



# INCAPACITATED

## WHY THE CAPACITY MARKET FOR ELECTRICITY GENERATION IS NOT WORKING, AND HOW TO REFORM IT

Byron Orme

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# CONTENTS

<b>Summary .....</b>	<b>3</b>
<b>1. Introduction .....</b>	<b>5</b>
<b>2. Challenges for the UK’s electricity system .....</b>	<b>7</b>
2.1 Renewable energy .....	7
2.2 New demand-side technologies.....	8
2.3 Phasing out coal and delivering new capacity .....	11
2.4 Increasing demand for electricity in the long term.....	11
2.5 Summary.....	13
<b>3. The capacity market.....</b>	<b>14</b>
<b>4. Is the capacity market fit for purpose? .....</b>	<b>17</b>
4.1 Security of supply .....	17
4.2 Value for money .....	17
4.3 Coherence with decarbonisation.....	19
4.4 New gas capacity .....	20
4.5 Summary.....	21
<b>5. Reforming the capacity market.....</b>	<b>22</b>
Recommendations.....	22
<b>6. Wider market reforms for a more efficient, cleaner electricity system .....</b>	<b>25</b>
<b>References .....</b>	<b>27</b>

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# SUMMARY

To keep the lights on over the next 15 years, two major challenges need to be overcome. The first is that a large number of power stations are set to close over that period, so their capacity will need to be replaced. The second is that the rollout of renewable technologies creates new difficulties for balancing supply and demand, because their output is variable.

In 2014 the government introduced a scheme – the ‘capacity market’ – designed to meet these twin challenges. It has so far awarded £2.8 billion in subsidies<sup>1</sup> to power stations in exchange for a guarantee that they will be online when they are required in order to meet electricity demand. Unfortunately, the scheme is failing. It is providing poor value for money for billpayers, is working against the government’s decarbonisation objectives, and is too focussed on large power stations at the expense of more efficient, demand-side solutions.

This report argues that the capacity market is therefore in need of fundamental reform. Changes should include the **splitting of the scheme into two separate auctions for old and new generation capacity**, and the introduction of an **emissions performance standard that excludes the most polluting plants from the scheme**. Taken together, the reforms that we propose would align the capacity market scheme with the government’s decarbonisation objectives, protect billpayers from excessive costs, and create a genuinely secure supply of electricity into the future.

## Key points

- The capacity market was designed by the Coalition government to ‘encourage the investment we need to replace older power stations and provide backup for more intermittent and inflexible low-carbon generation sources’. It awards payments to power stations in exchange for a guarantee that they will be online when required. The payments are allocated through an annual auction.
- Two capacity market auctions have already been held, in December 2014 and December 2015, which between them awarded contracts worth £2.8 billion.
- The scheme has three major flaws which together make it not fit for purpose.
  - **It provides poor value for money:** across the two auctions held so far, nuclear power plants have received payments amounting to £153 million in 2018 and £136 million in 2019, despite being almost certain to remain open during those years without receiving these subsidies. In the 2014 auction, a third of contracts were awarded to plants that had indicated that they did not need subsidy to stay online.
  - **It works against decarbonisation:** it has provided a lifeline to several old coal-fired power stations, which have received a total of £373 million in subsidies from both auctions.<sup>2</sup> It has also heavily incentivised the proliferation of new diesel generators, which are even more polluting than coal and which were awarded a total of £176 million in subsidies in 2015.
  - **It is focussed on generation:** the capacity market is designed around the requirements of large power stations, rather than around the needs of smart

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1 £1.7 billion in the 2014 auction and £1.1 billion in the 2015 auction. National Grid record the 2014 auction in 2012 prices and the 2015 auction in 2014/15 prices.

2 £293 million in the 2014 auction and £80 million in the 2015 auction.

energy technologies such as demand response and electricity storage, or for actions that would permanently reduce demand for electricity. The National Infrastructure Commission has estimated that billpayers could save £8 billion a year by 2030 if these alternatives were supported.

- The government is currently consulting on proposals to expand the capacity market so that it incentivises the construction of new gas-fired power stations. Our view is that the proposed changes do not solve the scheme's problems, outlined above, and that further reforms continue to be required.

## Recommendations

### **1. The capacity market should be split into separate auctions for old and new capacity**

The capacity market currently awards the same per-unit price for capacity to all operators. This means that existing power stations that would be able to operate without any payments at all receive the same price-per-unit as a new power station. The government has now made clear that it wants the capacity market to deliver new gas-fired power stations. This is likely to increase the price paid to all operators, and the total costs of the scheme. Instead, there should be a separate auction for new and old capacity. The payments would become more targeted to the capacity that bids for them and the scheme would be more efficient overall. There would also be far greater control of the amount of new capacity that is rewarded through the scheme.

### **2. An emissions performance standard should be applied to all capacity in receipt of capacity payments**

Carbon-intensive generation should be explicitly prevented from accessing the capacity market through the introduction of an 'instantaneous' emissions performance standard. This would effectively prevent any station that has a carbon intensity above a certain level from bidding into the capacity market. This limit could be set at a level that does not impact on any less carbon-intensive generation, such as new gas, that the government wants to incentivise.

### **3. New large-scale gas power plants should commit to using carbon capture and storage (CCS) if they are to stay open in the long term**

There is a role for new gas plants in replacing coal and providing flexible back-up as the electricity system is decarbonised. However, given the very low levels of carbon emissions that the UK's electricity supply needs to be producing by 2030, there can be only a very limited role for unabated gas generation. To access longer-term contracts, large-scale gas plants should either be built with CCS, or be required to install it in future.

### **4. Demand response providers should have access to longer contracts**

The capacity market currently favours traditional generation over new technologies that can reduce demand and so limit the number of power plants that need to be built. Demand response providers do not currently have access to the longer-term contracts available to power stations. The disparity in contract lengths available makes it difficult for them to compete with traditional generation. To remedy this, the capital expenditure thresholds (that is, the amount that a new plant needs to invest in order to access longer contracts) should be removed, and all new capacity should be permitted to bid for contracts of up to 15 years' duration.

# 1. INTRODUCTION

This report is about the security of the electricity supply in the UK. In the past, delivering security of supply was almost solely a question of making sure there were enough power plants capable of generating electricity to meet demand at the times of the year when it was highest. Now, the challenges of decarbonising the electricity supply in the UK, and integrating rapidly developing new technologies, has made this task more complex. But the prize is a more flexible, secure and clean supply of electricity that is capable of providing households and businesses with the power they need in the long term.

Chapter 2 of this report reviews some of these challenges. The growth of renewable energy has increased the potential supply of clean and cheap electricity; but because that supply is variable, the job of balancing supply and demand in the system has become more testing. New technologies and consumer behaviours for managing demand offer numerous opportunities to improve the balancing of the system, both by reducing demand at times when it would otherwise peak (and would therefore require existing power plants to increase their supply), and by shifting demand to when there would otherwise be an excess supply of electricity. These innovations have the potential to make our electricity system cheaper and more efficient – yet we are behind other countries, such as the US, in terms of maximising this potential.

Chapter 3 focusses on the UK’s primary policy tool for guaranteeing security of supply in the electricity system – the so-called capacity market. It looks at how this policy works, and what it has delivered thus far.

Chapter 4 looks in further detail at the design of the capacity market, and assesses its key strengths and weaknesses. It concludes that in its current form it is not capable of delivering the objectives that the government has set for it.

Chapter 5 looks at some of the ways in which the capacity market could be reformed in order to reshape the electricity system into one that is less carbon-intensive, more flexible and better equipped to deal with the long-term challenges of security of supply.

The challenges outlined in chapter 2 require reforms to the UK’s regulatory system as well as changes to the capacity market. Chapter 6 looks briefly at some of the reforms that need to be made by the Department for Energy and Climate Change (DECC), energy regulator Ofgem, and the National Grid in order to modernise electricity regulation and tackle the challenges of the 21st century.

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## The UK electricity market

The electricity market in the UK is a complex mix of different markets and government policies that are designed to achieve the three different (but related) outcomes often referred to as the energy ‘trilemma’:

- to decarbonise the supply of electricity...
- at the lowest possible cost to consumers...
- while ensuring security of supply.

Most of the UK’s electricity is traded in a wholesale market that matches supply and demand in half-hourly periods. In order to balance the amount of supply available and demand required, participants in the market trade in order to generate and supply electricity to businesses and customers (Ofgem, no date).

On the retail side, the six largest companies that provide electricity to UK households are often referred to as the 'big six'. Between them, British Gas, Npower, E.ON, EDF, SSE and Scottish Power control around 90 per cent of the retail supply of electricity and gas.

