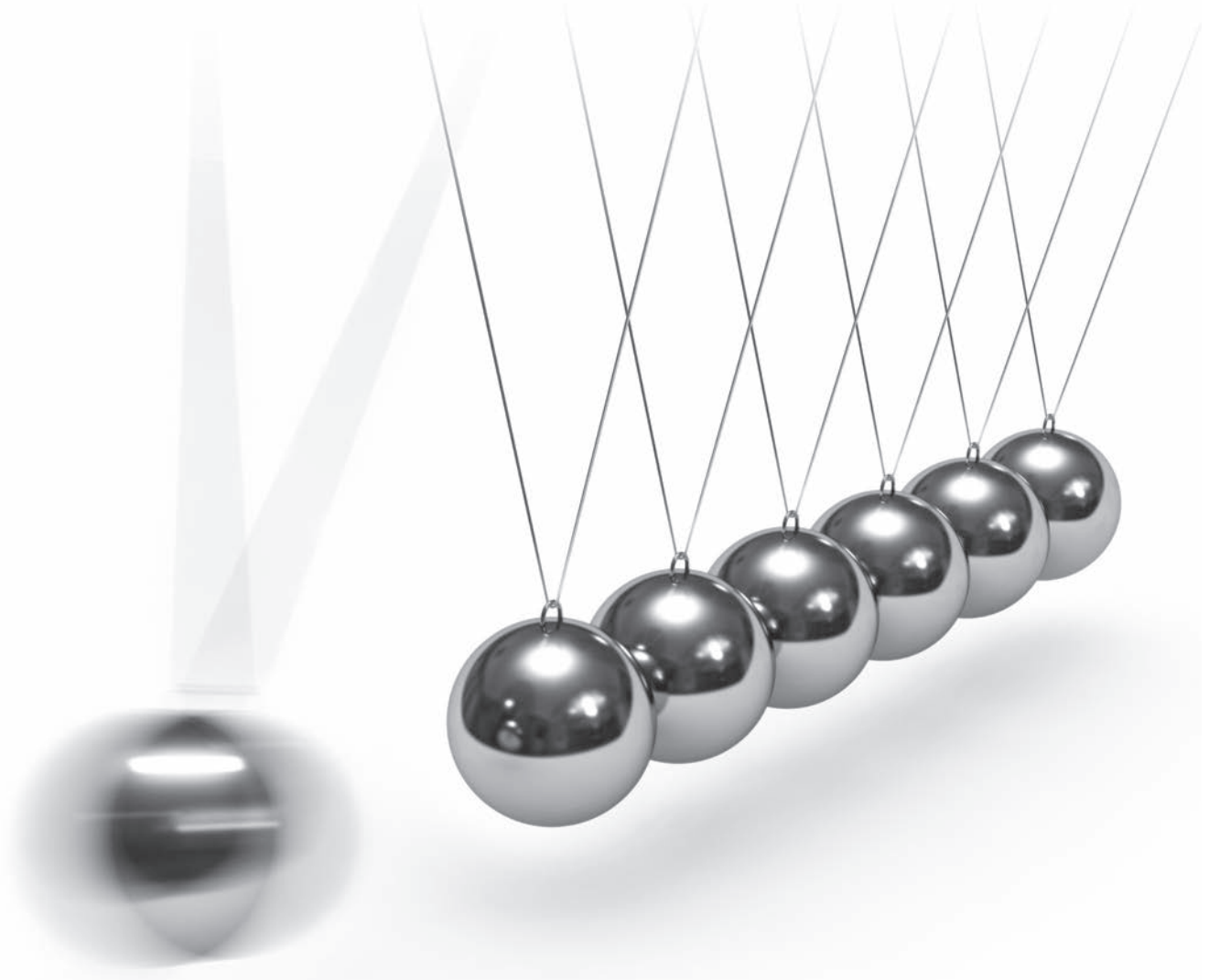
Demand Side Response

Bringing businesses into balancing

2015 Report



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Give businesses the keys to unlock inertia

By Tim McManan-Smith, editor, theenergyst

One of the ways the UK can meet energy challenges around security, affordability and decarbonisation is to use the energy we already have more efficiently. That requires businesses to become active participants in the energy system as opposed to passive consumers.

Thousands of larger organisations are already active, powering down at peak times to reduce their network costs, and some already help balance the grid by switching equipment on or off, up or down, upon request.

National Grid wants to bring more businesses into the fold. That is partially because the UK's energy mix, with increasing amounts of inflexible generation, requires more flexibility in the system in response.

That presents new opportunities for firms with the right mix of technology and business models to meet those needs.

CAN WE SCALE?

The demand side response (DSR) market is currently small, but National Grid believes significant growth – up to half of balancing services - can be achieved within the next five years. That is a large target. So what must happen to scale the market?

Readers of *The Energyst* are interested in demand side response. Surveyed for this report, eight out of ten that currently do not provide demand side response services would be interested in doing so. Most think they could shift up to 10% of load, while three out of ten think they could shift up to 25% of load without business impact. Yet the majority of businesses surveyed are not involved in demand side response programmes. Few have been contacted by energy suppliers or aggregators about it.

WHY NOT?

Why are end-users not doing something of interest to them and which yields revenue for existing assets? Aggregators admit it is a complex market with perhaps too many schemes and no real "glide path" for companies to understand the route from entry level to high level response provision. Other market participants says that the way the energy market is metered is the main barrier to scale.

The truth is, for many businesses it is just not core. Perhaps sharper price signals as a result of market developments will change that view.

However, businesses must be given the appropriate instructions in order to make the right business decisions and enter the market at lowest cost and maximum return.

JUST READ THE INSTRUCTIONS?

The current demand side response landscape is a complex patchwork of schemes, some of which appear to be picking technology winners, and some of which may conflict with others in the medium term.

Rather than trying to rewrite the instructions, perhaps policymakers and market participants should simplify the demand side response landscape and work out whether there is a better design that would give businesses confidence to become involved.

National Grid has signaled that intent with its Power Responsive approach (see page 24) and has called for businesses beyond the usual suspects to help design an appropriate framework for market scale.

BOTTOM UP

Recognising that the market must be designed to fit businesses, rather than try to make businesses fit policy, is a welcome shift from top down to bottom up market making. Building the rules and incentives around them may be the only way that demand side response will scale in time to hit National Grid's self-imposed target.

That approach also gives businesses every chance to insulate themselves against rising energy costs and have their say in shaping a market that will affect their operations. Indeed, 80% of survey respondents would or already do use the revenues gained from demand side response provision to offset energy costs or invest in energy efficiency measures, creating a halo effect in terms of UK competitiveness and decarbonisation.

As well as making their businesses more efficient and robust, businesses providing demand side response services also play a role in preventing energy bills being driven up further still. If system inertia can be harnessed, the need to pay for excessive new capacity is diminished.

Engaging UK businesses and providing a path to mass-market is no mean feat. Yet despite market challenges and hurdles, the fact that 94% of demand side response providers surveyed are satisfied with the outcome reflects positively on the existing nascent industry. If that can be replicated at scale, it would represent a successful start to the transition towards a smart energy system.

Further copies of the report are available to download from theenergyst.com

Demand side response survey: Key findings

To gauge businesses' views of demand side response, we asked subscribers to *The Energyst*'s enewsletter to take a short survey in June and July. The survey was also promoted at theenergyst.com and some responses came via that channel. In all 118 people completed the survey.

SAMPLE BIAS

Some of the findings are interesting. A third of respondents stated that they participate in demand side response programmes. Although part of *The Energyst*'s readership comprises larger energy users, that figure suggests some sample bias, which may be attributed to the fact that those who are interested or involved in a given area are more likely to be drawn to activity around it.

UNTAPPED MARKET

Other findings added weight to the view that the broader market remains untapped and potentially underserved. Of those not currently involved in demand side response programmes, roughly three quarters said they would interested in becoming providers if it did not disrupt their operations. However, the same proportion said they had not been approached by an energy supplier or aggregator regarding demand side response.

UNSUITABILITY AND UNCERTAINTY

Businesses not engaged in demand side response cited unsuitable equipment or processes as the main reason. Other inhibitors were concerns around business disruption, return on investment and ceding control to third parties. A quarter of those respondents said they did not know enough about demand side response markets to make a decision.

HALO EFFECT

The vast majority of respondents - both demand side response providers and non-providers - said that they would spend, or already do spend, revenues gained from demand side response on mitigating energy costs and funding energy efficiency measures. This suggests that scaling the demand side response market would also boost UK competitiveness as well as decarbonisation efforts.

POSITIVE EXPERIENCE

Of those that do participate in demand side response programmes, some 94% are satisfied with the outcome. If National Grid and other stakeholders are now ramping up efforts to scale the market, that statistic may prove a powerful marketing tool, potentially allaying concerns around trust and ceding control.

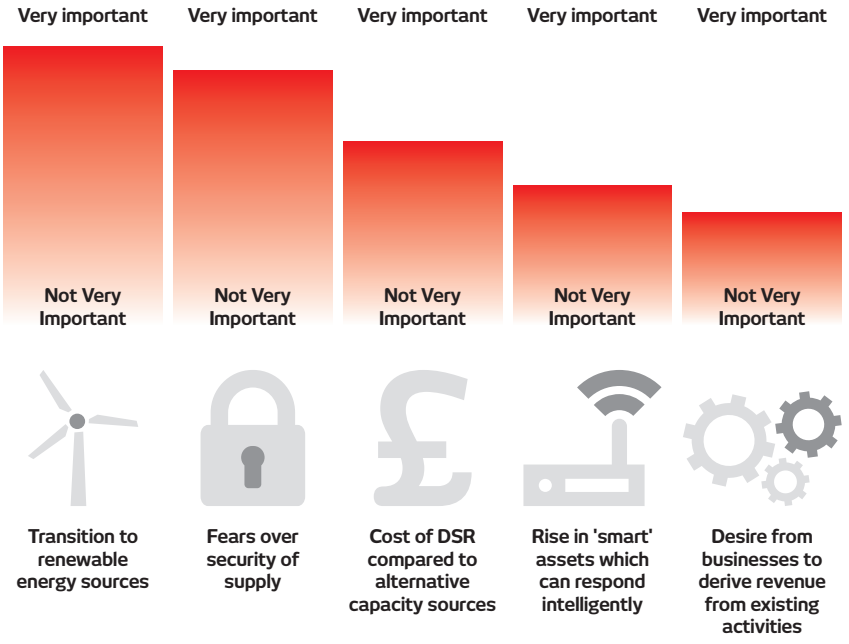
The report, completed by directors, managers and consultants working in large and small organisations across industrial, commercial and public sectors, suggested most respondents had at least heard of the main demand side response programmes. Qualitative studies would be required to work out whether respondents understood how schemes work and interact with each other.

See page 26 for survey demographics.

"Of companies that do participate in demand side response programmes, some 94% are satisfied with the outcome. For those ramping up efforts to scale the market, that statistic may prove a powerful marketing tool, potentially allaying concerns around trust and ceding control."

