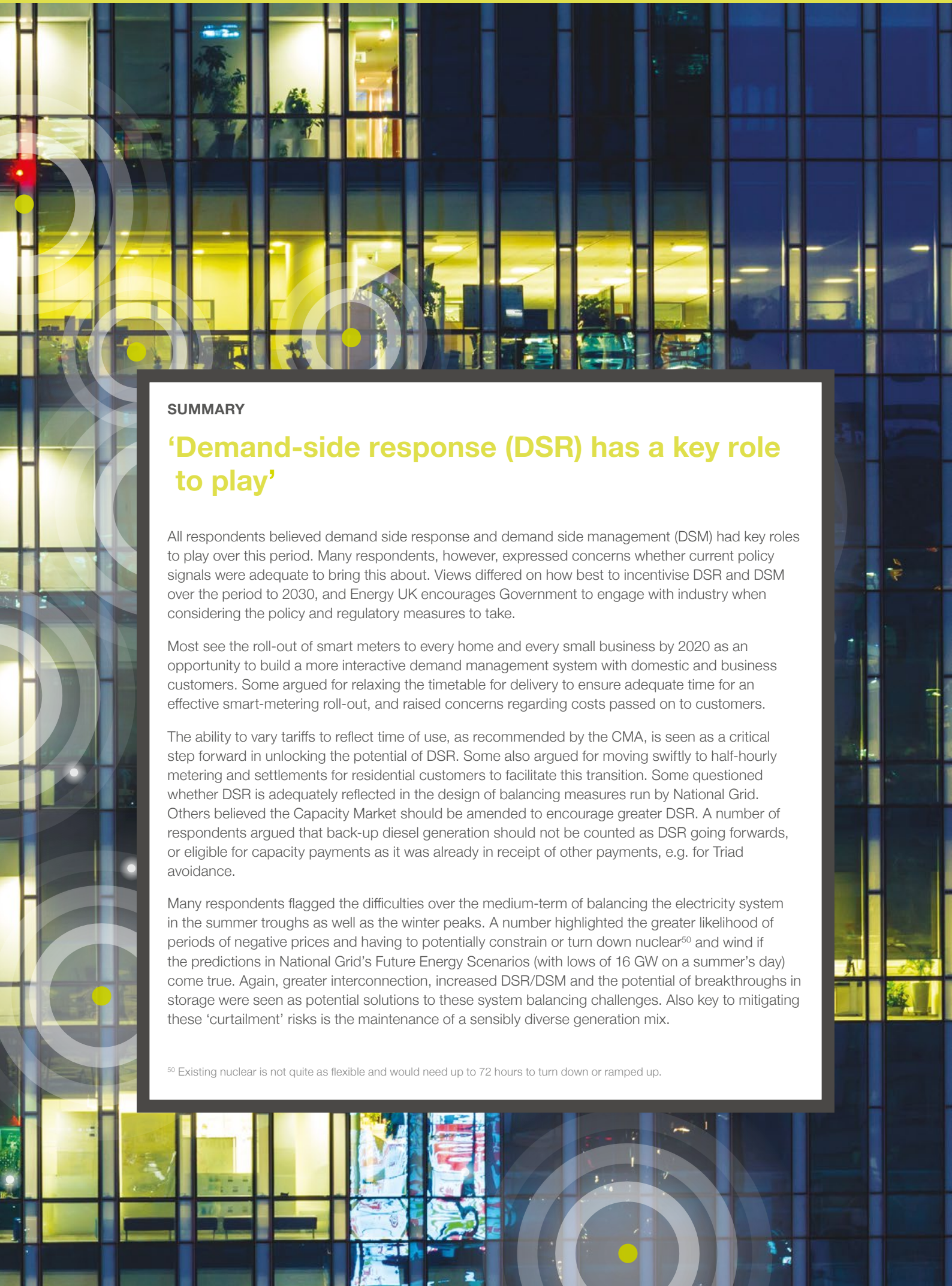
6. Demand-side response



SUMMARY

‘Demand-side response (DSR) has a key role to play’

All respondents believed demand side response and demand side management (DSM) had key roles to play over this period. Many respondents, however, expressed concerns whether current policy signals were adequate to bring this about. Views differed on how best to incentivise DSR and DSM over the period to 2030, and Energy UK encourages Government to engage with industry when considering the policy and regulatory measures to take.