A major programme of reform that took place during the previous parliament (2010–2015), known as 'electricity market reform' or 'EMR', was designed to help the UK meet its emissions reductions targets under the 2008 Climate Change Act (an 80 per cent reduction in emissions by 2050 relative to 1990 levels<sup>3</sup>) while guaranteeing that supply is sufficient to meet demand at all times.

Incentives for low-carbon generation of electricity are provided by 'contracts for difference'. These are handed out through an auction, and are structured to pay out the difference between the cost of building and generating low-carbon electricity, and the price that would be paid by the market. This is done by guaranteeing a 'strike price' – a guaranteed payment for the generator based on that price difference (DECC 2015a). The cost of this is recovered through consumer bills, and is controlled through the 'levy control framework', a cap on these and other costs of low-carbon technologies (NAO 2013).

EMR also introduced the capacity market, which was designed to ensure security of supply and is the focus of this paper. It is an auction that secures electricity capacity for specific future time-periods. Providers of capacity receive payments in exchange for a guarantee that they will be on the system in the future period specified. Generators that receive contracts for difference or any other low-carbon subsidy are not eligible for capacity market payments.

The UK's electricity system is managed and operated by National Grid, which is responsible for making sure that supply and demand is balanced. National Grid is also responsible for maintaining the physical infrastructure of the transmission network in England and Wales (National Grid, no date).

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3 See HM Government 2008



## 2. CHALLENGES FOR THE UK'S ELECTRICITY SYSTEM

There are a number of challenges that must be overcome if the UK is to resolve the energy 'trilemma' (see the boxed text in chapter 1) while the electricity system continues to undergo rapid technological changes. Below we set out four of these challenges.

### 2.1 Renewable energy

The UK's electricity generation system has undergone significant change in recent years. The growth of renewables has increased the share of available electricity that is low-carbon, and has also driven down the wholesale cost of electricity – by one estimate, wind and solar energy reduced wholesale costs by £1.55 billion in 2014 alone (Good Energy 2015). This is clearly a positive development: it means that we have greater access to clean and cheap supplies of energy. But it has also fundamentally changed the business model of large utility companies (Platt 2014).

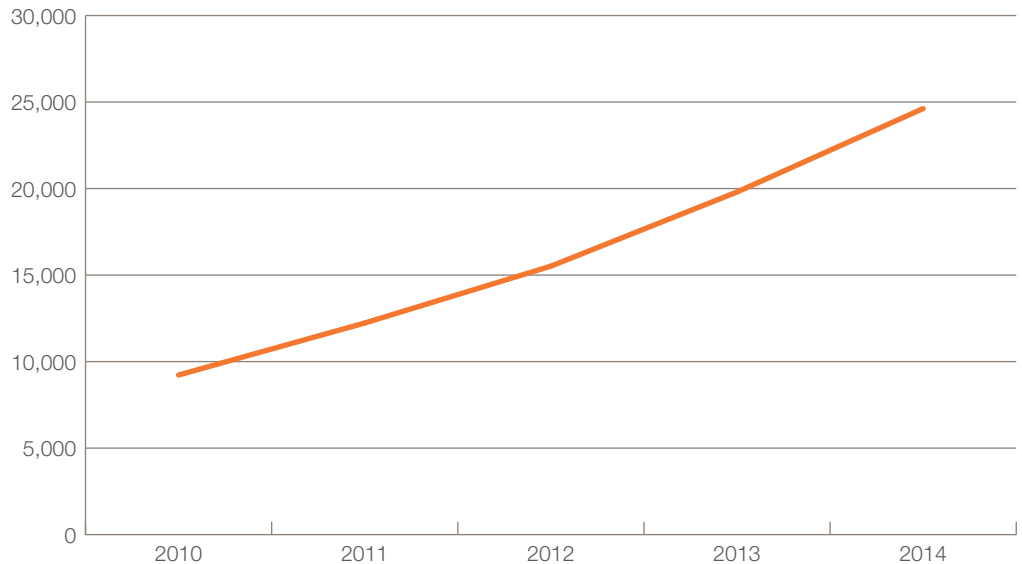
These companies have developed according to a business model in which large power plants deliver electricity, through a national transmission and distribution network, to passive consumers. That business model is now being undermined in several ways. First, because renewables generate electricity at no cost when the sun is shining or the wind is blowing, their power is used ahead of that from more expensive thermal plants (plants that generate electricity by burning fossil fuels), which have higher running costs. The thermal plants are therefore called upon to generate electricity less and less of the time, and make less money as a result. Renewables bring down the peak price for the same reason, and so also lower wholesale prices.

Secondly, renewable technologies can be smaller-scale than thermal plants, and so lend themselves to a more distributed use, including by households and businesses. This is particularly true of solar photovoltaic (PV) panels installed on roofs, which generate electricity 'onsite' rather than relying on the national transmission network. National Grid predicts that such 'distributed' generation could represent 40 per cent of all installed capacity by 2035 (National Grid 2015a). Solar PV has been rolled out on a scale that has already far exceeded that predicted in the plans drawn up by regulators. Initial business plans drawn up by many distribution network operators for the current pricing control period (covering 2015–2023) assumed that, in a high scenario, there would be 6.64GW of solar PV capacity deployed in the UK by 2030 (Platt 2014). But it has already exceeded that, with just under 9GW installed (National Grid 2015a).

These changes present huge opportunities, but they have also fundamentally changed the nature of the electricity market that the country relies upon to deliver secure supplies of power. Any policy that has the objective of securing the electricity supply into the future must take full account of this technology-driven shift – but as we argue in this paper, the government's recent attempts to do so have not been adequate.

**Figure 2.1**

Renewable generation capacity in the UK more than doubled between 2010 and 2014  
*Renewable installed capacity (MW), 2010–2014*



Source: DECC 2015b

## 2.2 New demand-side technologies

When electricity demand is high, prices increase because electricity must be taken from power stations with higher costs. One option for avoiding these higher costs is to reduce the amount of electricity being used, or change the time at which it is being used, rather than simply increasing supply. This is already done effectively in the UK by National Grid, which has agreements with energy-intensive businesses stipulating that they will reduce their electricity use at times of high demand on the system.

However, intensive users are not the only ones who are able to change the times at which they use electricity from the grid in this way. New companies known as ‘aggregators’ and innovative suppliers are able to co-ordinate the shifting or reduction of electricity demand from many smaller users in order to achieve economies of scale. New technology has increased the potential of these companies. Minute-by-minute monitoring of electricity use can help estimate when a business is best able to reduce the electricity it is taking from the grid, and smarter monitoring can give more businesses confidence that they are able to reduce their demand at certain times without negative effects on their operations.

There are a range of different ways in which businesses use electricity that can be altered for short periods in order to reduce demand at certain times, and increase it at others. This includes its use for heating and ventilation systems and refrigerators, as well as the timings of industrial processes (Frontier 2015a). In the US, where demand response plays a more significant role in some electricity markets, air conditioning units used during the summer are responsible for some of the biggest peaks in demand, and so have been used for demand response (Taylor 2015; see boxed text below).

The current level of industrial and commercial demand response in the UK is estimated by National Grid to be around 1GW, but this is expected to more than treble by 2022 under some scenarios (National Grid 2015a). Peak demand in the UK is around 60GW, of which industrial and commercial sites are responsible for around half (Ofgem 2015a).

Demand response delivers a clear economic benefit: it avoids the need for investment in new power plants that would be used only infrequently, when demand peaks. In the UK, much of the cost of building new plant is passed on to billpayers, either through the capacity market or through contracts for difference. If demand response reduces the size of peak electricity demand then less capacity needs to be built. For instance, one estimate has suggested that if daily peak demand were shifted by 10 per cent using demand response, it could reduce the need for backup capacity by 35 per cent by 2030 (Roadmap 2050, 2011).

Demand response can also save billpayers money, since it can reduce wholesale costs in the same way as renewables – that is, by reducing the amount of time for which the most expensive forms of generation are called upon. In one regional electricity market in the US, a 3 per cent reduction in demand during the 100 hours a year in which demand was highest was shown to lead to a price reduction of between 6 and 12 per cent (Hurley et al 2013).

Reducing the number of large thermal plants that need to be constructed, as well as reducing the amount of time for which they run, would lessen the cost of decarbonising the electricity system. Work carried out by Imperial College London for the Committee on Climate Change (CCC) shows that increased flexibility (in which demand response plays a significant role) can reduce bills by between £3.0 and £3.8 billion per year in a scenario in which the CCC's recommendation of reaching an average carbon intensity of 100g of CO<sub>2</sub> per kWh (g/CO<sub>2</sub>/kWh) by 2030 is achieved (ICL 2015). Similarly, work carried out for the National Infrastructure Commission shows that in a 50gCO<sub>2</sub>/kWh scenario, the saving to billpayers from increased flexibility would be £8 billion per year by 2030 (NIC 2016).

