

Planning our electric future: a White Paper for secure, affordable and low-carbon electricity



Planning our electric future: a White Paper for secure, affordable and low-carbon electricity

Presented to Parliament
by the Secretary of State for Energy and Climate Change
by Command of Her Majesty

July 2011

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Ministerial Foreword by the Secretary of State



Electricity is a fundamental part of our daily lives. It lights our homes and streets, keeps our schools and hospitals running, and powers our businesses. That's why it is so important that the electricity market works effectively.

Since the market was privatised in the 1980s the system has worked: delivering secure and affordable electricity for the UK. But it cannot meet the challenges of the future.

Around a quarter of our existing capacity – mainly coal and nuclear power stations – will close in the next decade. Keeping the lights on will mean raising a record amount of investment. However, the current market arrangements will not deliver investment at the scale and the pace that we need.

That investment must build an electricity system fit for the future. Traditional fossil fuels leave us open to volatile prices, deepen our dependence on imported energy and emit too much carbon. Instead, we need huge investment in renewables; a new generation of nuclear stations; and, in time, gas and coal plant that can capture harmful emissions. This will diversify supply and wean us away from imported fossil fuels.

By reforming the market, we can ensure future security of supply and build a cleaner, more diverse, more sustainable electricity mix. This White Paper sets out how we will encourage this investment in the most cost-effective way.

This will mean making sure we create the right conditions to attract the investment needed to transform our system, in particular by reducing risks and setting a clear and stable framework for investors.

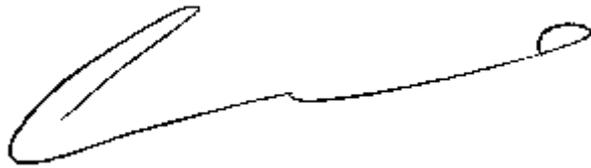
It means establishing a system where, in time, low-carbon technologies can compete against each other on a level playing field to find their place in the energy mix.

And it means making the existing market fairer:

- to consumers, who want investment to take place in the most cost-effective way so they do not pay over the odds for their electricity;
- to low-carbon generators, who currently have to compete in a market in which they are at a natural disadvantage; and
- to new entrants, who struggle to sell their electricity in a market dominated by six big firms.

But this White Paper is about more than encouraging investment in new generating capacity. The Government understands that the most cost-effective way to secure our future supplies is not just to build new power stations. We have put demand reduction and energy efficiency at the heart of our policy programme – and we are committed to making the electricity system more flexible and responsive.

These reforms will yield the biggest transformation of the market since privatisation, securing our future electricity supplies and heralding the shift toward a low-carbon economy. They will put us at the forefront of low-carbon technological development; ready to lead the world in the next energy revolution. And they will deliver secure, affordable and low carbon energy for generations to come.

A handwritten signature in black ink, appearing to read 'Chris Huhne', with a large loop at the start and a small circle at the end.

The Rt. Hon. Chris Huhne MP
Secretary of State for Energy and Climate Change

EXECUTIVE SUMMARY

1. This White Paper sets out the Government's commitment to transform the UK's electricity system to ensure that our future electricity supply is secure, low-carbon and affordable.
2. The package of reforms outlined here will mean that by 2030 we will have: a flexible, smart and responsive electricity system, powered by a diverse and secure range of low-carbon sources of electricity, with a full part played by demand management, storage and interconnection; competition between low-carbon technologies that will help to keep costs down; a network that will be able to meet the increasing demand that will result from the electrification of our transport and heating systems; and we will have made this transition at the least cost to the consumer.

An unprecedented challenge

3. Electricity plays a part in almost every aspect of modern life and is vital to our economic and social wellbeing. Since privatisation in the 1980s, our competitive market and system of independent regulation has served us well; delivering reliable and affordable electricity. It is crucial for the UK's international competitiveness and economic development that this continues. However, we face a number of unprecedented challenges in the coming decades:
 - **security of supply is threatened as existing plant closes:** over the next decade we will lose around a quarter (around 20 GW) of our existing generation capacity as old or more polluting plant close. Modelling suggests that de-rated¹ capacity margins could fall below five per cent around the end of this decade, increasing the likelihood of costly blackouts. In addition to this huge reduction in existing capacity, the future electricity system will also contain more intermittent generation (such as wind) and inflexible generation (such as nuclear). This raises additional challenges in terms of meeting demand at all times, for example when the wind does not blow;
 - **we must decarbonise electricity generation:** it is vital that we take action now to transform the UK permanently into a low-carbon economy and meet our 15 per cent renewable energy target by 2020 and our 80 per cent carbon reduction target by 2050. To put us on this latter trajectory, power sector emissions need to be largely decarbonised by the 2030s. Without reform, the electricity sector would have an emissions intensity in 2030 of over three times the level advised by the Climate Change Committee. Electricity Market Reform will put in place the institutional and market arrangements to deliver the scale of change

¹ The de-rated capacity margin is the capacity margin adjusted to take account of the availability of plant, specific to each type of generation technology. It reflects the probable proportion of a source of electricity which is likely to be technically available to generate (even though a company may choose not to utilise this capacity for commercial reasons).

in the power sector needed to meet the UK's carbon budgets, including the recently-adopted fourth carbon budget;

- **demand for electricity is likely to rise:** despite the improvements in household and non-domestic energy efficiency which will be generated through the introduction of the Green Deal and the roll-out of Smart Meters across the country, overall demand for electricity may double by 2050 due to the electrification of the transport, heat and other carbon-intensive sectors; and
 - **electricity prices are expected to rise:** increases in wholesale costs, the carbon price and environmental policies are likely to lead to higher bills in the future, even without factoring in the huge investment needed in new infrastructure. The Government is committed to reducing the impact on consumers by making sure investment takes place in the most cost-effective way possible. The cumulative benefits to the economy of Electricity Market Reform are expected to be over £9 billion higher than business as usual over the period 2010-30².
4. There is broad consensus that current market arrangements will not deliver the scale of long-term investment needed, at the required pace, to meet these challenges. Nor will they give consumers the best deal. This is in part because of the sheer scale of the investment required. Up to £110 billion³ investment in electricity generation and transmission is likely to be required by 2020, more than double the current rate of investment.
5. But it is also because the challenges of decarbonisation and security of supply are best met today through a combination of measures. The low-carbon and renewable energy objectives we have set reflect this approach, but current market arrangements do not. In particular:
- the current market price for electricity is driven by fossil plant, such as unabated gas-fired Combined Cycle Gas Turbine (CCGT), with much lower fixed costs relative to their operational costs in contrast to, for example, nuclear or offshore wind. Investors in non-gas fired generation are also disadvantaged by being exposed to more volatile and uncertain returns when compared to gas;
 - new low-carbon generators often have to overcome relatively high barriers to market entry. High construction costs and market illiquidity make it more difficult for low-carbon generation to compete with fossil fuels and impede market access. Small and independent players are also particularly affected by the risk of not being able to find long-term buyers for their electricity;
 - the social cost of carbon is not fully reflected in the market price as this does not take into account all of the damage caused by climate change.

2 Business as usual means all current policies, including the Renewables Obligation and the Carbon Price Floor.

3 Our analysis shows that around £75 billion could be needed in new electricity generation capacity, and Ofgem's 'Project Discovery' estimated that around an additional £35 billion of investment is needed for electricity transmission and distribution.

The carbon price is also volatile and hard to predict – making long-term investment decisions more uncertain; and

- the capacity and appetite of existing market participants to finance the unprecedented levels of investment needed is uncertain.
6. There are also likely to be insufficiently strong signals to invest in the level and type of capacity that we need in order to guarantee future security of supply. This is also due to the scale of investment needed and failures within the existing market.

Our strategy

7. At the heart of our strategy is a framework that will offer reliable contracts, administered through delivery arrangements that are trusted by investors, to achieve the diverse portfolio of generation we need to meet our goals as efficiently and cost-effectively as possible. Broadly this approach consists of four parts:
- long-term contracts for both low-carbon energy and capacity;
 - institutional arrangements to support this contracting approach;
 - continued grandfathering, supporting the principle of no retrospective change to low-carbon policy incentives, within a clear and rational planning cycle; and
 - ensuring a liquid market that allows existing energy companies and new entrants to compete on fair terms.

Contracting for Low-Carbon Generation

8. At the heart of our strategy to deliver this transition is a new system of **long-term contracts** in the form of Feed-in Tariffs with Contracts for Difference (FiT CfD), providing clear, stable and predictable revenue streams for investors in low-carbon electricity generation. This is a cheaper, more robust mechanism than the alternative support options available and provides greater certainty that we will meet our carbon emissions targets. These new contracts could be delivered by a range of possible delivery organisations – including private sector bodies.
9. In addition, there are two other complementary measures to decarbonise electricity generation. These are:
- the introduction of a **Carbon Price Floor** (CPF) to reduce uncertainty, put a fair price on carbon and provide a stronger incentive to invest in low-carbon generation now. This was announced in Budget 2011 and represents an early and long-term signal to investors that the Government is serious about encouraging investment; and
 - an **Emissions Performance Standard** (EPS) set as an annual limit equivalent to 450g CO₂/kWh at baseload to provide a clear regulatory signal on the amount of carbon new fossil-fuel power stations can emit.

This will reinforce the requirement that no new coal-fired power stations are built without Carbon Capture and Storage (CCS).

10. The new contracting approach and wider reforms implement the coalition agreement commitments to introduce an EPS and a new system of Feed-in Tariffs (FiT) and are consistent with the agreed position⁴ that new nuclear stations should receive no public support unless similar support is available to other low-carbon technologies.
11. Together, this package of measures will:
 - provide a more efficient and stable framework for investors, ensuring that the cost of capital required for new low-carbon generation capacity is lower. This varies by technology but the overall effect of the cost of capital reductions from Electricity Market Reform will be a potential saving of £2.5 billion over the period to 2030⁵;
 - encourage investment in proven low-carbon generation technologies, but also allow new technologies such as CCS to get off the ground and allow them to become cost-effective and compete without support. This is vital to our ability to adjust to different scenarios for fossil-fuel prices;
 - boost competition within the market as it will provide the framework for independent generators and new investors to invest in low-carbon generation. The ability of new entrants to come to the market will also be supported by action from Ofgem to improve liquidity;
 - lead to competition within and between different low-carbon generation technologies for their appropriate role in the energy mix, as we move to technology-specific auctions for contracts towards the end of the decade, and technology-neutral auctions further in the future;
 - introduce an appropriate policy framework in the electricity sector to contribute towards delivery of the fourth carbon budget; and
 - achieve our aims at least cost to the consumer.
12. We also recognise that reducing demand for electricity will lower carbon emissions and is likely to be more cost-effective than building additional generating capacity. As such, we will assess whether there are sufficient support and incentives to make efficiency improvements in electricity usage and consider whether there is a need for appropriate additional measures.
13. Engaging with consumers on energy use will also be crucial. We have already taken decisive action to reduce central Government emissions by 13.8 per cent (exceeding our original target of a 10 per cent reduction)⁶. The introduction of the Green Deal⁷ will enable homes and businesses to

4 http://www.decc.gov.uk/en/content/cms/news/en_statement/en_statement.aspx

5 Further detail is set out in the Impact Assessment.

6 In the period between 14 May 2010 to 13 May 2011.

7 The Green Deal will predominately help to reduce costs and carbon emissions around home heating. For the majority of homes this heating will be gas fuelled.

improve energy efficiency with no upfront cost. This will be complemented by a huge programme aimed at making sure every home in Great Britain has smart electricity and gas meters, with businesses and public sector users having smart or advanced energy metering suited to their needs. This will enable consumers to monitor and manage their energy consumption, and pave the way for a transformation in the way in which energy is supplied and used.

Contracting for Security of Supply

14. Historically the UK has benefited from robust security of supply. However the unprecedented nature of the challenge means there is a risk of uncomfortably low capacity margins towards the end of the decade. We need to take action now to address these issues and avoid problems in the future.
15. In addition, there are new opportunities from innovative technologies that will take demand off the system at times of stress, store electricity and connect our market to others in Europe. We need market arrangements that make the most of these opportunities.
16. Although we do not see security concerns until the latter half of the decade, we need to act now to address them. There are three primary challenges under the banner of security of supply:
 - **diversification of supply** – how to ensure we are not over-reliant on one source or technology and reduce our exposure to high and volatile fossil fuel prices;
 - **operational security** – how to ensure that, moment to moment, supply matches demand, given unforeseen changes in both; and
 - **resource adequacy** – how to secure sufficient reliable capacity to cover peak demand.
17. The measures outlined in this White Paper to contract for low-carbon electricity generation will have the effect of making our electricity supply more secure by encouraging a diverse range of new generation capacity and reducing our reliance on energy imports. New capacity will include renewables, CCS on gas and coal and new nuclear stations. It is clear that fossil fuels without CCS, especially gas, will also continue to have a key role to play in the coming years.
18. The System Operator, National Grid, is responsible for ensuring operational security. It does so by making sure supply balances demand at any given moment. Ofgem – as the independent regulator – is currently considering reform of some of the current mechanisms that ensure balance. The Government is supportive of reform and keen that improvements are made.
19. But these responses alone are unlikely to be enough. In order to ensure resource adequacy, the Government will legislate for a new contracting framework for capacity: a new **Capacity Mechanism**. We are seeking further views on the form this mechanism should take.

20. In this White Paper we have set out two options. The first is a targeted mechanism in the form of a Strategic Reserve, a development of the lead option from the December 2010 Electricity Market Reform consultation document, designed to address stakeholder concerns. This comprises centrally-procured capacity which is removed from the energy market and only utilised in certain extreme circumstances. The alternative would be a market-wide mechanism in which all providers willing to offer reliable capacity are provided incentives to do so. Under both options, we plan to ensure a fair and equivalent treatment of demand side resources such as storage and demand side response, alongside generation, with the aim of securing best value investment across the power system.
21. The Government recognises that reducing demand is likely to be more cost-effective than building additional capacity. This will also require better use of existing generation through the development of a more flexible electricity network. Government and Ofgem have made significant progress over the last few years on improving networks. However there are more significant challenges ahead. This White Paper sets out a high-level strategy on networks and system flexibility, detailing work over the coming months, in particular that being undertaken through the Smart Grid Forum. The Government will also develop its electricity systems policy next year, looking at the future system and focusing on challenges around balancing and system flexibility. This will include clarifying the role of demand side response, storage and interconnection, and the development of a smarter grid.

A New Institutional Framework

22. Putting in place an enduring, robust and credible institutional framework is critical to ensuring investor confidence. The institutional arrangements for administering FiT CfDs and capacity-based contracts will need to provide clarity and certainty and be trusted by investors.
23. Government will continue to set policy, ensuring the objectives of security of supply, decarbonising the electricity sector (in line with all carbon budgets) and cost-effectiveness are met.
24. It is likely that an organisation or organisations at arm's length from Government will administer the contracts. Other core functions to deliver the FiT and Capacity Mechanism include: translating the policy objectives into technical requirements, delivering the contracts, data reconciliation, managing payments, and monitoring compliance and enforcement.
25. The Government and the delivery organisation(s), working jointly, will periodically evaluate, according to a planning cycle clearly laid out in advance, their future strategy in the light of possible changes in costs, technological developments and new challenges to the energy system. The first of these assessments will be in 2016 and will also consider whether the new contract structure for low carbon is delivering all the benefits, especially for consumers, and improvements over the existing Renewables Obligation, that we expect, and on this basis consider any amendments to the future approach that may be required. As now, any

changes would be made in the light of our continued commitment to grandfathering and no retrospective change.

26. There are several key criteria that will inform the decision on which organisation(s) is best placed to take on this delivery role, including appropriate levels of accountability, independence, credit-worthiness, skills and value for money.
27. A decision on the roles and responsibilities of Government and those of the delivery institution(s), as well as more detail on functions, contracting and the planning cycle, will be set out around the turn of the year. We will continue to engage with stakeholders, as appropriate, in advance of this decision.
28. We envisage the EPS being administered outside of these arrangements. Subject to more detailed implementation planning, it is likely that the environmental regulators in each part of the UK will be best placed to administer the EPS.

Improving Market Liquidity

29. There are a number of barriers to entry and growth in electricity generation and supply markets. One of the most important is the low level of liquidity in the electricity wholesale market. Significant improvements are essential to promote a competitive market and long-term security of supply. The Government also considers liquidity reform to be critical in enabling Electricity Market Reform to deliver efficiently and cost-effectively.
30. Ofgem has set out proposals aimed at improving overall liquidity and meeting the needs of independent generators and suppliers. The Government welcomes the direction of travel set by Ofgem. Credible reference prices and routes to market are essential for low-carbon generation. The Government is working closely with Ofgem to ensure that, taken together, Electricity Market Reform and the liquidity reforms deliver the necessary improvements, including that there is enough liquidity to offer the means for independent generators of all sizes to compete effectively in the market.
31. To the extent that there are continued barriers to entry that are not addressed through Ofgem's actions, the Government will work with all stakeholders to identify appropriate solutions.

The economic case

32. The package of Electricity Market Reform measures has been designed to be the most cost-effective means to meet our objectives. This is particularly important as electricity prices and, to a lesser extent, bills are likely to rise relative to today with or without reform due to increases in wholesale costs, the carbon price and environmental policies. There is also substantial uncertainty about the outlook for fossil fuel prices, particularly gas – strengthening the case in the longer term for moving away from reliance on fossil fuels with potentially volatile prices.

33. In the short and medium term, the impact of Electricity Market Reform on bills is likely to be marginal compared to a baseline of continuing with the existing support arrangements for low-carbon generation. Average costs for households, businesses and energy intensive industries (EII) are likely to vary (either increase or decrease) against this baseline by less than one per cent over the initial period of reform.
34. However, towards the end of the period, reform is expected to have a more substantial impact in curbing rising bills. If we continued with current policies, average annual household electricity bills could rise by around £200 by 2030. With Electricity Market Reform, this increase in bills could be limited to around £160⁸ – a saving of £40 or around six per cent. Similar figures for businesses and energy intensive industries are around seven per cent and eight per cent respectively. Energy efficiency measures can help reduce bills further.
35. As part of the transition to a low-carbon economy, we must ensure that energy intensive industries remain competitive and that we send a clear message that the UK is open for business. There would be no advantage – both for the UK economy and in terms of global emissions reductions – in simply forcing UK businesses to relocate to other countries where carbon emissions continue unabated. As such, we commit to announcing in the autumn a package of measures to reduce the impact of government policy on electricity costs for energy intensive manufacturers whose international competitiveness is most affected by our energy and climate change policies and to support EII in becoming more energy and carbon efficient, where it would be cost effective for them to do so. We will examine international best practice in determining how to do this. We will also work with UK-based EII to ensure they benefit from rapidly increasing demand for materials in low-carbon supply chains.

Making it happen

36. Together, the policies outlined above will ensure secure low-carbon energy supplies, at least cost, and help deliver on the commitment to be the greenest government ever. But to be successful we need to ensure they are implemented effectively and efficiently. That means making sure that there is a smooth transition from existing policies, working closely and collaboratively with the Devolved Administrations to develop and deliver a coherent and seamless package of reform measures in each part of the UK, and ensuring that reforms are consistent with EU law.

Transitional measures

37. It is essential that the period of transition between the current and new market arrangements runs smoothly and allows investment to continue. As such, we support the principle of no retrospective change for low-carbon investments and have listened to industry views on the best way to transition to a new mechanism. Therefore:
 - to ensure ongoing Renewables Obligation (RO) stability, existing accredited generation will continue to be supported under the RO;

⁸ Current policies include the Carbon Price Floor and the Renewables Obligation.

- once the FiT CfD is introduced and until 31 March 2017, to provide flexibility new renewable generation will have a one-off choice between the RO and FiT CfD;
 - the RO will close to new accreditations on 31 March 2017. No generation will be able to accredit under the RO from that date; and
 - we will grandfather RO support for all technologies at the rate applicable on 31 March 2017.
38. To ensure the continuity of all low-carbon development, we will work actively with relevant parties to enable early investment decisions to progress to timetable wherever possible, including those required ahead of full implementation of the FiT CfD.

Devolved Administrations

39. The Government believes that by working closely with the Devolved Administrations, we will be able to deliver the level of new low-carbon generation the UK needs. We will continue to work together to design and deliver relevant elements of the policy package and ensure that reform is consistent with the devolution settlements and takes account of existing market arrangements.

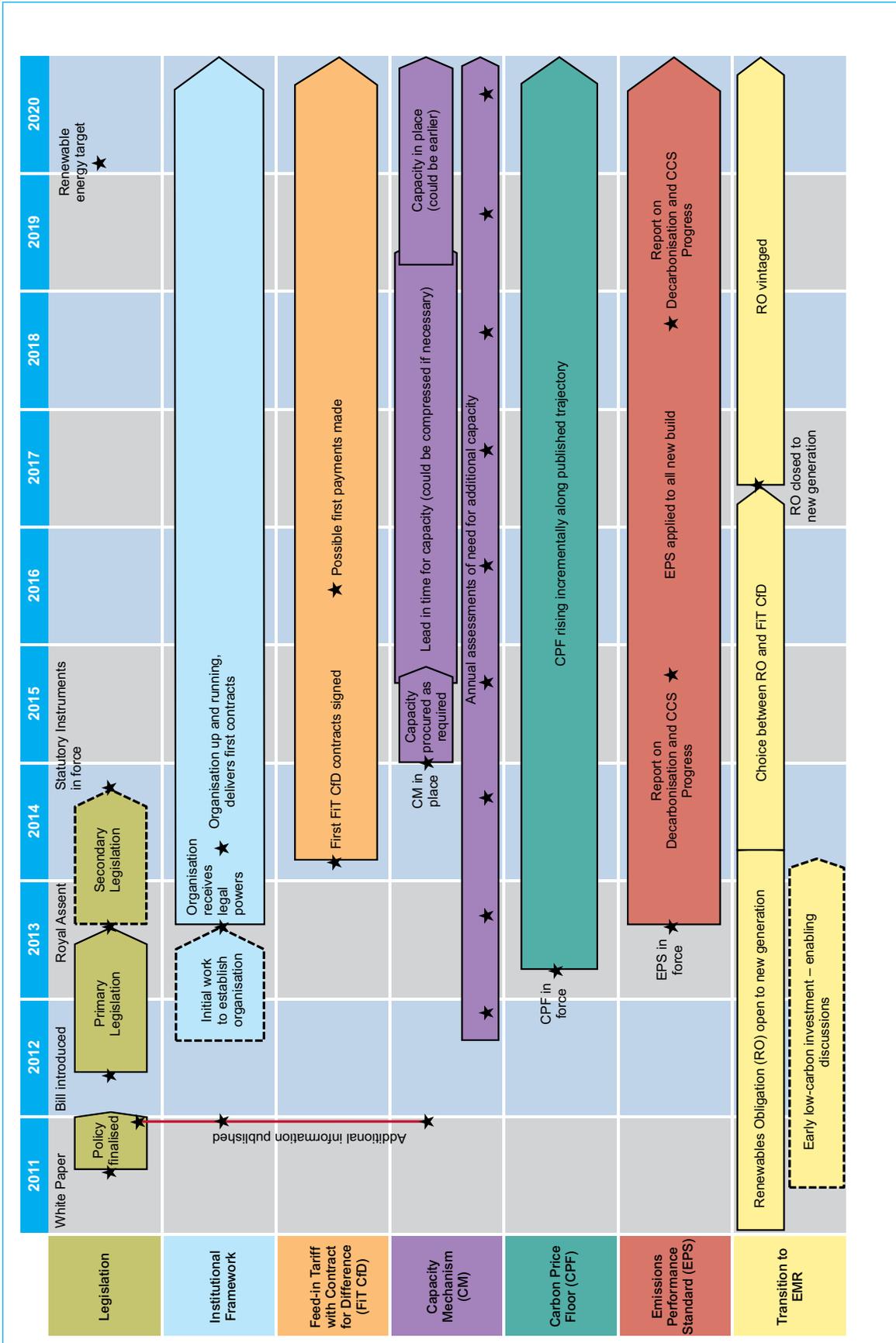
European Union

40. We are working closely with the European Commission and other stakeholders to ensure our reforms are consistent with, and complementary to, the wider integration of the GB market with EU electricity markets, of which we are fully supportive.

Next steps

41. We will publish a technical update by the end of the year. This will include:
- the detailed design of the Capacity Mechanism; and
 - more details on the institutional arrangements needed to deliver these policies.
42. In addition, we will:
- undertake an assessment over the coming year to determine whether DECC should take further steps to improve the support and incentives for the efficient use of electricity; and
 - develop an electricity systems policy next year, looking at the future system framework and focusing on challenges around balancing and system flexibility. This will include clarifying the role of demand side response, storage and interconnection, and the development of a smarter grid.
43. The Government intends to legislate for the key elements of this package through primary legislation in the second session, which starts in May 2012. We intend that this legislation will reach the statute book by spring 2013 so that the first low-carbon projects can be supported under its provisions in 2014. These dates are subject to Parliamentary time being available and the will of Parliament.

Figure 1: An indicative timetable for implementation and transition



Chapter 1 – Objectives, policy response and vision of Electricity Market Reform

Summary

- The Electricity Market Reform package will secure long-term electricity supply and decarbonise electricity generation, while minimising costs to the consumer.
- The Government announced in Budget 2011 that it would put in place a Carbon Price Floor to reduce investor uncertainty, put a fair price on carbon and provide a stronger incentive to invest in low-carbon generation.
- We will introduce new long-term contracts Feed-in Tariff with Contract for Difference (FiT CfD) to stabilise revenues and reduce risks to support investment in all forms of low-carbon electricity generation.
- An Emissions Performance Standard set at 450g CO₂/kWh will be introduced to provide a clear regulatory signal that new coal plants must limit their emissions.
- A Capacity Mechanism is needed to ensure future security of electricity supply. We are seeking further views on the type of mechanism required and will report on this around the turn of the year.
- This will be underpinned by a strategy for future electricity networks and work led by Ofgem to improve market liquidity. The Government is also undertaking a series of measures to improve energy efficiency, including the Green Deal.

Introduction

- 1.1 The electricity market needs wide-ranging reform. The complexity of the market and the scale of our ambition means a number of policy responses will be required in order to realise our goals. The detailed proposals are set out in later chapters of this White Paper. Together, these measures represent a coherent package designed to complement each other and achieve the Government's vision for Electricity Market Reform.
- 1.2 This section:
 - sets out the high-level objectives of Electricity Market Reform;
 - outlines the scale of the investment challenge;

- reviews the package of policies as set out in the Electricity Market Reform consultation document⁹;
- provides a high-level summary of the responses to the consultation;
- describes the interaction between the various elements of the Government's preferred policy package;
- describes a vision of the future electricity system after market reform; and
- discusses the wider context and how the Electricity Market Reform policy package complements the wider Government agenda.

Objectives

- 1.3 The primary objectives of Electricity Market Reform are to:
- ensure the future security of electricity supplies;
 - drive the decarbonisation of our electricity generation; and
 - minimise costs to the consumer.
- 1.4 The key to achieving these objectives will be to bring forward the level of investment needed in new low-carbon generation capacity and infrastructure at the required pace.

Meeting the Investment Challenge

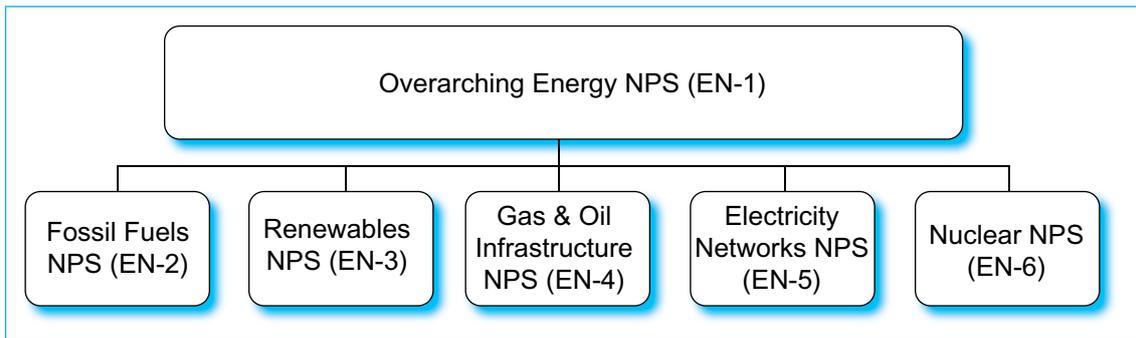
- 1.5 Given the scale of the investment challenge (with up to £110 billion needed in electricity generation and transmission in this decade alone), it is important we attract the necessary investment in the most cost-effective way possible.
- 1.6 Without reform, the existing market will not deliver the scale of long-term investment, at the pace that is needed, nor will it be able to ensure that consumers get the best deal. If we are to meet our long-term carbon and security of supply objectives, we need to reform the market now, and make investment in low-carbon generation in the UK more attractive.
- 1.7 We believe the package of measures set out in this White Paper will help create long-term, stable and predictable electricity market arrangements which are attractive to investors at home and overseas. This is particularly important as the existing 'Big Six' energy companies are unlikely to be able to finance all the investment at the scale and pace required.
- 1.8 Overcoming investment constraints will also require additional models of financing to encourage the participation of alternative sources of funding for generation and transmission projects. Given the importance of debt to finance new energy projects and the constraints faced by

⁹ <http://www.decc.gov.uk/en/content/cms/consultations/emr/emr.aspx>

banks, it is also important that providers of debt are able to refinance their capital commitments in the public debt markets.