Most see the roll-out of smart meters to every home and every small business by 2020 as an opportunity to build a more interactive demand management system with domestic and business customers. Some argued for relaxing the timetable for delivery to ensure adequate time for an effective smart-metering roll-out, and raised concerns regarding costs passed on to customers.

The ability to vary tariffs to reflect time of use, as recommended by the CMA, is seen as a critical step forward in unlocking the potential of DSR. Some also argued for moving swiftly to half-hourly metering and settlements for residential customers to facilitate this transition. Some questioned whether DSR is adequately reflected in the design of balancing measures run by National Grid. Others believed the Capacity Market should be amended to encourage greater DSR. A number of respondents argued that back-up diesel generation should not be counted as DSR going forwards, or eligible for capacity payments as it was already in receipt of other payments, e.g. for Triad avoidance.

Many respondents flagged the difficulties over the medium-term of balancing the electricity system in the summer troughs as well as the winter peaks. A number highlighted the greater likelihood of periods of negative prices and having to potentially constrain or turn down nuclear[50] and wind if the predictions in National Grid’s Future Energy Scenarios (with lows of 16 GW on a summer’s day) come true. Again, greater interconnection, increased DSR/DSM and the potential of breakthroughs in storage were seen as potential solutions to these system balancing challenges. Also key to mitigating these ‘curtailment’ risks is the maintenance of a sensibly diverse generation mix.

[50] Existing nuclear is not quite as flexible and would need up to 72 hours to turn down or ramped up.

6.1 Interview responses

Almost all respondents believed demand-side response (DSR) and demand-side management (DSM) would be key developments in the electricity sector[51]. Most interviewees agreed DSR is of growing importance with a key role to play over the next decade and supported the development of technology for this sector.

Some respondents were sceptical about the potential scale of DSR in the nearer term (the next five years). In the I&C sector, confidence in the potential value of DSR appeared to be growing, however several respondents believed breakthroughs in household-level DSR and any major advancement was likely around10 years away. They argued while it may prove to be a game-changing solution, there was uncertainty surrounding the policy encouraging DSR such as smart meters, time-of-use tariffs, smart grids etc. Government has since confirmed its support for the roll-out of smart meters to facilitate introduction of time-of-use-tariffs and other smart technology.

Almost all respondents believed demand-side response and demand-side management would be key developments in the electricity sector.

Comments made included the following:

"DSR will play a key role in the energy industry."

"A combination of Demand Management and Decentralised Energy is likely to have a significant impact on the generation mix to 2030 and it is important for the system to be able to successfully integrate and manage this."

"DSR will be slow in the short-term, but will be significant over the long term. Technology may change at a rapid pace similar to storage."

"DSR, DSM and smart technology will play a key role in decarbonisation. However, there needs to be a right market structure with better incentives to encourage more innovation."

[51] Demand-Side Response in this report covers a broad range of mechanisms and capabilities to manage consumer demand for energy. It is used interchangeable with Demand-Side Management.

[52] Demand net of on-site generation

[53] Thermal Green Demand Side Response: UK Market Overview and the Potential for DSR

[54] Sustainability First, Paper 13: 'realising the Resource: GB Electricity Demand Project Overview, October 2014

6.2 Analysis

Demand-side response is one of the key demand management measures available to the help balance the network. DSR addresses balancing constraints by adjusting energy consumption with the aim to mitigate over or under-supply. It does so by:

- Reducing / increasing consumption;
- Shifting consumption; and
- Optimising back-up generation or storage onsite.

By changing the profile of demand and increasing the flexibility of the demand side, DSR can assist the electricity market to adapt to the availability of (increasingly intermittent) supply and demand requirements. DSR encourages customers to undertake short-term shifting of demand, i.e. to increase as well as to decrease consumption (referred to as valley filling and peak shifting respectively), to increase export or to take excess energy from the electricity network.