However, demand response also faces some barriers. In particular, there may be some political aversion to relying too heavily on demand response due to a spurious association with the 'three-day week' of 1974, when an impending national coal strike caused the Conservative government to ban commercial consumption of electricity for more than three days a week in order to conserve fuel. In the election that followed, Ted Heath's Conservative party lost its parliamentary majority, and Labour formed a government under Harold Wilson. The enduring hold that the three-day week has on the British political psyche has recently been noted by the outgoing chief executive of National Grid, Steve Holliday (2016): though these events occurred over 40 years ago, politicians remain keenly aware of how damaging it is to governments for them to fail to ensure there is enough electricity for businesses to function. There is clearly a very significant difference between businesses choosing to use electricity more efficiently in order to earn additional revenue, and their being forced to do so because of insufficient supply – yet until that difference is widely understood, there will remain a danger that demand management will not achieve its full potential.

New technologies of electricity storage offer additional forms of flexibility. Storing electricity at times when supply outstrips demand and using it when demand is high is becoming increasingly viable, thanks to the speed at which storage technology is developing, and its costs falling.

Electricity storage technologies come in a range of shapes and sizes, and as a result have very different capabilities. At present, the largest form available in terms of capacity is pumped water storage, which has been operating for many years in the UK, helping National Grid with its balancing. Newer technologies on a smaller scale, such as lithium ion batteries, may be able to respond more quickly when demand is high. One such example is the 6–10MW battery made up of around 50,000 lithium ion batteries at Leighton Buzzard (NIC 2016). Smaller-scale 'behind the meter' storage, when twinned with solar PV, can help businesses to avoid using power from the grid at times of high demand. Some demand response providers are now installing new

battery technologies, like Tesla's 'Powerwall', to help manage the amount of electricity used from the grid at certain times (ECCC 2016a).

While their deployment has been very limited to date, it has recently been estimated that battery storage technologies in the UK could grow in capacity to over 1.6GW by 2020 (Baddeley et al 2016). However, the UK's regulatory framework creates barriers to entry – for example, large storage facilities currently have to obtain both supply and generation licences, which exposes them to two sets of costs. DECC are currently considering changes to the regulations in order to make it easier for energy storage technology to participate in the electricity market, including the development of a storage licence (Hansard 2016a: column 214). This is very welcome, and we encourage DECC to be ambitious in its approach to facilitating the development and integration of storage capacity.

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### Demand response in the US

In the US, companies that provide demand response have three different ways of making a profit out of selling their capacity to reduce the amount of electricity they draw from the grid.

The first is through the wholesale market, in which capacity from demand response can be sold in the same way as supply from electricity generators. The Federal Energy Regulatory Commission has taken the lead in opening up wholesale markets to demand response by permitting aggregators to bid directly into the wholesale market on behalf of retail customers. They have stipulated that demand response should be paid the full market price of energy, so comparable rewards go to so-called 'turn down' as well as generation in the market (Hurley et al 2013).

The second route to market is through 'ancillary services' bought by the system operator to help balance the electricity supply. In the UK, the equivalent of this is National Grid buying a range of different kinds of services such as the short term operating reserve, which procures extra capacity or demand reduction at times when demand is high.

The third route is through capacity markets. The US has numerous separate regional electricity markets, some of which have forward capacity markets that procure future supply, like the UK capacity market. For instance, the New England system operator (ISO NE) had the first forward capacity market in the US (delivery year: 2011), which oversaw a growth in demand response (Hurley et al 2013). This market splits up demand response into two categories, real time demand response (load turndown) and real time emergency generation (onsite generators). Both are rarely used, but when they have been they have proven highly reliable in terms of delivering the capacity required. Another large system operator covering Pennsylvania, Maryland and 11 other states (PJM) has become a leader in deploying demand response through a capacity market. In the PJM, this has proved a more popular route to market for demand response than the wholesale market, and demand response makes up around 10 per cent of total capacity (Mitchell 2014).

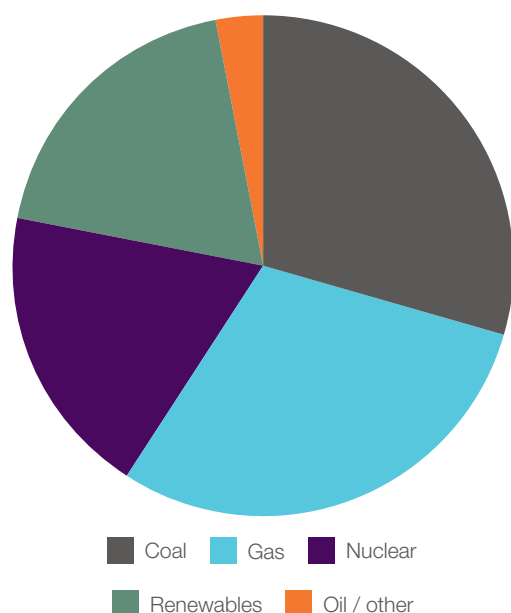
It is also worth noting that in some US forward capacity markets, energy efficiency measures are also able to bid in. Such measures do not need to demonstrate that they would not otherwise have been introduced, and those who install them are allowed to bid in even if they are receiving income from another scheme designed to promote energy efficiency (Mount and Benton 2015). In the UK, a pilot scheme designed to test whether energy efficiency should be able to bid into the capacity market is currently in its second phase. Out of a potential budget of £6 million, £474,000 was awarded to 37 projects across 24 organisations. By far the most common kind of reduction came from switching to more efficient lighting (DECC 2016a). IPPR believes this pilot scheme should be expanded to ensure that energy efficiency is further integrated with other elements of energy security policy.

## 2.3 Phasing out coal and delivering new capacity

The government has committed the UK to becoming the first major industrial nation to completely phase out the use of coal for power generation, with a target date of 2025 (DECC and Rudd 2015). As recently as 2014, coal was responsible for 30 per cent of electricity generation in the UK (DECC 2015b). There are 10 major coal power stations remaining, five of which are currently scheduled to close this year. These five power plants were responsible for 6 per cent of the UK's total greenhouse gas emissions in 2014 (Jones 2016). The phasing out of coal will help put the UK on a path to decarbonisation that is consistent with its targets – particularly its commitments as a party to the challenging global agreement on climate change delivered in Paris in December 2015, which requires emissions to reach net zero in the second half of the century.

**Figure 2.2**

Coal still accounted for 30 per cent of electricity generation in the UK in 2014  
*Electricity generation in the UK by source (%), 2014*



Source: DECC 2015b

However, the government has made the implementation of measures to phase out the remaining coal plants contingent on new gas capacity coming forward to replace it. In her 'policy reset' speech in November 2015, secretary of state for energy and climate change Amber Rudd said that the government would only proceed if it was 'confident that the shift to new gas can be achieved within these timescales' (DECC and Rudd 2015). The energy market is not currently delivering this new gas capacity, as wholesale prices are too low to stimulate new investment in gas-fired plants. Yet the capacity market was introduced in large part to stimulate such investment in new gas capacity. In chapter 4 below we assess the extent of the scheme's success in terms of achieving this.