- 1.9 In recognition of these challenges and alongside the new market framework, the Government is creating a Green Investment Bank (GIB). The GIB will offer a range of financial solutions to accelerate private sector investment in the UK’s transition to a green economy. The GIB will need to review the market need and potential impact of different interventions.
- 1.10 If we are to be successful in meeting the investment challenge, investors also need to have confidence in the planning system for major infrastructure projects. This means giving developers greater certainty on the policy framework for decision-making on major infrastructure projects. The Government has therefore put before Parliament six energy National Policy Statements (NPSs) for approval, displayed in Figure 2.

Figure 2: National Policy Statements for energy infrastructure.



- 1.11 The NPSs set out the need for new energy infrastructure, including electricity from a mixed portfolio of generation types, and (as set out in Chapter 6) the expansion and reinforcement of the transmission system to enable the connection of generation – especially new renewable and other low-carbon generation – into the National Grid.
- 1.12 The NPSs provide a clear framework for decision-making by setting out the strategic need for new infrastructure and how impacts associated with proposals can be mitigated to an acceptable level.

The Electricity Market Reform Consultation

- 1.13 In order to develop the measures necessary to tackle this investment challenge, the Government undertook a consultation exercise on Electricity Market Reform in December 2010. This set out a range of proposals to catalyse the cost-effective investment the UK needs to meet its carbon reduction and energy security goals. Responses to the consultation were received from a wide range of stakeholders.

This White Paper serves as the formal Government response¹⁰ and discussion of consultation responses can be found in relevant sections.

- 1.14 A separate consultation exercise¹¹ was conducted by HM Treasury on the introduction of a Carbon Price Floor (CPF), at the same time as that carried out on Electricity Market Reform. The response to the HM Treasury consultation was published in March 2011¹².
- 1.15 The Electricity Market Reform consultation sought views on:
- whether respondents agreed with the Government's analysis that reform of **current market arrangements** was required to deliver our security of supply and decarbonisation objectives;
 - options to support investment in low-carbon generation through a system of **Feed-in Tariffs (FiT)**, in particular whether consultees agreed with the Government's preferred option of a Feed-in Tariff with Contract for Difference (FiT CfD);
 - the introduction of an **Emissions Performance Standard (EPS)** to place a regulatory limit on the amount of CO₂ produced by new fossil fuel power stations;
 - options to provide security of electricity supply through a **Capacity Mechanism**, in particular whether consultees agreed with the Government's preferred option of a targeted mechanism;
 - options for **packages of policies** to reform the electricity market, in particular whether respondents agreed with the Government's preferred package of a CPF, a FiT (either a FiT CfD or Premium Feed-in Tariff (PFiT)), an EPS and a targeted Capacity Mechanism; and
 - issues surrounding **implementation** of reform.

Consultation Responses

Current market arrangements

- 1.16 The Electricity Market Reform consultation document described the existing electricity market and explained why the Government did not believe that the current market arrangements remained appropriate to deliver our objectives. There was broad consensus from consultation respondents that, without reform, the existing electricity market would not deliver the scale of long-term investment needed, at the required pace, nor would it give consumers the best deal.

10 All non-confidential responses will be published shortly after this White Paper. A full list of non-confidential respondents can be found in Annex A.

11 http://www.hm-treasury.gov.uk/consult_carbon_price_support.htm

12 http://www.hm-treasury.gov.uk/d/carbon_price_floor_consultation_govt_response

Feed-In Tariffs

- 1.17 The parallel consultation by HM Treasury set out the Government's proposal to introduce a CPF. However, the Government also explained that this would not in itself be enough to deliver sufficient investment in low-carbon infrastructure to meet our objectives and would not be cost effective. The Electricity Market Reform consultation described a number of other policy responses to achieve our aims, including the Government's preferred option of a FiT CfD and the leading alternative of a PFiT:
- **a PFiT:** a static payment which generators receive in addition to their revenues from selling electricity in the wholesale market; and
 - **a FiT CfD:** a long-term contract set at a fixed level under which variable payments are made to top-up the level of payment to the generator to the agreed tariff. The FiT payment would be made in addition to the generator's revenues from selling electricity in the market. The FiT CfD is a two-way mechanism that has the potential to see generators return money to consumers if electricity prices are higher than the agreed tariff.
- 1.18 Respondents to the consultation generally accepted that a FiT CfD could be introduced, and some believed that the FiT CfD represented the most effective mechanism to increase low-carbon electricity generation, but most requested more detail on how the FiT CfD would work in practice.
- 1.19 A number of the consultation responses expressed concern about the complexity associated with the FiT CfD. The PFiT was preferred by a number of renewable energy companies. This was in the main because of their similarity to the current Renewables Obligation (RO), which was understood by investors, and was felt to be easier to implement.
- 1.20 A number of consultation responses sought more information on the impact which the use of long-term contracts (and in particular the FiT CfD) would have on the cost of capital for those building low-carbon generation.
- 1.21 Many of the consultation responses observed that the FiT CfD approach set out in the consultation may need to be tailored to different types of technology.

Emissions Performance Standard

- 1.22 The Electricity Market Reform consultation proposed to set an annual limit on the total amount of CO₂ per unit of installed capacity that new fossil fuel power stations are allowed to emit and sought views on whether that limit should be set at either:
- a level equivalent to 600g CO₂/kWh, consistent with demonstrating post-combustion Carbon Capture and Storage (CCS) on a new, supercritical coal-fired power station; or

- a level equivalent to 450g CO₂/kWh, with specific exemptions for plant forming part of the UK's CCS Demonstration Programme or benefiting from European funding for commercial-scale CCS projects.

1.23 There was no consensus from respondents on the need to introduce an EPS. Some felt that an EPS would provide a useful backstop as part of a suite of measures intended to drive decarbonisation. Others felt further regulation was unnecessary and could deter investment. Consultation responses were generally split on the preferred EPS level, with some supporting the higher EPS level, and other stakeholders advocating a more stringent EPS level. Some wanted the EPS level to reduce over time.

Capacity Mechanism

1.24 The consultation set out the Government's view that, while options to improve the existing market such as improving liquidity would provide security of supply benefits, significant risks to security of supply remained. The Government consulted on the introduction of a Capacity Mechanism, with a preferred option of a targeted, rather than a market-wide, mechanism.

1.25 A number of respondents emphasised the importance of ensuring the Government was clear on the nature of the problem we were trying to solve with a Capacity Mechanism, and how it related to short-term balancing of the system. On the question of whether a Capacity Mechanism was required, some stakeholders took the view that capacity margins during this decade meant that a mechanism is likely to be needed. Others were sceptical of the need for a Capacity Mechanism and argued that the case for a significant market intervention had not been made.

1.26 A number of stakeholders expressed strong concerns about the consultation proposal to introduce a targeted mechanism. Most concerns related to the potential impacts of this mechanism on the way the electricity market operates. In particular some felt that a targeted mechanism would lead to a 'slippery slope' effect¹³ under which an increasing number of fossil/peaking plants would be included in the mechanism rather than operate in the market; and/or that a targeted mechanism would simply displace generating capacity which would have been available anyway. Some stakeholders suggested that a market-wide approach would avoid some of these problems and could be a more viable in the long term. A number of stakeholders highlighted the importance of the role of non-generation forms of reliable capacity such as demand side response, storage and interconnection.

¹³ If being in the capacity mechanism and receiving a capacity payment was more attractive than remaining wholly in the market, it could lead to lack of investment outside of the mechanism, meaning that the central body would have to procure ever more generating capacity.

Packages

- 1.27 Four potential packages for reform were put forward in the consultation. The consultation set out the Government's view that all four packages were capable of delivering the Government's decarbonisation goals and ensuring security of supply. However, the Government's preferred option was for a CPF; an EPS; a FiT CfD; and a targeted Capacity Mechanism. This was because the Government believed that this was the most coherent and most cost-effective package. A further package, which included a PFiT rather than a FiT CfD, was also identified as a credible alternative.
- 1.28 Some respondents supported the Government's preferred package. The main reasons given were that this package was the most likely to bring forward investment across low-carbon generation as a whole, and that it had the potential to be the most cost-effective and thus most affordable for consumers.
- 1.29 The alternative package – including the PFiT – was the preferred option for other respondents. The main argument given was that it was the most similar to the existing RO and that this would provide the greatest certainty to renewable generators and investors.
- 1.30 A number of stakeholders also argued that a one-size-fits-all approach was not appropriate given varied characteristics of low-carbon technologies. For instance, some advocated the adoption of both a FiT CfD and PFiT; suggesting that it might be appropriate to have different arrangements for different types of technologies.

Implementation

- 1.31 The consultation also considered implementation issues, particularly the institutional arrangements necessary to deliver the FiT CfD and the Capacity Mechanism, and the transitional measures required to ensure there is no hiatus in investment while Electricity Market Reform is put in place.
- 1.32 On the institutional arrangements for the delivery of FiT CfD, respondents flagged the need for a credible and durable counterparty to the contracts. Views differed on who could deliver this function. Respondents also stressed that anybody with obligations under FiT CfD should be creditworthy to ensure payments can be met over the long term. Several responses also highlighted the need for the institution to have the appropriate expertise and skills to deal with these long-term mechanisms and the technologies involved.
- 1.33 In the case of a Capacity Mechanism, most respondents suggested that a central body should be responsible for delivery. Some suggested that the System Operator's (SO) role could be extended to cover this, but a few respondents thought that this should be independent of other commercial activities and political influence. Some respondents suggested that a central agency should be established to manage the capacity contracts as this would allow for greater transparency.

- 1.34 The Electricity Market Reform consultation also set out proposals for a transitional framework from the current Renewables Obligation (RO) system to FiT CfDs. Most respondents supported ‘grandfathering’¹⁴ existing investments under the RO. They also called for RO ‘vintaging’¹⁵ arrangements to be clarified as early as possible. Given the size and scale of many projects under development, there was however, some concern that the 2017 cut-off date proposed for the RO may not allow a long enough lead in time for such projects, and a number of stakeholders supported a choice between the RO and FiT CfD.

Our Proposals

- 1.35 The Government has carefully considered the issues raised in the consultation and this White Paper contains proposals for reform of the electricity market which represent a coherent and complementary package designed to ensure the security of future electricity supply and the decarbonisation of electricity generation, at least cost. The policy package includes:
- as announced in Budget 2011, the introduction of a **CPF** starting in 2013 to reduce uncertainty, put a fair price on carbon and provide a stronger incentive to invest in low-carbon generation;
 - we will introduce **new long-term contracts** (FiT CfD) to stabilise revenues and reduce risks to support investment in all forms of low-carbon electricity generation;
 - an **EPS** set as an annual limit equivalent to 450g CO₂/kWh at baseload, to provide a clear regulatory signal on the amount of carbon new fossil-fuel power stations can emit; and
 - a **Capacity Mechanism** to guarantee future security of electricity supply as a quarter of ageing plant closes during this decade and the proportion of intermittent or less flexible low-carbon generation rises. We will confirm our decision on the type of mechanism around the turn of the year.
- 1.36 In addition, we are also undertaking further work to:
- develop by the turn of the year the detailed design of the Capacity Mechanism and more details on the institutional arrangements needed to deliver these policies;
 - undertake an assessment over the coming year to determine whether DECC should take further steps to improve the support and incentives for the efficient use of electricity;

¹⁴ Grandfathering is the policy intention to maintain a fixed level of Renewables Obligation (RO) support for the full lifetime of a generating station's eligibility for the RO, from the point of accreditation. Further detail can be found in Annex D.

¹⁵ ‘Vintaging’ the Renewables Obligation (RO) system means that it will no longer be open to accreditation for new stations. The closure of the RO to new stations will create a closed pool of capacity which will decrease over time as we approach the end date for the RO of 31 March 2037.

- develop an electricity systems policy next year, looking at the future system framework and focusing on challenges around balancing and system flexibility. This will include clarifying the role of demand side response, storage and interconnection, as part of the development of a smarter grid.

Coherence of the Policy Package

- 1.37 The Government recognises that it needs to provide the right market framework for industry to be able to deliver the necessary investment. Together, these measures create appropriate incentives to support investment, while ensuring that the costs to consumers are minimised.
- 1.38 The CPF, FiT CfD and EPS will together all drive the decarbonisation of the UK's electricity system. The CPF and FiT CfD are economic signals which act in a complementary manner, while the EPS provides a backstop regulatory signal.
- 1.39 The CPF builds on the existing EU Emissions Trading System (EU ETS) and provides a transparent and predictable carbon price which will make investment in low-carbon generation relatively more attractive, encouraging increasing amounts of investment as the carbon price rises and ensuring that the costs of carbon emissions are reflected fairly.
- 1.40 The FiT CfD will provide low-carbon electricity generators with increased confidence in their revenues through agreement of a long-term contract. If the wholesale electricity price is below the price agreed in the contract, the generator will receive a top-up payment to make up the difference. If the wholesale price is above the contract price, the generator pays the surplus back. This means that, as the CPF gradually increases the wholesale electricity price, the support needed for low-carbon generators is reduced.
- 1.41 The interaction of the Capacity Mechanism with the FiT CfD will depend on the type of mechanism chosen. A targeted Capacity Mechanism would require payments to be made to secure only the amount of generation capacity required to make up the expected shortfall in the market. In this mechanism, there is little interaction with the FiT CfD. There are a number of options for how a market-wide Capacity Mechanism would operate. In designing a market-wide mechanism we would consider as a key element any potential interaction with the FiT CfD.
- 1.42 Box 1 describes a vision of the electricity system in 2030 in which we have succeeded in attracting the necessary investment to the UK and reformed the market effectively.

Box 1: The Electricity System Following Reform

Achieving the objectives for Electricity Market Reform – together with other wider energy policy measures – will mean that in 2030 our electricity will be secure, sustainable and affordable. And the benefits of this will be felt throughout the energy sector and the wider economy.

By 2030, we will have achieved a reduction in our greenhouse gas emissions across the whole economy in line with our carbon budgets and will be firmly on track to achieving at least an 80 per cent reduction by 2050. We have substantially decarbonised electricity supply and also get more than one third of electricity generation from renewable sources.

The changes have enabled us to reduce our dependence on imported fossil fuels and lessened the impact of global price shocks and supply interruptions from overseas. A more diverse range of generation technologies has also increased our energy security and prices are being driven down by competition between technologies.

Wind power forms a substantial part of our generation mix with cost competitive wind turbines both on and offshore; wave and tidal energy technologies have proven themselves as dependable and are becoming significant means of generation; sustainable bio-energy is contributing to our electricity needs; a new generation of nuclear plants is in operation; and Carbon Capture and Storage is widely deployed on existing and new fossil fuel plants meaning carbon is stored safely underground rather than released into the atmosphere.

This range of new generation capacity is being used to power an increasing proportion of our transport and heating needs. Plug-in vehicles and heat pumps are commonplace.

The electricity market is now functioning more effectively, with fewer failures and barriers to entry than would have been the case without reform. And the transition has been made at least cost, resulting in lower bills for households and businesses than with an unreformed market.

Consumers are engaged in their electricity consumption and have the means by which to use energy more intelligently and effectively. Demand is responsive, making efficient use of available generation and network assets, meaning individuals save money and lower their personal impact on the planet. Meanwhile, investment in home insulation and energy saving devices has improved energy efficiency dramatically.

The electricity grid has evolved to accommodate more localised and intermittent sources of generation, as well as being smarter and more responsive. And we are connected much more extensively to European markets, helping to balance supply and demand by drawing on generation from across the continent when UK demand is high and exporting to other markets when there is surplus UK output.

Box 1: The Electricity System Following Reform (*continued*)

Commitment to the achievement of the UK's emissions reduction and renewable energy targets has provided the basis for business and economic development in these new sectors and the creation of green jobs. Our early move has given the UK a comparative advantage in the low-carbon sector and we are a world leader, at the forefront of technological development in this area. A large and highly skilled workforce has developed in response to the growth in the sector.

Wider Policy Context

1.43 The policy proposals within this White Paper form part of a much wider DECC agenda aimed at energy decarbonisation and security of supply. These include:

Decarbonisation

- a massive drive to improve energy efficiency through the Green Deal, the Energy Company Obligation, the roll-out of Smart Meters, the establishment of a new Office within DECC and a new commitment to reduce central government greenhouse gas emissions by 25 per cent by 2015;
- the world's first Green Investment Bank (GIB) to address market failures and help meet the low-carbon investment challenge;
- £1 billion for the creation of one of world's first commercial-scale CCS demonstration plants – strengthening the UK's position as a world leader in cleaner technology;
- over £200 million to support new low-carbon innovation, including up to £60 million for offshore wind manufacturing infrastructure at ports, up to £30 million to support innovation in offshore wind component manufacture and up to £20 million for the development of marine technologies;
- the Renewables Roadmap (published alongside this White Paper), which sets out our proposals for facilitating renewables deployment to 2020, and the Microgeneration Strategy, which sets out the actions to overcome a range of non-financial barriers that could prevent the microgeneration sector from realising its full potential;

Security of Supply

- as part of the current Energy Bill, giving Ofgem powers to sharpen the commercial incentives on gas market participants to reduce the duration, likelihood, or severity of a gas emergency. Ofgem is also considering, under its 'Significant Code Review', the case for enhanced supply obligations on gas market participants (which could be implemented via legislation or licences). This should help underpin commercial demand for additional supply (or demand) side flexibility such as additional long-term contracts and storage facilities;

- maximising the economic recovery of our remaining indigenous resources of oil and gas by launching a new offshore licensing round in 2012 – subject to the outcome of the Strategic Environmental Assessment; and
- working internationally – with the EU and more widely – to promote low-carbon growth, improve interconnection, encourage necessary transitional investment in oil and gas production, and promote more reliable transit of energy.

Chapter 2 – Decarbonisation

2.1 THE CHALLENGE

- 2.1.1 The Government believes that climate change is one of the gravest threats we face, and that urgent action at home and abroad is required. Decarbonisation of the economy in general and the generation of electricity in particular is a key priority. Our analysis shows that change is needed to meet our 2050 targets, in particular it indicates that the majority of decarbonisation of the power sector will need to be completed by the 2030s. Decarbonising the power sector is essential for facilitating decarbonisation of other sectors in the economy.
- 2.1.2 The UK faces a huge investment challenge to meet our targets for electricity decarbonisation, while ensuring security of supply, and keeping electricity bills affordable. Ofgem has estimated that we need at least £110 billion¹⁶ of new investment in electricity generation and transmission in the period to 2020. To put this in context, in the last decade the market invested less than half that amount. In a world of global competition for capital, this means both significantly increased investment by existing market participants and attracting investment from new sources of capital.
- 2.1.3 To meet our decarbonisation targets the majority of this new investment must be in a diverse range of low-carbon generation such as renewables, gas and coal Carbon Capture and Storage (CCS), and nuclear. Investing in diversity is key to preserving and enhancing the UK's security of supply.

The problem

- 2.1.4 The market has served us well. It has delivered enough capacity to keep the lights on, and to drive the UK's economy, while giving consumers some of the lowest prices in Europe.
- 2.1.5 However, in order to meet the challenges of the coming decades it is essential that the majority of new generation built is low carbon. Without incentives such as the current Renewables Obligation (RO), a number of factors combine to make low-carbon investment slow to come forward in the UK market and expensive to develop:
- **the EU Emissions Trading System (EU ETS) carbon price has not been certain or high enough to encourage sufficient investment in low-carbon electricity generation in the UK.** The Stern Review¹⁷ set out the case for addressing the negative

16 Our analysis shows that around £75 billion could be needed in new electricity generation capacity, and Ofgem's 'Project Discovery' estimated that around an additional £35 billion of investment is needed for electricity transmission and distribution.

17 The Stern Review on The Economics of Climate Change, HM Treasury, 2006, http://webarchive.nationalarchives.gov.uk/+http://www.hm-treasury.gov.uk/sternreview_index.htm

externalities associated with greenhouse gas emissions. It made clear that it is desirable for polluters to face the full social cost associated with the environmental damage they cause. The review concluded that a transparent and predictable carbon price is the most cost-effective way to encourage emitters to invest in alternative low-carbon technologies and change consumer spending patterns; and that acting sooner will also ensure a more equitable distribution of the costs of climate change for future generations;

- **the current market price for electricity is driven mainly by gas plant, such as Combined Cycle Gas Turbines (CCGTs)**, with much lower fixed costs relative to their operational costs and much lower capital costs per MW of capacity in contrast to, for example, nuclear or offshore wind; and
- **new low-carbon generators often have to overcome relatively high barriers to market entry.** These include poor market liquidity, together with high regulatory burdens and off-take risk which particularly affects smaller players.

Box 2: Why investment in low-carbon technologies differs from standard investment choices

Gas-fired power stations are a mature technology with low and predictable capital expenditure. They are quick to build and their fuel costs, which are a large proportion of operating costs, are naturally hedged because the price of electricity moves in line with the price of gas, since gas (or sometimes coal) is typically the price-setting (or marginal) plant. Their generation costs will tend to fall in line with any fall in revenues as electricity prices fall, preserving profitability.

Gas-fired power stations are able to run flexibly and can therefore relatively easily respond to shifting demand. The costs of flexing a gas plant to respond to daily peaks in demand are relatively modest although more frequent stop/start and fast ramp-up operations do have a significant impact on maintenance costs.

Each of the low-carbon technologies the Government is considering differs materially from this standard investment choice. In particular, low-carbon generation typically has high construction (capital) costs and low operating costs, and as a result low-carbon plants are wholesale price takers. It is therefore difficult to make an investment case for them in a market where wholesale electricity prices are predominantly set by the short-run marginal costs¹⁸ of unabated gas and coal plant, even if the carbon price was high enough for their levelised costs to be similar.

- 2.1.6 We cannot afford to wait any longer to address the decarbonisation challenge. Doing nothing will lead to consumers paying more in the long term. We must act now because low-carbon infrastructure requires

¹⁸ The incremental cost of providing an additional unit of electricity in the short term. Typically this only includes variable costs (such as fuel) that are needed to provide the additional electricity.

significant upfront capital investment as well as a number of years to build. Decarbonisation of the power sector is also essential for facilitating the decarbonisation of other sectors of the economy as clean power generation is extended to plug-in vehicles and electric heat.

- 2.1.7 However, current market arrangements will not deliver the scale of investment required, or deliver it at the pace needed to keep the lights on while meeting our decarbonisation targets. To facilitate this shift the market must be reformed.
- 2.1.8 The Carbon Price Floor (CPF), which builds on the EU ETS, provides a floor for the cost of carbon and as a result helps to drive investment in low-carbon generation. However, the CPF alone will not cost-effectively drive all of the investment in low-carbon generation that we require.
- 2.1.9 The introduction of Feed-in Tariff with Contract for Difference (FiT CfD) is expected to drive decarbonisation, in a cost-effective manner. These long-term contracts will provide greater revenue certainty to investors in all forms of low-carbon generation, and remove exposure to the volatile gas price, leading to a lower cost of capital for low-carbon generation.
- 2.1.10 These two instruments are complementary. The CPF provides a transparent and predictable carbon price which will gradually increase the wholesale electricity price. The FiT CfD will provide low-carbon electricity generators with a guaranteed price throughout the period of the long-term contract. As the price of carbon increases and gradually raises the electricity price, the support needed for low-carbon generators through the FiT CfD is reduced. Together the package of measures are the most cost-effective means of achieving our aims.
- 2.1.11 Alongside these two clear economic signals to the market, the Emissions Performance Standard (EPS) will act as a regulatory backstop which will limit the emissions from new fossil-fired power stations.
- 2.1.12 Together these three measures will operate as a coherent package whose constituent parts reinforce each other and deliver the level of decarbonisation needed at a lower cost to consumers.
- 2.1.13 In the longer term, post 2030, we anticipate there will come a point at which the electricity sector is significantly decarbonised and long-term FiTs are no longer required for new generation.

Wider Context

- 2.1.14 In the Fourth Carbon Budget, the Government set a legally-binding goal for reducing greenhouse gas emissions for the period of 2023 to 2027 of 1950 million tonnes of CO₂ equivalent – a 50 per cent reduction on 1990 levels.

Box 3: The Government's emissions and renewables targets

The Climate Change Act 2008 establishes a long-term framework to tackle climate change. The Act aims to encourage the transition to a low-carbon economy in the UK through unilateral legally binding emissions reductions targets. This means a reduction of at least 34 per cent in greenhouse gas emissions by 2020 and at least 80 per cent by 2050.

The first three carbon budgets, covering 2008-12, 2013-17 and 2018-22 were set in law in spring 2009 and require greenhouse gas emissions to be reduced by at least 34 per cent below the 1990 baseline by 2020.

The level of the Fourth Carbon Budget for the period 2023-2027 was set in law at 1950 mtCO₂ at the end of June 2011. The level set equates to a 50 per cent reduction in greenhouse gas emissions on 1990 levels for each year over the Fourth Carbon Budget period.

The Renewable Energy Directive sets a target for the UK to achieve 15 per cent of its energy consumption from renewable energy sources by 2020. At least 10 per cent of energy used by transport is also required to come from renewables by 2020.

- 2.1.15 Under current carbon accounting rules, the emissions reductions in the power sector that we count against our carbon budgets are calculated by reference to the EU ETS cap. The Government will review progress towards the EU emissions goal in early 2014. If at that point our domestic commitments place us on a different emissions trajectory than the ETS trajectory agreed by the EU, we propose, (depending on advice from the Committee on Climate Change and the views of the Devolved Administrations), to revise our budget to align it with the actual EU trajectory. Nonetheless it is clear that significant decarbonisation of the power sector is key to our longer-term climate change goals such as our 2050 target to reduce emissions by at least 80 per cent and action in the 2020s will be key to putting us on this pathway.
- 2.1.16 The Fourth Carbon Budget will put us on a pathway to our 2050 target. Government is currently carrying out further work looking at how we might deliver the necessary emissions reductions to meet the Fourth Carbon Budget and we plan to publish a report on this in the autumn. As shown in Chapter 7, the Government's proposed Electricity Market Reform policy package could if necessary deliver the kind of ambition in the power sector proposed by the Committee on Climate Change (CCC). We will be doing further work on this, looking at feasibility of different levels of emissions reductions in the power sector, over the coming months and beyond.
- 2.1.17 The Government is already committed to ensuring that the electricity sector delivers its share of the renewable energy target. In some scenarios this could mean approximately 30 per cent of our electricity

being generated from renewables by 2020. Much of this will be from wind power, onshore and offshore, though biomass could also play an important role. Looking beyond 2020, the Government believes that renewables have a strong role to play as part of our broader low-carbon portfolio and that emerging technologies such as wave and tidal may begin to play an increasing role. We will need to have largely decarbonised our electricity sector by the 2030s¹⁹.

2.1.18 The recent CCC advice to Government on renewable energy concluded that there is scope for significant penetration of renewable energy to 2030 and advised pursuing a portfolio approach with each of the different low-carbon technologies playing a role.

2.1.19 Electricity Market Reform sets the economic and regulatory framework for meeting this challenge. The market reforms are complemented by both the Renewables Roadmap²⁰ and the Microgeneration Strategy.²¹ These documents set out positive action to tackle some of the obstacles which could otherwise slow the decarbonisation of electricity. As part of this work, the Government recognises the benefit that decentralised supply and distributed generation can play, particularly in the context of delivering solutions that maximise local opportunities and meet the need and demands of local people and their communities. It is expected that distributed generation using eligible low-carbon technologies will be able to access the FiT CfD on the same terms as other generation types.