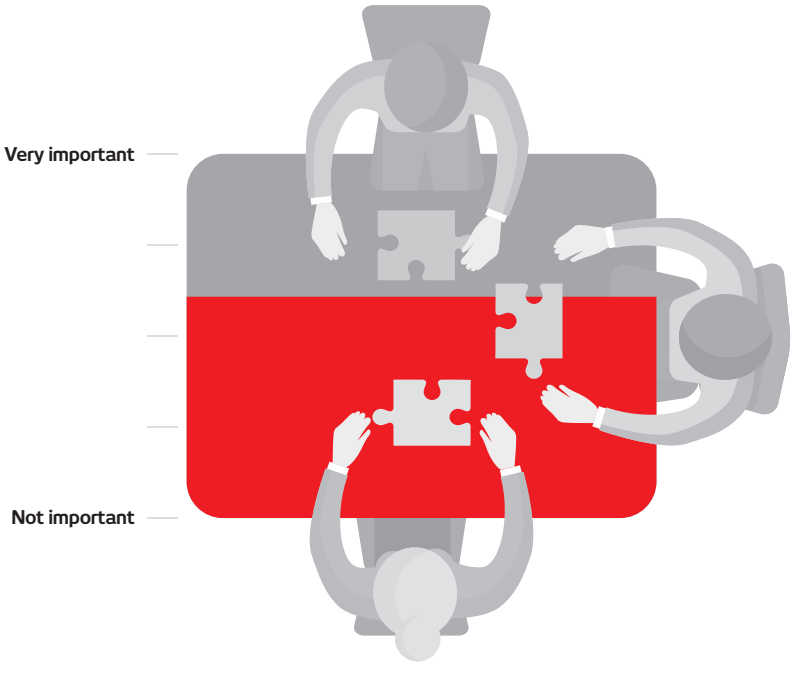
Which do you think of the following is driving future growth in DSR (demand side response)?

It appears that many firms surveyed think that intermittent and inflexible renewable generation is the key driving factor behind the need for more flexible consumption. Security of supply is related to that. The fact that end-users can realise revenue from these schemes is not considered a major driver in the development of the demand side response market. That may be because it is currently perceived as a top down rather than customer-centric market.



Where does DSR fit into your energy strategy in terms of priority?

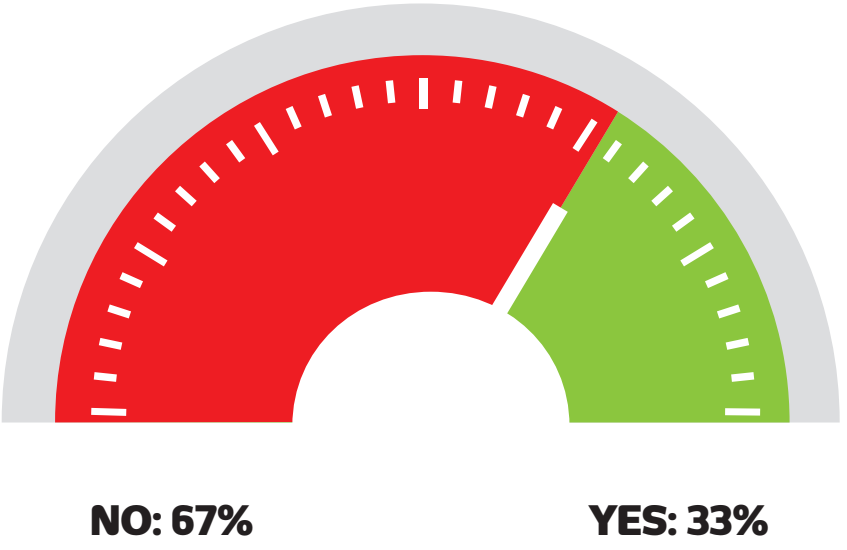
Responses to this question suggest that businesses do see demand response as having some importance, if not that much. There is probably a correlation with the proportion of respondents who do engage with demand response (roughly a third) versus the majority, which currently do not.



Does your organisation participate in DSR?

A third of survey respondents say they do currently participate in demand side response programmes. That is a high percentage compared to the proportion of UK businesses engaged in demand side response programmes. It could suggest an element of sample bias given that a survey about any topic will tend to attract those interested or active in it.

To counter that bias, we have split part of the survey data into answers from those that do, and those that do not currently participate in demand side response programmes.

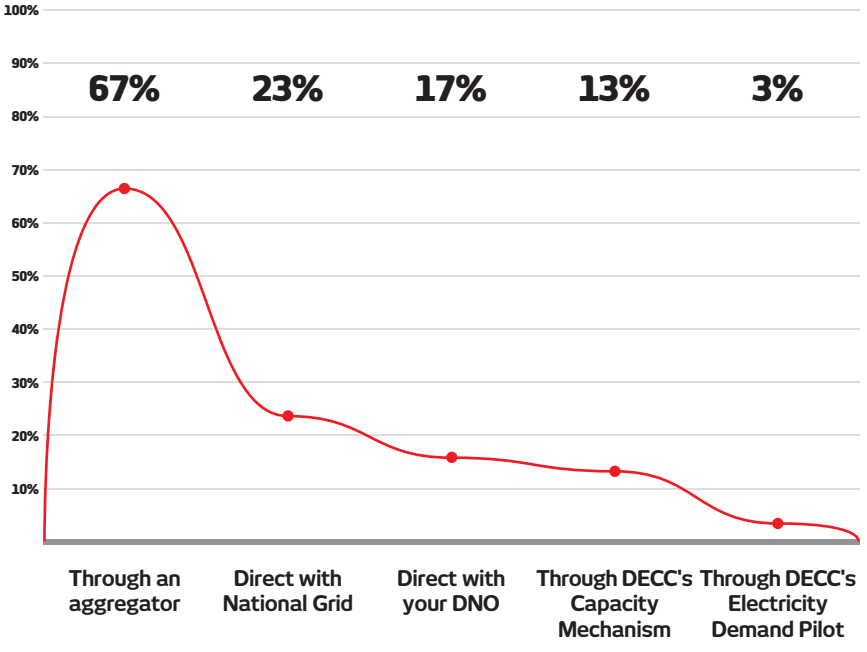


The following answers are from the respondents that do implement DSR within their organisation

How are you operating your DSR?

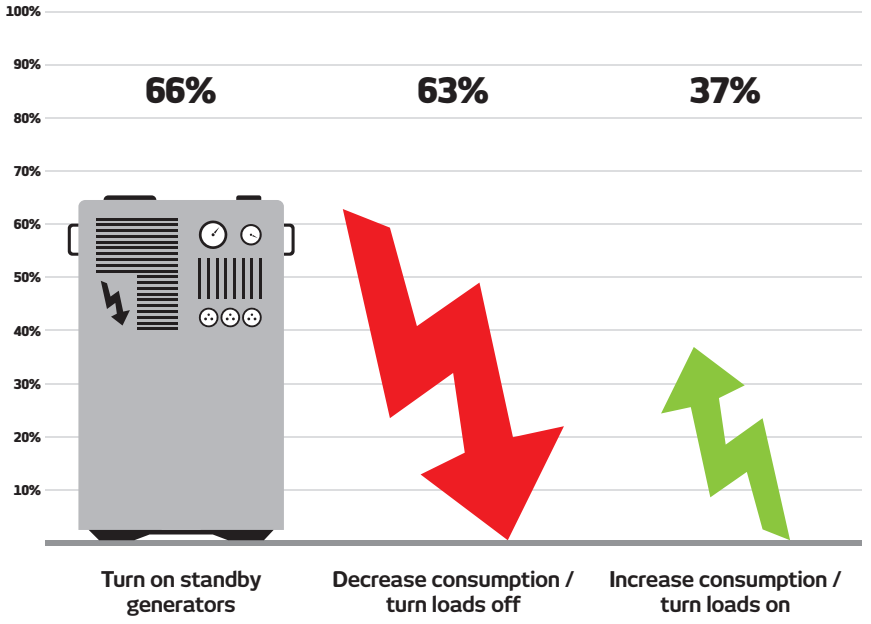
Two thirds offer their capacity through an aggregator, which reduces administration for the end-user while also allowing them to offer less capacity than by dealing directly. Aggregators tend to look for minimum 'parcels' of flexibility, for example, 100kW per site.

A further 23% of demand side response providers interact directly with National Grid, and these are likely major energy users. The minimum entry requirement for DSR programmes starts at 1MW. Roughly one in six respondents that offer DSR provision said they contract directly with their distribution network operator (DNO).



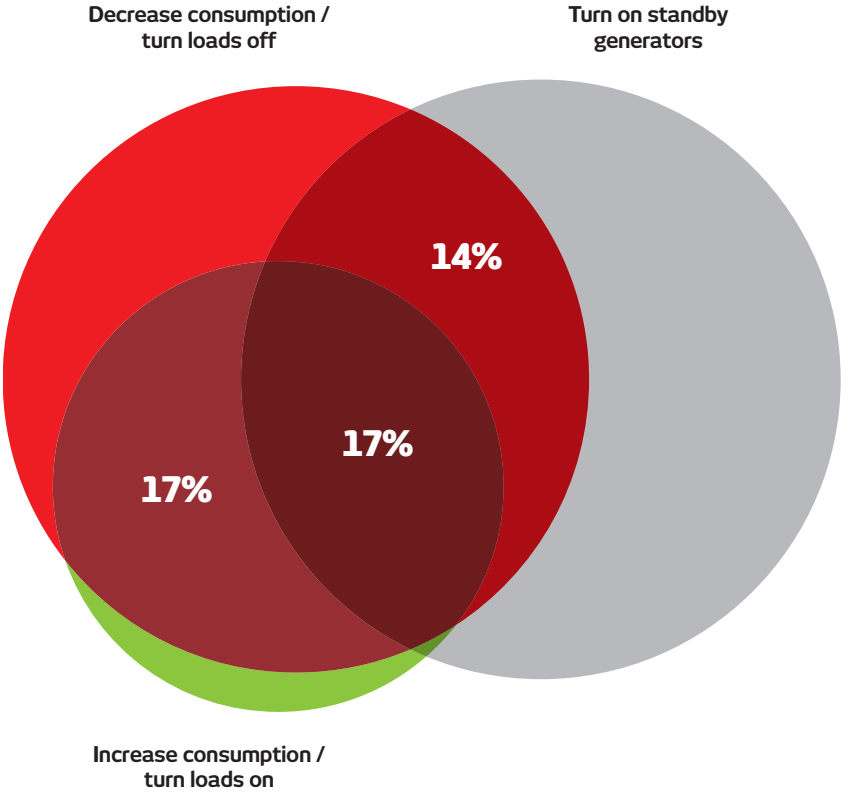
How do you participate in DSR?

Respondents use a variety of strategies to participate in demand side response. Roughly two thirds turn on standby generators which can be exported to the grid or allow the company not to draw power from the grid for the duration of the response. Roughly the same proportion turn off or decrease power consumption. Turning processes on to deal with over supply is less widely done by respondents. However, it may grow as more inflexible power is connected at both transmission and distribution level. Commercial scale energy storage development, such as batteries, could see many more firms using or exporting more power in response to market signals.



The Venn diagram shows the overlap between the three types of generic demand side response mechanisms. One in six respondents (17%) use all three mechanisms, while the same number turn loads on and turn loads off. Slightly fewer (14%) use both standby generators and turn off kit.

