, with changes in their behaviour, for reducing stress on the system. They can offer three different types of demand side response (DSR):

- Turn-down DSR: users temporarily reduce demand on the electricity grid by cutting their consumption.
- Turn-up DSR: users temporarily increase demand on the electricity grid by increasing their consumption.
- DSR by on-site generation: users temporarily reduce demand from the grid by using on-site generation or stored energy.

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#### Effects of DSR on typical demand profile



Source: Parliamentary Office of Science and Technology



Studies have shown that expanding the use of these approaches among businesses could lead to around a 10% reduction in electricity system costs. DSR could, it has been suggested, reduce the need for annual investment in the electricity transmission network capacity by £800mn and in peak generation capacity by £266mn.

## **Policy landscape**

A number of policy mechanisms have been implemented in recent years with the aim, at least in part, of supporting the development of DSR in Britain.

### **The capacity market**

Introduced by the coalition government through *Energy Act 2013*, the capacity market aims to ensure that Britain has sufficient reliable electricity supply from 2018 onwards. It does this by offering payments - either to power generators who are able to commit to providing electricity when it is needed, or demand-response providers who are able to reduce their usage and ease system stress.

This demand response can be either proven or unproven when it enters the capacity market auction, but it must demonstrate its operability upon winning a contract.

In the second capacity market auction, the results of which were released on 7 January, 456MW of DSR projects were successful - significantly higher than in the first auction, held in 2014.

### **National Grid**

National Grid operates a number of mechanisms in which organisations that offer DSR are able to participate. These schemes differ on account of the response time required from participants:

- In the Short Term Operating Reserve (STOR), the response must be delivered within a period between 20 minutes-four hours, and sustained for two hours.
- In Fast Reserve, the response must be delivered in two minutes and sustained for 15 minutes. National Grid procures 0.8 GW, of which DSR contributes 38% at night through automated storage heaters.
- In Frequency Response, the response must be delivered within 2-30 seconds and maintained for 10-30 minutes. National Grid typically procures 1.2 GW, with DSR contributing 8% through turn-down DSR.

### **Demand Reduction Pilot**

In February 2015, the government confirmed the winners of its first ever Energy Demand Reduction (EDR) pilot auction.

The pilot's purpose was to test whether projects that deliver lasting electricity savings at peak could, in future, compete for funding with electricity generation projects. A total of 18 organisations from across the UK secured £1.28mn in funding in return for agreement that they would, if necessary, reduce their electricity demand at peak times. Successful applicants included Network Rail, BAE Systems, Cheshire West and Chester Council and Tata Steel. The government said: "We want to see if reducing demand on the electricity grid can be a cost-effective solution that will work alongside building new power stations—guaranteeing our energy security, cutting emissions and lowering energy bills."

A second EDR auction is, as of January 2016, in its preliminary stages.

## **Incentives**

The financial incentives offered through these programmes remain the most substantial benefit to businesses of DSR. Research for the government, undertaken by Frontier Economics, said that such



payments were essential to providing businesses with the encouragement to look more closely at the potential of demand side management.

But there are other, non-financial incentives for businesses for becoming involved in demand-response schemes. They can, for example, receive a reputational boost through their improved green credentials and reduced carbon footprint.

**Aggregating DSR**

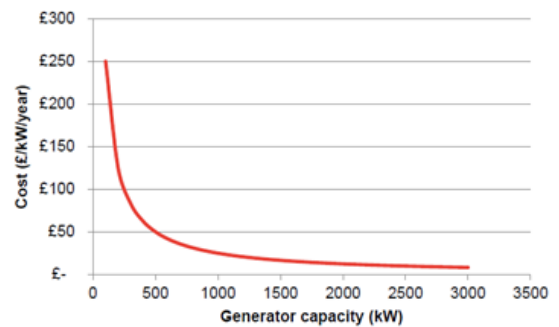
In order to meet the minimum volume requirements of the services in which they can participate, smaller DSR sites might need to be aggregated with other sites. Aggregators, like Kiwi Power, specialise in enabling participation in electricity demand side schemes. They contract with the individual demand sites (industrial, commercial or residential consumers) and aggregate them together to operate as a single DSR provider. The aggregator will then receive a percentage of the value created by the avoided consumption.