Box 4: The Renewables Roadmap

The Renewables Roadmap is published alongside the Electricity Market Reform package. The Roadmap focuses in particular on the eight technologies which evidence from the market suggests now have either the greatest potential to help the UK meet the 2020 renewable energy target in a cost-effective and sustainable way, or offer the greatest potential for the decades that follow. It outlines specific actions to remove the barriers to renewables deployment. Alongside the Roadmap, the Microgeneration Strategy sets out the actions that the Government is taking to tackle the non-financial barriers which could prevent the microgeneration sector from realising its full potential.

Taking these actions will not only help drive renewable deployment across the UK but will also be key to reducing costs for consumers and enabling mature renewables to compete on a level playing field against other low-carbon technologies in the longer term.

19 DECC's 2050 analysis (<http://www.decc.gov.uk/en/content/cms/tackling/2050/2050.aspx>) shows that power sector emissions need to be largely decarbonised by the 2030s. The Committee on Climate Change proposed that the power sector should be close to zero-carbon by 2030.

20 http://www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/renewable_ener.aspx

21 http://www.decc.gov.uk/en/content/cms/meeting_energy/microgen/stratategy/strategy.aspx.pdf.

- 2.1.20 Energy efficiency has an important role to play in reducing the amount of power we need and, as a result, reducing the amount of carbon emitted through electricity generation. Both demand side and supply side measures will be necessary. The Government is keen to ensure that electricity consumers contribute an appropriate share of the UK's overall improvement in energy efficiency. We will assess whether the existing package of efficiency measures is providing adequate encouragement for efficiency improvements in electricity usage and, in parallel, will study international examples to determine whether there might be appropriate additional measures we could introduce to the UK market.
- 2.1.21 In support of this greater focus on energy efficiency, the Government will establish a new Office within DECC to drive a step-change in national energy efficiency in the autumn. This new Office will work with leading industry experts to identify ways to drive further carbon abatement across the economy and to learn from best practice in other countries.
- 2.1.22 The Government will also ensure that regulations around heat products, efficiency standards and product lifecycle standards are properly aligned and that the UK engagement with the European Commission focuses on ensuring that devices, as well as the way we use them, become more efficient.
- 2.1.23 The Government recognises that heating and cooling accounts for a significant proportion of the UK's total energy consumption and nearly half of CO₂ emissions. Decarbonising the supply of heat across all sectors is therefore an essential component of reducing emissions by 80 per cent. The Government is therefore considering what actions are required now and through the next decade in order to ensure the supply of low-carbon, secure and affordable heating (and cooling) for homes, businesses and industry. This will complement work on Electricity Market Reform, by helping to reduce overall electricity demand and support system balancing.
- 2.1.24 Alongside these steps to reduce costs through domestic action, we have the potential to work with our European partners on renewables deployment. Such collaboration could provide an important mechanism to safeguard UK consumers in the event that the costs of domestic deployment do not come down and alternative, cheaper opportunities arise in other countries where the UK could 'trade' using the flexibility mechanisms set out in the Renewable Energy Directive. We plan to take powers to 'trade' renewable energy to provide this safeguard.
- 2.1.25 But this should not be viewed as a one-way exercise – trading also presents an opportunity for the UK. We have an abundant offshore wind resource and should also explore the possibility of exporting energy generated in UK waters to neighbouring Member States. As part of this we could see offshore wind projects connected to both the UK and mainland Europe, increasing our security of supply as part of an 'All Islands Approach'²². By exploiting our North Seas resources together we could also provide new manufacturing and jobs in the UK.

22 The All Islands Approach will develop an approach to energy resources across the British Islands and Ireland, to facilitate the cost-effective exploitation of the renewable energy resources available, increase integration of our markets and improve security of supply.

2.2 THE CARBON PRICE FLOOR

Summary

- In Budget 2011, the Government announced the introduction of a Carbon Price Floor (CPF) from April 2013. This is designed to top up the EU Emissions Trading System (EU ETS) carbon price to a target level for the electricity generation sector.
- The CPF will be introduced by removing from the Climate Change Levy (CCL) the current exemption for supplies of fossil fuels which are used to generate electricity in the UK. For generators who use oil to generate electricity, the amount of fuel duty they can reclaim will be varied.
- The CPF is the necessary first step in delivering a package of reforms for the electricity market to support low-carbon investment, but alone it will not drive the required investment.
- The CPF as announced in the Budget begins at around £15.70/tCO₂ in 2013 and follows a straight line to £30/tCO₂ in 2020, rising to £70/tCO₂ in 2030 (real 2009 prices).

Introduction

2.2.1 This section sets out why we consider the CPF to be a key measure to drive the necessary investment in low-carbon technology and explains how it will work alongside the EU ETS and the wider Electricity Market Reform package.

Context

The case for a Carbon Price Floor

- 2.2.2 The CPF is the first step to reforming the electricity market to support low-carbon investment. It gives an early and credible long-term signal to investors that the Government is serious about encouraging investment in low-carbon electricity generation.
- 2.2.3 Having certainty about the price of carbon is particularly important given the long lead times between the decision to invest in low-carbon generation and the plant generating electricity. High levels of uncertainty over future profitability and rates of return could increase the cost of capital for investors and deter investment altogether. If uncertainty is too great, investment will either not go ahead or capital could be diverted to less risky but more polluting forms of generation. If developers have confidence that the Government will support the carbon price over the long term, this should make a significant difference to investment decisions for new low-carbon generation.

- 2.2.4 The EU ETS, a cap and trade system covering the EU electricity generation sector and energy intensive industries²³, has created a market in carbon so that emissions across the EU can be abated at least cost. Although the EU ETS has achieved certainty over EU net emissions, along with a strong signal regarding the future level of the declining cap, the level of this cap (and associated carbon price) is not consistent with the pace and scale of decarbonisation that is needed for the UK to meet its 2050 targets. Thus the carbon price signal resulting from this cap has not been stable, certain or high enough to encourage sufficient investment in low-carbon electricity generation in the UK.
- 2.2.5 To enable a secure low-carbon transition in the UK power sector and encourage investment, the Government believes that there is a strong rationale to provide greater certainty and support to the carbon price faced by the sector. Therefore, the Government has moved to providing a stronger carbon price to promote investment in low-carbon generation over the longer term, to allow investors to include it as part of their investment appraisal.

Description of mechanism

- 2.2.6 Following consultation²⁴, the Government announced in Budget 2011 a price floor that targets £30/tCO₂ in 2020 rising to £70/tCO₂²⁵ in 2030 (2009 real prices²⁶). A price floor of £40/tCO₂ in 2020 would have led to a faster decarbonisation trajectory and higher level of low-carbon investment. However, there would have been larger impacts on existing generators and on electricity bills, which could have undermined competitiveness and would have increased fuel costs unnecessarily. On the other hand, a price floor of £20/tCO₂ in 2020 would not have sent a strong enough signal to encourage investment. The £30/tCO₂ in 2020 CPF is shown in Figure 3.

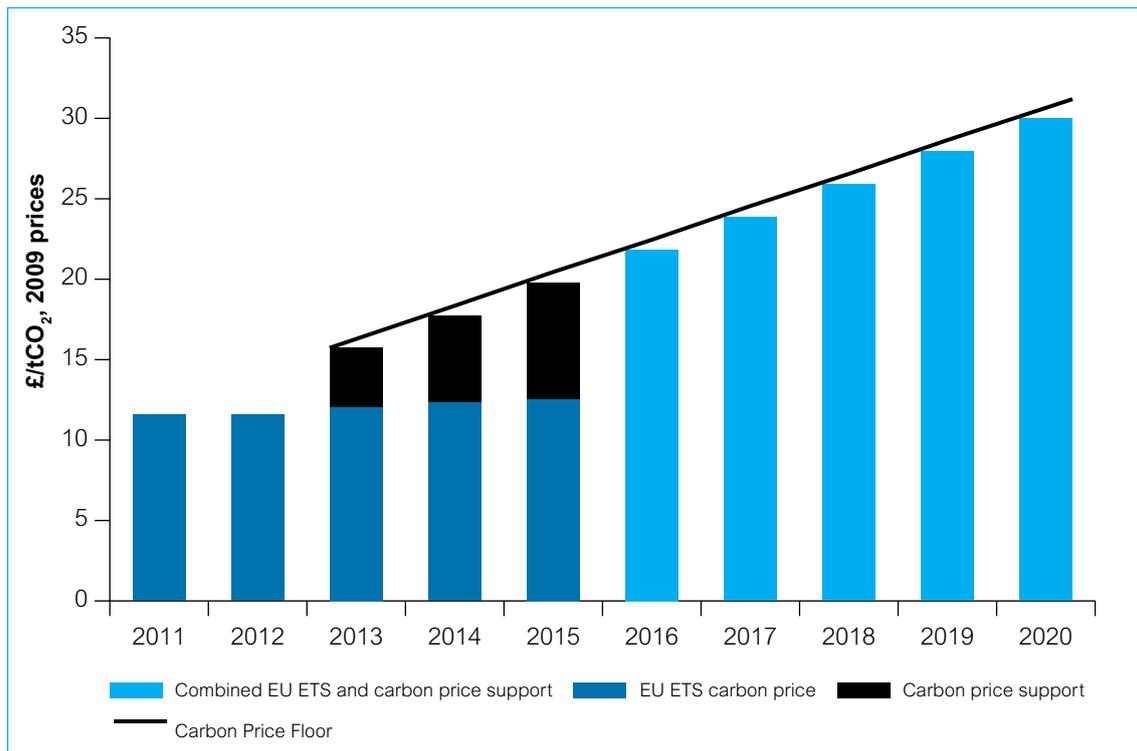
23 The EU ETS will include aviation from 2012 http://www.decc.gov.uk/en/content/cms/emissions/eu_ets/eu_ets.aspx.

24 http://www.hm-treasury.gov.uk/d/consult_carbon_price_support.htm
http://www.hm-treasury.gov.uk/d/carbon_price_floor_consultation_govt_response.pdf.

25 The Government's current estimated carbon price consistent with global action to limit the increase in temperature to 2°C is £70/tCO₂ in 2030. This estimate is subject to the progress of international negotiations and may be revised as the science of climate change develops.

26 This means prices expressed in real terms after removing the effect of inflation.

Figure 3: Carbon Price Floor to 2020.



- 2.2.7 Over the period 2013-30, a price floor targeting £30/tCO₂ will provide £1.9 billion of net present value benefits, achieving the right balance of encouraging investment without undermining the competitiveness of UK industry. It is expected to drive investment in low-carbon electricity generation equivalent to 7.5-9.3 GW of new capacity by 2030.
- 2.2.8 The carbon price support rates for 2013-14 announced in Budget 2011 are equivalent to £4.94/tCO₂. These rates represent the difference between the Government’s target carbon price (the floor) and the future market price for carbon in the EU ETS in 2013. Future rates will be announced at subsequent Budgets²⁷ depending on the prevailing carbon price. A sustained increase in the carbon price would reduce the tax rate necessary to meet the floor. These rates will be set two years in advance to allow generators time to plan hedging strategies and avoid damaging liquidity²⁸.
- 2.2.9 From 1 April 2013, supplies of fossil fuels used in most forms of electricity generation will become liable either to the CCL or fuel duty. Supplies will be charged at the relevant carbon price support rate, depending on the type of the fossil fuel used. The rate is determined by the average carbon content of each fossil fuel.

²⁷ For a detailed explanation of how rates are calculated, see http://www.hm-treasury.gov.uk/consult_carbon_price_support.htm

²⁸ Further details on the interactions between Electricity Market Reform and liquidity are set out in Chapter 5.

- 2.2.10 The CPF is not sufficient on its own to encourage the investment needed. Therefore, it needs to be combined with a Feed-in Tariff (FiT) mechanism to be able to meet the Government's decarbonisation and renewables objectives. For the CPF to drive all of the decarbonisation which is necessary, it would have to rise significantly higher than the level delivered through EU ETS (i.e. to at least £50/tCO₂ by 2020 – £20/tCO₂ higher than the current CPF target).
- 2.2.11 The Government's view is that the CPF will complement the Feed-in Tariff with Contract for Difference (FiT CfD), the Government's preferred model of a Feed-in Tariff (further detail can be found in the next section). Under the FiT CfD, long-term electricity prices (driven for example by gas prices or the carbon price) do not significantly affect the overall returns earned by low-carbon generators as they adjust automatically to differences in electricity prices. Therefore while the FiT CfD and CPF together provide more certainty of revenues and make investment in low-carbon technology more attractive, they also avoid generators making excess profits and therefore minimises consumer costs.

Devolved Administrations

- 2.2.12 The CPF is a UK-wide policy and will drive further investment in low-carbon technologies. In that respect, the Government recognises the different structure of the Northern Ireland energy market, and will work closely with the Northern Ireland Executive to monitor the interaction with the island of Ireland Single Electricity Market, and Northern Ireland's commitment to a higher level of investment in renewable electricity.

Next steps

- 2.2.13 The Government has already consulted on draft primary legislation on the CPF. The primary legislative powers to implement the CPF were presented to Parliament in the 2011 Finance Bill last March²⁹. Legislation relating to specific tax reliefs for Carbon Capture and Storage (CCS) and Combined Heat and Power (CHP) will be introduced in the 2012 Finance Bill, to be followed by secondary legislation later in 2012.

²⁹ <http://services.parliament.uk/bills/2010-11/financeno3.html>

2.3 FEED-IN TARIFF

Summary

- Long-term contracts will be the key mechanism for encouraging investment in low-carbon generation by providing greater long-term revenue certainty to investors.
- These long-term contracts, Feed-in Tariffs with Contracts for Difference (FiT CfDs), which stabilise revenues, should increase the rate of investment and lower the cost of capital, thereby reducing costs to consumers.
- In our central scenario, the FiT CfD reduces the cost of decarbonisation to 2030 by £2.5 billion compared to using the Premium Feed-in Tariff (PFiT) to deliver the same investment.
- Under high fossil fuel price scenarios the FiT CfD can scale back support, reducing the risk of unnecessarily high returns being paid to generators as they might be under a PFiT. The ability to avoid excessive support is a key advantage of the FiT CfD.
- To reflect the different commercial and operational behaviour among different classes of generation, the Government will tailor the design of the FiT CfD for different generation types.

Introduction

2.3.1 This section sets out:

- an overview of consultation responses on the low-carbon generation support mechanism and further work undertaken as a result;
- the rationale for choosing a FiT CfD as opposed to a PFiT;
- headline proposals for the design of the FiT CfD (including on reference prices) and on the form of price discovery, highlighting where further work is needed; and
- our broad approach to wider issues relevant to the FiT CfD.

Rationale for a Feed-in Tariff with Contracts for Difference

2.3.2 As set out in Section 2.1, without further reform the existing market will not deliver the scale of long-term investment in low-carbon generation, at the pace we need, nor will it give consumers the best deal. If we are to meet our long-term carbon targets, we need to reform the market now.

2.3.3 In the Electricity Market Reform consultation document³⁰, the Government proposed a FiT CfD as the lead option for driving decarbonisation. A PFiT was suggested as a fall back option.

³⁰ <http://www.decc.gov.uk/en/content/cms/consultations/emr/emr.aspx>

Box 5: Descriptions of Feed-in Tariff mechanisms

A **Feed-in Tariff with Contract for Difference (FiT CfD)** is a long-term contract between an electricity generator and a contract counterparty. The contract enables the generator to stabilise its revenues at a pre-agreed level (the strike price) for the duration of the contract. Under the FiT CfD, payments can flow from the contract counterparty to the generator, and vice versa.

A ‘two-way’ FiT CfD provides for payments to be made to a generator when the market price for its electricity (the reference price) is below the strike price set out in the contract. However, when the reference price is above the strike price, the generator pays back the difference. That is, generators return money to consumers if electricity prices are higher than the agreed tariff.

Figure 4: The operation of a baseload Feed-in Tariff with Contract for Difference

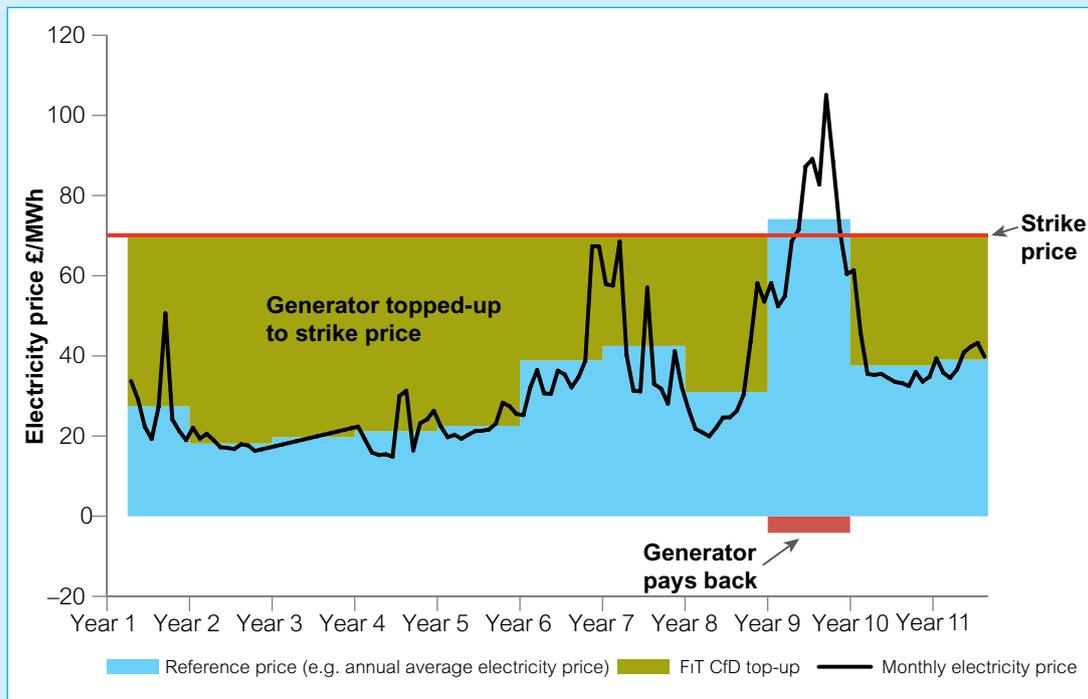
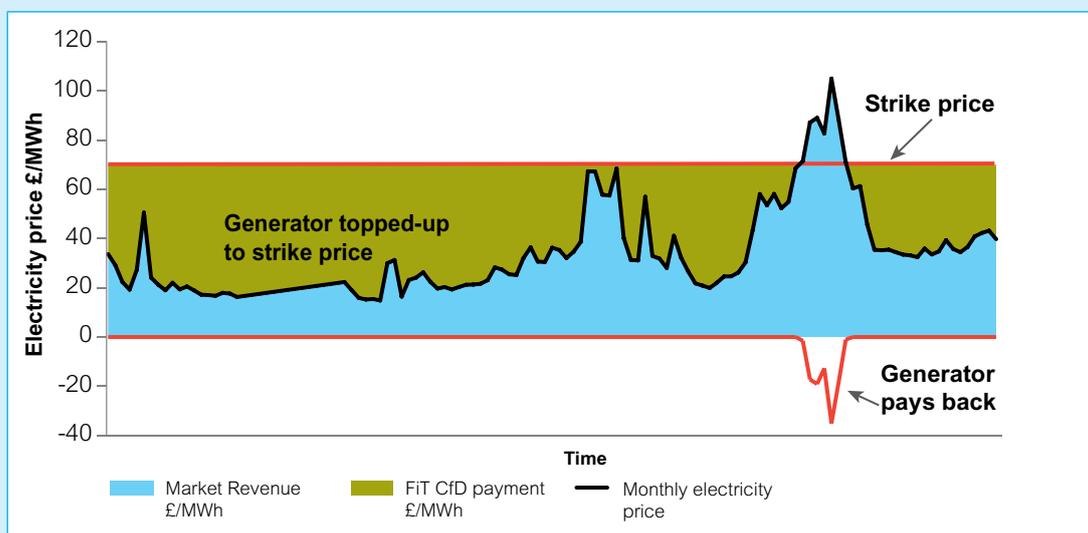


Figure 5: The operation of an intermittent Feed-in Tariff with Contract for Difference

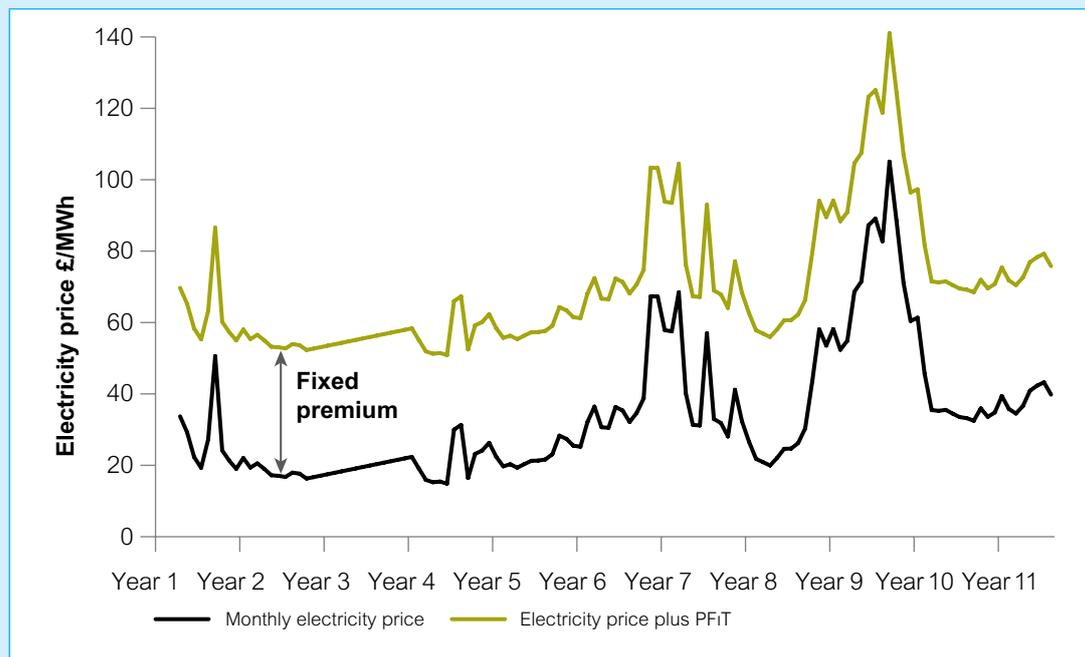


Box 5: Descriptions of Feed-in-Tariff mechanisms (*continued*)

This is similar to the model of FiT used in the Netherlands for renewables (though they call it a 'sliding premium') and in Denmark for offshore wind. It provides a similar level of revenue certainty to a Fixed FiT, but by setting the level of support according to the average price it preserves the efficiencies created by the market price signal, i.e. generators will have an incentive to sell their output above the average price because they will keep any upside.

A **Premium FiT (PFiT)** is a static payment which generators receive in addition to their revenues from selling electricity in the wholesale market.

Figure 6: The operation of a Premium Feed-in Tariff



- 2.3.4 The Electricity Market Reform consultation document established four criteria against which decarbonisation mechanisms would be judged. These were cost-effectiveness, coherence with the rest of the reform package, durability and practicality. The FiT CfD was identified as the support mechanism for low-carbon generation which offered the best balance of results across the four key criteria, because it was:
- potentially more cost-effective than the alternatives due to lower scope for rents in high electricity price scenarios and reduced cost of capital as a result of removing long-term electricity price exposure and providing long-term revenue certainty;
 - complementary to other elements of the reform package, interacting particularly effectively with the Carbon Price Floor (CPF);
 - a more resilient and flexible mechanism which will operate effectively in a wider range of scenarios and can deal with unanticipated

outcomes on carbon prices, fossil fuel prices or technology costs;
and

- able to provide more certainty that carbon targets will be met than PFiTs, because the impact of uncertain future wholesale prices is removed in favour of predictable revenue.

2.3.5 Following the consultation, we carried out further analysis to test some of the initial conclusions set out above; and ensure that there could be a manageable transition to the new framework.

2.3.6 In particular, the Government undertook further modelling to understand:

- the impact FiT CfDs would have on cost of capital for investors in low-carbon generation in more detail;
- whether we could develop a viable model for the FiT CfD which would work in the UK market; and
- how to manage the variability of the net costs of FiT CfDs.

If these issues could not be addressed then Government indicated that a PFiT mechanism could be an effective fall-back to drive investment in low-carbon generation.

2.3.7 Support for low-carbon generators under Electricity Market Reform is likely to fall under the definition used by the ONS for indirect taxation and spending. Similar arrangements to those in place to manage the overall impact of DECC levy-funded spending, including the existing RO, would therefore apply. Decisions on the overall size of the envelope for contracts will be taken at fiscal events (Spending Reviews and Budgets) in order to consider the cost of support in the round against other pressures on Government finances.

Further analysis of the preferred option

2.3.8 Respondents to the consultation generally accepted that, in principle, a FiT CfD could be introduced, and some believed that this represented the most effective mechanism to encourage investment in low-carbon generation. However, this view was largely offered subject to the Government providing more detail on how the FiT CfD would work in practice. While a number of the consultation responses expressed concern about the perceived complexity of the FiT CfD, PFiTs were preferred by a number of stakeholders involved in developing renewable energy projects. This was in the main because of their similarity to the current system, which was understood by investors, and which meant they would be easier to implement.

- 2.3.9 A number of consultation responses sought more information on the impact the use of long-term contracts (and in particular the FiT CfD) would have on the cost of capital for those building low-carbon generation. There was scepticism from some stakeholders about the impact FiT CfDs could have on reducing the cost of capital.

Cost-effectiveness

- 2.3.10 The FiT CfD should deliver low-carbon generation in the most cost-effective manner possible. The FiT CfD promotes this cost-effectiveness in three different ways: reductions to the cost of capital those building low-carbon generation face; reductions to the overall cost of support to consumers; and impacts on individual consumer bills. We have conducted further work on each of those areas.

a) Cost of Capital

- 2.3.11 Following responses to the consultation, we commissioned industry analysts to undertake further work to refine our understanding of the impact long-term contracts could have on the cost of capital³¹. This new analysis³² explicitly takes into account the views of industry participants regarding how investors make decisions. The analysis came to a similar conclusion to that conducted previously i.e. that a FiT CfD could deliver a lower cost of capital than might otherwise be achieved. It also confirmed the conclusion that the FiT CfD should reduce the cost of capital to a greater extent than the PFIT, as a result of the increased revenue certainty the FiT CfD provides.
- 2.3.12 Figure 7 sets out the conclusions on expected cost of capital reductions compared to business as usual. These would lead to an overall saving with a Net Present Value (NPV)³³ of around £2.5 billion over the period up to 2030.³⁴

31 See the accompanying Impact Assessment for more detail.

32 Conducted by Cambridge Economic Policy Associates and published alongside this White Paper.

33 'Net Present Value' (NPV) is a way of accounting for the sum of a project's future cash flows in today's terms – showing the difference between a future stream of benefits and costs. NPV recognises that society would prefer £1 today to £1 in the future – this is known as 'time preference'. Therefore due to time preference, future cash flows are 'discounted' (using a discount rate) when calculating NPV.

34 The Total net consumer cost of support to 2030 under central scenario is £25bn NPV 2009. This is explained in more detail within the accompanying Impact Assessment.

Figure 7: Comparison of the impact of possible decarbonisation mechanisms on cost of capital

Technology	Reduction in cost of capital due to PFiT (%)	Reduction due to FiT CfD (%)	How reduction in cost of capital under FiT CfDs compares to that under PFiTs
Onshore Wind	0%	0% to 0.3%	0% to 0.3% lower under FiT CfD
Offshore Wind (emerging)	0%	0.5% to 0.8%	0.5% to 0.8% lower under FiT CfD
Offshore wind (established)	0%	0.5% to 0.8%	0.5% to 0.8% lower under FiT CfD
CCGT with CCS	0.1%	0.1%	0% (reduction is the same under each)
Coal with CCS	0.4%	0.4%	0% (reduction is the same under each)
Nuclear	0.9%	1.5%	0.6% lower under FiT CfD
Biomass (power only)	0%	0.5%	0.5% lower under FiT CfD

b) Cost of Support

- 2.3.13 The claw-back element of the FiT CfD ensures that the mechanism stabilises the revenue of generators, as they have to pay back the proportion of support provided when the electricity (reference) price is above the strike price. FiT CfD ultimately stabilise generators' revenues without providing support when it is not required. A PFiT in contrast pays a set top-up amount for the duration of the contract. If, as is expected, the wholesale electricity price (including the price of carbon) rises over time, the amount of revenue paid to the generators under PFiTs will continue to rise for the whole period of the contract.
- 2.3.14 As a result of the lower cost of capital under the FiT CfD, and the scope for greater efficiency of the mechanism in avoiding over-rewarding generators when electricity prices are high, support costs under the FiT CfD could be 30 per cent lower than under the alternative PFiT model in the period to 2030. Even in a scenario where gas prices are low and the scope for excess rents in the PFiT is reduced, analysis suggests the average annual cost of FiT CfD to bill payers is around nine per cent lower than PFiT.

c) Bill impacts

2.3.15 As a result of lower support costs the FiT CfD would also lead to lower consumer bills relative to the PFiT. By 2030, the FiT packages could mitigate the impact of rising bills by six per cent (around £40) on average for domestic consumers, compared to the baseline.³⁵ In contrast, average annual electricity bills in the PFiT package of policies for reform could reduce the increase in bill levels by between one and five per cent depending on the choice of Capacity Mechanism.

d) Developing a viable Feed-in Tariff with Contracts for Difference

2.3.16 The consultation document emphasised the importance of developing a FiT CfD design which worked for all forms of low-carbon generation. This was echoed by responses from stakeholders. The Government acknowledges the need for more certainty and detail around how the FiT CfDs would function in order to avoid investors delaying their decisions unnecessarily. This section gives a brief, high-level overview of the Government's design proposals for the FiT CfD. Annex B sets out the detailed rationale supporting these proposals, and the accompanying Impact Assessment published alongside this White Paper provides further information on the costs and benefits associated with the FiT CfD.