## 2.4 Increasing demand for electricity in the long term

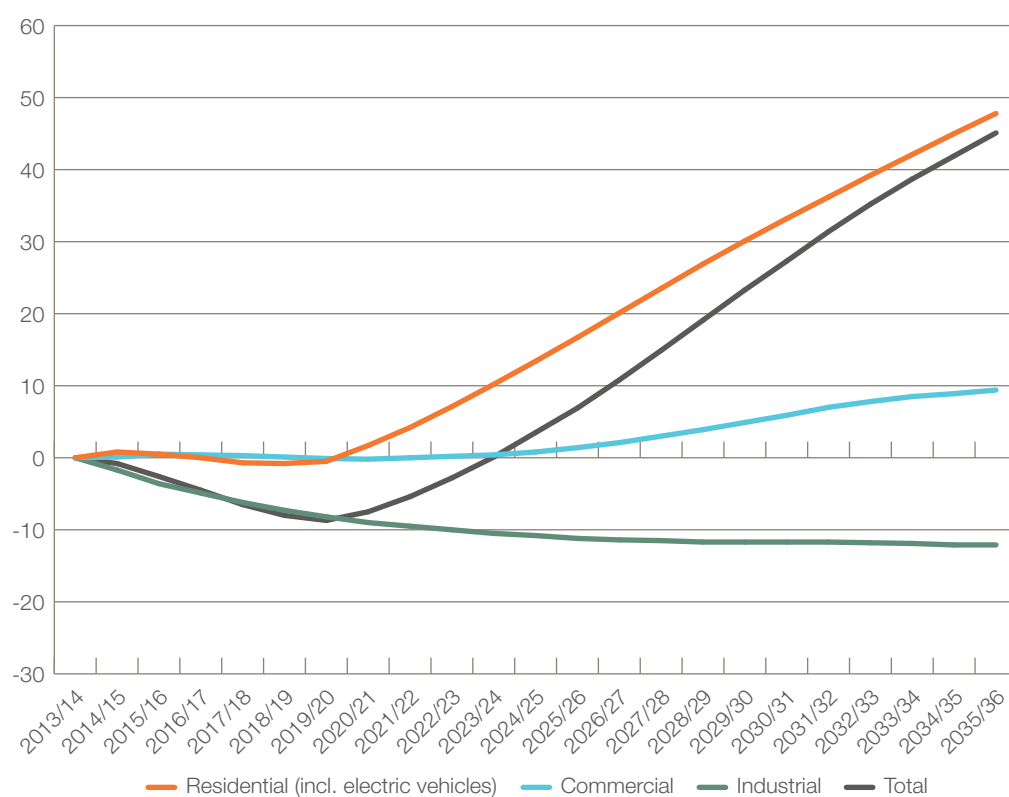
Electricity demand has been declining in recent years due to both greater efficiency in its use and wider structural changes in the UK economy. It has fallen from 351TWh/year in 2009/10 to 339TWh/year in 2013/14 (National Grid 2015a). In almost all of National Grid's future energy scenarios, total electricity demand

continues to fall until 2020, and remains broadly stable up to 2025. The exception to this is the ‘gone green’ scenario, which projects a slight rise before 2025, followed by a significant increase from then onwards as the heat and transport sectors are electrified (ibid). Increases in the use of electric technologies for heat such as heat pumps will require large increases in the electricity supply – which will need to be low-carbon if the UK is to meet its carbon budgets. Increasing demand for electricity in transport will have the same effect: the CCC’s central scenario for meeting the fifth carbon budget projects that plug-in vehicles will need to account for 60 per cent of car sales by 2030 (CCC 2015).

**Figure 2.3**

National Grid’s ‘gone green’ scenario projects a substantial increase in electricity demand from 2023/24 onwards

*Electricity demand (difference from 2013/14, TWh/year), 2013/14–2035/36*



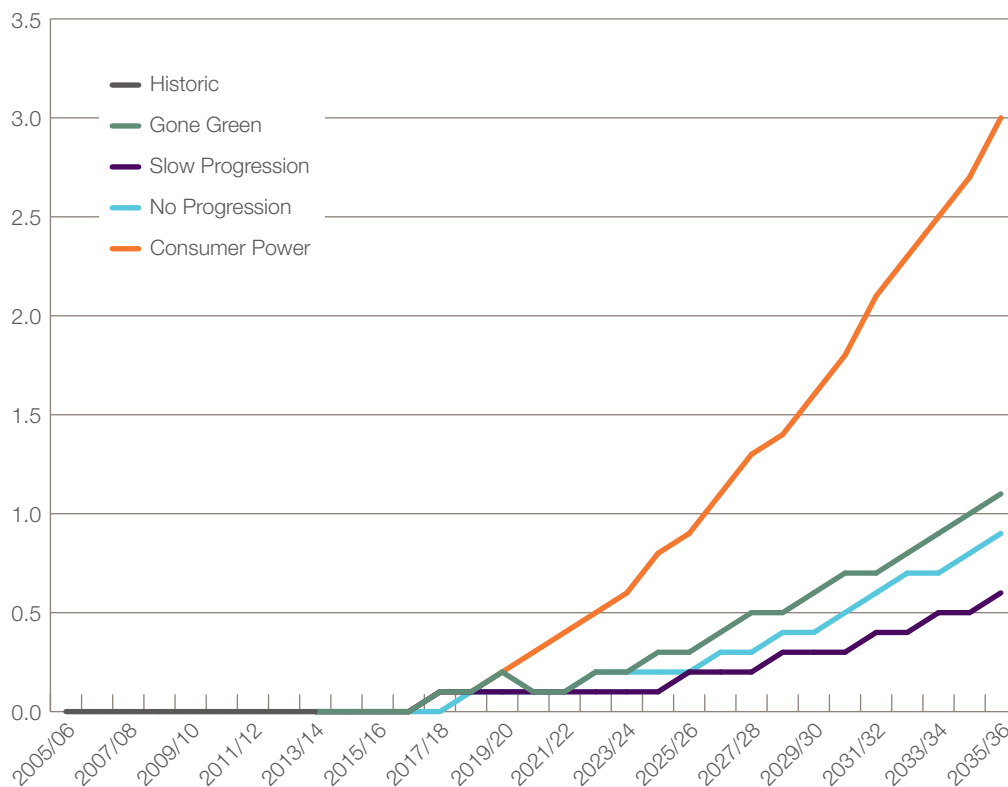
Source: National Grid 2015a

The electrification of heat and transport would not only increase electricity demand; it is also projected to lead to sharper peaks in that demand. Heat demand in particular is very concentrated around certain times of day. Unless patterns of usage are changed, integrating that demand into the electricity system will require a major increase in expensive generating capacity that is only used at peak times (DECC 2015c). Much of the projected increase in demand is uncertain, however – it will depend upon the way in which heat and transport decarbonisation proceeds. Electric vehicles and heat pumps can also contribute to balancing at certain times through charging, when there is excess generation from renewable energy (Sustainability First 2015). Nevertheless, the potential for heat and transport electrification to increase peak demand is clear.

**Figure 2.4**

Under all of National Grid’s scenarios, growing numbers of electric vehicles will contribute to peaks in electricity demand

*Electric vehicles’ contribution to projected peak electricity demand (GW) under different National Grid future energy scenarios, 2005/06–2035/36*



Source: National Grid 2015a

## 2.5 Summary

The old centralised model of electricity generation and supply is being disrupted by new technologies and new policy objectives. Both distributed generation and demand-side technologies have changed the nature of the energy system, and the deployment of both is predicted to accelerate. The role for government, the regulator and the system operator must be to manage this transformation of the system without supplies being interrupted, with the necessary infrastructure upgrades being carried out, and without bills soaring – all while remaining within set carbon budgets. To make this challenge even more difficult, it must be achieved as a large amount of generating capacity retires, and as electricity demand increases dramatically in the medium term. The government’s principal policy for navigating this new world is the capacity market. In the following chapter we explain how it works.

### 3. THE CAPACITY MARKET

The capacity market was introduced by the Coalition government in 2014 to ‘encourage the investment we need to replace older power stations and provide backup for more intermittent and inflexible low-carbon generation sources’ (DECC 2014a). The main auction awards payments to generators to secure their availability to deliver capacity, and to demand response providers in exchange for a commitment to reduce demand when required, and is held once a year for delivery four years ahead (the T-4 auction).

The total amount of capacity that is required for the period four years ahead is set in advance of each auction by the secretary of state, following a recommendation from the system operator, National Grid. Generators then bid to receive a contract in an auction based on the price at which they can believe they can supply capacity. The auction is split into ‘price makers’ (new-build power plants and demand response), which are allowed to set the price at which they can supply, and ‘price takers’ (existing power plants). The auction is a ‘descending clock auction’ whereby the price offered to generators decreases every half-hour until supply meets demand. Price-takers do not take part in this bidding process, but set the minimum price that enables them to generate, beneath which they drop out of the auction.