Kiwi Power’s website indicates that revenues for those involved in DSR could range from £20,000/ year for medium-sized businesses to £100,000/ year for larger businesses.

But the energy regulator Ofgem has said that achieving a meaningful amount of demand side management from domestic and small and medium enterprises (SME) customers is likely to require a high level of participation.

Furthermore, it is likely to be more expensive to set up and manage than for larger I&C customers providing an equivalent response. A recent Ofgem report concluded that it was likely that the “low hanging fruit” of I&C flexible demand would prove more attractive to aggregators in the shorter term, and DSR products for smaller customers would be relatively slow to emerge.

**Illustrative set-up costs per kW per year for diesel back-up generation**



Source: Frontier Economics

**Breakdown for a Demand Reducer**

Stage	SP covered	Capped Energy Mwh	Payment
Ramp Up	1	0.6	180
Utilisation	1	1	300
Utilisation	2	5.75	1725
Utilisation	3	5	1500
Ramp Down	3	0.5	150
Ramp Down	4	0.05	15

Source: National Grid

National Grid’s STOR offers Availability Payments (£/MW/h): that is, service providers are paid to make their unit/site available for the STOR service. The payments are offered for being able to reduce demand (an Availability Window payment) and actually reducing demand (Utilisation Payments (£/MWh)). The graph (left) is an illustrative payment graph, where each settlement period (SP) represents half an hour.

**Future developments**

Research commissioned by the government on DSR concluded that the push for the electrification of heat and transport – as part of work towards lowering the UK’s emissions in these sectors – was likely to increase overall and peak demand. At the same time, the roll out of technologies such as smart meters – which is expected to be completed in homes and businesses by the end of the decade - may increase the availability of DSR.

However, uncertainties remain about the pace of future progress on DSR, as many firms continue to perceive risks to becoming involved in offering it. For example, the Crown Commercial Service, which runs the DSR framework contract for the UK public sector, has suggested that organisations such as hospitals are sometimes unwilling to engage in demand response over perceived reliability issues.



Both Ofgem and government have recently concluded that the perception of DSR as becoming commonplace might ultimately prove important in realising its potential. As competitors gain an advantage through using DSR, others might be incentivised to become involved.

## **The role of energy efficiency**

Another key component of demand management is the deployment of energy efficiency measures that permanently reduce users' energy demand. Some of the key policies intended to improve energy efficiency within organisations are detailed below.

### **Energy Savings Opportunity Scheme (ESOS)**

ESOS is a mandatory energy assessment scheme for organisations in the UK that have over 250 staff or an annual turnover of €50mn/ year. Organisations that qualify for ESOS must carry out assessments, every four years, of the energy used by their buildings, industrial processes and transport. The objective is to identify cost-effective energy-saving measures.

An estimated 4,000 businesses—out of a total of 10,000 affected—were compliant with the Energy Saving Opportunity Scheme (ESOS) by the deadline of 5 December, according to statistics released by the Environment Agency. A quick guide on ESOS from the Monarch Partnership is available [here](#).

### **The Carbon Reduction Commitment (CRC)**

The CRC energy efficiency scheme is a mandatory programme aimed at improving energy efficiency and cutting emissions in large public- and private-sector organisations. Eligibility for the scheme is based upon electricity usage. If an organisation consumes over 6,000MWh of qualifying electricity through settled half-hourly meters.

### **Government energy efficiency review**

The government has recently opened a consultation on reforming the business energy efficiency tax landscape. The consultation proposes abolishing many of the current schemes and taxes faced by the non-domestic sector and creating a single business energy efficiency tax and a simplified reporting framework. This, the government believes, would save costs and reduce complexity. The conclusions of the consultation will be unveiled later this year.

**For more information on demand side management see:**

[Ofgem](#)

[Government](#)

[National Grid](#)

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