Tailoring the Feed-in Tariff with Contracts for Difference to different types of generation

2.3.17 Many of the consultation responses observed that the FiT CfD approach set out in the consultation may not suit all types of generation. Both now and in the future the UK will rely on a diverse range of generation to meet its electricity needs. It will also be important to create the right conditions for the new technologies whose early commercialisation is vital if we are to achieve our low-carbon energy goals.

2.3.18 Different types of generation have different characteristics. For example, intermittent generation such as wind operates differently to baseload plant such as nuclear, and is subject to different levels of certainty regarding output. Compared to wind, nuclear tends to provide a steady amount of output at all times when it is operating. More flexible plant, (mainly traditional fossil fuel at present, potentially Carbon Capture and Storage (CCS), biomass, good quality gas Combined Heat and Power (CHP) and new nuclear in future), has the ability to vary its output to follow demand, and may even turn off in response to prolonged periods where there is forecast to be either high levels of wind output or low demand.

2.3.19 These differing types of generation respond to different incentives. As a result, the Government will vary the key features of the FiT CfD to develop an approach that is best suited to each of the low-carbon generation types. The key aspects of the FiT CfD designs are illustrated in Figure 8 and discussed in detail in Annex B.

³⁵ The baseline bill is one which would result in the event that current policies including the Renewables Obligation and Carbon Price Floor are continued.

Figure 8: Low-carbon Feed-in Tariff with Contracts for Difference proposals³⁶

	Intermittent	Baseload
Contract Form	<ul style="list-style-type: none"> Two-way FiT CfD 	<ul style="list-style-type: none"> Two-way FiT CfD
Strike price	<ul style="list-style-type: none"> Annual inflation indexation³⁷ 	<ul style="list-style-type: none"> Annual inflation indexation Minded not to include fuel indexation for biomass. To be confirmed for CCS.
Market Reference Price	<ul style="list-style-type: none"> Day-ahead price Choice of baseload or hourly prices Not averaged over a longer period 	<ul style="list-style-type: none"> Year-ahead baseload price Choice of price sources
Contract Volume	<ul style="list-style-type: none"> Metered output 	<ul style="list-style-type: none"> To be confirmed, metered output or firm volume

2.3.20 A different structure may be required to influence investment in flexible low-carbon generation and one potential way to do this is through a one-way FiT CfD. Annex B provides further information. DECC will undertake further work on the arrangements for flexible generation and will produce firm proposals around the turn of the year.

Price discovery

2.3.21 In the Electricity Market Reform consultation document, the Government signalled that it was attracted to a greater use of auctioning or tendering as a mechanism to set the level of FiT CfD support. This was because the price discovery characteristics of an auction should enable financial support to be set at a level just high enough to promote deployment but not high enough to lead to excessive profits, with bids driven down by competition. However, the Government also made it clear that auctions would only be adopted if a practical way could be found to make them function in the UK electricity market and for newer technologies. The majority of respondents were sceptical about the use of auctions to set the level of support for low-carbon generation.

2.3.22 Since the consultation the Government has explored possible options for price discovery, working with experts to identify key challenges. The Government is committed to making the transition to the reformed market as smooth as possible. The Government is minded to move from administrative price discovery processes for low-carbon technologies to more competitive forms of price discovery such as auctions or tenders when the wider conditions in the market will support their successful deployment.

³⁶ These proposals are subject to the final design of any Capacity Mechanism.

³⁷ We recognise the need for investors to achieve a return reflecting real terms; a link between the strike price and a measure of inflation would remove the inflation risk of the investment.

- 2.3.23 Successful auctions or tenders minimise the risk of collusion while supporting participation from both incumbents and new entrants. They have been widely used as a result of this (examples include the 3G Telecom Licences auction and the Offshore Electricity Transmission (OFTO) auctions). There are a number of factors that will affect the ability of the institution to introduce auctions or tenders (see Chapter 4) and these include:
- having confidence that there are enough potential participants in the auction or tender for there to be competitive tension;
 - knowing that the development capacity of the potential participants exceeds the volume of new development sought by the institution in a given time period or tendering round; and
 - knowing that the projects or technologies eligible for the tender or auction are comparable so that the strike price is a meaningful way to discriminate between them.
- 2.3.24 Given the challenges involved in transition we do not believe that these conditions exist in the current market, however we will move towards technology-specific auctions or tenders towards the end of the decade and look for ways of introducing greater competition between technologies towards and into the early 2020s.

Renewables auctions or tenders

- 2.3.25 The UK electricity market already contains a wide range of firms that are able to invest in a broad range of renewable technologies. Furthermore, a number of the technologies that they invest in are mature (onshore wind) or rapidly maturing (offshore wind, solar, biomass), which means that the risks and uncertainties facing investors are diminishing.
- 2.3.26 As a result of there being a broad range of developers and diverse set of potential investments, the Government believes that it should be possible to move to more competitive types of price discovery for renewables. The move from the current price discovery system to a more competitive one will require the Government to be clear that this would not jeopardise adequate deployment of renewables.

Other low-carbon technologies

- 2.3.27 Other low-carbon technologies such as coal or gas CCS or nuclear have less mature markets with fewer participants. For example, there are currently only three nuclear consortia with access to sites which have been identified as strategically suited to new nuclear build. The sheer scale of the capital costs associated with these projects and the risks they face mean there is lower scope for new entry in the short term.

- 2.3.28 In the medium term, technology-specific auctions or tenders for commercially deployable nuclear and CCS generation should be possible. The Government intends to introduce an auction or tender process for price-setting for specific technologies from 2017. Tariffs for generation that will be commissioned prior to 2020 are most likely to be set through an administrative price setting process.

Institutional arrangements

- 2.3.29 The FiT CfD will require new or existing organisations to take on additional roles and responsibilities. Chapter 4 sets out the institutional arrangements and governance principles that Government is likely to apply, including to assess the impact in practice of these new contracts and to inform decisions on any necessary amendments.

Interactions with other Electricity Market Reform measures

- 2.3.30 The Government recognises that there will be interactions between FiT CfDs and the options for the Capacity Mechanism. We are committed to continuing to develop these mechanisms in a coherent and complementary manner. Consequently, whichever Capacity Mechanism is chosen will be developed in a manner which works effectively with the FiT CfD. See Chapter 3 for more detail.

Liquidity

- 2.3.31 Liquidity is a term used to describe volume of trading or 'depth' of the market. Liquid markets enable companies to buy or sell a product without causing a significant change in its price and without incurring significant transaction costs. Liquid markets also provide market participants with confidence in the accuracy of traded prices. This in turn informs investment decisions and can help facilitate new entry.
- 2.3.32 In the electricity market, the ability to buy or sell electricity quickly and without incurring significant costs is crucial to new investors unfamiliar with the market. It also gives confidence to generators that they can manage periods when they are short (or long) on electricity compared with their contractual requirements by trading electricity to manage their position. The ability to trade to balance a position is a particular issue for independent generators and therefore for potential new entrants.
- 2.3.33 A significant proportion of consultation respondents underlined that improving liquidity could be essential for supporting the operation of FiT CfDs. A number of stakeholders have expressed concerns that there is currently insufficient market liquidity to support an effective FiT CfD. The Government acknowledges these concerns, and agrees that it is crucial that there is strong liquidity in the electricity wholesale market for the FiT CfD to function effectively. The FiT CfD requires a robust reference price which is reflective of market fundamentals and cannot be manipulated. This is to ensure that payments made under FiT CfD cannot be distorted, which could leave consumers paying more than is necessary.

- 2.3.34 The Government welcomes Ofgem’s commitment to tackle liquidity. Their recent consultation proposes interventions to provide the electricity market liquidity that market participants, in particular independent market players, require to compete against existing firms and to encourage competition between vertically-integrated players. The Government will continue to work closely with Ofgem to ensure that Electricity Market Reform and Ofgem’s work on liquidity are effectively aligned.
- 2.3.35 Chapter 5 describes some of the barriers to entry faced by independent generators, including new entrants. Market liquidity is a key issue, but there are related concerns that in part may be a consequence of poor liquidity, including potentially limited routes to market for some independent generation and new entrants.

Offtake risk

- 2.3.36 Independent renewable electricity generators have raised concerns that poor levels of liquidity could leave them reliant on Power Purchase Agreements (PPAs) – an agreement to supply to another company – to secure finance for investment and that in the absence of a renewable obligation from 2017, PPAs would only be available at a steep discount. We note these concerns and are considering whether further action is necessary. See Chapter 5 for more detail.

Devolved Administrations

- 2.3.37 By working closely with the Devolved Administrations, the UK will be able to deliver the required new generation of secure low-carbon power sources. We have been discussing the FiT CfD proposals with the Devolved Administrations, and we will continue to work closely with them as we develop our proposals.
- 2.3.38 Our preference remains a UK-wide FiT CfD. However, because electricity policy – with the exception of nuclear generation – is devolved to Northern Ireland, we will work in partnership with the Northern Ireland Executive, which is conducting further analysis of options. We will engage constructively with the Northern Ireland Executive on its preferred solution, to ensure that, where appropriate, any Northern Irish solution can work alongside the FiT CfD in a UK-wide context.

Next steps

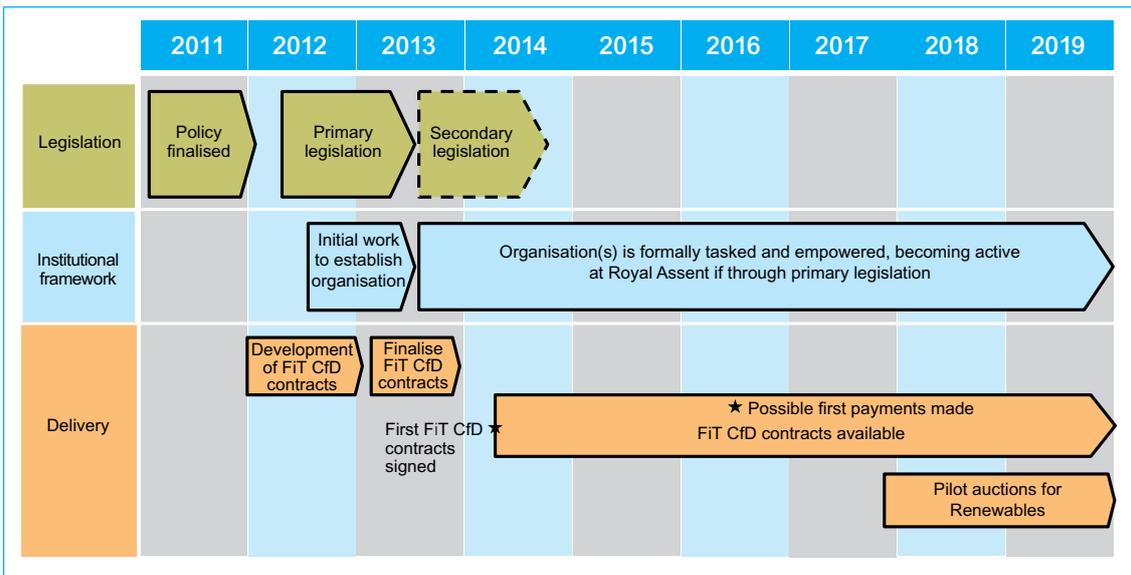
- 2.3.39 The Government will use FiT CfD as the key mechanism to drive decarbonisation, alongside the CPF. This is because the analysis undertaken by the Government and the responses to the consultation suggest that FiT CfD are cost-effective, offer certainty, could operate effectively in the electricity market, facilitate market entry and are resilient enough to adapt to the wide range of future scenarios.

2.3.40 Moving forward the Government will:

- continue to work closely with Ofgem to ensure the Electricity Market Reform proposals and their liquidity reforms are fully complementary;
- continue to develop its thinking on contract-letting processes and consider the best means of ensuring the processes smaller developers follow are fair, rigorous and proportionate;
- consider carefully the interactions between the FiT CfD and the Capacity Mechanism, developing both mechanisms in a coherent and complementary manner. One option might be to include an element of payment for capacity within the FiT CfD;
- bring forward legislative provisions in the second session; and
- ensure that the implementation of FiT CfD allows adequate assessment of the efficiency and effectiveness of this new mechanism.

2.3.41 Figure 9 sets out an illustrative timeline for implementation.

Figure 9: An indicative timetable for the implementation of a Feed-in Tariff



2.4 THE EMISSIONS PERFORMANCE STANDARD

Summary

- An Emissions Performance Standard (EPS) regime applicable to new fossil fuel power stations will support the UK's decarbonisation objectives.
- As set out in the Coalition Agreement, the EPS will help deliver the Government's commitment to prevent the most carbon intensive (i.e. unabated coal) power stations from being built.
- It provides a regulatory back stop on the amount of emissions that a new fossil fuel power station can emit, and in the longer term it could be used to give a clear regulatory signal to back up the economic signals provided by the Electricity Market Reform package and existing policies.
- The EPS will initially be set at a level equivalent to 450g CO₂/kWh (at baseload) for all new fossil fuel plant, except Carbon Capture and Storage (CCS) demonstration plants. It will not be retrospective.
- The EPS will be subject to regular reviews as part of the process of three-yearly reports on decarbonisation under the Energy Act 2010.
- Any changes in the level of the EPS will not apply to plant consented under the framework for a specified period. Details of this 'grandfathering' period will be determined following further engagement with stakeholders.

Introduction

2.4.1 Unabated coal plants are one of the most carbon-intensive forms of electricity generation. Although coal may have an important role to play within the UK's diverse generation mix, it is important it does so in a manner which complements the transition to a low-carbon economy.

2.4.2 This section sets out:

- the principles for applying the EPS;
- the level at which the EPS will be set;
- the treatment of existing plant under the EPS;
- the treatment of biomass and heat; and
- the flexibilities that will apply to the EPS.

Context

2.4.3 Coal and gas-fired plants will continue to play an important role in our electricity mix as the UK makes the transition to a low-carbon economy. In 2010, they provided around 75 per cent of the UK's electricity³⁸. Gas in particular will be needed to provide vital flexibility to support an

38 Energy Trends, May 2011 (5.4)

http://www.decc.gov.uk/publications/basket.aspx?filepath=statistics%2fsource%2felectricity%2fet5_4.xls&filetype=4&minwidth=true#basket

increasing amount of low-carbon generation and to maintain security of supply as we make the transition to a low-carbon electricity system.

- 2.4.4 Electricity generated from coal typically produces twice the emissions of electricity generated from gas. The UK cannot, therefore, sustain investment in new, wholly unabated coal plants if it is to meet its decarbonisation targets. New coal could perform a role in providing both security of supply and low-carbon electricity if, instead of its carbon being emitted into the atmosphere, it were captured and permanently stored in underground geological formations. This is why any new coal plant is already required to be built with CCS on at least 300 MW (net) of its capacity, and we expect that plant builds under this policy will retrofit CCS to their full capacity during their lifetime.
- 2.4.5 To support this and provide greater regulatory certainty, the Government also committed, in the Coalition Agreement, to the introduction of an EPS.

Rationale for an Emissions Performance Standard

- 2.4.6 The objective of the EPS is to ensure that while fossil fuel-fired electricity generation continues to make an important contribution to security of supply, it does so in a manner consistent with the UK's decarbonisation objectives. The EPS will act as a backstop to limit how much carbon new fossil fuel plants can emit, and work alongside the other policies set out in this White Paper as part of a suite of measures to drive decarbonisation while maintaining security of supply and affordable prices.
- 2.4.7 The mechanism will provide further clarity on the regulatory environment for fossil fuel power stations, building on the requirement that new coal-fired power stations must be constructed with CCS. The EPS will complement the economic signals provided by the Carbon Price Floor (CPF) and Feed-in Tariff with Contract for Difference (FiT CfD). Initially it will support the requirements set out in the National Policy Statements (NPS), and in the longer term could be used to give a clear regulatory signal on emission reductions.
- 2.4.8 In the future it may be appropriate to use the EPS in a different way, for example to require full CCS on some or all new fossil fuel plant once the commercial and technical viability of CCS is better understood. Introducing the measure now will provide a framework for this, without prejudging what actions may be needed in the future. Accordingly, the Government considers that the measure should be introduced in a way which provides certainty on emission limits for new plant built under this framework, but it will periodically review the impacts of the mechanism and consider whether it should be modified as part of the process of providing decarbonisation reports to Parliament under the 2010 Energy Act.

Options for an Emissions Performance Standard

- 2.4.9 In the Electricity Market Reform consultation document³⁹, the Government proposed setting an annual limit on the total amount of CO₂ per unit of installed capacity that new fossil fuel power stations are allowed to emit. The Government proposed to apply an ongoing principle of grandfathering, i.e. the level of the EPS on the date of consent of a new power station will apply for the economic life of the installation.
- 2.4.10 The Government sought views on two options for the level of the EPS:
- a level equivalent to 600g CO₂/kWh, consistent with demonstrating post-combustion CCS on a new, supercritical coal-fired power station; and
 - a level equivalent to 450g CO₂/kWh, with specific exemptions for plant forming part of the UK's CCS Demonstration Programme or benefiting from European funding for commercial-scale CCS projects.
- 2.4.11 There was no consensus among respondents on the need to introduce an EPS. Some respondents felt that it would be a useful backstop as part of a suite of measures intended to drive decarbonisation. Others felt further regulation would be unnecessary and could deter investment. Consultation responses were generally split on the preferred EPS level, with some supporting the higher EPS level, and others advocating a more stringent EPS level.
- 2.4.12 Consultation responses largely supported an annual EPS limit calculated at baseload, mostly favoured to help minimise the security of supply risk. There were mixed views on the scope of an EPS scope, and whether it should be fuel-specific or technology-neutral. Many stakeholders, including generators, and some in the wider energy industry, were concerned that applying an EPS to gas would deter investment in new gas plants, whereas others expressed concern that applying an EPS exclusively to coal would drive investment in unabated gas.

Chosen Option

- 2.4.13 The Government has concluded that an EPS for fossil fuel plant, set at an annual limit of CO₂ equivalent to 450g/kWh (at baseload) should be introduced⁴⁰. As a first step, this will build on and support the requirement to demonstrate CCS as part of the consenting process. An EPS at an equivalent of 450g CO₂/kWh will provide a clearer regulatory signal on the need to reduce emissions, and means that typical coal-fired power stations subject to the requirement must limit their emissions by 40 per cent compared to what they could otherwise emit. As part of the package of reforms outlined in this White Paper, it is also consistent with the UK's decarbonisation objectives. The level is also

39 <http://www.decc.gov.uk/en/content/cms/consultations/emr/emr.aspx>

40 The appropriate definition of 'Fossil Fuel' for these purposes will be the subject of further consideration prior to the introduction of any legislation.

consistent with the current average carbon emission intensity across the electricity sector⁴¹, but without restricting the new gas plant the UK needs to be built to maintain sufficient capacity. An exemption for plant in the UK CCS Demonstration programme, or benefiting from European funding for commercial scale CCS, will provide flexibility for the UK to demonstrate the full range of CCS technologies.

- 2.4.14 As an annual limit on allowed emissions of CO₂ the EPS will offer the flexibility necessary to operate plant equipped with CCS, while also providing a clear requirement that new coal plant will have to reduce emissions. It will also help minimise security of supply risks, a point largely supported by consultation responses.
- 2.4.15 The Government will apply the EPS to individual plant rather than across a generator's portfolio. We believe that this is currently the most transparent approach to implementing the EPS.

Review

- 2.4.16 The EPS must provide long-term certainty to investors over regulatory measures, but at the same time, we recognise that in the future it may be appropriate to use a tighter EPS. For example, this may be appropriate once the commercial and technical viability of CCS technology, as well as costs, are better understood (respecting the key principle of grandfathering, see below). However, the Government considers that specifying a future, tighter EPS for new plant at this time would not be based on adequate evidence and could add significant investment risk given that CCS has not yet been proven for commercial-scale electricity generation.
- 2.4.17 There is already a statutory requirement under the Energy Act 2010 for the Government to report on progress in decarbonising the GB electricity system and on the development and use of CCS. The first reporting period ends in 2011, with further periods running on a three-year basis starting in 2012. As part of this, the Government will also review key elements of the EPS (including its level) as appropriate. In practice, the first review of the EPS will be as part of the report due by the end of 2015.

Grandfathering

- 2.4.18 Creating sufficient certainty for investors is a key objective of the reforms. It is important to provide investors with a sufficiently clear understanding of the regulatory environment that will govern their plant, as failure to do so may push investors towards different markets that are perceived to be less risky. With this in mind the operation of the EPS will not be retrospective. It is intended that plants which are

⁴¹ The average carbon emission intensity across power stations on an 'electricity generated' basis in 2010 was 449.4g/kWh. This figure is derived from the total electricity generated by power stations in 2010: 347601 GWh (Energy Trends, Table 5.4: Electricity production and availability from the public supply system: http://www.decc.gov.uk/publications/basket.aspx?filepath=statistics%2fsource%2felectricity%2fet5_4.xls&filetype=4&minwidth=true#basket), and total carbon emissions from power stations in 2010: 156.2 MtCO₂ (UK greenhouse gas emissions: provisional data tables 2010: http://www.decc.gov.uk/publications/basket.aspx?filetype=4&filepath=Statistics%2fclimate_change%2f1514-ghg-emissions-provisional-2010.xls&minwidth=true#basket)

consented before the EPS is legislated for will not be subject to the mechanism.

- 2.4.19 Furthermore, in order to provide sufficient certainty for investment in new plant, the Electricity Market Reform consultation proposed a principle of grandfathering for the economic life of a power station. This would mean that the level of the EPS in place at the point that a power station is consented remains at the level which is relevant for its economic life.
- 2.4.20 Many consultation respondents viewed the principle of grandfathering as an important provision, which reduces regulatory uncertainty and enables them to proceed with investments.
- 2.4.21 However, some respondents to the consultation expressed concern that the proposals could perpetuate the relative attractiveness of investment in unabated gas, discouraging investment in CCS and/or other low-carbon generation. There was also a concern that it could prevent the Government from using the mechanism to require CCS (or other measures) to reduce emissions from existing power stations in the future, once the technology is proven to be technically and commercially viable. Respondents were also unclear on what constituted 'economic life'.
- 2.4.22 The UK will require new gas plant to enable us to make the transition to a low-carbon electricity system while ensuring security of supply. To provide sufficient certainty for investors to build gas plants, a principle of grandfathering will be implemented. Therefore Government intends to apply this principle from the point of consent, to remove the risk that the EPS applicable to any given plant will be tightened while it is under construction.
- 2.4.23 Whilst we are going to need new, unabated gas in the next few years, we recognise that, in the longer term, it is likely that emissions from gas plant will need to reduce if we are to largely decarbonise the electricity sector and meet our climate change targets. In doing so, there is likely to be a role for gas plant equipped with CCS, which is why new gas plants are required to be built carbon capture ready.
- 2.4.24 In introducing the EPS, the Government is seeking to strike the right balance between investor certainty and appropriate support for decarbonisation. While the FiT CfD and CPF will be the primary drivers for decarbonisation and the use of CCS, and it is important to provide sufficient clarity for investors, the Government recognises that it might not be appropriate to limit its ability to tighten the EPS for plant consented under this framework indefinitely. We are, therefore, minded to grandfather on the basis of a clear and pre-determined period (i.e. the duration for which a plant will not be subject to possible changes in the level of EPS).
- 2.4.25 Government recognises that there are a number of options on how this could be implemented in practice, and will undertake further analysis and engage with stakeholders to clearly define the arrangements,

determine the most appropriate duration for this grandfathering period (with one suggested period being around 20 years), and determine the most practical and least disruptive mechanism to implement it.

- 2.4.26 While grandfathering will be an important part of the EPS, it may not be appropriate to continue offering it to new plant in the same form indefinitely. Whilst there would be no retrospective changes (i.e. no change to the grandfathering provisions a plant has already secured), as part of reviewing the EPS under the decarbonisation reporting process referred to above, the Government intends to consider whether the form of grandfathering available to new plant remains appropriate in light of the development and understanding of CCS technology and deployment, the status of decarbonisation, and the need to maintain security of supply. Grandfathering provisions (i.e. the ability of new plant to get a grandfathered EPS) will however be available at least until the end of 2015.

Upgrades and life extensions of plant

- 2.4.27 The Government intends that plant consented before the EPS is legislated for will not be subject to it. However, to prevent lock-in to high-carbon generation, the Government considers it also appropriate that plant which undergo significant life extensions or upgrades fall under the EPS regime. For example, this could include upgrading boilers to supercritical status, which is more efficient than the UK's existing coal-fired power stations and could extend their lifetime by a period similar in length to the lifetime of new coal plants. However, the Government recognises that there are a number of uncertainties regarding what events would constitute such significant upgrades or life extensions. We will therefore work with stakeholders to define what this should mean in practice.
- 2.4.28 Upgrades to comply with EU law will not trigger the bringing of a plant within the EPS, nor will retrofit of CCS or conversion works undertaken to facilitate the use of biomass. To do so could act as a disincentive to improve environmental performance of existing power stations.

Technologies

Carbon Capture and Storage

- 2.4.29 The Government has made it clear that the EPS will be set in a way which does not undermine the development of coal and gas CCS technology. The Government will consider the options for how to implement exemptions to the EPS for CCS demonstration plant.

Biomass

- 2.4.30 The Government intends to zero rate biomass under the EPS. While biomass is not carbon neutral, it is regarded as low-carbon, as the lifecycle emissions of biomass plants are significantly lower than those of fossil fuels. The Government expects sustainably sourced biomass to make a significant contribution towards achieving the UK's renewable

energy targets. Applying the EPS to any level of biomass emissions above zero could reduce the incentive to invest in sustainable biomass generation. While we accept there are issues around biomass and wider sustainability, the Government believes these can be addressed through alternative tools rather than the EPS⁴².

- 2.4.31 Furthermore, installations which use biomass exclusively as the fuel in their combustion activities or any other process are specifically excluded from the EU Emissions Trading System (EU ETS). Consequently, choosing to effectively zero rate biomass under the EPS treats it in a manner consistent with the EU ETS.

Combined Heat and Power

- 2.4.32 Good Quality fossil fuel Combined Heat and Power (CHP) is a highly efficient process, and plants that use it deliver a significant reduction in carbon emissions compared to the separate methods of generating heat and power via a boiler and a power station. Good Quality CHP will be a key technology in helping to deliver our carbon budgets while the grid decarbonises, and will still play a pivotal role in providing secure and cost-effective energy supplies, particularly for industry. The Government will therefore continue to promote the development of Good Quality CHP in the UK.
- 2.4.33 An EPS which does not make allowances for the fuel used to generate useful heat when calculating the allowed emissions could penalise CHP facilities and act as a disincentive to investment. Some consultation respondents have argued that to be treated fairly, fuel used to produce useful heat should be subtracted before the calculations are made. For example, if the EPS only considers total fuel into a plant, a gas CHP plant that emits around 380g CO₂/kWh of electricity would have to sacrifice their heat supply and use their fuel predominantly for electricity generation.
- 2.4.34 The Government will look to avoid structuring the EPS in a way which could act as a disincentive to investment in CHP, as far as is practicable. The Government will look to explore the specific complexities and technicalities with stakeholders before bringing forward detailed regulations on this issue.