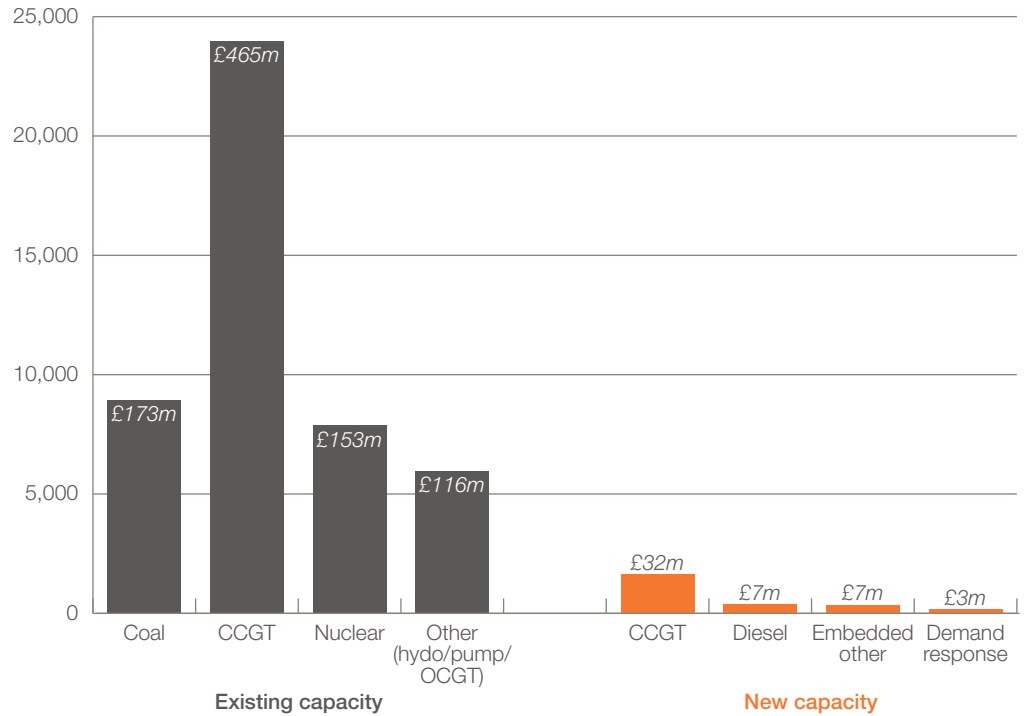
Contracts that last one, three, or up to 15 years are available, but to access the longer contracts operators must prove that they are spending above a certain threshold on building or upgrading their plant. For the 15-year contract, that level of expenditure was set at £255/kw capacity in the latest (2015) auction; for the three-year contract the threshold was £130/kw (National Grid 2015b). Any capacity spending less than these amounts would only have access to one-year contracts. This rule is designed to take into account the different costs associated with building new capacity, and running and refurbishing existing capacity. If the costs are higher then access to longer contracts can provide more revenue certainty and therefore make it easier to obtain finance. These attempts to level the playing field across different technologies and investments mean that, for instance, a nuclear power plant that is committing to deliver one year of power availability – in a period when it was planning to be generating anyway – is competing on price in the same auction against a combined cycle gas turbine (CCGT) project that is yet to be built and is committing to deliver power (and secure payments) for up to 15 years.

In the first auction held in December 2014, 49GW of total capacity was awarded contracts for delivery from 2018/19 (National Grid 2014). The ‘clearing price’ – the amount those awarded contracts will receive per kilowatt per year – was £19.40. Just 5 per cent of the capacity that received contracts was new plant, while payments of just under £173 million for 2018/19 alone, and £293 million over the lifetime of contracts lasting longer than one year, were awarded to existing coal-fired power stations. The UK’s nuclear power stations also all received contracts amounting to total payments of £153 million in 2018/19 for 7.9GW. By comparison, only 172MW of demand response was successful in the auction, amounting to payments of £3 million. The total value of contracts awarded for the year 2018/19 was £956 million, with the total value of all contracts awarded (including contracts that last longer than one year) £1.7 billion (Jones 2014).



**Figure 3.1**

New plants lost out in the 2014 capacity market to older generators  
Size of contracts (MW and £m) awarded to new and existing plans in the 2014 T-4 auction, by generation type for delivery year 2018/19 (2012 prices)



Source: Jones 2014

The second auction was held in December 2015, with 46GW auctioned and a final clearing price of £18.00/kW for delivery from 2019 (National Grid 2015c). This time, 4.4GW of existing coal plants were awarded contracts, bringing the total cost of coal contracts for 2019/20 to £139 million. Again, all nuclear capacity that bid into the auction received contracts, this time worth £136 million for 2019/20. The one planned new gas CCGT plant that received a contract – the Carrington project owned by Ireland’s state electricity company ESB – only bid for a one-year contract. The amount of demand response that cleared was, at 456MW, higher than in 2014. New diesel generators received contracts worth £176 million. IPPR has previously urged the government to prevent these diesel generators from accessing the capacity market (Aldridge 2015). For the first time, capacity from interconnectors linking the UK with Netherlands and France were allowed to bid in, and received contracts; another proposed interconnector linking the UK with Belgium bid in but failed to win one.<sup>4</sup> Total payments for 2019/20 were £942 million, and total payments including longer contracts were £1.1 billion (Jones 2015).

As well as the auctions to procure capacity for four years ahead, there are also ‘transitional arrangements’ auctions for demand response. The first was held in early 2016, and procured 0.8GW capacity at a clearing price of £27.50/kW for delivery from October of this year. Any demand response that receives a contract in the transitional arrangements auction is banned from taking part in the T-4 auction for three years (Martin 2016). Auctions are also held a year in advance of

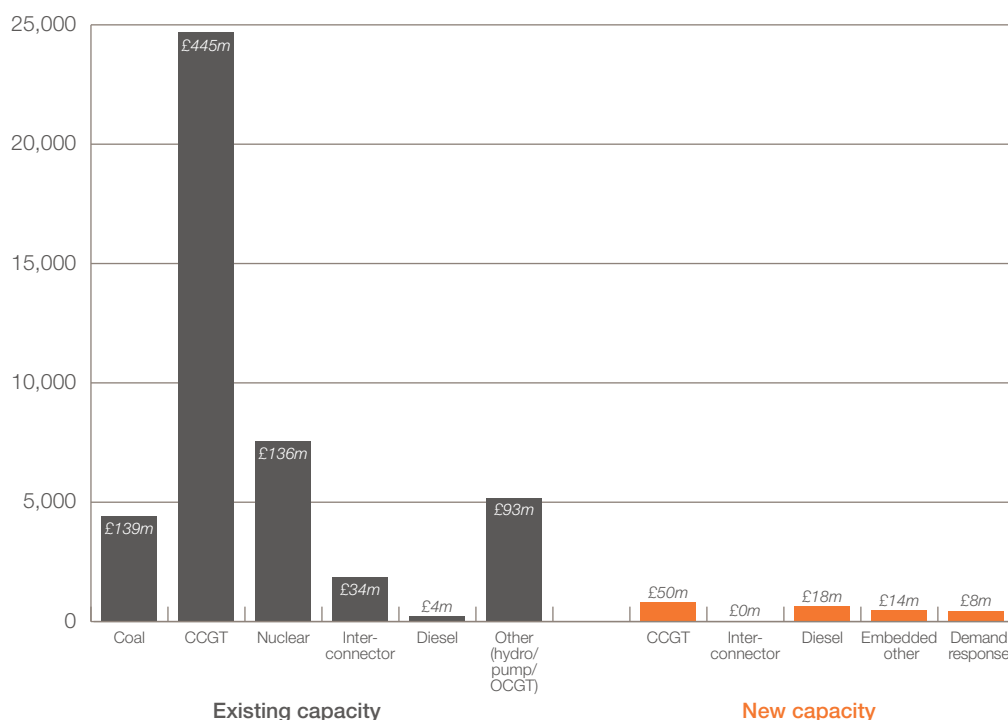
<sup>4</sup> Interconnectors link the UK’s electricity market with other electricity markets in Europe, allowing the import and export of electricity when there is excess supply in one market and demand in another.

delivery (known as 'T-1'). Up until now the government has reserved 2.5GW for these year-ahead auctions; however, it is consulting on a proposal to bring forward much of this capacity into the next T-4 auction (DECC 2016b).

**Figure 3.2**

The mix of generation that won contracts in the 2015 capacity market auction was little different to that in 2014 one

*Size of contracts (MW) awarded to new and existing plants in the 2015 T-4 auction, and costs of delivery in 2019/20 from contracts awarded in the 2014 and 2015 auctions,\* by generation type for delivery year 2019/20 (2014/15 prices)*



Source: Jones 2015

\*Note: the £ figures include the costs of multi-year contracts awarded in the previous, 2014 T-4 auction for delivery in 2019/20, as well as those awarded in the 2015 auction.

Furthermore, the government is also now proposing to hold an additional auction at the beginning of 2017 to deliver capacity for 2017/18, in response to narrowing capacity margins and concerns about security of supply during that winter (ibid). Given the small amount of new capacity procured in the two T-4 auctions, it is possible that the clearing price in this auction will be similar to that in the two auctions held thus far.

## 4.

# IS THE CAPACITY MARKET FIT FOR PURPOSE?

After two capacity market auctions, we are now able to evaluate the scheme's success in meeting its objectives. DECC's impact assessment for the capacity market, from June 2014, sets out the scheme's objectives as follows.