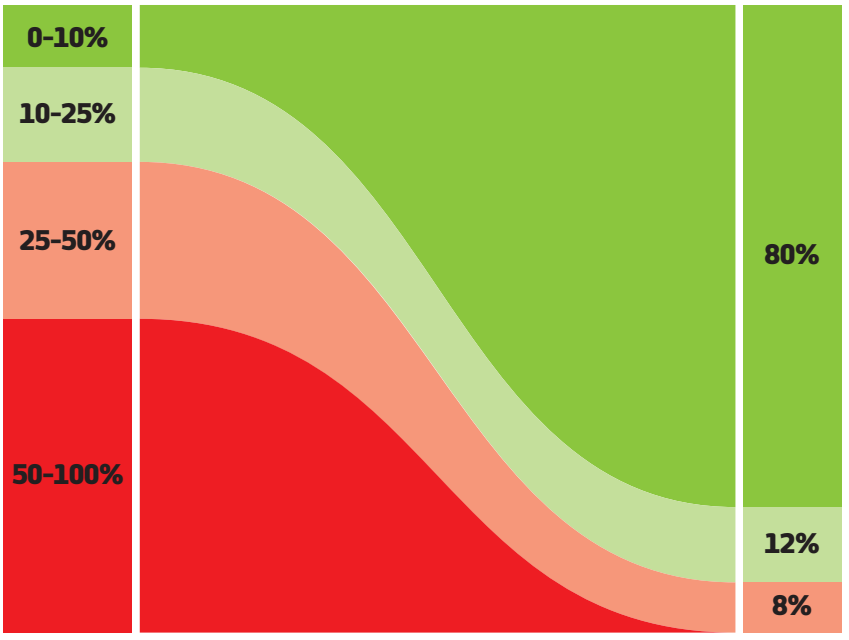
Like all energy management programmes, it shows the integrated nature of implementing demand side response, whereby a number of assets are utilised to provide capacity for the system and revenue for the end user. Some 50% use a combination of techniques.



How much of your consumption approximately do you utilise for DSR?

The vast majority make up to 10% of their typical power consumption available for demand side response purposes, trimming various non-critical processes.

Around one in eight firms can go beyond that to 25% of load, while approximately one in 12 can make between 25% and 50% of their power consumption flexible when called upon.

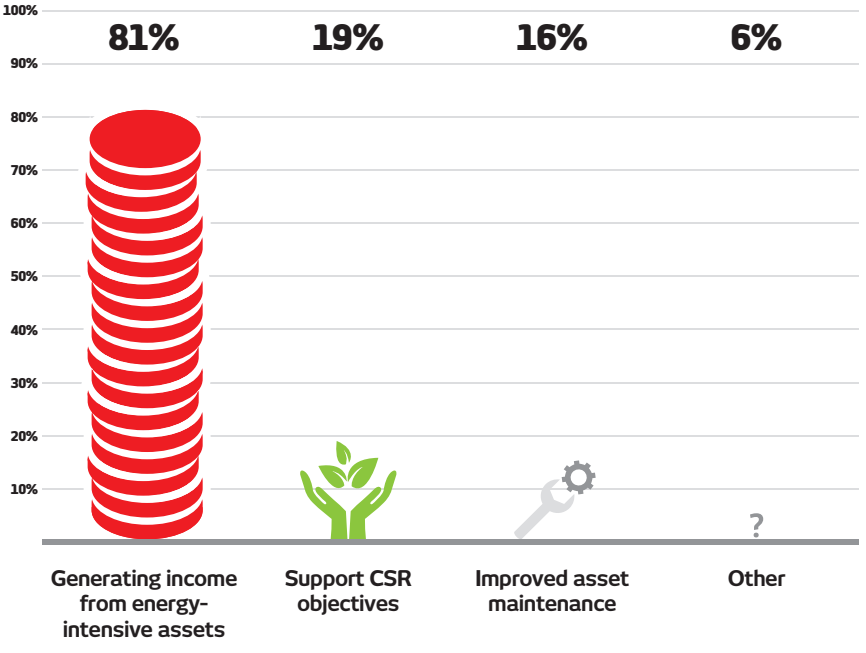


What was your main motivation for participating in DSR?

Whatever the political or systemic reasons for the current desire to scale demand side response, for businesses it is almost all about revenue. Eight out of ten firms participate in DSR to generate income from their assets.

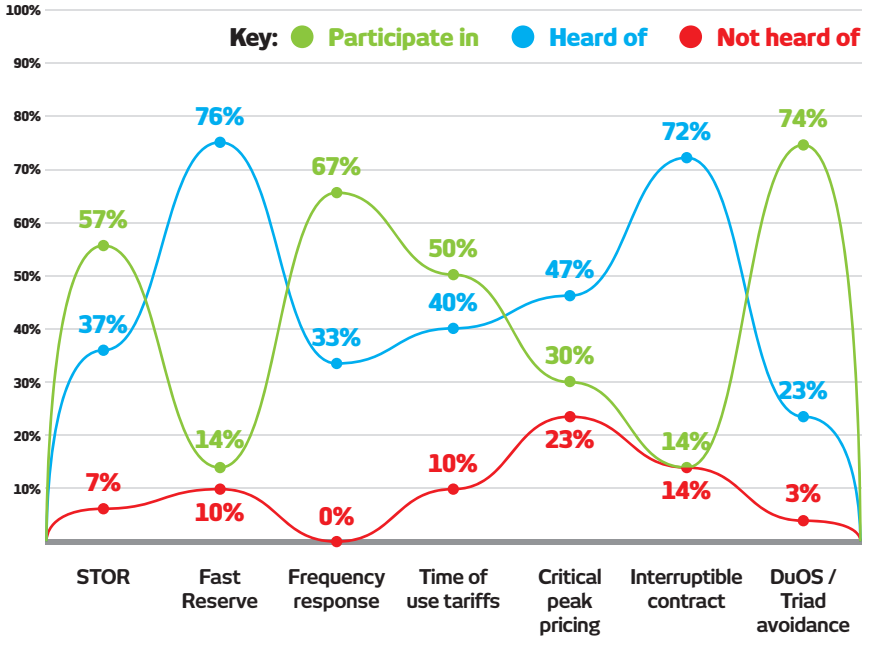
Meanwhile, around one in six think demand side response participation will extend the lives of those assets and perceive DSR provision as linked to improved maintenance.

Around a fifth see their DSR programmes as a support to their corporate social responsibility objectives as investor appetite for good corporate citizenship maintains its upward trajectory.



Which of the following DSR programmes are you utilising or have you heard of?

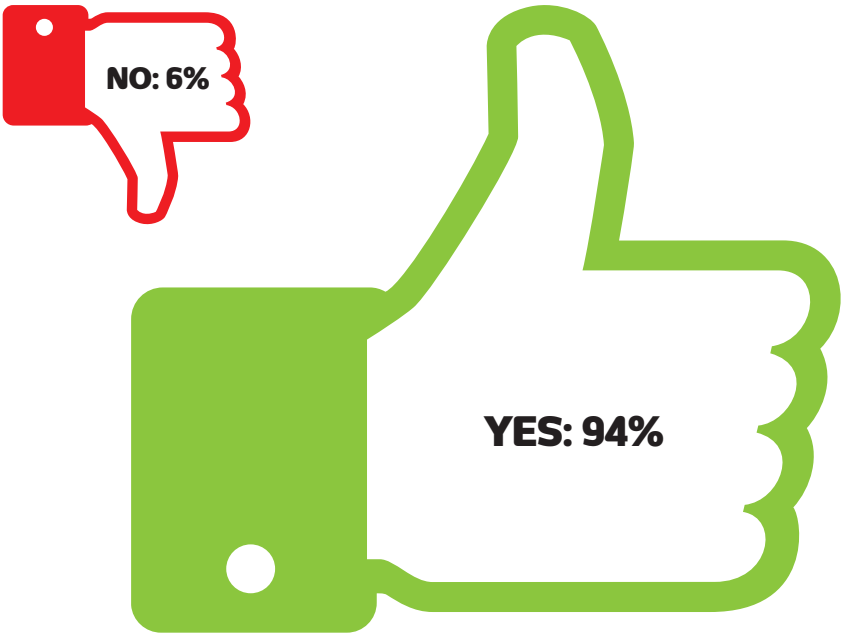
The vast majority of respondents that do provide demand side response services have heard of most of the current DSR programmes. Critical peak pricing was the only mechanism that showed any significant lack of awareness. Duos/Triad avoidance is undertaken by around three quarters of those respondents, with two thirds also providing frequency response. At least half of demand side response providers surveyed said they use time of use tariffs and engaged in the Short Term Operating Reserve (STOR) market.



Have you been satisfied with the outcome?

Of those that do participate in demand side response programmes, the overwhelming majority are satisfied with the outcome.

Given that some of the barriers to scaling the market suggested by respondents that do not participate in demand side response programmes are concerns around disruption and trust, this statistic could be one way of engaging new providers and allaying those concerns.

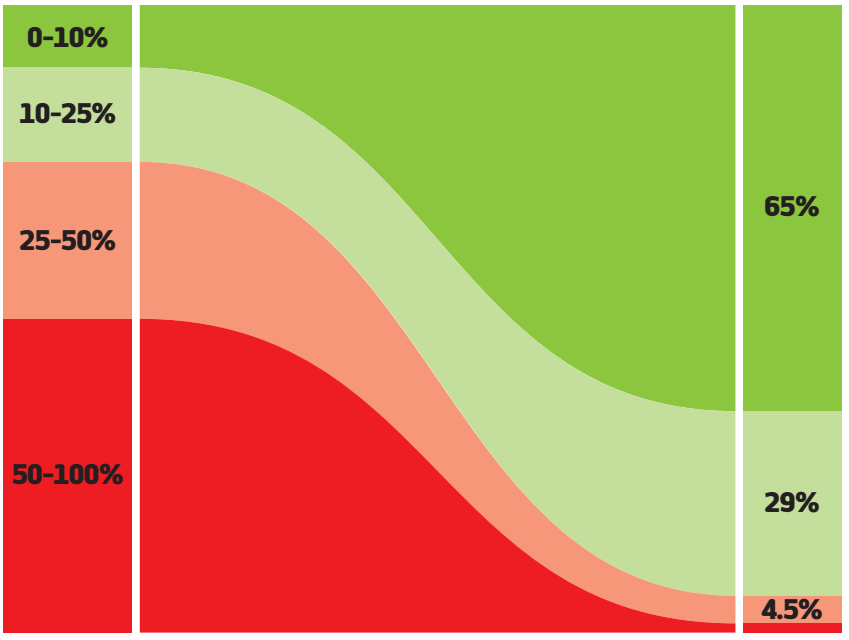


The following answers are from respondents that do do not implement DSR within their organisation

How much of your electricity demand do you perceive to be flexible without impacting your business?

These figures are reasonably similar to those respondents that do provide demand side response and the majority (65%) think they could shift up to 10% of their loads.

However, the remainder of those that do not (yet) provide demand side response services are more bullish about how flexible they could be. More than a third think they could achieve between 10% of load and 50% of load shifting.



Do you know that that DSR can involve turning equipment on as well as off?