Institutional arrangements

- 2.4.35 When implementing the EPS, the Government will be looking to keep any additional regulatory burden on operators or public bodies to a minimum, and believes that it can be implemented in a manner consistent with the administration of other mechanisms. The Government also intends to apply the EPS only to plant at or over 50 MW declared net capacity.

⁴² The UK has introduced sustainability criteria for biomass under the Renewables Obligation, including minimum lifecycle greenhouse gas emissions savings of 60 per cent compared to the use of fossil fuel. The Government will continue to apply sustainability standards to biomass and bioliquids under the new support framework.

2.4.36 The Government's initial view, subject to more detailed implementation planning, is that the relevant environmental regulators (e.g. the Environment Agency in England and Wales and Scottish Environment Protection Agency (SEPA) in Scotland) are likely to be best placed to administer the EPS.

Interactions with the other Electricity Market Reform measures

2.4.37 Safeguarding security of supply is a key consideration for the Government, and we are committed to minimising any risks of unforeseen impacts. The Government proposed building in some flexibilities to the EPS to address short-term security of supply issues including exceptions in the event of short-term or longer-term energy supply emergencies.

2.4.38 Respondents expressed mixed views around exceptions to the application of the EPS. Most supported the principle where there are short-term energy shortfalls to protect security of supply and considered that the situations should be set out clearly in advance. Some, however, opposed it and highlighted risks such as investment uncertainties and undermining the mechanism.

2.4.39 Setting the EPS at 450g CO₂/kWh will ensure that there is no material impact on capacity margins. In addition, as an annual limit the EPS will allow for power stations to operate in an unconstrained manner during periods of high demand. However this will have to be matched by those stations running reduced hours at other times to compensate for their emissions during high demand periods. Setting the EPS in this way will enable very flexible power stations, which only operate during the periods of highest demand ('peaking plant'), to run when the system needs them. As peaking plants only run for short periods of time during the year their annual emissions would be negligible. As a result the Government does not consider this will have a material impact on overall emissions from the electricity sector.

2.4.40 The Government intends to build in the additional flexibilities proposed in the consultation, and provide for the Secretary of State for Energy and Climate Change to be able to make limited exceptions to the EPS in order to maintain energy security, for example in circumstances where there are short-term or longer-term energy supply emergencies. In such emergencies it could, for example, allow coal power stations to turn off their CCS equipment without being penalised by the EPS. This would allow those stations to provide additional electricity to the grid. Alternatively those power stations could be allowed to operate at a higher output (or load factor) than would be the case if they were always subject to EPS constraints.

2.4.41 There may be other reasons why exceptions are required, and the Government will explore the extent to which such situations exist and take appropriate steps to deal with them in designing the regime.

2.4.42 The Government will ensure that these flexibilities do not undermine the benefits of the EPS. They will be shaped and controlled carefully and will strike the balance between providing certainty while safeguarding security of supply.

Devolved Administrations

2.4.43 The Government is keen that the framework of the EPS regime should, as far as possible, cover the whole of the UK and is working closely with the Devolved Administrations in Scotland, Wales and Northern Ireland to achieve this in a way which takes appropriate account of their policy preferences, existing market arrangements and respective devolution settlements.

Next Steps

2.4.44 The Government will continue to work with stakeholders to develop the detail of key aspects of the implementation of the proposed EPS regime, including:

- the appropriate arrangements for grandfathering provisions;
- operation of exemptions;
- further definitions for upgrades or life extensions that would bring a plant under the EPS regime; and the best way to account for heat energy; and
- seek to introduce the EPS regime, probably through a mixture of new primary and secondary legislation, in the second session.

Chapter 3 – Securing future electricity supply

3.1 THE CHALLENGE

- 3.1.1 The UK needs secure, low-carbon and affordable electricity. Households and businesses expect there to be light and power when they need it. It is a core function of Government to ensure that these expectations are met. Historically, the UK has benefited from robust security of supply, largely due to competitive markets underpinned by robust independent regulation.
- 3.1.2 Over the coming years, the UK electricity market will undergo profound changes. Some of these changes will help make our electricity supplies more secure. For example, decarbonisation will encourage a diverse range of generation capacity and reduce the extent to which we rely on imported fossil fuels, and improved energy efficiency will help to limit the overall amount of electricity supply we need.
- 3.1.3 However, the changes to the market also raise legitimate concerns over the security of future electricity supply. Over the next decade, we will lose around a quarter of existing capacity as a result of plant closures due to ageing plants and environmental regulation. We will see a significant rise in intermittent and less flexible generation to support our climate change objectives. Our fossil fuel generation will also become increasingly dependent on imports. Reduced energy use has a central role to play in reducing the overall quantity of generation required, and demand side response (DSR) in particular can play a vital role in enabling security of supply at times of system stress, but even with increased energy efficiency we expect overall demand for electricity to increase as a result of the electrification of our transport, industry and heating systems.
- 3.1.4 There are also a number of market failures in the electricity market which are likely to be exacerbated by the increase in intermittent and less flexible generation⁴³. Taken together, these changes and market failures mean that investment in the flexible capacity needed to ensure security of supply, particularly during extended periods of high demand and low wind, may not be forthcoming.
- 3.1.5 We need to ensure that the system is able to keep the lights on within this new context and put us on a sustainable pathway for the decarbonisation of our electricity system.

43 These market failures are discussed in more detail below and in the accompanying Impact Assessment http://www.decc.gov.uk/en/content/cms/legislation/white_papers/emr_wp_2011/emr_wp_2011.aspx

3.1.6 A strong, competitive market, with increasingly responsive demand and independent regulation, will be central to achieving our security of supply aims at least cost to the consumer. However, given the unprecedented nature of the challenge, business as usual is unlikely to be enough to ensure secure supply. Without action, we face a significantly increased risk of being unable to meet our energy needs, resulting in voltage reductions and blackouts as capacity margins tighten from around the end of this decade. The Government therefore believes that a Capacity Mechanism will be required to ensure security of supply.

Wider context

3.1.7 These reforms sit within a wider security of energy supply agenda aimed at reducing demand and ensuring resilient, diverse supply, in both the domestic and international markets. This includes:

- **reducing our demand for energy.** In particular, the Green Deal will finance household and business energy efficiency improvements at no up-front cost to consumers, while the roll-out of Smart Meters will enable consumers to optimise their electricity and gas demand;
- **maximising the economic recovery of our existing hydrocarbon reserves,** on which a significant proportion of our electricity generation depends. Around 20 billion barrels remain, of which around 3.5 billion are situated in the deepwater areas West of Shetland;
- **ensuring we have a strong, resilient market and infrastructure.** Gas market reform will improve our resilience to low probability/high impact events. The Green Investment Bank (GIB) will help to fund the scaling-up and deployment of green technology and clean energy projects. New import infrastructure will ensure resilient access to global energy markets, particularly for gas, oil and electricity. The development of a smarter, more flexible grid will help in the management of demand peaks. Implementing the conclusions of the Ofgem Review, including the Strategy and Policy Statement⁴⁴, will help ensure that the regulatory regime is ready to meet the new challenges that we face; and
- **continuing to play an active role internationally.** This means promoting low-carbon growth, encouraging necessary transitional investment in oil and gas production, and promoting more reliable supply of energy and enhanced price stability. And we continue to pursue the liberalisation of energy markets, in the EU and globally.

3.1.8 Electricity Market Reform is an integral part of our comprehensive approach. It will help ensure that the right long-term signals are in place to enable cost-effective investment in all forms of low-carbon generation, while ensuring security of supply and the best possible deal for consumers.

44 http://www.decc.gov.uk/en/content/cms/meeting_energy/markets/regulation/regulation.aspx

3.2 CAPACITY MECHANISM

Summary

- We face increasing security of supply risks from around the end of this decade. This is due to two main factors: around a quarter of existing generation is closing; and a significant proportion of new generation is likely to be more intermittent and less flexible.
- Our modelling indicates that de-rated capacity margins will fall below 10 per cent around the end of this decade⁴⁵, and will significantly increase the risk of costly voltage reductions and blackouts. Market failures mean this risk is even greater.
- New non-generation measures such as demand side response (DSR), storage and new connections to other countries offer significant opportunities to improve security of supply and reduce the overall generating capacity that is needed. Market arrangements need to ensure that these approaches can play their part in enabling secure supplies for consumers.
- There are potential reforms to the current market (e.g. cash out⁴⁶) which can help improve security of supply, but these are unlikely to be sufficient. We believe that a Capacity Mechanism will be needed, and are consulting on the type of Capacity Mechanism to be introduced. We present two options:
 - a targeted mechanism, with a proposed model of a Strategic Reserve; or
 - a market-wide mechanism, in the form of a Capacity Market.
- A consultation paper can be found in Annex C. We will set out our decision around the turn of the year and legislate to introduce the most appropriate mechanism in the second session.

Introduction

- 3.2.1 Ensuring security of electricity supply is a key Government priority. The Coalition Agreement emphasised our commitment to reforming energy markets to deliver security of supply.
- 3.2.2 The Electricity Market Reform consultation document⁴⁷ discussed the need for a Capacity Mechanism to ensure security of supply, and stated a preference for introducing a particular type of mechanism – a tender for targeted resource. Respondents had mixed views on the proposals. We have therefore carried out further analysis to strengthen our assessment on the need for, and design of, a Capacity Mechanism, and are seeking views on the type of mechanism to be introduced.

⁴⁵ The de-rated capacity margin is the capacity margin adjusted to take account of the availability of generating capacity, specific to each type of generation technology. It reflects the expected proportion of a source of electricity which is likely to be technically available to generate (even though a company may choose not to utilise this capacity for commercial reasons).

⁴⁶ Imbalance Settlement or 'cash out' is the process used to settle differences between the financial contracts and the physical metered volumes of market participants.

⁴⁷ <http://www.decc.gov.uk/en/content/cms/consultations/emr/emr.aspx>

3.2.3 This section sets out:

- the problem we are trying to solve with a Capacity Mechanism;
- proposed reforms to the current market and the need to go further;
- how the introduction of a Capacity Mechanism will ensure security of supply;
- options for Capacity Mechanism design; and
- next steps in the policy development and legislative process.

3.2.4 We are consulting on the type of Capacity Mechanism to be introduced. Detailed proposals for mechanism design, and questions for stakeholders, are set out in Annex C.

Context

3.2.5 As set out above, the GB electricity market is about to undergo unprecedented changes. These changes can contribute to improving security of supply – in particular, by delivering a more diverse generation mix and more interconnection. However, these changes also pose challenges to security of supply – in particular, the retirement of existing plants, and the increased proportion of intermittent and less flexible generation on the system⁴⁸. If we provide the right framework, industry can deliver the necessary investment in flexible capacity, including a diverse mix of generation, DSR, storage and interconnection. The Electricity Market Reform package will drive the uptake of cost-effective measures to ensure security of supply – alongside Ofgem-led reforms on cash out and liquidity.

The problem

3.2.6 A number of responses to the consultation emphasised the importance of ensuring we are clear about the nature of the problem we are trying to solve with a Capacity Mechanism, and how it relates to short-term balancing of the system. There are three different, linked challenges under the general banner of ‘security of supply’:

- **diversification of supply:** how to ensure we are not over-reliant on one energy source or technology and reduce our exposure to high and volatile prices;
- **operational security:** how to ensure that, moment to moment, supply matches demand, given unforeseen changes in both; and
- **resource adequacy:** how to ensure there is sufficient reliable and diverse capacity to meet demand, for example during winter anti-cyclonic conditions where demand is high and wind generation low for a number of days.

⁴⁸ Our analysis, carried out by Redpoint Energy, suggests that in a scenario including the Feed-in Tariff with Contract for Difference and a Strategic Reserve to provide a 10 per cent de-rated capacity margin, around 35 GW of new capacity will be required to meet demand in 2020 given expected plant closures. Our analysis suggests that 18 GW will be wind generation which is less reliable than fossil fuel generation.

- 3.2.7 By diversifying our portfolio of generation technologies it is possible to address the first challenge. A higher level of intermittency potentially makes the second and third challenges greater. The second should continue to be addressed by the System Operator (SO), National Grid, through the current approach, including the procurement and operation of Short-Term Operating Reserve (STOR) – see Box 6. We propose that the Capacity Mechanism addresses the third problem, though interactions between a Capacity Mechanism and short-term balancing actions would need to be carefully considered.
- 3.2.8 We define ‘reliable capacity’ as capacity which is able to address the challenge of delivering resource adequacy.
- 3.2.9 This includes not just traditional power stations but also non-generation technologies and responses such as DSR, storage, interconnection, and other innovative approaches. These technologies and approaches have the potential to make a significant contribution to security of supply, while reducing the need for large scale infrastructure and making better use of generation assets. We intend that the proposed Capacity Mechanism would incentivise such approaches, and be compatible with a future electricity system in which consumers are engaged in their electricity consumption and demand is responsive.

Box 6: Short-Term Operating Reserve

The System Operator (SO), National Grid, is responsible for maintaining the stability of the electricity system by ensuring that supply and demand are in balance at all times. Although individual market participants will have planned ahead of time for the expected demand in each half hour, there will be times when demand is greater than forecast; and occasionally a generating unit will fail, meaning that additional generation must be brought on line to replace it.

In part, National Grid can balance the system by accepting offers and bids in the Balancing Mechanism. However, it has a responsibility to ensure that, regardless of the availability and commercial decisions of generators, it will always be able to meet its operating needs.

To fulfil this responsibility, National Grid makes an assessment of how much reserve capacity is required to manage these uncertainties in the period about four hours ahead of real time. This requirement is about 4 GW, and is largely met by the Short-Term Operating Reserve (STOR), whereby National Grid contracts reserve capacity to be made available on demand. Demand side response can be contracted through STOR if it meets the technical requirements set by National Grid.

As greater amounts of wind generation are added to the system, National Grid expects that the level of required reserve will increase, due to the need to cope with real time unexpected changes in wind generation in addition to existing challenges; this can be both the wind dropping off or blowing too hard causing generation to drop rapidly.

The proposed options for a Capacity Mechanism are not intended to remove the need for this operating reserve, though interactions between the two will need to be considered.

Rationale for a Capacity Mechanism

- 3.2.10 In the Electricity Market Reform consultation document we outlined reasons why we cannot be confident that the current electricity market will deliver the appropriate level of reliable capacity to produce adequate security of supply in the medium to long term.
- 3.2.11 Some respondents to the consultation took the view that capacity margins during this decade mean that a mechanism is likely to be needed. Others were sceptical of the need for a Capacity Mechanism and argued that the case for a significant market intervention had not been made.

Modelling of capacity margins

- 3.2.12 Our latest modelling of the future electricity system suggests that over the medium to longer term, investment in generation will not be sufficient to avoid potentially difficult levels of energy unserved. Even without market failures, de-rated capacity margins are expected to fall below five per cent in some years, increasing the likelihood of black

outs. Market failures are likely to exacerbate this risk.

3.2.13 If low capacity margins lead to energy unserved, there are resultant costs to consumers. For example, if de-rated capacity margins fall to 3 per cent in the early 2020s, in a year we could expect around 20 GW of energy unserved, with estimated costs to the economy of £200-600 million⁴⁹.

3.2.14 Projections are uncertain, but suggest:

- **From now to 2013:**

- De-rated capacity margins appear robust (but will need to be closely monitored).

- **Mid 2010s:**

- Margins likely to become tighter as some plants impacted by the Large Combustion Plant Directive and then the Industrial Emissions Directive retire, and current nuclear plant closes. Some new construction, or de-mothballing, will be required to ensure security of supply.

- **Late 2010s:**

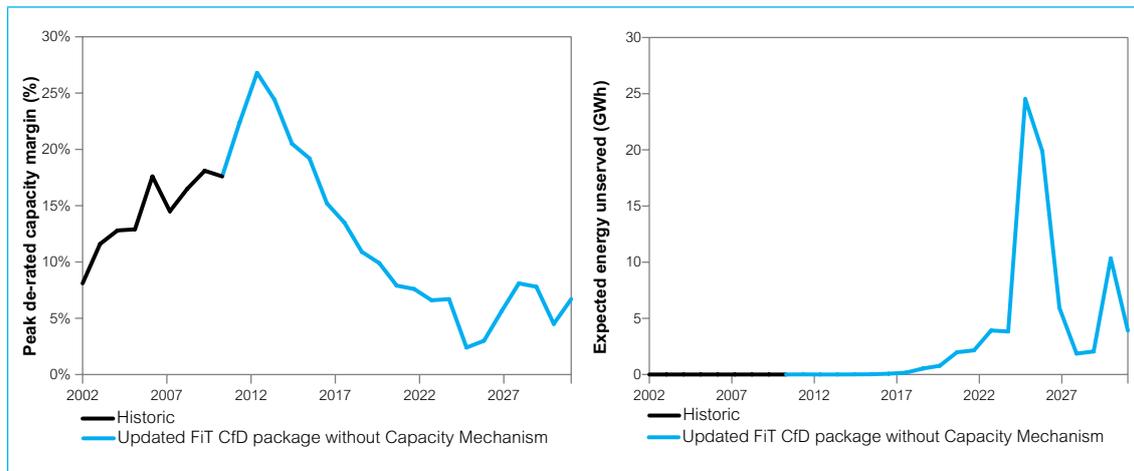
- Margins tighten, intermittency grows and a Capacity Mechanism is likely to be needed to ensure security of supply; and
- As can be seen in Figure 10, towards the end of the decade the de-rated capacity margin falls below 10 per cent, and below five per cent in more than one year.

3.2.15 Figure 10 shows the modelled capacity margin and expected energy unserved under an Electricity Market Reform scenario including FiT CfD but without a Capacity Mechanism. These projections do not include the market failures set out below⁵⁰.

⁴⁹ The cost depends on the average Value of Lost Load (VoLL), which is the theoretical value to the GB economy of preventing blackouts. It is the electricity price at which an average consumer would rather be cut off than continue paying. Estimates of VoLL are very uncertain. Oxera, an economics consultancy, published a range of estimates for VoLL. We have assumed a VoLL of £10,000/MWh for our analysis.

⁵⁰ These projections assume that the electricity market delivers the economically efficient level of de-rated capacity margin. Prices are allowed to rise to consumers' Value of Lost Load (VoLL) of £10,000/MWh and, in the modelling, investors know this. In reality, if investors do not believe that prices will be allowed to rise to VoLL because of the market and regulatory failures described below, then the security of supply outcomes could be worse than those modelled. For our future modelling, we will examine whether it is possible to reflect the impact of market failures on capacity margin and energy unserved.

Figure 10: Peak de-rated capacity margin and expected energy unserved (GWh) to 2030



Market failures

3.2.16 There are a number of market failures which exist in the electricity market. These include:

- **reliability is a public good** – consumers cannot buy reliability for themselves without providing it for everyone else, so there is not enough demand for generation companies to provide it⁵¹;
- **there are barriers to entry in the wholesale market** – market liquidity is a key issue, but there are related concerns including potentially limited routes to market for some independent generation; and
- **prices in the electricity market may not send the correct signals** to ensure optimal security of supply.

3.2.17 On the latter point, expectation of price caps in energy markets leads to ‘missing money’. At times of system tightness, marginal generators⁵² should be able to raise their prices to the point where they can cover their long-run marginal costs, and in the limit, raise their prices to very high levels – that is, to the value at which energy consumers are indifferent to being disconnected (the Value of Lost Load (VoLL)). However, there are a number of reasons why generators may not be able to realise the necessary prices and hence not cover their long-run costs. These reasons include actions taken by the SO to balance the system that are not priced correctly, as well as regulatory intervention.

3.2.18 In particular, investors are likely to be concerned that periods of high prices will lead to regulatory intervention in the form of price caps, and this concern will reduce the incentive to invest. There are examples of regulatory intervention following periods of high prices (for example, during and following the California energy shortage of 2001-02) and

51 In future a more flexible demand side, enabled by new technologies including Smart Meters, could mean consumers have more opportunity to choose individual levels of reliability.

52 Capacity that enters the market in times of high demand/system scarcity.

investors may believe that such intervention will be likely in any future prolonged period of high prices. The reforms to the current market discussed below, such as changes to the cash out arrangements, will address some of these issues but are unlikely to fully address investors' worries concerning regulatory intervention leading to this 'missing money'.

- 3.2.19 We believe that the challenges posed by these market failures are likely to become more acute over the coming decade than they have historically been. At present, GB has a very comfortable margin of generation capacity and periods of scarcity are rare. This surfeit of capacity arose largely from the 'dash for gas' during the 1990s when, following privatisation of the electricity industry, a large amount of gas-fired generation was built in an investment climate conducive to its construction.
- 3.2.20 Given the drive to build low-carbon generation, the situation now faced by an investor who is considering building a new fossil plant is very different to that faced by an investor in gas generation in the 1990s. Many of the new low-carbon plants that will be built in the coming years will typically have very low running costs and so any new fossil plants will only run when the low-carbon plants are not running. Revenue from fossil plants will be more volatile and uncertain, and the investment decision therefore more risky.
- 3.2.21 In addition, it may be argued that the costs of under-investing in capacity and resulting cost of blackouts means that consumers may prefer to invest more rather than less, in order to insure themselves against the risk that exceptional conditions result in disruption, loss of service, and periods of high prices. This will mean that consumers pay more than they would without a Capacity Mechanism, but benefit from increased reliability as a result of sufficient capacity being on the system. A fuller discussion of the market failures identified here is included in the accompanying Impact Assessment⁵³.

Reforms to the current market

- 3.2.22 Ofgem is undertaking two reform processes to improve the operation of the current market: to sharpen the incentives for market players to balance supply and demand through cash out reform; and to increase the amount of electricity traded in the market through its liquidity project⁵⁴. The Government strongly supports this work. This section sets out the Government's views on these issues in relation to security of supply.

Cash out reform

- 3.2.23 Electricity is traded in half hour settlement periods. Bilateral trading between generators, suppliers and intermediaries ends one hour before the half hour period in which electricity is generated, supplied

53 http://www.decc.gov.uk/en/content/cms/legislation/white_papers/emr_wp_2011/emr_wp_2011.aspx

54 <http://www.ofgem.gov.uk/CustomPages/Pages/Publications.aspx>

and consumed. The SO is responsible for ensuring that the electricity system remains balanced within each half hour period. The system can be out of balance when electricity generators or suppliers are also out of balance – that is, when market participants deviate from their declared intention to generate or supply electricity. The SO incurs costs on behalf of the industry for increasing or reducing supply or demand to balance the system.

- 3.2.24 Imbalance Settlement or ‘cash out’ is the process used to settle differences between the financial contracts and the physical metered volumes of market participants. Cash out prices are intended to reflect the costs the SO incurred when balancing the system. We believe the current cash out price may not fully reflect the costs of ensuring that demand and supply are in balance and at times may be too low.
- 3.2.25 In August 2010, Ofgem consulted on whether to undertake a Significant Code Review (SCR) of cash out⁵⁵. We believe that cash out prices should accurately reflect the costs of balancing the system within that settlement period and we support Ofgem’s intention to launch a cash out SCR. We would expect this to improve incentives for market investment in new capacity.
- 3.2.26 Ofgem has identified a number of areas for consideration to improve cash out. The list of issues below is not exhaustive and others may be brought forward before and throughout the process. The options are not mutually exclusive.
- 3.2.27 In summary the options include:
- changing to a single or fixed spread cash out price – different cash out prices for selling and buying electricity, as exist currently, provide balancing incentives but create more than one price for what is essentially the same product;
 - changing to more marginal pricing – a scheme closer to marginal pricing should result in more cost reflective prices if system balancing actions can be accurately removed from the price⁵⁶;
 - more effective allocation of reserve contract costs – by targeting costs to the period in which the reserve is used this should be more cost reflective⁵⁷; and
 - putting a price on the currently non-costed SO actions – customers could be compensated for involuntary voltage reductions and automatic demand disconnection, and these costs included in the cash out price.

55 Ofgem introduced the process of Significant Code Reviews (SCRs) in 2010 as a result of its review of industry code governance. SCRs give Ofgem a leadership, coordination and change initiation role where a number of code changes are necessary in order to address an issue with a significant impact on the achievement of its remit.

56 System balancing actions include balancing locational constraints and second-by-second balancing.

57 Should more accurately reflect the costs incurred by the System Operator when balancing the system to market participants that are out of balance.

- 3.2.28 It will be for the Gas and Electricity Markets Authority (GEMA) to decide when and whether to launch a SCR⁵⁸. The Government is keen that Ofgem launches the cash out SCR as soon as possible, and takes account of the ongoing work on a Capacity Mechanism, but does not wait for it. We strongly encourage industry to work with Ofgem to make cash out more reflective of actual costs within the settlement period.
- 3.2.29 A more accurate cash out price should make the spot market price more reliable. A more reliable spot market price will in itself improve security of supply by providing greater incentives to market players to invest in development and/or retention of capacity. In addition, some forms of Capacity Mechanism would need a reliable reference price, which could be provided directly by the cash out price or indirectly by influencing the price in the spot, day ahead and forward markets⁵⁹.
- 3.2.30 There are risks to be managed in implementing cash out reform, including the risk that if cash out prices become more volatile, there will need to be sufficient liquidity to allow market participants (particularly smaller suppliers and generators) to trade out of imbalance positions. We would expect Ofgem to consider this issue and any related negative impacts on non-vertically integrated companies as part of its Impact Assessment.

Liquidity

- 3.2.31 The interaction between Ofgem's work to improve market liquidity and Electricity Market Reform is discussed in Chapter 5. We note that Ofgem's liquidity project is ongoing, and seeks to ensure that the wholesale power market better meets market participants' needs – including those of independent suppliers and generators.
- 3.2.32 As outlined in the Electricity Market Reform consultation document, a more liquid market could reduce security of supply risks. Improved liquidity is also important to support effective Capacity Mechanism implementation.

Government view

- 3.2.33 Based on current projections, we continue to believe that a Capacity Mechanism is needed to guarantee security of supply over the medium to longer term. The challenges of plants shutting as a result of environmental regulation and old age, combined with a shift to a greater proportion of low-carbon and intermittent and less flexible generation, raise credible concerns for the security of supply outlook in the latter part of this decade.

58 Ofgem is governed by the Gas and Electricity Markets Authority, which consists of non-executive and executive members and a non-executive chair.

59 'Spot' trading means trading for delivery on the same day as the trade (within day). 'Day-ahead' trading refers to buying and selling for delivery of electricity on the day after trading takes place. 'Forward' trading refers to buying and selling for delivery of electricity in the month ahead and after, and may include trades for months, seasons and years ahead of delivery.

3.2.34 There are three arguments endorsing this view:

- the Government supports Ofgem's work on liquidity and cash out, but our analysis of the electricity system indicates that even in a GB electricity market without the market failures identified above, capacity margins would fall throughout the next decade. Without a Capacity Mechanism we would expect to see increased levels of energy unserved from around the end of this decade;
- market failures that apply to electricity markets in general mean that the level of investment in reliable capacity is likely to be lower than in a market not subject to these market failures. These market failures are likely to be exacerbated by the changes taking place in the GB market; and
- when faced with uncertainty, consumers may prefer to invest more to insure themselves against the risk of disruption, loss of service and periods of high prices due to under-investment.

Options for a Capacity Mechanism

3.2.35 A well designed Capacity Mechanism will ensure security of supply by:

- providing a regular revenue stream to some or all providers of capacity, which in turn encourages greater investment in the types of capacity required to deliver resource adequacy;
- providing a more secure capacity margin than one that would be determined by the market without intervention; and
- encouraging peaking plants⁶⁰ and non-generation approaches such as a DSR and storage.

Overview of December 2010 consultation proposals

3.2.36 In the Electricity Market Reform consultation document, we set out a number of ways to implement a Capacity Mechanism, using either a targeted or market based approach:

- **capacity payment** – reimburses all providers through a payment for available capacity, with the level of payment set by a central organisation;
- **capacity obligation** – an obligation on suppliers to contract with providers for a certain level of capacity or pay a buy-out price;
- **capacity auction** – the capacity is set centrally a number of years in advance, with the price determined by an auction and paid to all resource clearing the auction;
- **reliability option** – a forward auction for a financial instrument, 'a call option', where providers must be available to the SO for distribution above the defined strike price; and

⁶⁰ Power plants that generally only operate at times of high demand/scarcity.

- **tender for targeted resource** – capacity payments are only given to resource required to make up the shortfall in the market. The level of payment is set through a competitive tendering process.

3.2.37 We expressed a preference for a tender for targeted resource, and sought views on various elements of design for this approach.