1. **Security of electricity supply:** 'to incentivise sufficient investment in generation and non- generation capacity to ensure security of electricity supplies'.
2. **Value for money:** 'to implement changes at minimum cost to consumers'.
3. **Coherence with decarbonisation:** to 'avoid unintended consequences [...] to minimise design risks and ensure compatibility with other energy market policies, including decarbonising the power sector' (DECC 2014b).

To these three initial aims we can now add the specific objective of delivering new gas capacity. Recent ministerial announcements have made it explicitly clear that this is now something they expect of the capacity market. On 7 January 2016, Andrea Leadsom, minister of state at DECC, said:

*'We are reviewing the capacity market to make sure we bring on new gas.'*

Hansard 2016b: column 422

Below we evaluate the outcomes of the capacity market in relation to each of these four objectives in turn.

### 4.1 Security of supply

As we saw in the previous chapter, the capacity market has delivered the required amount of capacity in each of its two auctions so far. This would appear to indicate that it has delivered on its security of supply objective. However, some questions remain.

At least one large power plant with a capacity market contract for 2018/19 (Fiddlers Ferry coal-fired power station) has announced that it will close in 2016. If it goes ahead with this it will have to pay penalties for failing to deliver on its capacity market contract, but that will presumably be less expensive than remaining online and running at a loss. It is also unlikely that the new CCGT plant (Trafford) that has a contract for 2018/19 will be ready in time for that year (Gosden 2015). So, even before addressing the question of whether the capacity delivered has been the best possible value for money, the capacity market is struggling to deliver on its own stated aim of guaranteeing a certain level of capacity in a delivery year. The government is consulting on tougher penalties for failing to deliver new capacity, which may help to prevent cases like this in future auctions.

### 4.2 Value for money

In both the 2014 and 2015 auctions, the clearing price was low. Ofgem pointed out in its assessment of the first auction in 2014 that the clearing price of £19.40/kW was 'below many forecasters' expectations', and the price for 2015's auction was lower, at £18.00 (Ofgem 2015c). However, the question of whether or not that investment is

providing a good return is more complex, and in three important respects consumers are not getting value for money.

### **‘Deadweight’**

First, allowing all capacity, both old and new, to bid into the market has meant that a lot of plants that would almost certainly have been running without additional subsidy will now be receiving windfall payments. This includes the entire UK nuclear fleet, which will receive £153 million in 2018/19, and £136 million in 2019/20 – just for being online, as they almost certainly would have been anyway (although their operators contend that the payments are necessary to pay for life-extension work to keep the plants open). It is clear that many plants that could remain on the system with no or very small capacity market payments are receiving a windfall (Cornwall Energy 2015). In the first auction, nearly a third of existing plants entering did not place an exit bid (a price beneath which they would not be able to commit to staying open to generate electricity, and so would drop out of the auction) (Ofgem 2015b). Given that the total payments amounted to £956 million, if the size of successful units receiving payments were uniform, this would amount to an estimated £300 million. This means that the capacity market is awarding unnecessary contracts, and many of the payments being made are effectively deadweight.

### **Lack of a level playing field**

Second, as we saw in chapter 2, demand response technologies can cut costs for consumers by removing the need for the most expensive plants to run in order to meet peak demand, and so reducing the need for new plants to be built. Just 0.35 per cent of the successful capacity bids in the first auction were demand response, and in the 2015 auction it was just over 1 per cent (Jones 2014 and 2015). As the energy and climate change select committee has argued, this means that consumers are effectively paying for generation capacity that will not be needed in the future as the demand response industry grows, thereby increasing long-term costs.<sup>5</sup> While some demand response was procured in the transitional arrangements auctions, this capacity will not be able to bid into the main auctions for three years (Martin 2016).

The capacity market does not currently provide a level playing-field for demand response, principally due to the difference in the contract lengths available to new generation and demand response. Longer contract lengths help to build a business case and secure investment: aggregators need to convince businesses that they will have a revenue stream that is secure enough to justify installing the new technology and establishing practices that allow them to turn down demand, which is clearly more difficult when contracts only last for one year. As discussed above, longer contracts are only available in the capacity market above a capital expenditure threshold of £255/kW – and demand response is not capital-intensive enough to qualify. In chapter 5 we set out how the issue regarding variance in contract lengths can be addressed to ensure that demand response is not unduly penalised.

### **The carbon price floor conflict**

Third, capacity payments are working against another government policy – the carbon price floor (CPF), which sets a minimum price for carbon emissions produced in electricity generation. The CPF is designed to disincentivise fossil generation, especially more carbon-intensive options such as coal; capacity payments are designed to incentivise generators to stay online. The CPF, together with the EU emissions trading scheme, also has the effect of increasing household energy bills. It is highly inefficient to both penalise and subsidise the same generating units. It also represents a bad deal for consumers, who pay for both.

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5 See for example ECCSC 2015.

### 4.3 Coherence with decarbonisation

The third stated objective of the capacity market is to ensure compatibility with other energy market policies, including decarbonising the power sector. However, opening up the market to *all* capacity has meant that carbon-intensive generation is able to secure contracts and to cover the penalties that they face elsewhere in the market, such as the CPF. As we have seen, coal-fired power stations have continued to receive payments worth hundreds of millions of pounds, despite their high levels of carbon intensity and the government's stated aim of phasing them out.

**Table 4.1**

The capacity (MW) of, and length of capacity market (2014 and 2015) contracts won by, UK coal-fired power stations

Coal-fired power stations	Capacity (MW)	2014 capacity market	2015 capacity market
Eggborough	1,960		
Longannet	2,260		
Rugeley	1,006		
Aberthaw	1,586	1-year contract	1-year contract
Fiddlers Ferry*	1,961	1-year contract	
Ferrybridge	980		
Ratcliffe	2,000	1-year contract	1-year contract
West Burton	2,012	3-year contract	
Cottam	2,008	3-year contract	
Drax	1,900	1-year contract	1-year contract

Sources: DECC 2015d, National Grid 2014 and 2015b

\*Note: announced it would close in 2016 despite a capacity market contract for delivery in 2018/19.

IPPR also estimates that 375MW of diesel generators were successful in the first capacity market auction, and 650MW in the second (Aldridge 2015).<sup>6</sup> Our calculations suggest that diesel generators were able to compete at a lower price because they were receiving large payments in other parts of the market, such as through 'triad avoidance payments' (incentives to reduce demand by charging based on the periods of the year at which demand is highest) and through other services that help National Grid balance supply and demand on the network (Frontier 2015b).

The carbon intensity of diesel generators is estimated to be over 1,000gCO<sub>2</sub>/MWh – above even that of a coal plant (Aldridge 2015). As the generating units are usually small (a representative unit is 24MW) they are not subject to a number of environmental restrictions that affect larger generators. We welcome the indication from DECC that measures will be taken by the Department for Environment, Food and Rural Affairs from 2019 to restrict these generators using air pollution regulations, but our view is that they should not be eligible for payments at all (DECC 2016b).

The provision of financial support to carbon-intensive generation such as coal and diesel generation is clearly working against the objective of decarbonising the energy system – the government's stated goal. It provides a lifeline to operators that face penalties elsewhere in the market, and which might otherwise reduce their running hours or go offline completely. IPPR's view is that, given the right market conditions, alternative capacity (both generation and demand response) could replace carbon-intensive generation, and that this would provide greater security in the long term and better value for money for billpayers.