Over three-quarters understood demand side response to be about taking as well as giving capacity, which suggests a good grasp of the fundamentals of demand side response by most respondents.

As more businesses are bought into half-hourly settlement and as reforms to the balancing regime take effect, the ability to use more power when required will become more important to system balancing as more inflexible generation is connected at both transmission and distribution levels.

NO: 24%

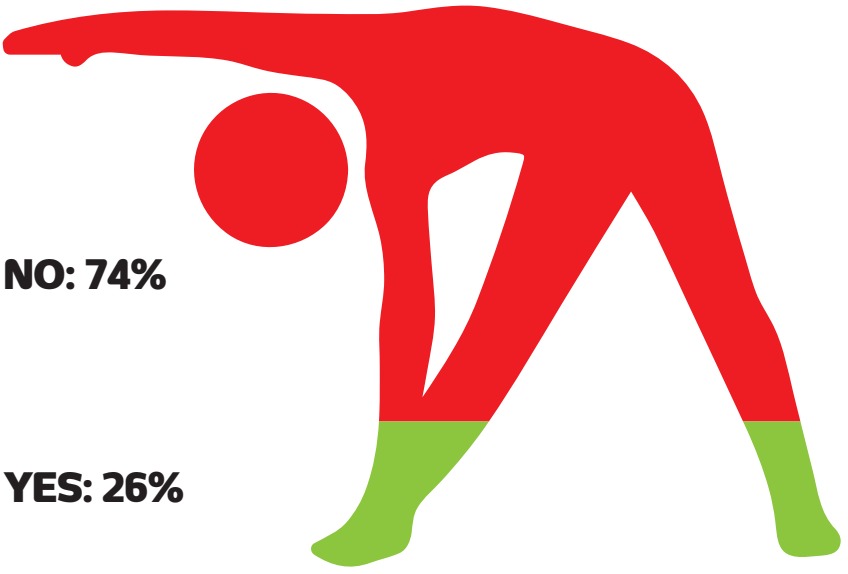
YES: 76%

Has your electricity supplier or an aggregator spoken to you about the advantages of flexibility in your energy consumption?

Three quarters of respondents have been approached neither by an aggregator nor supplier about the potential of incorporating demand side response.

There could be a number of reasons for this. Many businesses may not be considered by aggregators to have sufficient loads to be a priority. Suppliers may feel it is not their duty to tell customers how to respond to signals from the national or local power network.

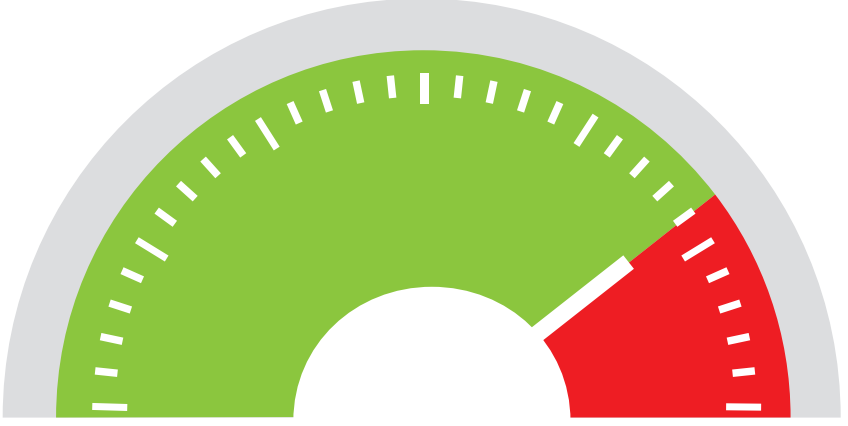
But if the UK energy system is to be made more flexible, and businesses have expressed appetite and ability to shift loads, this represents a missed opportunity.



Would you be interested in earning money through DSR if this did not affect your operation?

Eight out of ten respondents are interested in turning their assets into a revenue stream via demand side response provided it did not disrupt their business.

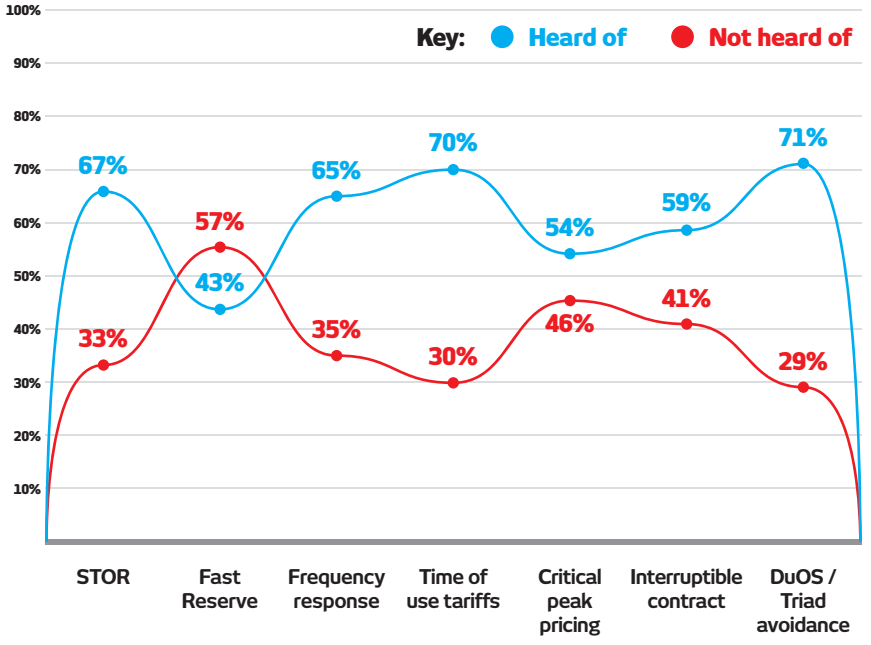
The remainder that said they would not consider demand side response cited either a lack of understanding of the various mechanisms, or because their processes are not suitable. It could be that they simply don't believe it would not adversely affect their core operations.



Which of the following DSR programmes are you utilising or have heard of?

These figures suggest a reasonable level of awareness of existing demand side response programmes, considering these responses come from those not engaged in DSR.

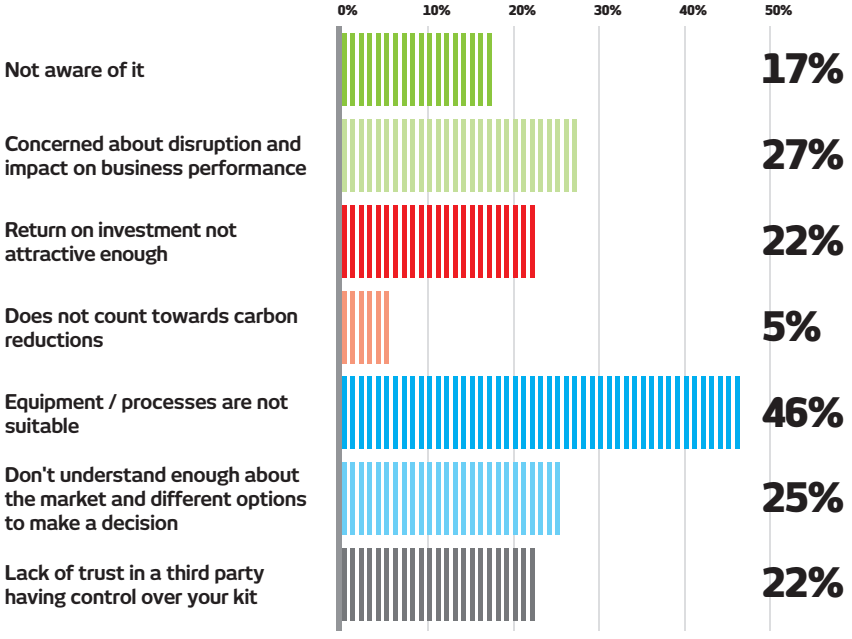
Whether respondents have an understanding of how the various schemes operate and interact is a moot point and would require qualitative analysis.



Why have you not considered DSR?

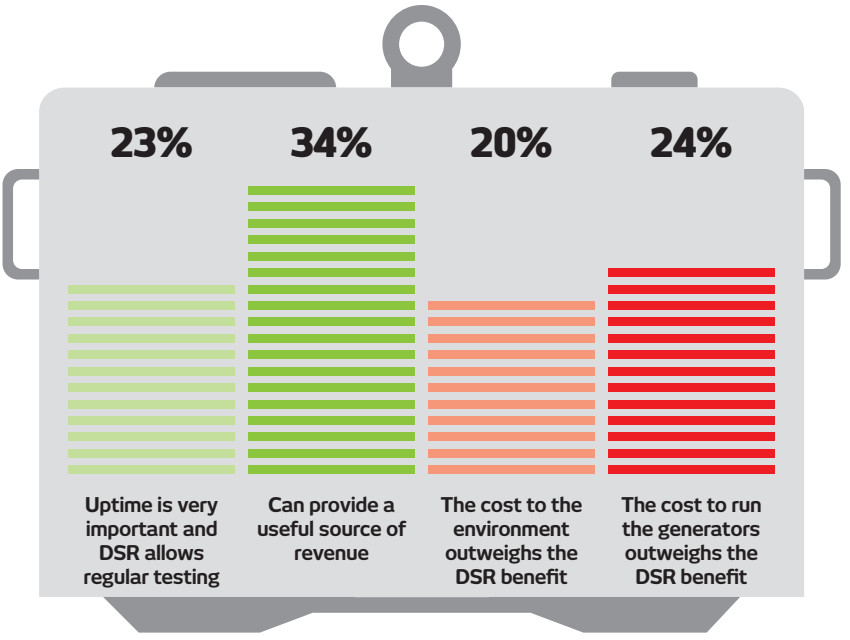
This was a multiple choice question and the standout reason for respondents so far avoiding the demand side response market is that almost half do not believe that their kit or process is suitable for DSR.

The remaining reasons appear roughly equal in weight. Fears over business disruption, a lack of detailed understanding about the market, some distrust about letting other parties control equipment and concerns that the returns do not match the effort would apply to many industries involving partnerships and an element of ceding control.



What are your thoughts on using diesel back-up generators for DSR?

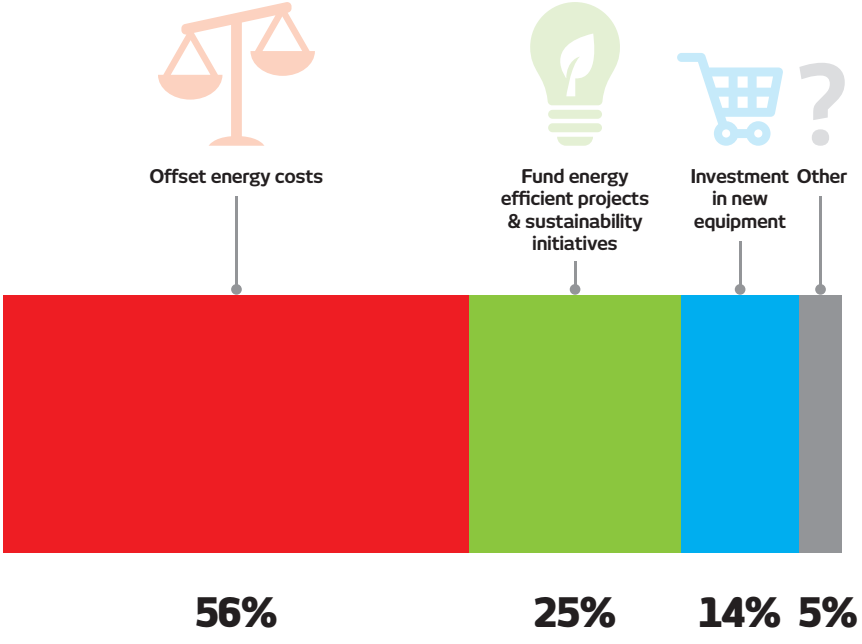
The audience is slightly in favour of using diesel generators for demand side response with a majority (57%) stating it is either a good way of testing back-up power or represents a useful source of revenue. The remainder however, think that the costs, either financial or environmental, outweigh the benefits.