Summary of responses

3.2.38 A number of stakeholders expressed strong concerns about the consultation proposal to introduce a targeted mechanism. Most concerns related to the potential impacts of this mechanism on the way the market operates. In particular some felt that a targeted mechanism would lead to a ‘slippery slope’ where an increasing number of fossil/peaking plants would be included in the mechanism rather than operate in the market⁶¹; and/or that a targeted mechanism would simply displace generating capacity which would have been available anyway. Some stakeholders suggested that a market-wide approach would avoid some of these problems and could be more viable in the long term. A number of stakeholders highlighted the importance of the role of non-generation forms of reliable capacity such as DSR, storage and interconnection.

Preferred Options

Overview of proposals

3.2.39 We have listened to concerns from stakeholders about the options we put forward in the consultation. In response, we have both refined the detail of the original preferred option to seek to address the concerns raised; and explored an alternative, market-wide model in more detail. We are seeking views in the consultation, set out in Annex C, on the detailed design of our approach for each:

- a **targeted mechanism**, with a proposed model of a **Strategic Reserve**, a development of the lead option from the Electricity Market Reform consultation document which aims to mitigate concerns raised by stakeholders. This comprises centrally-procured capacity which is removed from the electricity market and only utilised in certain circumstances; or
- a **market-wide mechanism** in the form of a **Capacity Market**, in which all providers willing to offer capacity (whether in the form of generation or non-generation technologies and approaches such as storage or DSR) can sell that capacity; and the total volume of capacity required is purchased. There are several forms of Capacity Market, depending on the nature of the ‘capacity’ and how it is bought and sold. In particular, there are a number of ways to purchase capacity – including through a central auction or a supplier obligation. One form of a Capacity Market is a **Reliability Market**, for which, given its innovative nature, we are keen to gain stakeholder

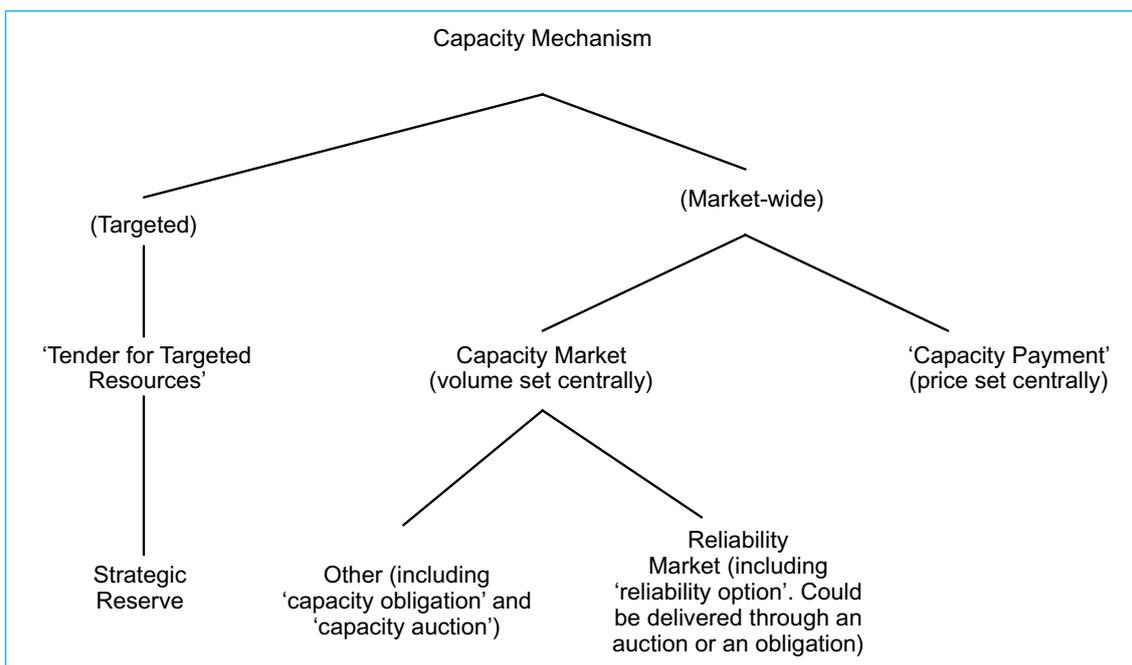
61 If being in the Capacity Mechanism and receiving a Capacity Payment was more attractive than remaining wholly in the market, it could lead to lack of investment outside of the mechanism, meaning that the central organisation would have to procure ever more generating capacity.

feedback. We recognise that there are other forms of market-wide mechanism, such as those which set price in order to incentivise sufficient volume (Capacity Payments), and these remain under consideration.

3.2.40 Figure 11 shows the kinds of Capacity Mechanism that we discuss in this chapter, and the Capacity Payments mechanism discussed in the Electricity Market Reform consultation document.

3.2.41 We will set out our preferred option in a technical update to the White Paper around the turn of the year.

Figure 11: Possible models for a Capacity Mechanism



Notes:

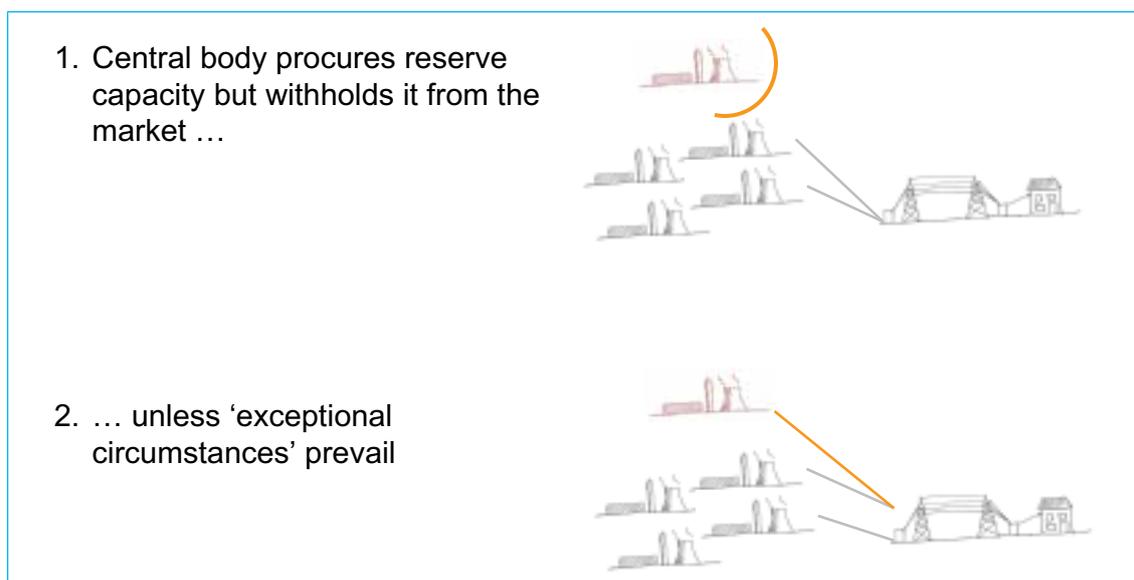
The Capacity Mechanism types in inverted commas are those proposed in the Electricity Market Reform consultation document.

Under a Capacity Market, one distinction is what is bought and sold (i.e. a regulatory definition of capacity or a reliability contract). Another distinction is how the capacity is bought and sold, which could be through a central auction and / or a supplier obligation.

Option: a targeted mechanism

- 3.2.42 We have refined our proposal for a targeted mechanism to a Strategic Reserve with the aim of addressing stakeholder concerns.
- 3.2.43 A Strategic Reserve is an amount of reliable capacity which is held outside the electricity market apart from under certain, exceptional conditions. A determination would be made centrally about the level of reliable capacity required as well as an assessment of whether the market would be likely to deliver this, on the basis of independent advice.
- 3.2.44 If no shortfall is expected then no additional capacity would be procured. When a shortfall in reliable capacity is anticipated, a central organisation would be responsible for competitively procuring the necessary volume and mix of Strategic Reserve to meet demand.
- 3.2.45 Criteria would be set to enable the appropriate reserve capacity to be procured. These criteria would potentially allow all forms of reliable capacity – including flexible generation, distributed generation, DSR, storage and other suitable approaches.
- 3.2.46 The price at which the reserve enters the market, and methodology for changing the price, were of particular concern to stakeholders given the potential for this to lead to a ‘slippery slope’ (see above). We propose that the Strategic Reserve would be withheld from the electricity market and only be released when prices rise above a certain level – the despatch price. A proposal for price setting is set out in Annex C.
- 3.2.47 The costs of a Strategic Reserve would be met by consumers through revised supplier and generator pricing arrangements. However these costs should be outweighed by the benefits of ensuring security of supply. Figure 12 shows how a Strategic Reserve would operate to ensure a capacity margin.

Figure 12: Operation of a Strategic Reserve



Option: a market-wide mechanism

3.2.48 We have also considered a market-wide mechanism in the form of a Capacity Market, which would introduce a market for capacity in addition to the existing electricity market. Providers of capacity could operate in both markets.

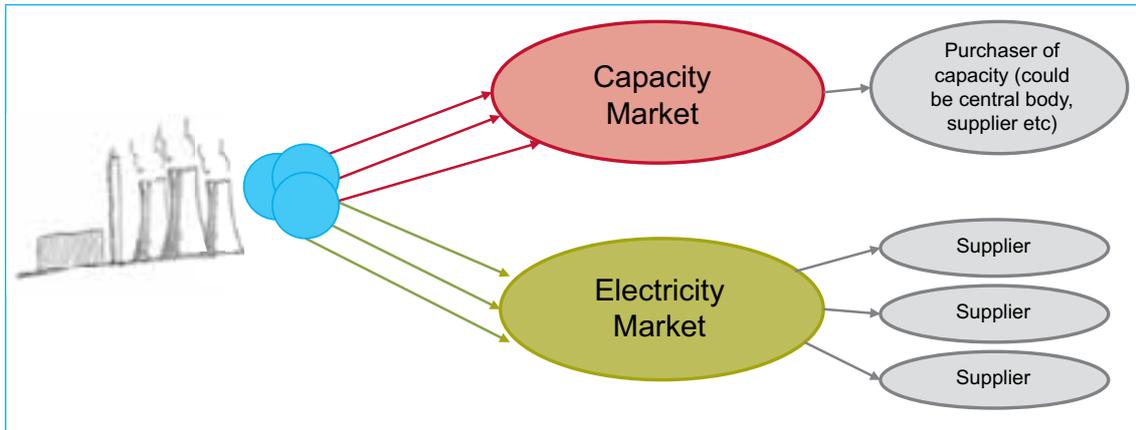
3.2.49 Figure 13 shows how a Capacity Market works. The required volume of reliable capacity would be determined by a central body based on forecasts of the peak demand some years ahead. That total amount of demand for capacity would be purchased from any provider willing to supply it, subject to its ability to be available when required. Providers of capacity could include existing generators, companies that are planning to build a new power plant, and companies offering other forms of capacity such as distributed generation, DSR, storage and other suitable approaches.

3.2.50 In effect, providers of capacity in a Capacity Market substitute uncertain returns in the electricity market for long-term certainty from the Capacity Market. Consumers benefit from certainty of supply and increased price stability.

Forms of Capacity Market

3.2.51 The term 'Capacity Market' is quite broad and covers a range of models. Any Capacity Market must address at least two questions: the nature of the product e.g. how much capacity can be offered to the market by a given power plant; and what penalties to impose if the promised capacity is not available when required during the contract period.

Figure 13: Operation of a Capacity Market.



Note:

Providers of reliable capacity participate in the Capacity Market and/or the electricity market. In the Capacity Market, they are incentivised to be available (or penalised for not being available).

3.2.52 There are a number of different forms of Capacity Market. Some Capacity Markets incentivise and regulate capacity through administrative means. For example, the PJM system in North America operates a forward capacity market known as the ‘Reliability Pricing Model’ (RPM)⁶². In this market, the capacity that a provider is able to offer into the market is calculated centrally based on a number of technical parameters such as outage rates. These are estimated based, for example, on historic data or through comparison with similar types of generation. A series of ‘resource performance assessments’ are carried out to assess whether the resource honoured its commitments during the contract period. If the resource is assessed as having failed to deliver the required level of capacity, then an administratively determined penalty is imposed and the revenue from charges given to resources that exceeded their commitment levels⁶³.

3.2.53 An alternative form of Capacity Market – a **Reliability Market** – uses a financial instrument to incentivise available capacity. In a Reliability Market, what is purchased from providers is a ‘reliability contract’ – essentially a call option. The reliability contract provides a hedge for the holder of the contract, enabling the holder to purchase electricity at no more than the strike price (or, if electricity is simply not available, to be compensated)⁶⁴. In return for this hedge, the provider receives a payment (the option premium) which provides a more reliable source of income on which to base an investment decision.

62 PJM is the electricity transmission system serving all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia.

63 For further detail on the ‘Reliability Pricing Model’ see, for example, PJM Manual 18, PJM Capacity Market, Revision 12, 2011, <http://www.pjm.com/markets-and-operations/-/media/documents/manuals/m18.ashx>.

64 The ‘strike price’ is a price agreed by the parties to the reliability contract and represents the effective maximum price that the electricity buyer will have to pay for the volume agreed in the contract. When the market price is higher than the strike price, the seller of the reliability contract pays the buyer the difference in price for the total volume of electricity agreed.

- 3.2.54 In a Reliability Market, the provider offers the amount of capacity that they believe they can reliably make available when required, while the ‘penalty’ for non-availability is simply the payment that is made when the option is called.
- 3.2.55 Detailed proposals around the design and areas for consultation, for the Strategic Reserve and market-wide Capacity Mechanism, can be found in Annex C. In the case of a market-wide mechanism, we have investigated a Reliability Market in more detail given its innovative nature, but other models of Capacity Market remain under equal consideration.

Comparative analysis

- 3.2.56 Annex C provides a summary of the key trade-offs and relative assessment of the Strategic Reserve and Capacity Market for comparative purposes against eight criteria⁶⁵. The chosen Capacity Mechanism will need to be developed to best meet all of these criteria.
- 3.2.57 The key trade-offs are:
- a **Strategic Reserve** has a well understood design, has been implemented in several markets, and could straightforwardly be implemented here. However, this model may be less effective in providing the desired level of security. It may be less effective in encouraging the wider use of non-generation approaches such as demand side participation compared to a market-wide solution; and it is potentially less effective in reining in the exercising of market power⁶⁶ in the electricity market.
 - a **Capacity Market** is likely to achieve the required security of supply, is potentially more compatible with a longer term move to a more responsive demand side, could mitigate exploitation of market power in the electricity market, and is efficient if well designed. It also has potential to more strongly encourage non-generation responses to system adequacy issues such as DSR. However, some designs of Capacity Market would constitute a more innovative approach in our market, so would present design challenges and need further development and stakeholder input before we can be confident they will work. A Capacity Market would also need to be carefully designed to manage interactions with the FiT CfD, since both provide support for capacity but the two offer different incentives for reliability.

65 Criteria considered are: achieves sufficient security of supply; cost-effective, practical and feasible; durable to changes in the GB market, including to the demand side; robust against the use of market power; supports supply side efficiency; compatible with our market; consistent with decarbonisation and renewables targets; compatible with other Electricity Market Reform measures.

66 For example, by withholding generation in times of scarcity to drive prices up.

The role of non-generation technologies and approaches

3.2.58 The Government is keen for non-generation technologies and approaches, as well as traditional electricity generation, to form a central element of delivering security of supply and play a fair and equivalent role in a Capacity Mechanism. Technologies and approaches such as DSR, storage and interconnection have potential to contribute to security of supply, while reducing the need for large scale infrastructure and making better use of generation assets. The importance of such approaches, particularly DSR, was emphasised by a significant proportion of respondents to the consultation.

Box 7: Definition of technologies and approaches

Demand side response

Demand side response (DSR) is an active, short-term reduction in consumption whereby an energy user or aggregator guarantees to reduce demand at a particular time. It can be used to help balance supply and demand in a context of significant intermittent and inflexible generation. It enables this by shifting demand from periods where demand is greater than supply to periods where supply is more plentiful – for example, by self-supplying using local back-up generation, or by not using the electricity at that time. In the current GB market DSR is principally used to reduce demand in periods of system stress (e.g. sudden loss of generation or transmission failures). DSR actively participates in the Short-Term Operating Reserve (STOR), contributing 445 MW in 2010.

Response to wholesale price is currently limited to large industrial consumers that have half hourly meters and are charged the wholesale electricity price. The introduction of Smart Meters could increase the opportunities for DSR, for example through greater use of time or price-sensitive tariffs. To automatically respond to variable tariffs or wholesale prices, consumers would need equipment (to complement Smart Meters) that will reduce demand automatically by turning off non-essential electrical devices. This, in conjunction with the likely electrification of heat and transport which could significantly increase the amount of discretionary demand, could lead to greater participation of the demand side in the wholesale market.

Box 7: Definition of technologies and approaches (continued)

Storage

Like DSR, electricity storage currently plays a limited but important role. It involves storing electrical energy in another form (such as heat) when supply outstrips demand, and reproducing this as electricity when the system requires it. Currently, installed storage capacity in GB is just under 3 GW and is largely made up of pumped storage. Other storage technologies are currently less mature, but storage has significant potential to grow (particularly with the electrification of heat and transport) as it can capture energy generated by inflexible low-carbon generation and reproduce this in times of scarcity. It also offers significant technical flexibility which can assist in the fine tuning of the network which is carried out by the System Operator (SO), National Grid.

Interconnection

Interconnectors are physical links between GB and other electricity grids, which allow electricity to be imported or exported in response to price signals. GB currently has 3.5 GW of interconnection, which is around five per cent of peak GB demand. Different countries have different peak demand times, so trade across interconnectors can support security of supply without extra investment in power plants. Interconnection can play a role in enabling cost-effective integration of low-carbon energy by allowing for export/import at times of high/low renewable output.

The benefits

- 3.2.59 The Government believes that technologies and approaches such as DSR, storage and interconnection can contribute to cost-effectively delivering security of supply in a number of ways, such as:
- **trimming the peaks and filling the troughs** – DSR and storage can be used to shift demand from times when there is little or no spare capacity to times of excess capacity, thereby reducing the total capacity required and increasing the proportion of energy produced by low-carbon generation. Similarly, interconnection can be used to shift the excess capacity in one country to meet the demand in another. As periods of peak demand may occur at different times in different countries, interconnection can increase the reliability provided by a given level of total capacity;
 - **reducing market power** – a more dynamic demand side and use of storage can reduce the market power of players on the generation side in times of scarcity. Interconnection increases competition and allows market access for a greater number of participants; and
 - **reducing the need for spinning reserve** – if non-generation approaches are available to respond at short notice (e.g. 30 minutes) they can replace fossil fuelled plants that the SO has ‘warm’ on

standby (i.e. BM Start Up⁶⁷), thus reducing the generation capacity needed. Similarly greater interconnection can allow for sharing of system services, reducing requirements over a connected area.

Implications for Capacity Mechanism

3.2.60 The different types of Capacity Mechanism proposed have different implications for non-generation approaches. We are seeking views on how different Capacity Mechanism designs might encourage the use of such approaches as part of our approach to delivering security of supply in Annex C. Implications could include:

- **a Strategic Reserve:** DSR and storage which can guarantee reduced energy use in a way that meets resource adequacy needs could bid to act as part or all of the reserve. The role of interconnection is discussed in Annex C.
- **a Capacity Market:** DSR and storage could potentially participate in a Capacity Market alongside other providers of reliable capacity, for example by ‘selling’ reliability contracts in a Reliability Market. The role of interconnection is discussed in Annex C.

Affordability

3.2.61 The modelled differences in cost between the two Capacity Mechanism proposals is relatively low in absolute terms compared to other Electricity Market Reform proposals. This is not surprising, as the two options are at least theoretically capable of producing exactly the same outcome if designed efficiently. Any differences are likely to be due to the way that either mechanism is designed.

3.2.62 Despite there being relatively little difference in the net cost of either mechanism, a Capacity Market would be likely to lead to a larger flow of funds as potentially large capacity payments lead to lower wholesale electricity costs.

3.2.63 Further detail on the costs and benefits of the two options is set out in Annex C and in the accompanying Impact Assessment published alongside this White Paper.

Interaction with other Electricity Market Reform measures

3.2.64 The FiT CfD, set out in Chapter 2, potentially interacts with the Capacity Mechanism, given that both policy instruments affect the amount of capacity brought forward.

3.2.65 The Strategic Reserve operates outside the electricity market and it is assumed that most recipients of FiT CfD will not be directly affected, however some generating capacity, for example fossil fuel plants with Carbon Capture and Storage (CCS), may be able to operate flexibly enough to offer extra capacity into the market at times of peak demand.

⁶⁷ BM Start Up is a reserve service contracted on the day by the System Operator to ensure plants with a start-up time of several hours are available in the Balancing Mechanism at peak.

3.2.66 A Capacity Market could create other interactions with low-carbon support. We will continue exploring these interactions as proposals are developed. Further details are set out in Annex C.

Devolved Administrations

3.2.67 Further development of the scheme will include discussions with the Welsh Government and Scottish Government to determine how the Capacity Mechanism should apply in their jurisdictions. This will be partly determined by similar decisions in relation to the FiT CfD and by the design of the Capacity Mechanism. The UK Government and the Northern Ireland Executive have agreed that because the Single Electricity Market for the island of Ireland already uses a Capacity Mechanism, the proposed Capacity Mechanism would apply across GB only.

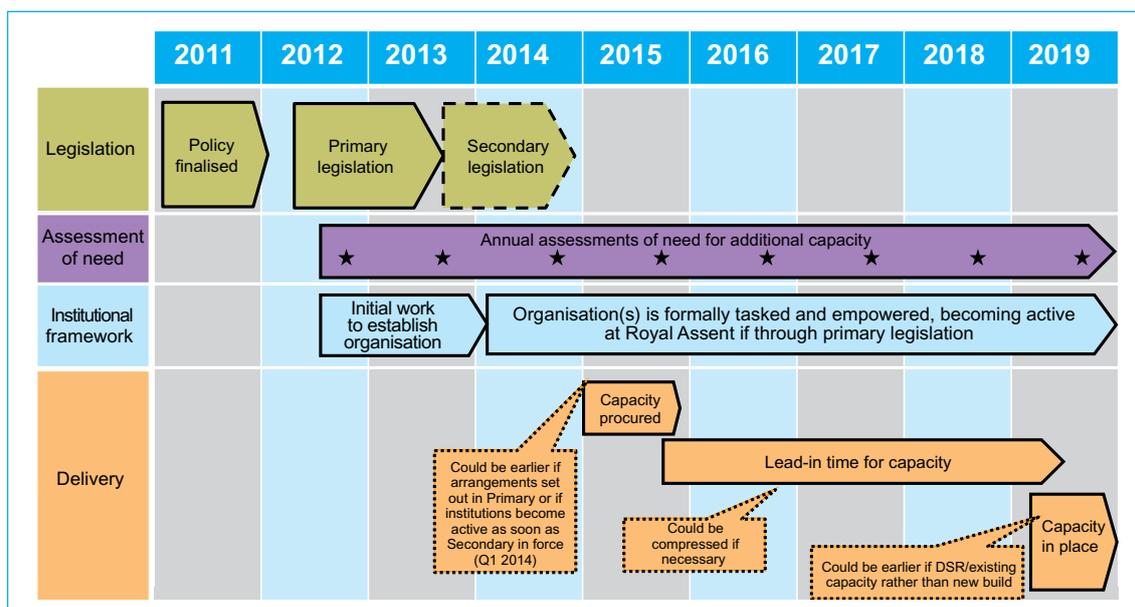
Next steps

3.2.68 The Government will set out its decision on the chosen Capacity Mechanism model around the turn of the year with a view to legislating in the second session.

Timing

3.2.69 We believe that, under existing market arrangements, there is likely to be a shortfall in available capacity from around the end of this decade. The timing for the setting up and entry into operation of a Capacity Mechanism would need to be such as to provide certainty that any shortfall arising on such a timescale would be dealt with. Figure 14 sets out our initial view of when a Capacity Mechanism could be introduced and possible milestones.

Figure 14: An indicative timetable for the implementation of a Capacity Mechanism



Chapter 4 – A new institutional framework

Summary

- The Government recognises that putting in place a transparent, enduring, robust and credible institutional framework to deliver the Electricity Market Reform package is critical to ensuring investor confidence.
- Key considerations raised in the consultation responses include: accountability and governance; independence; the need for the contract counterparty to be credit worthy; securing the right skills and resources; and value for money for the consumer. The consultation responses have informed the criteria the Government will use to design the institutional framework.
- Several options for the delivery organisation are being considered including a new public body, an existing public body or an existing private body. The delivery organisation would be likely to work at ‘arms length’ from the Government to administer the contracts.
- The new institutional framework will enable the following key functions to be performed in delivering the Feed-in Tariff with Contract for Difference (FiT CfD) and Capacity Mechanism:
 - setting the overall policy approach and objectives;
 - translating policy objectives into technical requirements;
 - delivery of the contracts;
 - data reconciliation and managing payments; and
 - monitoring compliance and enforcement.
- A decision on which organisation will be responsible for delivery of the contracts will be published around the turn of the year once the Capacity Mechanism design has been decided. We will continue to engage with stakeholders as appropriate as we take this work forward.

Introduction

- 4.1 Under the current market arrangements, the Government makes policy and a range of delivery bodies (e.g. Ofgem E-Serve) deliver this policy. National Grid⁶⁸ operates the GB transmission network, private generators produce the electricity which is sold to consumers by suppliers, and Ofgem performs an important role as the economic regulator. Competition between both generators and suppliers helps encourage innovation and minimise costs.

⁶⁸ National Grid is the GB System Operator and transmission owner for England and Wales. In Scotland the transmission system is owned by SP Transmission Limited and Scottish Hydro Electric Transmission Limited.

- 4.2 Electricity Market Reform builds on this existing competitive market structure. The major new policies being introduced as part of the package will require specific delivery arrangements. This section considers the delivery requirements for the FiT CfD and Capacity Mechanism policies. The Emissions Performance Standard (EPS) is considered separately in Chapter 2.

Consultation responses

- 4.3 Regarding the delivery of a Feed-in Tariff, respondents flagged the need for a credible and durable counterparty to the contracts. Views differed on who should deliver this function and whether it should be a new or existing organisation. Respondents also stressed that the organisation with liabilities under the FiT CfD should be highly credit worthy to ensure that payments can be met over the long term.
- 4.4 Several responses highlighted the need for the delivery organisation to have the appropriate expertise and skills to deal with these long-term mechanisms and the technologies involved. Other points made were: the need for significant resource given the magnitude and commercial complexity involved; the importance of a complaints resolution process and enforcement; a requirement for suitable performance incentives and service agreements; equitable treatment of demand side resources; and the need for the fundamental workings of the market to continue.
- 4.5 Most respondents suggested that a central organisation should deliver the proposed targeted Capacity Mechanism. Many suggested that the System Operator's (SO) role could be extended to cover this and there were a few comments that this should be independent of other commercial activities and political influence. Some respondents suggested that a central agency should be established to manage the capacity contracts as this would allow for greater transparency.

Vision for the institutional design of the electricity market

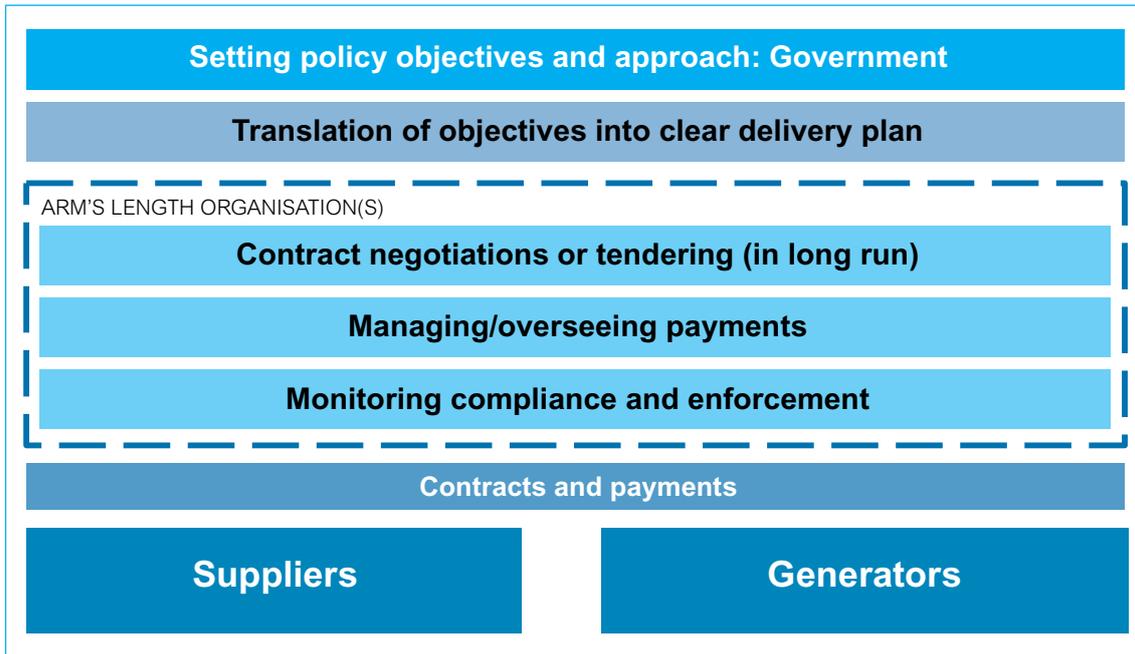
- 4.6 The aim of the Electricity Market Reform package is to ensure a secure, diverse and low-carbon technology mix at least cost to the consumer. Key to this is ensuring that the right arrangements are in place to deliver the policies on the ground. It is crucial that investors have confidence that decisions are taken fairly and that there exists a stable, predictable environment within which to make the necessary investment decisions.
- 4.7 The options could include a delivery organisation performing the contract counterparty role or overseeing contracting between suppliers and generators, with the government continuing to make decisions on policy issues, providing a legislative framework and setting the delivery organisation's objectives. The range of options for the delivery of the Capacity Mechanism depend on the policy approach taken following further consultation (see Chapter 3 and Annex C).