Other demand-side management tools include energy efficiency and distributed energy as described in the chapters above. Energy efficiency permanently reduces the demand and includes measures such as building insulation, more efficient lighting solutions, building energy management systems (BEMS), higher efficiency boilers etc. Distributed energy refers to power generation on the system such as stand-alone distributed generation units, storage system (e.g. heat pumps, batteries), solar thermal systems etc. Energy efficiency and distributed or 'decentralised' energy are covered in separate chapters.

6.2.1 Benefits of DSR

Interview respondents flagged a number of benefits of DSR, and argued DSR could generate value for the GB system in the following ways:

- **Introduction of greater efficiency** with regard to system capacity (i.e. capacity required at times of system stress or peak demand) and guarantee adequate security of supply at potentially lower costs than thermal generation.
- **Reduction in wholesale electricity prices** by driving down the average generation costs. By reducing demand at peak periods, DSR can lead to lower peak prices which can be passed on to customers via lower energy bills.
- **Improve the investment in transmission and distribution networks:** A reduction in net-demand at peak times[52] on the transmission and distribution grid can reduce grid reinforcement costs for the network operators.
- **Potentially reduce greenhouse gas emissions** by reducing the demand for high emission peaking plants to balance the system. This is particularly important in the future in the context of the UK's move to a low-carbon economy where there system will be constrained by intermittent generation. More efficient utilisation of plant helps reduce GHG emissions and resource consumption.

Interviewees acknowledged the benefits of DSR are difficult to quantify, although some pointed towards specific papers for indicative estimates. For example:

- A report commissioned by Energy UK synthesising public data suggested that 20% of peak demand (12GW) could be successfully shifted on demand[53].
- A paper prepared by Sustainability First stated that the technical potential of demand management (capping) at system peaks is between 33% in winter and 29% in summer[54].
- Based on a study prepared by DECC in 2014 assessing the total cost reduction impact of a Smart Grid DSR could have an overall reduction potential ranging between 20%-30%[55].
- Other estimates vary, but many suggest a potential energy saving of over 10% of peak demand.
- In 2013 in the USA just the additional revenue earned by customers from DSR exceeded $2.2bn which comes in addition to the avoided infrastructure investment costs as a result of DSR[56].

6.2.2 Barriers to DSR roll-out in GB

Several interview respondents expressed concerns that insufficient action was being taken to develop the market for DSR and demand-side management in GB, and mentioned a number of barriers to the roll-out of DSR products and technology.

Table 5 below sets out a variety of ways in which DSR currently operates in the GB market. Some of the mechanisms described below are still operating on a trial basis and are yet to be fully developed.

Interview respondents flagged a number of barriers to the deployment of DSR. The key areas mentioned included

[55] Smart Grid Vision and Routemap: Smart Grid Forum: February 2014

[56] SEDC, Mapping demand response in Europe today, April 2014

concerns around market structure, the perception of DSR, economics and market and regulatory arrangements.

- **Market structure:** Until recently, the supply market has been relatively stable with the existence of predictable and manageable levels of generation; predictable fluctuations in demand through investment in flexible thermal generation; and grid re-enforcements. The distribution network is currently built with sufficient network capacity to accommodate peak flows. Consequently, there has been no need for network operators to actively manage their networks. Given the increasing penetration of renewables with distribution networks and continuing decline in industrial and larger scale demand, the system requires further investment in flexibility which DSR can provide. DSR could be one potential solution but needs the evolution of a flexibility market and commercial arrangements to encourage the engagement of suppliers, aggregators and consumers. National Grid's Power Responsive campaign; the System Operability Framework process and DNO trials are a good start. The main type of engagement at present lies in Triad Avoidance[57] and low levels of participation from in-house demand management to reduce energy costs, mainly from energy intensive users. Work still needs to be done to engage SME and domestic sectors on the benefits of DSR.
- **Perception of complication:** Traditionally only energy intensive users have had half hourly metering installed. SMEs and domestic consumers have been metered on sector averaging profiles and have little knowledge or experience. With the advent of smart meters, and the support of their supplier / aggregator, consumers will become more aware of their ability and potential value of proactively managing their demand.
- **Economic barriers:** Consumers require a financial incentive to change their patterns of electricity consumption. This requires investment of both money and effort by customers. It also exposes them to risk: if they are unable to deliver the service for which they are contracted, they will be liable for penalties. For participation to be attractive, the benefits must outweigh the costs and risks. Aggregation of DSR can help here, as aggregators can build portfolios of customers who together can reliably meet system needs, while managing risks on those customers' behalf.