How do you / would you use the revenue from DSR?

Eight out of ten respondents would – or already do - use the money made from demand side response to either offset energy bills or fund energy efficiency initiatives.

This suggests that success in scaling the demand side response market would also have a multiple halo effect. Businesses would be able to insulate themselves from higher energy costs, thereby making UK PLC more competitive. They would also help further decarbonise the economy by making themselves more energy efficient, thereby also permanently reducing demand. Reducing demand would have the added benefit of improving security of supply.



Breaking down the barriers to scale

Eight out of ten businesses surveyed by The Energyst have appetite to provide demand side response services. National Grid wants to rapidly grow the market. So what's stopping the two sides coming together and how can barriers to scale be overcome? Level the playing field, simplify the market and get as many firms as possible settled half-hourly, say TPIs, aggregators and specialist suppliers. Brendan Coyne reports

National Grid has announced major plans to increase the volume of balancing services met by demand side response providers. That is, pay businesses with sufficient flexibility within their processes to turn equipment on or off, or up and down when required, so that the UK's electricity system remains stable.

The move presents an opportunity to businesses. Today, National Grid pays power stations to respond for the vast majority of balancing services. But within five years' time, the system operator wants up to half of balancing services to come from businesses in return for payment.

Procuring 30-50% of balancing from energy users by 2020 is a major change in business model for National Grid. It is a large aspirational goal, with little time to achieve it. The System Operator must now plot a path for businesses to follow into demand side response (DSR) schemes and has called on businesses to help create the roadmap.

TOO MUCH CONFUSION

The ability to help shape the future of demand side response is good news for UK firms, says Chris Kimmett, commercial manager at Open Energi. The company is one of a number of aggregators working with businesses to package-up demand side response services to National Grid.

One of the barriers to scale, says Kimmett, is confusion in the market due to a plethora of demand side response schemes that make it complex for even the most sophisticated businesses to navigate.

"The products and services are very Grid-centric at the moment. I struggle to get my head around them and I know the big industrial companies struggle too," he says. "I can't imagine the difficulties that smaller companies face."

Current demand side response mechanisms include Fast Frequency Response, Bridging Frequency Response, Short Term Operating Reserve (STOR), STOR Runway, Demand Side Balancing Reserve and the Capacity Market. Separately, the department of energy and climate change (Decc) is running the Electricity Demand Reduction Pilot Scheme.

CLEARER GUIDANCE

Kimmett thinks providing clarity and guidance around which programmes are suitable for which businesses and explaining succinctly and simply how each works would be a useful start.

"There are an awful lot of schemes out there. The language used around them is not easy to understand. There is no clear guidance to say: this

> *"There are an awful lot of schemes out there. The language used around them is not easy to understand. There is no clear guidance."*

is exactly what National Grid buys; this is why; this is the price it is willing to pay; and here are the assets that are suitable for these markets," says Kimmett.

"Very little central guidance comes out from National Grid on that. But I think it would deliver a quick win."

National Grid should take the role of "champion, policy broker and neutral party that sits in the middle", says Kimmett.

"Setting out targets is a good thing. What we need now is a very clear guide path through those markets, from toe-dipping all the way up to very high value services."

CLEARER POLICY

But Tim Rotheray, head of the Association for Decentralised Energy, which recently merged with the UK Demand Response Association, thinks simplifying the market rather than the instruction manual might be a better approach.

"There is a need for education, but that is possibly the wrong way to go about things," says Rotheray.

"Instead of explaining a complex raft of mechanisms, flip it on its head. Let's understand what the market can provide and then design the simplest, most effective way for those services to be brought forward in a cost-effective manner."

"The work by National Grid, Ofgem and Decc must come together," Rotheray continues. "That is definitely not the way policy is presented to the user at the moment. They face a barrage of options."

Around 80% of readers surveyed by *The Energyst* for this report – across

The ADE's Tim Rotheray

the public sector, large corporates and SMEs - said they were interested in demand side response participation. Asked whether their energy supplier or an aggregator had contacted them about demand side response, the same percentage replied they had not.

That supports the view that policy is the problem, Rotheray suggests.

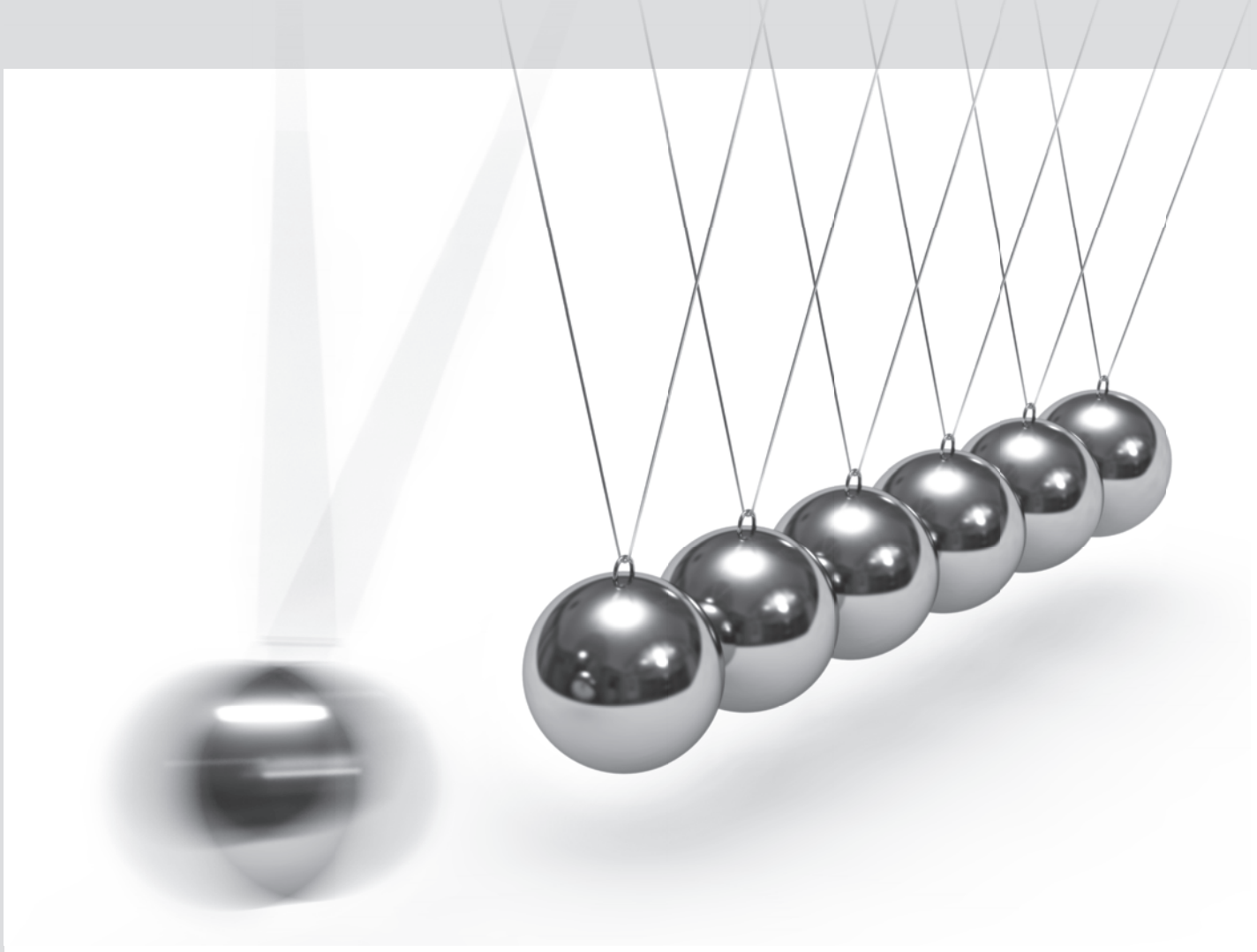
"You have to ask why that is. I very strongly suspect that is because [suppliers and TPIs] do not think the design is sufficiently right or attractive to roll out to their customers."

Barriers to scaling demand side response in 10 seconds

What are the barriers that must be removed to scale DSR? According to Tempus Energy CEO Sara Bell: "Half hourly settlement, smaller parcel sizes from National Grid and a level playing field. No policy maker should be making technology choices. That doesn't make sense and they aren't qualified to do so. Let the market compete on an even footing and they will see what happens is security of supply at lowest cost to customers."

Design the policies around businesses, says Association for Decentralised Energy CEO Tim Rotheray: "Understand what the market can provide and then design the simplest, most effective way for those services to be brought forward in a cost-effective manner."

Provide price certainty, says Open Energi's Chris Kimmett: "A two-year certainty on price - and it doesn't necessarily need to be a hugely high price - would do a lot to drive growth in the industry."



Open Energi's Chris Kimmett

Frequency Response payback

Businesses signing up to provide Frequency Response services typically achieve around a two year payback on equipment, according to Open Energi's Chris Kimmett. Other aggregators have their own thresholds but Kimmett says the firm looks for at least 100kW of response at each site.

CLEARER PRICES

Open Energi's Kimmett thinks that one of the missing policy ingredients is certainty. He thinks many business would favour price certainty over substantial returns.

"A two-year certainty on price - and it doesn't necessarily need to be a hugely high price - would be a starting point and do a lot to drive growth in the industry," he says.

"We should always be able to come in way, way cheaper than building any new generation and we should come in cheaper than the marginal cost of operating a generator. We should be cheaper than burning coal and gas," says Kimmett. "It is not a case of needing a very high price, but being able to build in certainty for long enough to get some payback on your assets."

CHANGE THE CAPACITY MARKET

The capacity market is an area that many demand side response providers feel is a missed opportunity.

One of the levers of the government's intervention in the electricity market, the capacity market was originally intended to help keep the lights on at lowest cost. It was designed to incentivise investment in new generating plant and reward companies that could provide guaranteed capacity and demand side response services. The policy was also implemented to help make the economic case for plant operating around intermittent renewable generation.

The first auction, held in December 2014 for the winter of 2018/19, largely rewarded existing gas, coal and biomass plant, with up to 15 year contracts. Demand side response providers represented 0.35% of the total 49.26GW procured, and were offered only one year contracts.

Demand-side response providers think that the current market framework requires a rethink.