- 4.8 Based on the consultation responses, the Government believes it is important that the institutional framework established for delivering the FiT CfD and Capacity Mechanism satisfies the following requirements:
- **accountability:** ensuring that policy is designed and delivered with the appropriate accountability and thorough and transparent processes that allow public scrutiny;
 - **independence:** operating at ‘arm’s length’ from the Government, as appropriate, and within the required governance arrangements, to create the reliable market framework investors need in order to have the confidence to make important investment decisions. Putting arrangements in place which do not give rise to potential conflicts of interest, which may damage investor confidence, is equally important;
 - **credit worthiness:** providing reassurance to investors that payment commitments will be met. Key to this is establishing appropriate mechanisms that give investors this confidence. This may involve:
 - legislation to ensure that payments can be met through the collection of the necessary funds e.g. a consumer levy;
 - some other means to recover costs and meet the liabilities under FiT CfD contracts;
 - a mechanism to insure against counterparty insolvency which could be, if this was a central organisation, similar to the special administration regime for network companies, or in the case of suppliers, similar to the mutualisation fund for the Renewables Obligation (RO); and
 - a mechanism to insure against generator default risk e.g. the posting of credit for the Balancing Mechanism.
 - **technical expertise:** knowledge of how the energy market works, to enable effective forecasting of future demand and supply and the costs and benefits of different low-carbon generation and reliability levels will be key, as will understanding the Government’s objectives, the role of different technologies in achieving these objectives, the short and long-term investment opportunities and the interactions between different policy interventions and the impact on the electricity market;
 - **commercial and financial skills:** specialist financial and commercial expertise in order to establish effective contracting and tariff-setting arrangements as appropriate for these policies; and
 - **value for money:** ensuring that the Government’s policy objectives can be delivered in the most cost-effective manner for consumers.

Delivery model

- 4.9 In order to deliver the policies successfully, there are a number of core functions that will need to be carried out by the government and a delivery organisation or organisations. The precise split of functions may differ for different policies and will depend on the approach taken on the Capacity Mechanism following consultation.
- 4.10 In summary, the core functions are:
- **setting the overall policy approach and objectives:** defining the overall approach and strategic outcomes for the policy, to ensure that the government's objectives, such as security of supply, decarbonising the electricity sector and cost-effectiveness, are secured. This role will remain with the government;
 - **translating the policy objectives into technical requirements:** setting out how the policy should be delivered, for example, by establishing detailed technical requirements in a transparent delivery plan that is understandable to all market participants. This role will likely remain with the government although this could potentially be given to an arm's length organisation or organisations;
 - **delivering the contracts:** negotiating where appropriate and delivering contracts with market participants. This could involve negotiating contracts directly with generators or it could mean overseeing contracts between third parties such as suppliers and generators. This role will likely be given to an arm's length organisation or organisations;
 - **data reconciliation and managing payments:** collecting large amounts of data, managing complex calculations and potentially large payments in a timely and efficient manner; and
 - **monitoring compliance and enforcement:** ensuring compliance with the required technical standards and the monitoring and governance obligations.
- 4.11 Figure 15 provides an illustrative model for the institutional arrangements for the FiT CfD.

Figure 15: An indicative delivery model for Feed-in Tariff with Contracts for Difference



- 4.12 An integral part of this illustrative delivery model will be the planning and review process that enables the policy objectives and approach set by the government to be translated into policy delivery so as to assure investors that both the delivery organisation and the government are committed to delivering these objectives.
- 4.13 A regular and pre-determined planning cycle could take place on, for example, a five-yearly basis and should be timed to be consistent with other processes such as the setting of carbon budgets under the Climate Change Act (in 2011, 2016, 2021 etc) and Spending Reviews. There could also be a framework document setting out the government’s policy objectives and other standard governance tools such as annual reports.
- 4.14 The Government and the delivery organisation(s), working jointly, will periodically evaluate, according to a planning cycle clearly laid out in advance, their future strategy in the light of possible changes in costs, technological developments and new challenges to the energy system. The first of these assessments will be in 2016 and will also consider whether the new contract structure for low carbon is delivering all the benefits, especially for consumers, and improvements over the existing Renewables Obligation, that we expect, and on this basis consider any amendments to the future approach that may be required. As now, any changes would be made in the light of our continued commitment to grandfathering and no retrospective change.

Options for delivery organisation(s)

- 4.15 The institutional framework may require one or more delivery organisation depending e.g. on the chosen Capacity Mechanism. There may be synergies between delivering the FiT CfD and elements of delivery of a Capacity Mechanism. Potential synergies include: similarities in information technology systems; contract management; generator and supplier relationships and the need to manage interactions between the two mechanisms. In this case a single organisation for both mechanisms may be appropriate. However, there are also several elements of the policies which are different and could justify different organisations.
- 4.16 Specific delivery functions (such as data reconciliation, payment management and enforcement) could be performed by a separate entity or the same delivery organisation.
- 4.17 The delivery organisation(s) could be:
- a new Executive Agency or Non-Departmental Public Body (NDPB);
 - an existing public body;
 - a new public corporation; and/or
 - a private sector body.

Wider considerations

- 4.18 An important wider consideration is the Government's recent Delivery Review which considered the delivery undertaken by a number of DECC's arm's length bodies. This Review underlined the importance of ensuring that DECC is able to respond effectively to any future delivery challenges. The Review's conclusions are summarised in Box 8.

Box 8: DECC Delivery Review

The conclusions of the DECC Delivery Review⁶⁹ were published on 19 May 2011. The Review considered the delivery undertaken for DECC by a number of arm's length bodies including the Energy Saving Trust, the Carbon Trust, Ofgem E-Serve, the Environment Agency, the Coal Authority and the Energy Development Unit (within DECC).

The Review outlined a number of measures to help ensure DECC is able to respond to the future delivery challenge. This will mean:

- improved governance for the delivery of existing DECC programmes, to ensure maximum value for money and improved oversight by DECC Ministers;
- focussing delivery of our energy efficiency objectives through the Green Deal, competitively tendering where possible the services that will underpin it;
- for new programmes, unless there is a clear case for placing delivery with a third party, delivery will be led by DECC to ensure accountability to Ministers, but with aspects of delivery contracted out, where possible and appropriate, to provide maximum value for money; and
- DECC will set up a new Office which will provide a wider energy efficiency strategy and strong programme management, and develop a joined-up view of the customer offer.

- 4.19 It is also important to consider the wider landscape of bodies already acting on behalf of the government in the energy sector. As set out above, Ofgem plays a critical role as the energy market regulator. The Government has recently reviewed the role of Ofgem and published the full findings alongside this White Paper, summarised in Box 9.

⁶⁹ DECC Delivery Review, May 2011: <http://www.decc.gov.uk/en/content/cms/about/partners/review/review.aspx>

Box 9: Conclusions of the Ofgem Review

The Government published the high-level conclusions of the Ofgem Review on 19 May 2011. A full report is published alongside this White Paper⁷⁰. The report emphasises the Government's continuing commitment to a framework of independent economic regulation for the energy sector and to Ofgem as the independent regulator.

The Ofgem Review concluded that Ofgem's statutory duties are appropriate and reflect the issues that the regulator should consider in making their decisions. However, the current framework of broadly-scoped duties and weak guidance is very unlikely to be able to support a predictable regulatory environment that is coherent with Government strategy, as the energy sector goes through a period of substantial change over the coming decades.

A new statutory 'Strategy and Policy Statement' will be established. This document will:

- set out the Government's policy goals for the gas and electricity markets;
- describe the roles and responsibilities of Government, Ofgem, and other relevant bodies; and
- define policy outcomes that Government considers Ofgem to have a particularly important role in delivering.

Ofgem will continue to operate independently in deciding how to regulate the energy markets, but will be required to demonstrate how its decisions support delivery of the policy outcomes defined by Government.

- 4.20 Other important considerations in determining the institutional framework for Electricity Market Reform include ensuring value for money, minimising the administration time and the costs of setting up any new organisation or amending an existing one, and compatibility with Government policy on the establishment and governance of arm's length bodies.

Next Steps

- 4.21 The Government will continue to develop the institutional design in line with the key criteria and considerations set out in this chapter and through engaging with stakeholders as appropriate. The full details on which organisation(s) will be responsible for administering contracts, the precise remit it will be given by the government, the appropriate governance and accountability arrangements and more details on the contracting and planning cycle will be published around the turn of the year.

⁷⁰ DECC Ofgem Review, May 2011: http://www.decc.gov.uk/en/content/cms/meeting_energy/markets/regulation/regulation.aspx

Chapter 5 – Paving the way for new entrants

Summary

- There are a number of barriers to entry and growth in the UK's electricity generation markets.
- Significant improvements in wholesale market liquidity are essential, not only to ensure a competitive market and promote long-term security of supply, but also to enable Electricity Market Reform to deliver efficient and cost-effective reforms. The Government welcomes Ofgem's work in addressing liquidity issues through its Retail Market Review.
- Independent generators, including new entrants, need viable routes to market that meet their commercial needs and allow them to achieve the relevant reference prices to enable them to benefit from the Feed-in Tariff with Contract for Difference (FiT CfD) and some Capacity Mechanism options.
- The Government will work closely with Ofgem to ensure that, taken together, Electricity Market Reform and the liquidity reforms reduce barriers to entry and deliver the necessary improvements in wholesale market liquidity. The Government will act where necessary to introduce reforms where the structural barriers to market entry are not addressed through the actions taken by Ofgem.

Introduction

- 5.1 There are barriers to entry in the electricity generation and supply markets including the costs and complexity of participation, limited routes to market for some independent generators, including new entrants, and overall low levels of liquidity. We focus on the issues facing independent generators. The Government also recognises that independent suppliers face barriers to entry that need to be addressed.
- 5.2 This section sets out:
- the current market arrangements;
 - the impact of low liquidity and Ofgem's liquidity proposals;
 - the need for viable routes to market;
 - the importance of reference prices; and
 - the Government's view on liquidity and barriers to entry.

Context

5.3 The Electricity Market Reform package is designed to support a wide range of investors and attract new entrants to the generation market. The Government wants to see reduced barriers to entry and a market that provides:

- sufficient overall liquidity to ensure that all market participants can readily buy and sell energy and efficiently manage their risks;
- viable routes to market; and
- robust and reliable reference prices accessible to all generators.

Current market arrangements

5.4 All generators need to manage a range of risks in order to operate effectively in the wholesale market. These risks include:

- **offtake risks**⁷¹ – it is important that generators have a viable route to market;
- **balancing risks** – including the need to buy and sell power in the intra-day market and avoid exposure to the cash out price (discussed in Chapter 3);
- **credit** – collateral and financing risks related to wholesale market trading. Credit terms are a commercial matter for the parties, but it is important that the market participants are able to efficiently manage their exposure across all their trading activities;
- **price risks** – the FiT CfD proposals address the price risk for low-carbon generation (subject to achieving the reference price). For other generators, including gas generation, the hedging of fuel purchases, carbon price and power sales are likely to be an important part of managing price risks; and
- **basis risk** – which is the risk of deviation between the market price achieved by the generator and the reference price in, for example, FiT CfD contracts.

5.5 The current market climate is not as conducive as it could be to the participation of new entrants, small and independent generators. Independent market players have identified a range of concerns including large trade sizes, a limited range of products that do not meet their needs and a difficulty in meeting their hedging requirements⁷². Risk management can be more challenging for independent generators and suppliers than for the large vertically-integrated power companies which have, for example, a natural hedge between generation and supply activities. Market liquidity is a key issue, but there are related concerns that in part may be a consequence of poor liquidity, including potentially limited routes to market for some independent generators including new entrants.

⁷¹ Offtake refers to the sale of power from generation projects.

⁷² <http://www.ofgem.gov.uk/Markets/RetMkts/rmr/Documents1/summer%202011%20assessment.pdf>

Liquidity in electricity wholesale markets

- 5.6 Ofgem has identified particular concerns around the low levels of liquidity in the forward markets⁷³, while evidence suggests that the day-ahead markets⁷⁴ tend to offer reasonably liquid trading (and are improving)⁷⁵. A lack of liquidity in the electricity wholesale market makes it difficult for independent suppliers and generators to buy and sell energy at the volume and in the timescales they need to operate effectively in the energy market and undermines investment signals. Ofgem identified a number of possible reasons for low liquidity, including the role of vertically-integrated⁷⁶ generators who may have less need to trade and are able to hedge⁷⁷ between their supply and generation activities.
- 5.7 Liquid markets offer a range of important benefits, including:
- allowing parties to better manage long-term risk and providing long-term price signals about future market development, which inform investment decisions and promote long-term security of supply;
 - increasing confidence in traded prices (a large number of gas and electricity supply contracts between buyers and sellers are referenced to market prices), which also inform investment decisions; and
 - facilitating new entry in generation and supply by allowing new entrants to buy and sell electricity to match their output and customer base with confidence.

Stakeholder views on Electricity Market Reform

Overview of December 2010 consultation responses

- 5.8 Many stakeholders considered that improved liquidity would be essential to the success of Electricity Market Reform and highlighted the importance of aligning Ofgem's liquidity project and Electricity Market Reform. Some stakeholders argued that improved liquidity would provide a FiT CfD with reliable reference prices and could reduce the need for a Capacity Mechanism. There was a range of views on the measures needed to improve liquidity, including some form of trading obligation and centralisation of electricity trading arrangements.

73 'Forward' trading refers to buying and selling for delivery of electricity in the month ahead and after, and may include trades in months, seasons and years ahead of delivery.

74 'Day-ahead' trading refers to buying and selling for delivery of electricity on the day after trading takes place.

75 http://www.ofgem.gov.uk/Markets/RetMkts/rmr/Documents1/RMR_Appendices.pdf. The most recent assessment can be found at: <http://www.ofgem.gov.uk/Markets/RetMkts/rmr/Documents1/summer%202011%20assessment.pdf>.

76 Where one supply group owns two or more parts of the energy supply chain. For example, where the same supply group owns generation capacity and also supplies energy to the retail market.

77 'Hedging' refers to making some kind of investment, with the objective of reducing exposure to (short-term) price movements in an asset already held. Normally, a hedge consists of taking an offsetting position in a related asset. Hedges can be either financial or physical. For example, a generator might hedge the risk of electricity price movements:

- financially by selling electricity in the forward markets or entering into long-term contracts; or
- physically by integrating with an electricity supply business, such that any downward movement in prices resulting in a loss in revenues for the generation business is offset by an increase in revenues for the supply business.

- 5.9 Many independent players, including wind developers, and some financial players, argued that current levels of liquidity were low, and would need to be improved. Others felt that current levels of liquidity would not pose significant barriers to investment or to reliable reference prices.
- 5.10 Some stakeholders felt that, by retaining exposure to market prices and providing incentives to trade, both a FiT CfD and a Premium Feed-in Tariff (PFiT) could help prevent any deterioration in short-term liquidity, especially when compared to a Fixed Feed-in Tariff. There was also a recognition from many stakeholders that a FiT CfD could concentrate liquidity in markets linked to reference prices.

Ofgem's liquidity project

- 5.11 Ofgem announced a programme of work in June 2009⁷⁸ to improve liquidity in the wholesale electricity market. Ofgem's March 2011 Retail Markets Review (RMR)⁷⁹ showed that liquidity fell overall in the GB power market over the course of 2010 from an already low base.
- 5.12 Ofgem concluded that the market was failing to develop and that action was required. It put forward two proposals for intervention (the Mandatory Auction⁸⁰ and Mandatory Market Maker⁸¹) to provide the electricity market liquidity that market participants, in particular independent market players, require to compete against existing firms and to encourage competition between vertically-integrated players. Ofgem considered that its proposals would improve competition and contestability in the energy retail markets to the benefit of consumers. Ofgem's final decision regarding intervention will be reached following the publication of an Impact Assessment by the end of 2011.
- 5.13 In the context of Electricity Market Reform, the Government feels it is essential that there is sufficient liquidity in relevant products across the whole market to offer a robust reference price and the means for independent generators of all sizes to manage their balancing and offtake risks.

78 <http://www.ofgem.gov.uk/Pages/MoreInformation.aspx?docid=58&refer=Markets/WhlMkts/CompanEff>

79 http://www.ofgem.gov.uk/Pages/MoreInformation.aspx?file=RMR_FINAL.pdf&refer=Markets/RetMkts/rmr

80 A new licence condition that would require large vertically-integrated generators to make available between 10 per cent and 20 per cent of their power generation into the market.

81 A new licence condition that would require large vertically-integrated players to offer buy and sell prices for specified products and volumes on a continuous basis.

Routes to market

- 5.14 All generators need to be able to sell their electricity in a way that meets their commercial needs. At a high level there are two routes to market:
- sell power through a Power Purchase Agreement (PPA) with a supplier or aggregator who will manage key risks including offtake and balancing risks on behalf of the generator; or
 - sell power directly in the index market(s), e.g. through brokered Over the Counter (OTC) contracts or on power exchanges.
- 5.15 The FiT CfD, by providing long-term price certainty, will help to mitigate some of the risks that can prevent generators from trading directly in the market. Some independent renewable generators, however, have raised concerns that poor levels of liquidity could leave them with no choice but to enter into PPAs to secure finance for investment and that, in the absence of a supplier obligation, PPAs would only be available at a steep discount. Regardless of the depth of market liquidity, some smaller generators may still prefer to pass the risk of managing trading and balancing risks on to bigger companies through PPAs, not least because direct market participation can be complex and may require an in-house trading capacity.
- 5.16 A more liquid market could play an important role in allowing independent generators, including new entrants, to trade directly and may encourage aggregation services from market participants who act on behalf of generators to sell power and manage risks across a portfolio.
- 5.17 The Government's view is that those firms that are able to manage balancing risks associated with intermittent renewables will still find opportunities in offering PPAs. As with the current Renewables Obligation (RO), market economics and competition will determine the discount that generators are exposed to. There may be new opportunities for those other than suppliers to offer aggregation services and enter the PPA market. There may, however, be transitional issues arising from the shift from the RO to the FiT CfD system that may create offtake uncertainty and/or lead to less favourable PPA terms than might currently exist. The Government anticipates that these uncertainties will stabilise over time and any price discrepancies should be eroded through competition.
- 5.18 The Government will keep the evidence under review. While Ofgem's current liquidity reforms may support both direct trading and the role of aggregators to some extent, they may not in themselves address all the issues that might make it difficult for some independent generators and a wider range of new entrants to secure a viable route to market. The Government will, therefore, take action to improve routes to market, should that prove to be necessary.

- 5.19 For some small distributed generation there may be opportunities to supply directly to consumers, but they may be deterred by the costs and complexity of acting as an energy supplier. Ofgem published its final proposals for a 'Licence Lite' regime in February 2009⁸². This will allow small electricity generators to become licensed suppliers under a regime which is proportionate to their size and impact, while protecting consumers' rights to switch energy supplier. The Government is closely monitoring progress made by the industry in using these proposals to gain better access to the market.
- 5.20 Cooperative fund structures and not-for-profit business models, including with the involvement of the third sector, have proven to be successful options for supporting development of distributed generation projects that can increase diversity of supply at the same time as meeting the needs of local people, including supporting local fuel poverty objectives. Joint action on such projects can spread risk across a number of players and help to leverage investment. The Government is interested in the opportunities provided by community finance initiatives and is equally keen to ensure there is appropriate support for new investors.

Reference Prices

- 5.21 Improved liquidity is essential to ensure credible reference prices, which are a key element in investment decisions and in the operation of the FiT CfD (see Chapter 2) and some types of Capacity Mechanism (see Chapter 3 and Annex C). The costs of providing support through the FiT CfD are likely to be lower where the reference prices against which the level of support is assessed properly reflect the fair market price.
- 5.22 Reference prices can be drawn from a number of market indices reflecting bilateral trading including OTC deals arranged through a broker and activity on power exchange platforms. Relatively small volumes are traded on these power exchanges. These relatively low volumes of traded energy and the small number of participants may make it harder for generators to secure the reference price and may lead to potential for manipulation of the indices⁸³.
- 5.23 Current day ahead market indices are likely to provide a sufficiently robust reference price. The current volumes traded on the day ahead market are enough to absorb initially relatively small quantities of FiT CfD supported power from 2014. Moreover, the participation of FiT CfD backed generation in the market is likely to further strengthen liquidity in the day ahead market. However, it is extremely important that liquidity in this market does not deteriorate and that volumes in the market are not displaced.

82 http://www.ofgem.gov.uk/sustainability/environment/Policy/SmallrGens/DistEng/Documents1/DE_Final_Proposals.pdf

83 Ofgem estimate four per cent in the day ahead and nine per cent in the forward market. <http://www.ofgem.gov.uk/Markets/WhlMkts/CompanEff/Documents1/GB%20wholesale%20electricity%20market%20liquidity%20-%20summer%202010%20assessment.pdf>

- 5.24 Some stakeholders raised concerns about the fragmentation of day ahead market liquidity between a number of trading platforms. This may pose a basis risk if platforms used by FiT CfD supported generation are out of line with the indices that make up the reference price. The Government's view is that the market indices, including reporting of brokered trades and activity on power exchanges, are currently closely aligned. The Government will keep this evidence under review.
- 5.25 Forward market reference prices are not reliable, due to low levels of liquidity. We anticipate that Ofgem's work will strengthen liquidity in the forward market and help to provide credible reference prices. Should Ofgem decide to bring forward a Mandatory Auction as is currently proposed, it is possible that such an auction could provide a transparent and robust reference price for the baseload FiT CfD.
- 5.26 There are also possible interactions between Ofgem's proposed interventions to improve liquidity and a Capacity Mechanism. For a Capacity Market, in the form of a Reliability Market, to function properly, it would need a reference price for wholesale electricity to determine the payback required from generators. In particular the market that provides this reference price could see increased liquidity, but this may mean trading has been displaced from other markets.

The Government's view

- 5.27 The Electricity Market Reform package seeks to address the Government's objectives in relation to low-carbon generation, security of supply and affordability. We can minimise costs by removing barriers to entry and increasing competition in the market, in particular by improving market liquidity and providing more reliable reference prices and ensuring that all independent generators, including new entrants, have a viable route to market.
- 5.28 A more liquid market also supports security of supply through better price formation and stronger investment signals. A more liquid spot market also reduces offtake risk and means that closing out positions in a long-term contract could be easier⁸⁴.
- 5.29 The Government sees Ofgem's work on improving liquidity as complementary to the Electricity Market Reform package and welcomes the clear direction of travel set by Ofgem in its recent proposals. The Government will act where necessary to introduce reforms where the structural barriers to market entry are not addressed through the actions taken by Ofgem.

⁸⁴ Why we need to fix our broken electricity market, special report, Poyry, 2008.

Next steps

- 5.30 Ofgem published an updated assessment and set out their next steps in June 2011⁸⁵. Ofgem is minded, based on its latest full assessment and preliminary review of consultation responses, to introduce a Mandatory Auction and Mandatory Market Maker obligation. Ofgem expect to publish an Impact Assessment and its decision towards the end of 2011.
- 5.31 The Government will continue to work closely with Ofgem to ensure that the Electricity Market Reform package and Ofgem's work on liquidity are effectively aligned. This includes consideration of whether in combination the measures lead to sufficiently robust reference prices and to all market participants having routes to market.
- 5.32 To the extent that there are continued barriers to entry that are not addressed through Ofgem's actions, the Government will work with all relevant stakeholders to identify appropriate solutions.

⁸⁵ <http://www.ofgem.gov.uk/Pages/MoreInformation.aspx?docid=59&refer=Markets/RetMkts/rmr>

Chapter 6 – Future networks and system flexibility

Summary

- The changes driven by Electricity Market Reform will have a significant impact on future networks and the way supply and demand is balanced. The future electricity network will need to be able to support the new low-carbon generation promoted by the Electricity Market Reform package.
- Changes to the network and growth in demand side response (DSR), storage and interconnection will need to accompany the transformation of electricity generation that is at the core of the reforms.
- The Government recognises the need for strong leadership on networks and ensuring effective balancing of supply and demand going forward.
- We are setting out future work to address network issues that will be taken forward through the Smart Grids Forum. We will also be setting out our electricity systems policy, focusing on challenges around balancing and system flexibility, in summer 2012.

Introduction

- 6.1 Electricity Market Reform introduces incentives to the market to drive investment in generation. The reforms will change the generation mix, leading to increased levels of inflexible and intermittent generation, much of which will need to be built in new locations. At the same time, changes to the energy system associated with decarbonisation will lead to increasing and new forms of demand. These changes will impact on the regulated parts of the electricity sector, presenting a challenge as well as an opportunity for networks and the way we balance supply and demand.
- 6.2 The Government and the energy regulator, Ofgem, have already made strong progress on the delivery of transmission networks in the context of decarbonisation. While this important work will continue, the development of the distribution network, and the use of smarter approaches and technologies, will be an increasing priority going forward. We also need to ensure the market can deliver the right amount of flexibility, enabling the best use of generation assets, through the use of DSR, storage and interconnection.
- 6.3 The Government has a responsibility to ensure this transition, in order to meet wider objectives around decarbonisation, security of supply and affordability. In future, this responsibility, and any related policy trade-offs, will be reflected in the Strategy and Policy Statement (see

Chapter 5) that will be introduced through the implementation of the Ofgem Review conclusions⁸⁶.

6.4 This section sets out:

- progress to date in addressing network challenges;
- the implications of the changes driven by the Electricity Market Reform package for networks and balancing; and
- the Government's future work programme to address future challenges in this area.

Context

Evolution of networks policy

6.5 The GB electricity network has developed to facilitate power flows, in the main, from large-scale centralised generation, to consumers across the country. The transmission network (the 'motorways' of the electricity system) has evolved to be relatively smart and actively managed, while the distribution network (the local network that delivers to consumers) has developed as a more passive system.

6.6 Networks have delivered secure energy from generation which is responsive to the daily fluctuations in demand, at relatively low cost to consumers. This has been achieved through Government setting a framework of independent regulation to deliver both the networks and system operation needed; and the protection of consumers' interests in these monopoly sectors.

Recent policy and progress on transmission networks

6.7 There has been significant activity within Government over the past two years to develop networks policy and manage the challenges to meet our 2020 renewable targets.

6.8 This work has focused on the transmission network, primarily to ensure that new generation in new locations is able to connect to the system promptly and efficiently, and that the system is able to deliver the necessary electricity to consumers. See Box 10 for further details.

⁸⁶ http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/markets/regulation/regulation.aspx

Box 10: Government projects on networks

- a) **Transmission Access Review**⁸⁷: in order to improve access to the network, the Government implemented the ‘Connect and Manage’ regime on an enduring basis in August 2010. This built on successful interim arrangements introduced by Ofgem. ‘Connect and Manage’ has to date reduced connection times for 69 large generation projects by an average of six years and has also benefitted 74 small-scale generation projects, helping to facilitate the achievement of our 2020 targets.
- b) **Offshore Transmission**⁸⁸: the Government has worked with the regulator to implement an innovative regime for offshore transmission. The Government and Ofgem are also undertaking the Offshore Transmission Coordination Project with industry to maximise opportunities for coordination of transmission infrastructure.
- c) **Electricity Networks Strategy Group (ENSG)**⁸⁹: the Government has worked with Ofgem and industry through this group to produce analysis on the transmission upgrades that might be necessary to meet the UK’s 2020 renewables target. We plan to refresh this analysis and extend the scope to 2030.