Table 5: Schemes allowing DSR participation

Type	Description
STOR/STOR Runway	NG Balancing Service to increase generation or reduce demand with-in 20 to 240 minutes (depending on the type of contract).
Fast Reserve	NG Balancing Service to procure active power where delivery must start within 2 minutes of the dispatch instruction.
Fast Frequency Response	NG Balancing Service to procure generation increase or demand reduction response with-in 30 seconds. Fast Frequency Response can be employed to mitigate falling system frequency (e.g. due to loss of supply), as opposed to dynamic frequency response which is used to minimise variations in steady state frequency.
Capacity Market	Market wide mechanism for demand reduction within four hours of instruction.
Triad Avoidance	Reduction in demand during TRIAD periods, the three highest system peak demands in any year. Demand reduction at those times is strongly incentivized.
DUoS Charge Avoidance	Reduction in demand at peak time to avoid peak distribution charges for larger 'maximum demand' metered consumers.
DSR by DNOs	This avoids network reinforcement (currently at trial stage).
Demand Turn Up	NG Balancing Services to increase demand during periods of high generation and low demand (at development stage) – e.g. during periods of summer minimum demand when solar PV output is high.
Imbalance Charge Optimisation	Reduction in the exposure to imbalance charges.
Wholesale Price Optimisation	Reduction in the wholesale costs faced by the customers.

Source: Lightsource, Good Energy and Foresight Group (2015), The Decentralised Energy Transition, October 2015

[57] The triad system is the way National Grid charges businesses for the cost of the transmission network. By reducing load and increasing generation when national demand is at its highest, customers can save or earn money.

- **Regulatory arrangements:** The energy policy of the UK Government has been mainly focusing on permanent demand reduction with measures such as Green Deal and Energy Saving Opportunity Scheme (ESOS). DSR aggregators have seen an increased role in the ancillary services, as that is the only market open to it in the absence of the opportunity to participate in wholesale or balancing markets. Most demand-side response does not currently have access to wholesale and balancing market. The inability of demand-side participants to access the wholesale and balancing markets and their limited ability to access ancillary services markets (due to poor product design and procurement arrangements) has knock-on effects on the capacity market. DSR participants are not competing on the same basis as generation resources, which can access wholesale and balancing market revenues.

6.2.3 Unlocking the benefits of DSR in GB

The most consistent message from respondents regarding how to unlock the potential benefits of DSR was the importance in ensuring demand-side measures operated on a level playing field with other technologies. Some commented that comparisons of the cost effectiveness of different demand- and supply-side options should be done on a like-for-like basis.

Ultimately, however, a range of views was expressed regarding how to unlock the potential benefits of increased DSR/DSM in GB. The ability to vary tariffs to reflect time of use (ToUTs), as recommended by the CMA, was seen as a useful step forward. Some also argued for acceleration towards half-hourly metering and settlements for residential customers. Some questioned whether DSR is adequately reflected in the design of the new balancing measures run by National Grid, and others believed the capacity market should be amended to encourage greater DSR. A number of respondents believed back-up diesel generation should not be counted as DSR going forwards or eligible for capacity payments.

Given the wide range of options for incentivising/remunerating DSR, and the importance of ensuring a level playing field, Energy UK strongly encourages Government to engage with industry and consult on the potential measures it can take. Energy UK believes further work in this area is needed to arrive at the optimal policy/regulatory solutions.