"The capacity market is very generation-centric," says Kimmett. "The requirements are designed for generators. Meeting those requirements is relatively easy for

> *"I would argue it is not necessarily of benefit for Decc or Ofgem to see every single wiring diagram of every single fan to which we are connected."*

Half hourly metering matters

Only businesses that pay for their electricity on a half hourly basis can mitigate their network charges through various mechanisms. Most of those mechanisms are based around reducing electricity usage at peak times. Currently, only around 100,000 organisations are metered and settled half hourly. To scale the demand side response market, and to enable more businesses to try to avoid rising network charges, more businesses will need to be settled half hourly.


John Ferris, Utilitywise

generators. But when you translate the rules to the demand-side, some requirements are very onerous."

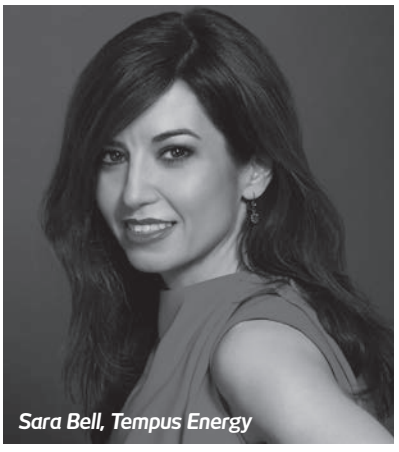
Kimmett says they are onerous both in regard to the rigidity of necessary commitments and from a prequalifying perspective. That makes it very difficult for businesses to participate in the market, which in turn represents a significant barrier to scaling demand side response. He cites the following example:

"You need to provide a line diagram of every single load that is connected to the service. For a power station that makes sense - you have one easily accessible line diagram and that's great," says Kimmett. "But our service goes down to individual fans in a supermarket. I would argue it is not necessarily of benefit for Decc or Ofgem to see every single wire diagram of every single fan to which we are connected. It should be about proving the service rather than proving every single component within the service. There is still a generation mindset."

"Instead of explaining a complex raft of mechanisms, let's understand what the market can provide and then design the simplest, most effective way for those services to be brought forward."

CHALLENGE GENERATION MINDSET

Sara Bell, CEO of Tempus Energy, agrees on the need to change the generation mindset.


Sara Bell, Tempus Energy

Bell has lodged a formal complaint about the design of the capacity market with the European Commission. She is satisfied that the market design contravenes competition law. Her complaint is that generators can bid for up to 15 year contracts, but demand-side businesses can only bid for one year contracts. That is anti-competitive, she argues, and represents a barrier to market scale. As such Bell is "extremely confident" of winning the case.

GO SMALLER TO SCALE

Another barrier to scale, says Bell, is the minimum market entry requirement. Currently the lowest threshold of any programme is 1MW. Bell points out that in the US market, the minimum requirement is 100kW.

"If [National Grid] wants to grow demand side response and flexibility, it needs to reduce its parcel sizes," says Bell. "At the moment you have to be very large to play."

HALF-HOURLY SETTLEMENT

The biggest barrier to market, says Bell, is half-hourly settlement.

"At the moment, only half-hourly settled businesses can reduce their network charges by changing their consumption," Bell continues. "While you are profile settled, you can't do that."

Only around 100,000 businesses are settled half-hourly. Most business accounts are settled according to their profile rather than their actual half-hourly consumption. Ofgem is attempting to move another 160,000 businesses to half-hourly settlement, although the timetable has slipped.

Bell says that is a missed opportunity. She suggests a reason for the delay is because big energy companies do not want to take on the risk of having to match supply with actual demand on a half-hourly basis. She says that's because they would incur financial penalties for getting it wrong, also known as imbalance risk.

"Half-hourly settlement is the most important thing. As soon as you do half hourly settlement you unlock the market," she says.

CONFLICTING POLICIES AND VOLATILE PRICES

John Ferris, head of energy markets at Utilitywise, welcomes National Grid's large demand side response target. He also welcomes its intention to open up the process of designing future schemes to market participants beyond "the usual suspect".

Ferris agrees balancing and settlement is a key issue, alongside the way the market rewards flexibility. But he says changes to those elements will emerge from Ofgem's Balancing and Settlement Significant Code Review.

Those changes should ultimately create more volatile electricity prices - which will lead to a greater number of businesses becoming more fully must exposed to market volatility. That means they will have to act, or pay more for their energy. That should encourage greater participation

"There are multiple schemes that conflict with each other and it is hard to see which ones are going to win out at the moment."

Will distribution networks manage local demand side response?

Another question around demand side response is whether local or national actors would be best placed to manage it, given the amount of generation and other activity now taking place at distribution level.

Some of the businesses surveyed for this report already contract directly with their local distribution network operator (DNO) for demand side services.

But as more distributed generation connects to the power system, so the potential for conflict at a national versus local level increases, says Smart Grid Consultancy director Gary Swandells. He says a national system operator, for example, could be telling a wind farm to turn off, while a local grid might be trying to turn distributed generation back up again.

Building a decentralised power system would require a "fundamental change" to the market and would make electricity market review policies become apparent as the "bolt on" measures Swandells believes they are.

It would take years to work through, he admits, but putting local networks in control would potentially bring a far greater range of participants into the market and unlock more of the available inertia.

Might proposing sweeping changes stun businesses considering demand side response into inaction? No, says Swandells. Most businesses currently contract through an aggregator and may continue to do so whether their response provision serves a regional or national purpose, he says. Meanwhile, distribution networks becoming local system operators will need aggregators' services and technology, whether by acquiring them or in partnership with them, says Swandells.

> *"It will shift from the minority being involved to the majority. If it is a market structure change, you become part of that market whether voluntarily or involuntarily. If you remain a dumb consumer, you will forego a significant opportunity to either mitigate cost or generate revenue."*

Swandells, who helped commercialise the UK's first aggregator, Flexitricity, thinks distribution networks could ultimately manage the bulk of grid balancing. He is currently involved with Scottish Power Energy Networks' bid for Ofgem innovation funding to test what he claims will be "Europe's first distribution system operator", otherwise known as a DSO. Should Project Evolution win funding, Swandells says it will "sweep aside" existing market rules to see how distribution networks could act as a local system operator.

He thinks that in the future, National Grid will make "objective requests to DSOs and the DSO will then decide what to turn on or off, turn up or turn down on the system" as local active components will require local control. National Grid does not have access to the granular level of information needed to manage the volumes of active customers that will find themselves priced out of being 'dumb' consumers of power, Swandells believes.

"Aggregators understand that the world doesn't stand still," he adds.

Whoever ends up managing demand side response, Swandells believes market forces will drive scale, and that National Grid's Power Responsive announcement is an accelerant.

"It will shift from the minority [of businesses] being involved to the majority. If it is a market structure change, you become part of that market whether voluntarily or involuntarily.

"If you remain a dumb consumer," warns Swandells, "you will forego a significant opportunity to either mitigate cost or generate revenue."

in peak avoidance and, eventually, demand side response schemes.

But Ferris thinks the market response to those rule changes will initially be a permanent reduction in demand, rather than a flexible market.

He also predicts challenges will arise from conflicting policies.

"The first thing businesses will do is shift consumption out of most expensive times. [Only then will] they look for flexibility to benefit from spikes in prices," says Ferris. "I think the market for the next two to three years is probably too immature to go much beyond permanent shifts in consumption."

However, Ferris warns that the market for demand side response may start to mature at precisely the time the capacity market kicks in.

"The question I have is, if that happens in 2018/19, how much does the capacity market coming in dampen the volatility in short term prices? There are multiple schemes that conflict with each other and it is hard to see which ones are going to win out at the moment."

That could prove problematic and policymakers will need to think carefully about resolving conflicts to avoid creating another barrier to market scale.

But the good news is that there is appetite for change.

National Grid has set out a challenging target and is attempting to drive change by opening the market design up to UK businesses. Some 80% of firms surveyed for this report said they would be interested in earning revenue from demand side response if it did not affect their operation. That is a strong synergy.

The timeframe is not long in energy market terms. But the potential prize is a smarter, more resilient grid and the opportunity for businesses to make money from existing assets. Given that businesses will bear the brunt of the cost of decarbonisation, it's an opportunity not to be missed.

> *"Half hourly settlement is the most important thing. As soon as you do half hourly settlement you unlock the market."*

Re-energising the electricity system – the story of DSR today

Demand Side Response (DSR) is set to play a powerful role in regenerating the electricity system in the UK. It may be a market that's taking its first steps, but as Duncan Burt, Head of Commercial Operations, explains, there are already a number of mechanisms and incentives in place to encourage businesses to be a part in this unfolding story

Winds of change are swirling around the electricity landscape. As large power stations close and more renewables come on line, we face fresh challenges in balancing supply and demand in the electricity system. It's a new picture that requires new thinking.

Supply is only half the equation when we look at building a secure, affordable and sustainable energy system for the future. We also need to think about using energy more efficiently and reassess our response to managing electricity demand. This is where Demand Side Response (DSR) comes in.

WHAT IS DSR?

DSR is all about intelligent energy use. By 'demand side', we mean services that give businesses and consumers the flexibility to turn up, turn down or shift demand in real time.

DSR gives customers the opportunity to change the way they consume energy in response to real-time signals. By delivering these signals, we want customers to ask themselves whether they really want to use this much electricity, from this source, at this cost, right now. And we give them the means and motivation to make adjustments.

These actions could be undertaken by households, industrial and commercial customers, or distributed generators, and could be achieved, for example, by reducing the use of lights; appliances; heating, ventilation and air-conditioning; back-up or distributed generation; pumps, motors and compressors; and other manufacturing processes.

INDUSTRIAL REVOLUTION

Household customers actually only use a third of total annual electricity by volume. It's industrial and commercial customers that consume the remaining two thirds, so our focus at this stage is firmly fixed on them.

By giving these industrial users more flexibility in how and when they use electricity, it can help us soften peaks in demand and fill in the troughs, especially at times when power is more abundant, affordable and clean.

While the value to the system is clear, business and industry stakeholders have told us they're less clear about where the value lies for them in DSR.

SO WHAT ARE THE BENEFITS?

Businesses profit in two ways from participating in DSR. Firstly, you're actively paid to reduce your demand, which gives you a smart way to save on your total energy costs. Secondly, it can help reduce your carbon footprint.

While the primary business case for most companies will be the financial one, there's also an important CSR (Corporate Social Responsibility) element here too, as it reduces the need for carbon-hungry additional generation to meet demand.

Although still in its infancy, DSR is very much a reality. Several mechanisms and incentives are already in place for major energy users to be a part of this unfolding, pioneering story.

We understand that every business differs in what it can provide to National Grid in terms of demand capacity and responsiveness. But most large industrial businesses can potentially benefit. Here are a few of the ways you can contribute to DSR today:

SHORT TERM OPERATING RESERVE

Also known as STOR, this is a service to provide additional power from generation or demand reduction. STOR is needed because at certain times of the day National Grid needs power in reserve to deal with demand being greater than forecast – or a shortage of generation caused by a plant being out of action. A STOR provider must be able to offer a minimum of 3MW of generation or steady demand reduction, deliver full MW within 240 minutes or less from receiving instructions from us and provide full MW for at least two hours when instructed. For Demand Side Providers looking for investment support to grow new volume, STOR Runway is a new route into the STOR market.