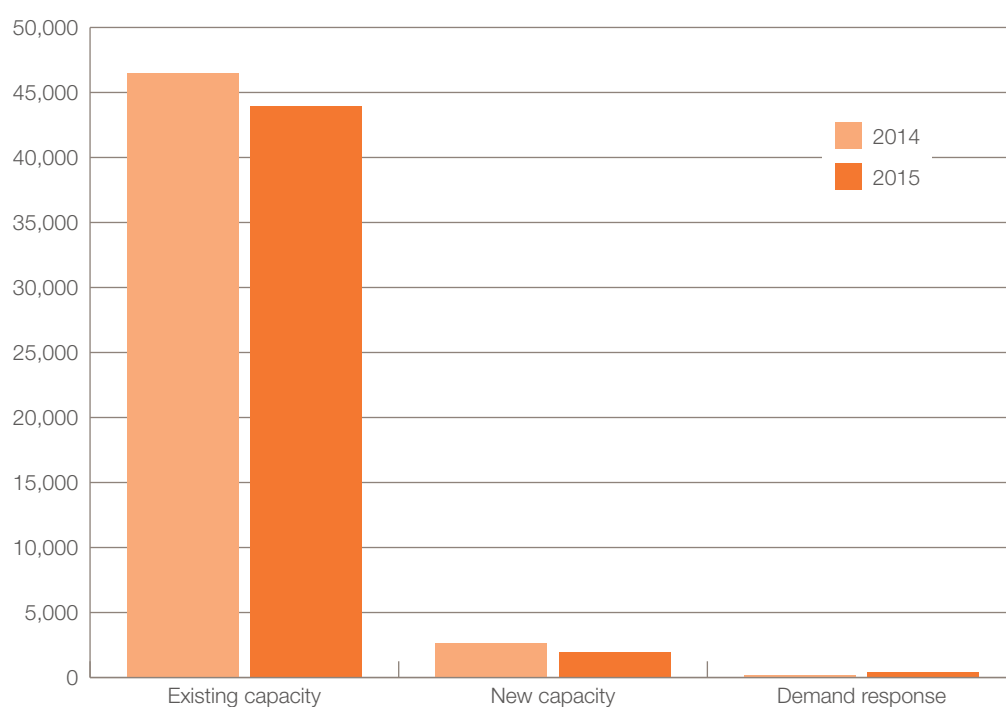
<sup>6</sup> The capacity market results put out by National Grid do not include fuel types, so the numbers may be approximate for smaller generating units.

## 4.4 New gas capacity

In 2014, the first auction saw only 5 per cent of capacity provided by new generation, which included just one large gas CCGT project. That project has since struggled to find the finance that it requires to be built, despite having a capacity market contract (Gosden 2015). This suggests that the price at which the company bid into the auction has not convinced investors that it will be capable of making a profit. In 2015's auction, only 4 per cent of capacity was new-build generation.

**Figure 4.1**

New capacity accounts for a small fraction, and demand response for an even smaller fraction, of capacity market contracts  
*Contracts (MW) awarded to existing and new capacity, and demand response, in the 2014 and 2015 capacity markets*



Sources: National Grid 2014 and 2015c

In part, this may result from the fact that it is not clear to what extent the capacity market was actually designed to bring forward new capacity. Its original impact assessment stated that the first objective of the market is to 'incentivise sufficient investment in generation and non-generation capacity to ensure security of electricity supplies' (DECC 2014b).

However, other statements appear to cast doubt on how much new-build capacity the government expected to come forward. When the UK government's application to the European Commission for the state aid agreement for the capacity market was initially requested, it was challenged by an existing operator. That operator believed it was an unfair subsidy, as a new CCGT plant would be more likely to win a contract than an existing CCGT plant due to the 15-year contract available to the former. In response, DECC ran the same example as provided by the existing operator in its legal challenge through its models with only small alterations, and concluded that 'the UK's simulations show that the existing CCGT would be able to bid lower than the new build CCGT'. The response went further, saying 'The UK's simulation of an auction shows that, in most cases, existing plants would be able

to bid lower than new build, except for a few relatively old and low efficiency plants which appear to be uncompetitive' (EC 2014).

The government is currently consulting changes to the capacity market that are designed to rectify this by increasing the amount of capacity being procured. In the 2015 auction, 5.4GW of new gas capacity missed out on a contract. The additional capacity likely to be bought in the 2016 T-4 capacity auction if the government implements the proposals on which it is currently consulting is expected to be at least 3GW. By increasing the total amount of capacity being bought, the government is making it more likely that at least some of this will be new gas capacity. However, there is as yet no guarantee of this, and existing coal plants could receive payments instead.

#### 4.5 Summary

Taken together, it is apparent that while the capacity market was set up with the intention that it would be a technologically neutral auction, in effect it does not offer a 'fair fight' either between demand response and existing capacity, or between new small-scale diesel generation and large-scale gas CCGT. The rules disadvantage demand response and favour existing generation. Diesel generators are currently advantaged by the number of revenue streams available to them. Consumers are set to pay out on contracts won by generators that would have been able to generate with no additional payments whatsoever. And factors outside the capacity market are exacerbating its failure to support the decarbonisation of the electricity supply. Our conclusion, in summary, is that the capacity market is not fit for the purposes for which it was designed. In the next chapter we therefore make a number of recommendations for how the capacity market can be reformed in order to better deliver on its own objectives.

## 5. REFORMING THE CAPACITY MARKET

The original aim of the capacity market was to deliver security of supply at the lowest cost while not conflicting with the need to decarbonise the energy sector. In the previous chapter we outlined why it is not delivering on those objectives. In chapter 2 we looked at how the electricity system is changing, and why it requires greater flexibility in order to integrate renewable sources of electricity and reduce reliance on large thermal plants in order to meet peaks in demand. IPPR's conclusion is that the capacity market needs to be reformed so that it:

- stops subsidising the most polluting forms of generation such as coal and diesel
- provides more of a level playing-field so that demand response can play a greater role in providing the capacity needed in future
- ensures that consumers no longer have to pay out windfalls to power stations that would have been online anyway.

Our recommendations would result in a capacity market that recognises the need to decarbonise and delivers better value for billpayers.

### Recommendations

#### 1. The capacity market should be split into two separate auctions for old and new capacity

The government is currently consulting on proposals to increase the amount of capacity required in the next T-4 auction in 2016, potentially by more than 3GW. Increasing demand in the auction in this way is likely to lead to additional costs, as new capacity is more expensive than existing capacity. However, existing capacity would be paid the same price as new capacity, which would create an inevitable windfall for the former.

It is possible to prevent these windfall payments. Under the current capacity market, the system operator, National Grid, makes recommendations as to the total capacity procured in the auction. National Grid should instead recommend the amount of *new* capacity to be procured in one auction (auction A) and the amount of existing capacity that could be procured for a separate auction (auction B). Given the need to ensure that any recommendations that National Grid makes are in accordance with the statutory carbon budgets set out under the Climate Change Act, the independent CCC should be required to advise the secretary of state on whether National Grid's recommendations are consistent with those budgets.

The clearing price in auction A may be higher than it has been for the two auctions to date, but it would only be paid to providers of new capacity. Conversely, it is very likely that the clearing price in auction B would be very low, thus reducing the windfall payments going to existing generators and compensating for the increased price in auction A.

Splitting the four-year auction in this way would mean that the payments would become more targeted to the capacity that bids for them, and the scheme would become more efficient overall. There would also be far greater control of the amount of new capacity that is rewarded through the scheme and ultimately brought online.



## **2. An emissions performance standard should be applied to the capacity market in order to exclude the most polluting types of generation**

While the government's proposals to limit the emissions from diesel generators are to be welcomed, it remains a fundamental contradiction in government policy that high-carbon energy sources are being subsidised. IPPR's view is that carbon-intensive generation should be explicitly prevented from accessing the capacity market, through the use of an 'instantaneous' emissions performance standard (EPS). This would effectively disallow any station over a set carbon intensity to bid into the capacity market, including coal and diesel generators. This limit could be set at a level that does not impact on any less carbon-intensive generation, such as new gas, that the government wants to incentivise.

It could be argued that this proposal does not meet the criterion of technology neutrality required by state aid guidelines. However, the state aid guidance from the EU says that measures for generation adequacy (such as capacity markets) should 'give preference to low-carbon generators in case of equivalent technical and economic parameters' (EU 2014). Our recommendation is that the government adds an EPS as a technical requirement of the capacity market.

The removal of coal in this way may prompt National Grid to continue to temporarily contract coal power stations to remain available in case of a severe power shortage, without being able to sell power on the wholesale markets. It is our view that if that were to be the case, it is preferable to paying polluting stations to stay open and allowing them to run indefinitely.

## **3. The government should require new large gas plants of over 300MW to be built with carbon capture and storage technology, or to commit to installing it in future**

The government currently requires plants over 300MW to be 'CCS ready'. However, if the government intends to build a large amount of new gas capacity, that requirement needs to be strengthened to become a commitment to introducing CCS, alongside a realistic plan for siting the plants in order to allow for the transportation and storage of the CO<sub>2</sub> produced. The current requirements allow plants to be built in places that make it unlikely that they will be able to use CCS in future (Littlecott 2016 forthcoming).