FREQUENCY RESPONSE

We use balancing services called frequency response to ensure sufficient generation and demand is always available. It kicks into action automatically – and in a matter of seconds – when response is rapidly required. National Grid uses various balancing services to control system frequency. Aside from the Mandatory Frequency Response (MFR) required from transmission-connected generators, there are commercial services available to both supply and demand-side providers. These are Firm Frequency Response (FFR) and Frequency Control by Demand Management (FCDM). Both services provide a route to market for demand-side providers; for FFR specifically, a FFR Bridging contract option is available for providers looking to grow to scale over a given period.

DEMAND SIDE BALANCING RESERVE

Demand Side Balancing Reserve (DSBR) is a new opportunity for large industrial and commercial electricity consumers to earn money by offering to reduce/shift demand during periods of high system demand during winter periods if instructed to do so by National Grid.

Following a pilot in Winter 2014/15, 2 tender events have resulted in the procurement of 488MW for 2015/16. A consultation is being run currently to consider the extension of the service by a further 2 years as well as a number of commercial enhancements.

Some of the UK's biggest energy consumers are already supporting plans to boost the use of demand side measures. Among those who've adopted DSBR and STOR are a numer of businesses in the water industry. They've told us that DSR schemes are an excellent fit for the wastewater treatment industry, as electricity is the second highest cost for their businesses.

Prices are tighly regulated in the water industry, which means utility firms can't pass the cost of rising electricity prices on to customers. This means they have to use power in a smarter way, and DSR gives them the flexibility to do so.

ANGLIAN WATER

Anglian Water was one of 12 companies that took part in our DSBR pilot over the winter. Although the DSBR was never used, we were able to thoroughly test how the system would work.

By calling upon back-up generators at 80 of their operational sites, the company can easily switch its demand should it get the DSBR call.

London Underground is another major energy user that is jumping on board. The Tube is the biggest power consumer in London, and also has the largest private power network in the country. So they're well placed to reduce demand.

Through DSBR, London Underground is able to offer 55MW of demand reduction by making use of its stand-alone emergency back-up supply at the Greenwich Power Station. They can quickly respond by switching to Greenwich's five gas turbines for the length of time required.

Taking advantage of Demand Side Response has been positive for the business as it's enabled them to make use of an existing asset and create additional revenue.

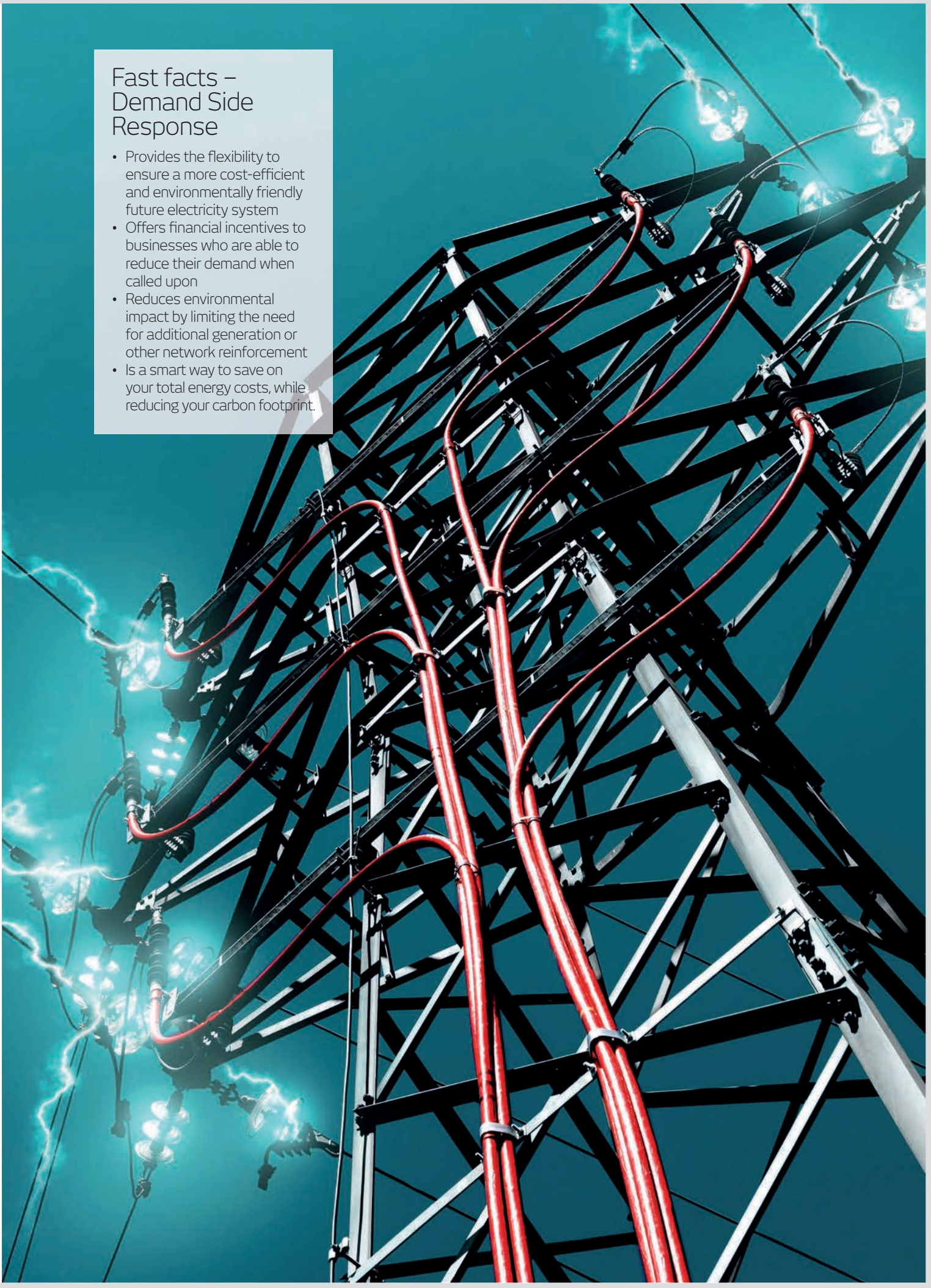
GREATER COLLABORATION

So businesses are signing up for DSR, but we need greater collaboration if we're to realise its full potential. It's why we're launching Power Responsive – a framework to turn debate into action and support the rapid acceptance of demand side solutions. We'll discuss this in a lot more detail in my next article about the future of DSR.

The winds of change aren't going to blow over. At National Grid, we're embracing this new reality and can see the value demand side solutions will bring. Major power users can already harvest some significant benefits, so let's work together to make DSR as strong as it can possibly be.

How to get involved

If your business would like to be a part of the DSR story, there are a number of framework agreements that you can sign up to along with other opportunities to tender. You can contact National Grid directly (commercial.**operation@nationalgrid.com**) or an aggregator to find out more about the financial and other related benefits that could be available in current schemes. You can also send your questions on future DSR developments to **powerresponsive@nationalgrid.com**



Fast facts – Demand Side Response

- Provides the flexibility to ensure a more cost-efficient and environmentally friendly future electricity system
- Offers financial incentives to businesses who are able to reduce their demand when called upon
- Reduces environmental impact by limiting the need for additional generation or other network reinforcement
- Is a smart way to save on your total energy costs, while reducing your carbon footprint.

Frequency response: Turning assets into revenue

Of the various demand side response programmes, frequency response can be the most lucrative for businesses, according to Open Energi. Here's what utilities, manufacturers, hospitals and universities have to say about it.

Frequency response is National Grid's way of keeping the electricity system stable at 50Hz. It requires a rapid response to any changes in electricity supply or demand, for example, if a power station unexpectedly goes offline, or an interconnector drops out.

Of the various demand side response programmes, frequency response can be the most lucrative for businesses, according to Open Energi.

The aggregator installs its Dynamic Demand software into equipment controls so that they can respond to changes in grid frequency. It's an entirely automated system and by turning up or down as required, companies are paid for providing National Grid with a rapid response. Open Energi says because it's the fastest form of response, the payments per megawatt hour are potentially the highest.

KIT AND CONTROL

Businesses surveyed for this report said they had not considered demand side response markets because their equipment was unsuitable. However, suitable equipment includes heaters, pumps, drives, chillers, refrigerators and air conditioning units - plant used by most businesses.

Another concern was business disruption and loss of control. Open Energi heads this off by stating that the technology never overrides the equipment's own control parameters, so performance is unaffected. Typically loads are only switched for one to two minutes at a time, and 80% of switches are for less than four minutes. That degree of control is enough to reassure even companies with critical infrastructure, such as those outlined below.

UNITED UTILITIES

After trials at two wastewater treatment plant and a water pumping station, United Utilities is rolling out the technology across the North West region, with 10MW planned over the next 12 months. Combined with other technologies, the company aims to create 50MW of demand side response capacity over the next five years. The estimated £5m revenue generated will be reinvested into site assets.

"Water and wastewater treatment is a really energy intensive process and power is one of our biggest operating costs, so we're looking both inside and outside our business to see how we can work smarter," said United Utilites Energy Manager Andy Pennick. "That means using less power and being willing to be flexible in the way we use that power."

AGGREGATOR VERSUS AGGREGATES

Open Energi worked with Aggregate Industries for two years to work out how to make the technology work with bitumen tanks at 40 asphalt plants across the UK. The result should be "significant" revenue generation, according to the firm. The process has also realised some 350MWh per year in energy savings and anticipated CO_2 reductions of almost 50,000 tonnes over five years.

POTS OF MONEY

Caparo Bridge Aluminium is generating revenues of up to £25,000 per annum by installing the software within the controls of its aluminium holding pots, which store molten aluminium for automotive die castings. It now offers just over 1MW of response.

"We are constantly looking at ways of reducing our overheads and energy is a massive part of that," according to Wayne Priest, plant director at Caparo Bridge Aluminium. The firm has turned "some of our most energy-intensive assets into income", he added.

PUBLIC PURSE

Hospitals and universities are unlocking the inertia in heating and cooling systems to generate revenue. Southend University Hospital helps offset its £2.4 million annual energy bill by connecting its six 18kW chillers to the Dynamic Demand system.

"The data I receive is incredibly useful," stated energy manager Manoj Chohan. "Now I know exactly how, why and when we are using energy, and the equipment that was costing us the most to run is generating an income."

The University of East Anglia has also connected its chillers and air handling units to the system and will deliver demand totalling up to 1MW that earns in excess of £60,000 over the first three years.

"The solution was quickly and easily integrated with our BMS," said assistant director of estates Martyn Newton. "It is great because once it's installed it runs itself and provides a revenue stream with no impact on how our equipment performs."

GO SMALLER FOR SCALE

While satisfied that the business case for frequency response stacks up, some of the larger firms suggested they could deliver more response – and help scale the market – if the rewards were sufficient to connect smaller plant and equipment.

"Ultimately for us is it is a commercial decision to become involved in DSR," said one energy manager. "We have lots of smaller assets which could be flexible, but the cost benefit to put them into the market doesn't necessarily stack up. Because 100kW might cost us the same to put into frequency response as a megawatt," he continued.

"To scale the market, you need to look at how you make it cost beneficial to bring in those smaller assets. We would like to put them in. But currently, it is just not worth it."

Shaping the future of DSR

Demand Side Response (DSR) is at a crucial crossroads – and National Grid needs more large industrial users to get on board if it's to achieve its potential. Here, National Grid's Head of Commercial Operations, Duncan Burt, discusses the future of DSR and how a new campaign, called Power Responsive, aims to get more businesses engaged

Demand Side Response (DSR) may be in its infancy, but it's bursting with potential. If we can seize this opportunity, we can provide consumers with the flexibility they need in a changing energy market - and help build a secure, sustainable and affordable electricity system for the future.

We've set a target to achieve 30-50% of our balancing from Demand Side Response by 2020 – but there's a long way to go to achieve it. While we believe DSR can benefit everyone – from the smallest household consumer to the largest manufacturer – our immediate focus is on large, industrial users. It's the logical way to make the quickest impact.

In my last article, I talked about what DSR is and its potential benefits. Just to recap, DSR is about offering businesses and consumers the flexibility to turn down or turn up their electricity consumption to help balance the Grid – when we need them to do so. In return, we offer financial incentives.

NEW TOOLS

It's common wisdom that low-carbon generation and intermittent sources are a big feature of our current and future energy landscape. And it's vital we find new tools to help new electricity systems function well - and at an affordable cost. DSR plays a significant role.

In the past, the electricity system was fairly simple and linear – large generators on one side, and power flowing in a single direction, to consumers on the other side. That world is already consigned to history.

We've been busily adjusting to this new reality. We're engaging more actively, not just with the big generators, but with aggregators, customers and a new breed of smaller generators. However, we need a broader approach to take it forward and accelerate the acceptance of DSR.

POWER RESPONSIVE

A new programme of engagement on demand side participation, called Power Responsive, aims to achieve this. It's a framework for turning debate into action; a practical platform to galvanise businesses, suppliers, policy makers and others to seize the opportunity to shape the growth of demand side response collaboratively, and deliver it in practice, at scale, by 2020.

The goal of the campaign is for businesses and consumers to be

active energy users, save on total energy costs and secure our energy now and in the future.

The real strength of Power Responsive is in collaboration. So, the more businesses that get involved the bigger the impact will be, and the greater impact it will have on hitting the 2020 target.

REMOVING OBSTACLES

The underlying aim of the campaign is to identify and break down barriers to participation. We've spoken to a lot of stakeholders already, and some of the issues they tell us they face include:

- There is a need for a coordinated approach to addressing barriers and finding solutions
- Lack of knowledge of schemes, products and markets and the ways to participate
- The package of products available isn't wholly attractive for businesses to participate
- More certainty and stability is required to ensure the right investment signals exist

Through Power Responsive, it's our goal to deconstruct these barriers and create markets that don't discourage potential participants.

Of course, our ultimate ambition for DSR should relate to every customer – from industrial, to business, to commercial, to everyone at home.

But, today, we're a long way from that aspiration. And our immediate priority needs to be the quickest path to making a significant breakthrough. Therefore a sensible starting point has to be large industrial and commercial users.

SO HOW CAN BUSINESSES GET INVOLVED?

Firstly, businesses that are interested in the opportunities presented by DSR can look at the products we currently have available (at the National Grid or dedicated Power Responsive website) and see if any of them are a good match. Secondly, through Power Responsive, they can get directly involved in the debate and help us build the new products and mechanisms that shape future markets and enable the growth of DSR.

We understand that there are plenty of different industry agendas and interests to navigate. DSR challenges many existing business models. On the other hand, it creates exciting opportunities for new ones.

My hope is that Power Responsive will engage a wider range of industries and by making more companies aware of the benefits of DSR, we'll open up the borders of the market beyond early adopters.

OPEN MIND

We need to approach the future of DSR with an open mind. Which is why we're actively seeking out different thoughts and ideas through our Power Responsive campaign. And we need everyone else to be equally open-minded to maximise the benefits to all.

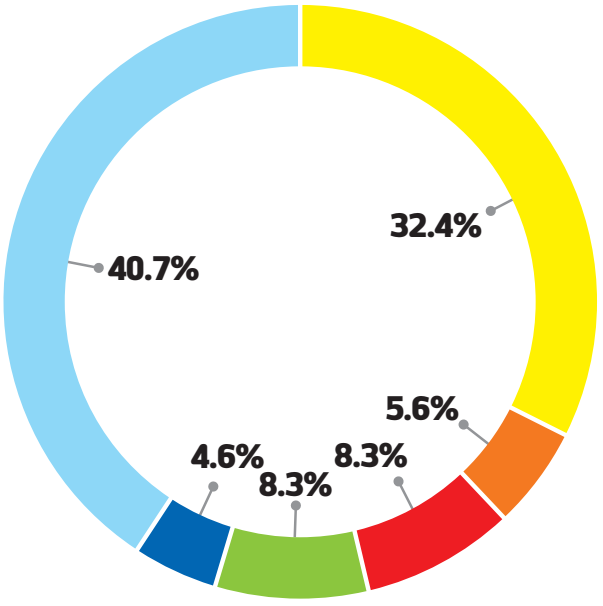
When it comes to capitalising on the opportunities presented by the demand side, the time for action is now. At National Grid, we don't have all the answers. What we do know is that the technology is primed, there's momentum behind the effort and working together we can shape and share the possibilities created by demand side solutions.

How to get involved

If your business would like to be a part of the DSR revolution, there are a number of framework agreements that you can sign up to and other opportunities to tender. Contact National Grid directly (**commercial.operation@nationalgrid.com**) or an aggregator to find out more about the financial - and CSR - benefits that could be available. If you'd like to be a part of the important conversation about the future of DSR, visit the website at **powerresponsive.com** or send your questions to **powerresponsive@nationalgrid.com**

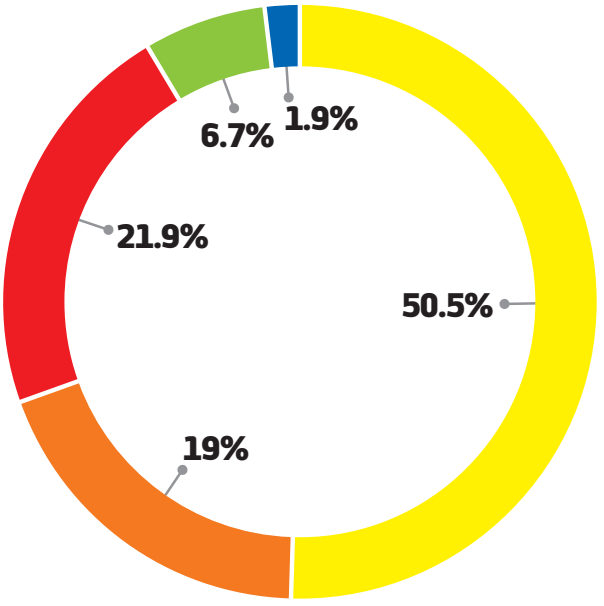
Survey respondents' demographic breakdown

Number of employees



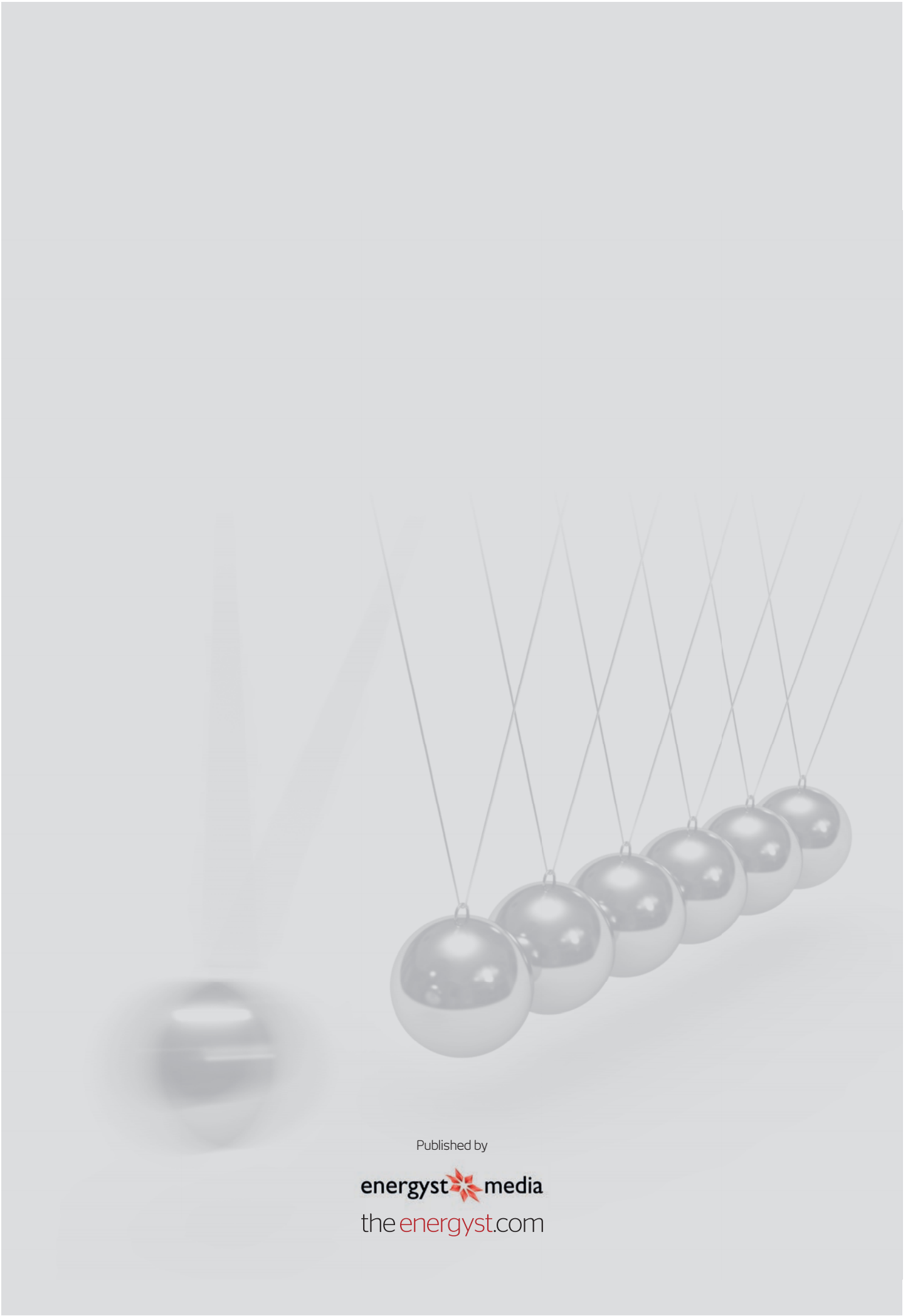
- 0 - 49
- 50 - 99
- 100 - 249
- 250 - 499
- 500 - 999
- 1000+

Annual energy consumption



- <£1m
- £1m - £10m
- £10m - £100m
- £100m - £1bn
- £1bn+

Job title



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