While new gas-fired plants will help reduce CO<sub>2</sub> emissions if they take the place of coal-fired capacity, in the long term unabated gas still emits too much carbon pollution for the UK to meet its climate targets. The CCC's least-cost pathway to 80 per cent reductions in emissions by 2050 projects the average carbon intensity of the power sector at around 100gCO<sub>2</sub>/kWh by 2030. Unabated gas is around four times more carbon intensive than this (ECCC 2016b). If gas-fired generation is to be relied upon to deliver a substantial amount of the UK's electricity in the long term, the government needs to ensure that CCS technology is developed that would significantly reduce its carbon intensity, and bring it closer to, or under, the average required carbon intensity for the power sector as a whole by 2030. Without such efforts, there is a risk that investment in large gas plants to replace coal could be deterred by an expectation of future regulation that would reduce their running hours (McGlade et al 2016).

The CCC has said that the transition to a more flexible system will involve a role for flexible unabated gas plant alongside demand response, storage and interconnection (particularly if they use new technologies to increase their efficiency and flexibility). In its power sector analysis for the fifth carbon budget, the CCC says that if more of this kind of gas capacity were to come forward, it 'would require less overall thermal plant to be built to stabilise the system, be less likely to curtail renewables output, and reduce overall emissions' (CCC 2015).

Taken together, the picture is clear – while some unabated gas can play a role in transitioning to a more flexible system overall, in the long term the UK’s emission reduction targets mean that we cannot rely on gas without CCS. In the 2020s, the main contribution that can be made by gas is as part of a flexible system that includes increasing levels of demand response, storage and interconnectors, all supporting the deployment of additional renewables.

#### **4. Demand response providers should have access to longer contracts**

While demand response aggregators are unlikely to require the 15-year contracts that are currently available for new-build plants with capital expenditure requirements above £255/kW, they should have access to longer contracts. Barriers to the delivery of demand response are not always related to levels of capital expenditure: there is also the need to convince businesses that want to take part that they will have access to a revenue stream for longer than one year, as well as the need to overcome a possible reluctance to be among the early adopters of new technology. The disparity in contract lengths available makes it difficult for them to compete with traditional generation. The capital expenditure thresholds should be removed, and all new capacity should be permitted to bid for contracts of up to 15 years.

#### **5. Remove further barriers to participation for demand response**

The transitional arrangements auction is designed to act as a bridge to develop demand response. But without access to the main capacity auction, it is a bridge to nowhere. Demand response providers should also be able to take part in both the four-year and transitional arrangements auction. As these auctions cover different years, it does not follow that they will receive a double subsidy. Demand response providers should not be restricted from entering the main capacity market auction if they receive a contract in a transitional arrangements auction.

The capacity market favours generation in its requirements to prove that capacity is available. If a demand response provider changes either the type of ‘turn down’ they are offering or the companies with which they are working, they have to go through the metering test again, despite being committed to delivering the same capacity. This requirement should be removed as it limits their flexibility, and could impact upon their reliability.



Taken together, these reforms would significantly improve the design of the capacity market. The split between old and new capacity in particular would be likely to require changes to the state aid agreement that the UK has already received from the European Commission (Frontier 2015c). This may mean that it is unlikely that these changes could be put in place in time for the 2016 capacity market auction, designed to deliver for the year 2020/21. However, this is no reason for the government to persevere with the existing design, given that it is failing to deliver on its original objectives. The European Commission is currently reviewing the design of European capacity markets, with a report expected around the middle of this year (Cañete 2015). The UK government’s focus on using the capacity market to deliver new gas, and the changes that are being made to this end, may already be at variance with the initial design that was given state aid approval. The government should therefore take this opportunity to propose significant alterations to the design of the UK’s capacity market.

Capacity markets are not the only way to ensure security of electricity supply. IPPR has previously set out our preference for a ‘strategic reserve’ (Garman and Aldridge 2015). However, we are now two years into the capacity market scheme, and the government is attempting to reform it through a consultation. Our view, therefore, is that the recommendations set out above are the minimum that the government must undertake. Without reforms on this scale, the capacity market will continue to fail to meet its own objectives, and will damage the wider needs and future of the UK’s energy system.

## 6.

# WIDER MARKET REFORMS FOR A MORE EFFICIENT, CLEANER ELECTRICITY SYSTEM

Both the capacity market and the government's wider regulatory framework are designed around an increasingly outdated view of the electricity market – one centred on large power stations, owned by large utilities, supplying passive consumers. Today, new entrants and new technologies offer opportunities to transform the market. Below we set out a number of reforms, over and above those to the capacity market proposed in chapter 4, that would start to open up the system to these new opportunities.

As we have shown, demand response is particularly disadvantaged in the capacity market. However, it is disadvantaged outside of it, too. Demand response providers are held back by barriers to entry to the wholesale markets. Currently, to take part in the wholesale market, demand response providers need to purchase supply licences. **The 'balancing and settlement code' should therefore be updated to allow demand response providers to compete fully in the wholesale market, with a new specifically designed licence that recognises the wider benefits to the system of increased demand response.**

Changes also need to be made to get the domestic sector, as well as the business and commercial sector, to take advantage of the potential of demand response. The rollout of smart-meters should enable households' electricity use to be measured in half-hour settlement periods, just as that of many businesses is already. This would open up greater potential for more demand response at a household level. Much of this could take place through the tariffs that are offered by electricity providers. However, while there is currently a time-of-use tariff available, the number of different tariffs that can be offered by suppliers has been limited to four by Ofgem's retail market review (RMR). The Competition and Markets Authority (CMA) has expressed concern both about the potential effect that this is having on competition now, and at the likelihood that it hampers the development of tariffs that can make the most of smart-meter technology (CMA 2015). The CMA says that while RMR changes have not been in place for long enough for them to be sure of their effects, 'the evidence in hand at this stage is not particularly encouraging' (ibid). It has since recommended that that the 'simpler choices' element of RMR be scrapped (CMA 2016). **Ofgem should ensure that proposals on tariff reform allow for greater innovation, the importance of which will increase as the smart-meter rollout continues.**

Storage providers have also played only a very limited role in the capacity market thus far, despite their potential to help provide a more flexible system. The only storage that has been able to take part has been existing pumped hydro plants such as Dinowig and Ffestiniog in Wales. As was discussed in chapter 3, a wide range of different storage technologies are now emerging onto the market; these technologies have different capabilities and are able to make different contributions to balancing supply and demand. Storage is also disadvantaged by a regulatory regime that has never before had to integrate technologies that have the attributes of both users (when charging) and suppliers (when discharging). As such, there is no single storage licence that they can access, which leaves

them open to paying two sets of charges. **Ofgem should therefore introduce a storage licence to remove this double regulation, and allow for greater growth in the industry.**

In 2014 IPPR argued that the market dominance of large, vertically integrated utilities (that is, those that both generate electricity and supply to customers) was delaying the transition from the current electricity model to a more modern and flexible system (Platt 2014). DECC has since acknowledged this, stating in December 2015 that this is one of the market failures that represents a barrier to a smarter energy system. In this recent report, the department said that ‘existing energy market players have significant influence through existing policy and regulatory processes which may make *introducing new business models and ways of doing things more challenging*’ (DECC 2015b). The regulator, Ofgem, has also recognised that there is a problem in this area, and is in the process of carrying out work to better integrate what it refers to as ‘Non Traditional Business Models’ (Ofgem 2015a). **Ofgem should expedite its work on integrating new and innovative business models into its regulatory regime.**

IPPR very much welcomes the National Infrastructure Commission’s recent report aimed at helping Ofgem, DECC and National Grid to ensure that the right regulatory environment and infrastructure is in place to deliver a more flexible electricity system (NIC 2016). Ensuring that Ofgem makes the necessary changes to integrate demand response and storage providers into the UK’s electricity market is a vital part of that, and this first report from the National Infrastructure Commission on flexibility should be the beginning of the process, not the end of it. **We recommend that the National Infrastructure Commission monitors the progress of DECC, Ofgem, and National Grid to ensure that its recommendations are acted upon, and that opportunities to create greater flexibility in the electricity system are maximised.**



These recommendations represent the first, immediate steps that should be taken within the UK’s current regulatory framework for electricity. Ultimately, however, the UK’s regulatory regime may have to undergo more significant shifts if it is to incorporate new technologies and transition to a more flexible and efficient system. The government is considering creating an independent system operator carved out of National Grid’s existing functions, which would mean separating the system operator from the business responsible for the physical transmission infrastructure. However, this alone may not be sufficient. A new system operator is likely to have to take on more responsibility, collecting more information on how the grid operates at local levels (currently the preserve of Distribution Network Operators), and overseeing an altogether more integrated system (Lockwood 2016). New York State is currently reviewing its regulation of the electricity system in its entirety, in order to reflect the evolving, decentralised reality that is being brought about by new technologies (Mitchell 2016). We recommend that the British government conducts a similarly comprehensive review of its entire regulatory framework, to make sure that it is fit for the future.

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