Progress by the regulator on the investment framework

- 6.9 Ofgem began to increase incentives on network companies to innovate with their Low Carbon Networks Fund⁹⁰, which finances projects to show how the distribution network could work in a low-carbon context. Ofgem has also developed a new regulatory regime for investment in the electricity and gas networks through its ‘Revenue = Incentives + Innovation + Outputs’ (RIIO) framework. RIIO⁹¹ sets a framework to encourage network companies to take a more strategic and longer term approach to network investment. It will also make funding available to ensure more investment is directed towards network innovation. Network companies will be encouraged to play a greater role in facilitating decarbonisation.
- 6.10 Ofgem has also initiated Project TransmiT⁹², which will consider whether the current transmission charging arrangements are suitable to deliver low-carbon generation while maintaining secure and affordable supply. Both of these projects are owned and led by the regulator. The Government will continue to work closely with Ofgem to ensure that its objectives are taken into account. The Government is also keen to see the positive activity being taken at the transmission level fed into future thinking in the context of distribution networks.

87 http://www.decc.gov.uk/en/content/cms/meeting_energy/network/deliv_access/deliv_access.aspx

88 http://www.decc.gov.uk/en/content/cms/meeting_energy/network/offshore_dev/offshore_dev.aspx

89 http://www.decc.gov.uk/en/content/cms/meeting_energy/network/ensg/ensg.aspx

90 The Low Carbon Networks Fund made up to £500 million available to distribution network operators over five years, from April 2010: <http://www.ofgem.gov.uk/networks/elecldist/lcnf/pages/lcnf.aspx>.

91 <http://www.ofgem.gov.uk/Pages/MoreInformation.aspx?docid=120&refer=Media/FactSheets>

92 <http://www.ofgem.gov.uk/Networks/Trans/PT/Pages/ProjectTransmiT.aspx>

Network development in the long term

- 6.11 The Government has also begun work to establish how the network may need to adapt to future challenges. DECC set out its initial view of future networks in 'Smarter Grids: the Opportunity'⁹³ in December 2009. Since then the Government has undertaken further work to develop our understanding of the transition that the whole system connecting generation to demand will need to undergo. This has included analysis of the future balancing challenge and the role of DSR, storage and interconnection.

Box 11: A vision for future networks and system flexibility

By 2030 electricity networks will be delivering to consumers in the context of a significantly decarbonised economy both on the generation and demand side.

Distribution network operators will be playing a more active role, directly contributing to managing challenges on the network, such as widespread charging of electric vehicles and use of heat pumps, in innovative ways, and making the best use of available distributed energy resources. Information and communications technology will provide greater visibility of the flows on their networks, allowing operators to make the most efficient use of available network capacity. At the same time networks will also be bigger to cope with increasing electrification and to connect up generation in new areas, both onshore and offshore.

Consumers will be engaged in how they consume electricity and will have access to a range of tariffs and offers, which will enable them to match their consumption to times when there is more generation available, and therefore cheaper, reducing their overall energy bills in the process. As a result, demand will be more responsive to changes in the electricity price, shifting from times when prices are high to those times when prices are lower.

Distributed energy, and distributed energy storage, will also interact with the network, helping to manage local network constraints and balance supply and demand, reducing the pressure on centralised generation. At the transmission level, we will be much more integrated with other markets, with diversity in generation and demand across Europe and potentially even beyond, helping us make the most efficient use of energy resources across countries.

93 http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/network/strategy/strategy.aspx

The challenge ahead

- 6.12 Looking ahead, the pressures on the network are increasing; in particular, the period up to 2030 is likely to see significant new challenges. The reforms set out in this White Paper will drive increased levels of intermittent renewable generation, and higher levels of inflexible generation, such as nuclear. These changes mean that there will need to be more flexibility in other parts of the electricity system. In the medium term this flexibility could come from fossil fuel based plant. In the longer term, as we go through the 2020s, we will derive the flexibility we need from other sources, such as DSR, interconnection and electricity storage.
- 6.13 Increased demand with different load patterns, due to the electrification of heat, transport and industrial processes, as well as an expected increase in population, will pose significant challenges to local networks and the balancing of the system. There could also be increased levels of localised and community-based energy, which would make managing the local network more complex than it is today. Ofgem's Low Carbon Networks Fund is beginning to trial how some of these technologies could interact with the network, but the challenges will grow looking forward.
- 6.14 Potential changes to the demand side are shown in Figures 16 and 17. Not only is overall demand likely to increase by 2030, but daily fluctuations in demand could be much larger. At the same time, new low-carbon technologies will present an opportunity for networks and balancing, as they will enable significantly more demand shifting.

Figure 16: Illustrative example of a seven-day demand profile in 2010

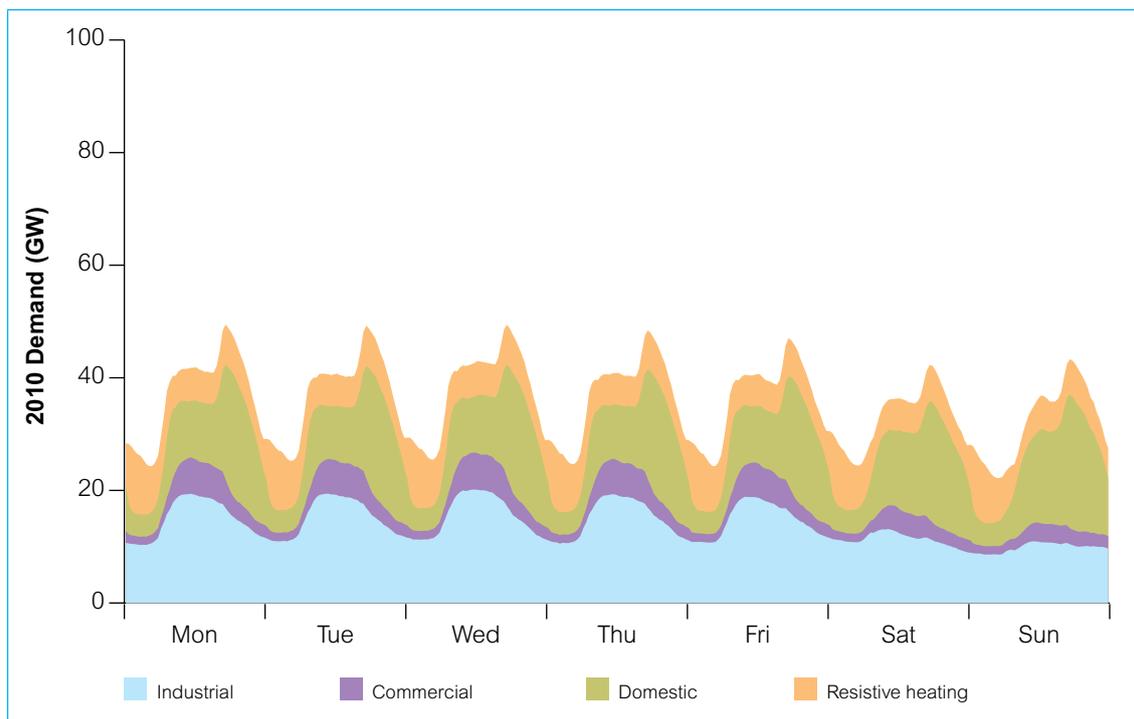
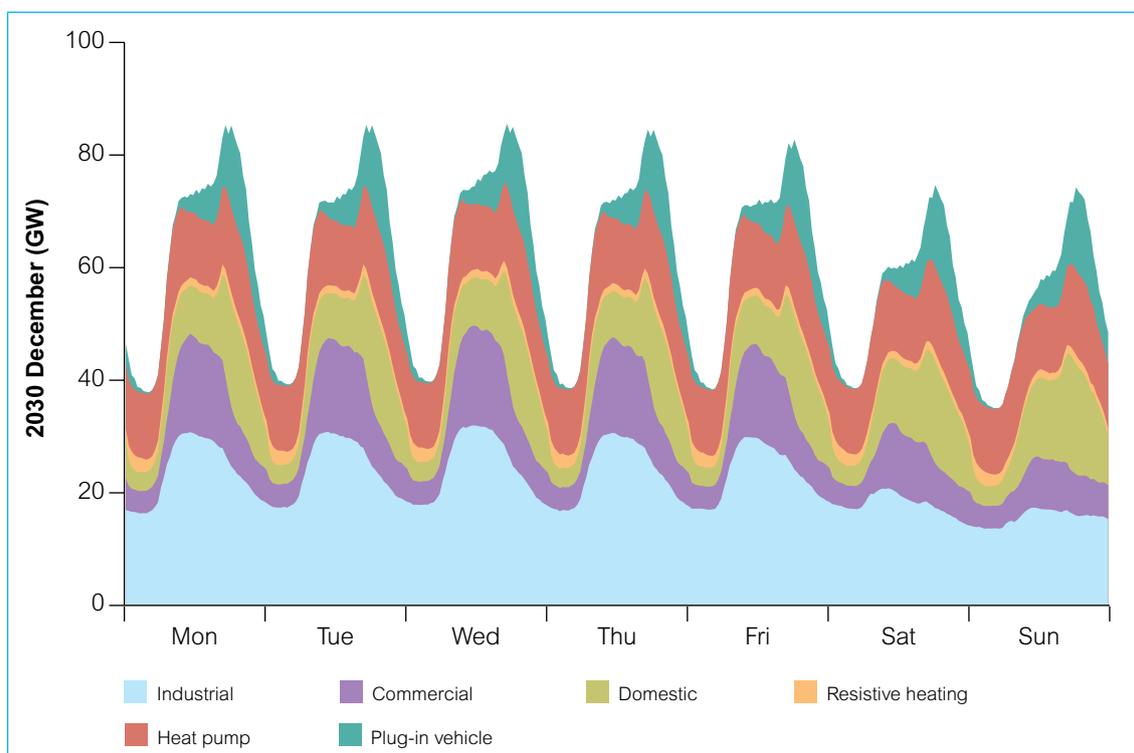


Figure 17: Illustrative example of a seven-day demand profile in 2030



Source: Based on DECC's 2050 pathways analysis 'spread effort' pathway which shares ambitious efforts on decarbonisation over all sectors including demand and generation⁹⁴.

Note: Figure 16 shows the shape of current national demand. Figure 17 shows an illustrative scenario of how this could look on an average week in November 2030, before any demand side response is taken into account.

94 <http://www.decc.gov.uk/en/content/cms/tackling/2050/2050.aspx>

- 6.15 Uncertainty over the rate of electrification of heat, transport and other sectors is a key challenge. Current thinking suggests that a gradual increase to 2020 will need to give way to a significant ramp-up in deployment in the period to 2030. However, significant uncertainty over the rate of electrification means it is difficult for distribution network investment to anticipate and prepare for changes elsewhere in the system.
- 6.16 The Government believes that all these challenges may require a fundamental transformation in the way the network links generation and demand and in how the system operates to keep demand and supply in balance.

Future Work Programme

- 6.17 Core to meeting these challenges will be the development of a smarter distribution network. In addition, the Government will need to consider the overall framework through which supply and demand is balanced. We will need to understand what changes might be required to the system framework and the incentives within it to ensure secure system balancing. This will include the role we expect different sources of flexibility to play in the future, in particular DSR, storage and interconnection. We will set out our electricity systems policy next year.
- 6.18 The Government has begun work through the Smart Grids Forum, a cross-industry group that it leads with Ofgem, to consider how future network challenges can be addressed. This will complement the ongoing Low Carbon Networks Fund trials. In the future, the Strategy and Policy Statement, as detailed in the conclusions of the Ofgem Review⁹⁵, will provide an important mechanism for Government to set out any strategic policy trade-offs that it considers need to be made to develop the future network and deliver the flexibility we need.

Smarter distribution network development

- 6.19 A bigger, smarter distribution network will need to be developed. The Government can help by providing some clarity about what might be expected from networks in the future.
- 6.20 There is uncertainty over the speed, scale and nature of developments in networks that will be required, particularly in response to greater electrification of heat and transport and increasing distributed generation. Without guidance from the Government, there is a risk that uncertainty over the rate of change could lead to insufficient or inappropriate investment, resulting in the network being unable to deal with future challenges. Therefore, the Government will lead work through the Smart Grids Forum, along with Ofgem, to develop a set of shared scenarios and assumptions to act as a guideline for network companies and the regulator in making decisions about future network investment. This will focus on trajectories for the take-up of electrified transport and heating as well as distributed generation, and is planned for publication in early 2012.

95 http://www.decc.gov.uk/en/content/cms/meeting_energy/markets/regulation/regulation.aspx

- 6.21 In addition Ofgem will be leading work, with the Government's help, to develop a framework for understanding and evaluating the value drivers for smart grid solutions. This will also aim to identify the factors that influence these drivers and how these change over time. The framework should facilitate discussion between Ofgem and network companies in the business planning process. A final report is planned in spring 2012.

Box 12: Distributed Energy

Alongside the Electricity Market Reform, there is a parallel challenge to unlock the potential of distributed energy.

Distributed generation is electricity generation that is directly connected to a local distribution network, rather than to the high-voltage electricity transmission system. Because distributed generation often involves the simultaneous generation of useable heat, it is often referred to as distributed energy.

At the domestic scale, distributed energy commonly takes the form of individual building-scale installations such as micro wind and solar photovoltaics⁹⁶, which can generate electricity for local consumption. In some cases such technologies are also able to export any excess electricity to the distribution network, potentially creating revenue for the owner. Domestic-scale distributed energy technologies that generate heat include heat pumps and micro-Combined Heat and Power (CHP). These options currently require electricity and gas respectively to operate, but are more efficient than traditional electricity and gas heating, thus helping to reduce demand.

Domestic properties can also benefit from community or direct-scale distributed energy, where properties are connected to local electricity networks or district heating schemes. The viability of such district systems, particularly in the case of heat, is often dependent on the density of demand and the proximity of low-level demand to 'anchor loads' like hospitals or commercial/industrial users.

The economies of scale and efficiencies of the larger installations in commercial and industrial sectors means they can provide additional benefits over domestic installations. This is particularly true of combined heat and power schemes, which generate useable heat consumed locally, either through district heating schemes or for industrial use. This greater scale can also open up a range of additional options, such as waste to energy plants. While these options can have high upfront capital costs, particularly where heat distribution infrastructure is required, larger organisations are usually better placed to take a longer term view of their energy needs, allowing them to consider pay-back periods in excess of those that may be acceptable to individual consumers.

96 For further information see the DECC Microgeneration Strategy:
http://www.decc.gov.uk/en/content/cms/consultations/microgen_strat/microgen_strat.aspx.

Box 12: Distributed Energy (*continued*)

Used in the right ways and as part of an evidence-based approach to energy planning, distributed energy technologies have the potential to complement both each other and the wider centralised energy system. They can also be an important tool in engaging consumers in their energy use. In particular, we recognise that integrated, local-level distributed energy systems could be an important step towards a more coordinated approach that includes, for example, transport and waste.

Distributed energy and local generation could have a much greater role to play in the future energy system and the Government recognises the need to put in place the conditions to unlock its potential. In the context of this White Paper, distributed energy provides a number of potential benefits:

- distributed energy can harness a wide range of smaller-scale renewable and low-carbon energy sources, so contributing to the decarbonisation of electricity and security of supply;
- as it is local, it lends itself to community involvement and investment, and it can also reduce the need for transmission network reinforcement, since the electricity produced by distributed electricity generation is normally consumed locally; and
- distributed energy can act, especially when combined with community-scale heat storage, as an alternative to heat being generated from electricity, and therefore help manage demand on the electricity system. There is also potential for this heat storage to be charged by excess electricity generation resulting in further opportunities for demand side response (DSR).

To ensure proposals in this document and changes taking place across the sector deliver in practice on our ambition, we will convene a Government Industry Contact Group on Distributed Energy. The group will be chaired by Ministers, and will involve a small number of key industry representatives.

How does distributed energy fit within the context of the Electricity Market Reform?

The Government recognises the need to facilitate action at the distributed scale and, following feedback from the Electricity Market Reform consultation, our proposals have been developed with consideration of all scales of generation. These include the following:

- both types of Feed-in Tariff (FiT) and the Capacity Mechanism will encourage distributed generation in different ways (see Chapter 2 and 3); and
- Ofgem is taking action to improve market liquidity, which should help smaller players access the market. As described in Chapter 5, the Government will act where necessary to introduce reforms where the structural barriers to market entry are not addressed through the actions taken by Ofgem.

System flexibility

- 6.22 As well as ensuring appropriate network investment, there will be a need for increased flexibility. Increasing the flexibility of the electricity system will be important both to deal with increasing amounts of intermittent and inflexible generation and to manage constraints on the network. Changes to the way the network is operated, and growth in solutions such as DSR, storage and interconnection will be needed. These flexible solutions will be vital in ensuring we have an electricity system that maximises the use of our low-carbon generation and network assets.
- 6.23 The Capacity Mechanism will play an important role in ensuring resource adequacy and will be designed to enable flexible solutions, in particular DSR. Chapter 3 and Annex C explore how the Capacity Mechanism could encourage demand side solutions.
- 6.24 There are also technology-specific barriers which potentially require Government intervention. We will consider the issues and set out our conclusions as part of the development of our electricity systems policy next year. The following sections look at the issues and potential for action on DSR, storage and interconnection.

Demand side response

- 6.25 DSR helps balance supply and demand in the context of significant amounts of intermittent and inflexible generation, in particular by shifting demand from periods where supply is limited to periods where it is more plentiful. As outlined in the Electricity Market Reform consultation document⁹⁷, the Government acknowledges the potential for more responsive demand as one of the most cost-effective ways to manage future balancing challenges. Up to 2020, it appears that most potential for DSR comes from the commercial and industrial sectors. However, beyond 2020, increasing electrification of heat and transport means the domestic sector could also play more of a role.
- 6.26 Smart Meters will engage consumers in their electricity use by allowing them to better control their electricity consumption, ultimately leading to demand reductions. The mass roll-out of smart and advanced meters, which we expect to complete in 2019, is an important first step for DSR in the domestic and commercial sectors. As well as stimulating energy efficiency, smart meters will facilitate innovation in the supply of electricity, including the introduction of new Time of Use Tariffs, and potential for more dynamic shifting of demand. For example, this could involve charging a plug-in vehicle or switching on a washing machine when electricity prices drop below a certain level.
- 6.27 As well as rolling out Smart Meters, we will need to ensure that energy suppliers and other providers of services are more broadly enabled and encouraged to engage consumers in DSR. This is likely to be important in the short term for larger consumers in the industrial and commercial

97 <http://www.decc.gov.uk/en/content/cms/consultations/emr/emr.aspx>

sectors, but will be increasingly important in the domestic sector as electrification occurs. In particular, it will be important that the settlement system⁹⁸ rewards suppliers that shift demand. The regulator and industry have already commenced work to drive forward some of the necessary changes so that the system is ready to enable DSR. Over the coming months the Government will need to consider whether it has a role in this process.

- 6.28 It is currently not clear how consumers will respond to greater incentives to shift demand. Positive engagement of consumers at all scales, from individuals and district heating schemes to heavy industry, will be necessary to maximise DSR potential. The Government will need to make sure that the broader policy framework supports the development of appropriate consumer offers and incentives to participate in demand response, while also ensuring consumer protection.
- 6.29 Data from Smart Meters will be important to managing the network in an efficient way. The Government is working with stakeholders to examine the level of data required for these purposes. We also need to ensure that there is a mechanism through which network operators are able to influence demand to manage constraints on the network and maintain security of supply.

Storage

- 6.30 Storage can provide benefits to the electricity system by storing electricity in a different form when it is in surplus, and providing additional resource when there is a shortage. Storage also has strong potential in system and network operation. However, high capital costs, combined with uncertainty over future revenues and inexperience in the market, mean that commercial deployment of electricity storage may be limited in the short term.
- 6.31 There is a considerable global research and development effort into storage technology, which may lead to reduction in costs over time. It will also be important for the Government, alongside industry, to develop understanding of the role storage should play in the future electricity system, particularly with regard to network and system operation. Further, the Government will need to ensure that the broader framework is appropriate to realise the full benefits of storage as part of a low-carbon electricity system. At the same time, we will continue to support research and development in storage technology.

⁹⁸ 'Settlement' is the process which ensures that suppliers pay for the electricity used by their customers, and that generators are paid for what they produced.

Box 13: Government activity on research and development into storage

- The Government funded two electricity storage projects through the **Low Carbon Investment Fund** to trial and demonstrate the contribution storage can make in managing distribution networks in the context of decarbonisation.
- The **Energy Technologies Institute**⁹⁹ has launched a competition for the design, build and demonstration of a large-scale electrical energy storage technology. The winner will be announced before the end of this year.
- The Government **has over £200 million**¹⁰⁰ **of innovation funding** for low-carbon technologies over four years from April 2011. Electricity storage is being considered as part of our planning for innovation support.
- There are also opportunities to demonstrate and trial energy storage technologies through **Ofgem's £500 million Low Carbon Networks Fund**¹⁰¹. For instance CE Electric is trialling energy storage in its Customer-led Network Revolution project.

Interconnection, Offshore Transmission, and Supergrid

- 6.32 Interconnection provides a link between two different electricity markets. Diversity in demand and generation results in differences in price between different markets. For example, when the wind blows heavily on the continent, prices may drop. Interconnectors would then deliver cheaper electricity into the GB market. The benefit of interconnection in allowing efficient use of available generation will increase with greater levels of inflexible and intermittent generation. As well as offering potential for cost-effective integration of renewables, interconnection also contributes to security of supply and provides greater competition, reducing costs to consumers.
- 6.33 Interconnection in the GB market has traditionally been built on a merchant basis under which investors, rather than consumers, take on the risk of investment, but are able to capture the financial rewards. This is in contrast to many other EU countries where interconnection is part of the regulated asset base. This difference in regulatory regimes has created challenges in the development of some projects. In addition, those developing interconnectors under the merchant approach have had to apply for an exemption from the relevant requirements of European legislation, introducing a level of uncertainty in the regulatory process. In light of this, several investors have signalled that they are unwilling to build interconnection under the merchant approach.
- 6.34 In response to these challenges, Ofgem is consulting, along with CREG (the Belgian regulator), on a proposed regulated interconnector investment regime based on a cap and collar approach, using project NEMO (proposed interconnection between GB and Belgium) as a pilot

⁹⁹ <http://www.energytechnologies.co.uk/Home/Technology-Programmes/EnergyStorageandDistribution.aspx>

¹⁰⁰ http://www.decc.gov.uk/en/content/cms/funding/funding_ops/innovation/innov_fund/innov_fund.aspx

¹⁰¹ <http://www.ofgem.gov.uk/networks/elecdist/lcnf/pages/lcnf.aspx>

project. Under the cap and collar approach, returns above the ‘cap’ would be redistributed to users of the electricity network. Conversely interconnection owners will be refunded by the system if returns are below the ‘collar’ and a project fails to deliver expected benefits.

- 6.35 Ofgem’s cap and collar regime appears to have broad support from industry, and there has been a significant upsurge in proposals for new interconnectors since plans have been announced. Currently GB has 3.5 GW of interconnection, but if most current proposals were realised we could have 8-10 GW by the 2020s. Though interconnection is not a direct substitute for domestic capacity, 8-10 GW would be equivalent to around 10 per cent of installed capacity. As well as the regulatory regime for interconnection, there are broader questions around how to coordinate the development of interconnection with the offshore transmission network to:
- ensure effective trading with other countries;
 - ensure effective exploitation of the renewable resources we have; and
 - maximise the benefits of offshore transmission and interconnection.
- 6.36 The Government and the regulator are engaged in a number of initiatives with domestic stakeholders and neighbouring countries to consider these issues.

Box 14: Government and regulator initiatives

- a) **The Offshore Transmission Coordination Project (OTCP)**¹⁰², led by Ofgem and the Government, is considering the need for further measures to allow the potential for coordination within and between different generation zones and with interconnectors.
- b) **The North Seas Countries’ Offshore Grid Initiative** will consider different configurations for interconnection and offshore transmission, associated regulatory, technical and planning barriers, and the need for better coordination with EU partners. The work done under the OTCP will be an important input to the Government’s approach in this initiative.
- c) **The All Islands Approach**¹⁰³ will develop an approach to energy resources across the British Islands and Ireland. This will facilitate the cost-effective exploitation of the renewable energy resources available, and increase integration of our markets and improve security of supply.
- d) **The French-UK-Ireland (FUI) Region regulators forum**¹⁰⁴, is investigating options for cost-effective market integration, taking account of the different market designs in each Member State, how the maximum benefits of greater market integration can be captured in each case, and how compliance with relevant EU legislation might best be achieved.

¹⁰² http://www.decc.gov.uk/en/content/cms/meeting_energy/network/offshore_dev/offshore_dev.aspx

¹⁰³ http://www.decc.gov.uk/en/content/cms/news/pn11_050/pn11_050.aspx

¹⁰⁴ http://www.energy-regulators.eu/portal/page/portal/EER_HOME/EER_ACTIVITIES/EER_INITIATIVES/ERI/France-UK-Ireland

- 6.37 Our analysis, which includes the contribution of current and expected interconnection, indicates that de-rated capacity margins fall below 10 per cent towards the end of the decade, and potentially below five per cent in more than one year, meaning that a Capacity Mechanism is needed. We expect that interconnection will continue to make an important contribution to security of supply, alongside domestic capacity. See Chapter 3 and Annex C for further details of how a Capacity Mechanism could integrate with interconnection.
- 6.38 In the longer term, further integration of electricity markets, for example via a European Supergrid (a grid which operates across countries and links low-carbon generation with centres of demand), is likely to require a much deeper level of coordination between countries. The processes outlined above are a first step in considering how we might approach the development of a European Supergrid in an objective, evidence-based manner.

Electricity systems policy

- 6.39 The Government will develop its electricity systems policy next year, focusing on challenges around balancing and system flexibility. We will look at the future management of the electricity system and will set out different options for responding to the changing demands that will be made of the electricity network as a whole. The policy will also address the role that flexible solutions such as DSR, storage and interconnection will need to play, as part of the development of a smarter grid, to maximise the efficiency of generation and network assets while ensuring security of supply.

Next Steps

- 6.40 The shared scenarios and assumptions developed through the Smart Grid Forum and set out early next year will act as a guideline for networks companies and Ofgem in planning the next round of distribution network investment.
- 6.41 The development of a framework for understanding and evaluating the value drivers for smart grid solutions, also through the Smart Grids Forum, will be led by Ofgem and published in spring 2012. This will facilitate discussion between Ofgem and the network companies as part of the business-planning process.
- 6.42 We will set out our electricity systems policy in summer 2012, including discussion of the future system framework and how it will need to adapt to deal with future challenges.

Chapter 7 – Costs and benefits

Summary

- The Electricity Market Reform package will help ensure that we meet renewable energy and environmental targets, while ensuring security of supply, at least cost to the consumer.
- The Electricity Market Reform packages under a Feed-in Tariff with Contract for Difference (FiT CfD) offer the greatest benefits to society, around £9 billion for the period to 2030, compared to continuing with current policy.
- Electricity prices and bills could rise slightly in the short term but over the long term, costs to business and to the consumer will be lower than without reform. Average consumer bills are estimated to rise by around £200 from 2010 to 2030 without reform. Electricity Market Reform will limit this increase in bills to around £160, a saving of £40 per customer on the average bill.

Introduction

- 7.1 The proposals presented in this White Paper will help to meet the UK's decarbonisation targets and reduce the risks of a future security of supply problem for the GB electricity market. It is essential that the changes to the current electricity market arrangements are cost-effective. The preferred option for reform should therefore be the one which results in the least cost to the economy and in particular minimises any cost to consumers.
- 7.2 To achieve this affordably markets need to function efficiently. The Government can enable an efficient market by removing barriers to entry – intervening only to resolve identified market failures where necessary, according to the principles of better regulation. These reforms will also facilitate a green economy, with long-term economic and sustainable growth, and are complementary to policies such as Green Deal.
- 7.3 This section sets out:
- the alternative reform packages;
 - an assessment of the packages against each of the Government's energy market objectives;
 - sensitivity analysis of the Electricity Market Reform policy proposals, to ensure the packages are robust against different scenarios; and
 - a discussion of the impact of the policies on the wholesale market.

- 7.4 In the Impact Assessment published alongside this White Paper, we have assessed in detail the Electricity Market Reform measures under four different packages¹⁰⁵.
- 7.5 The four packages considered in detail in the accompanying Impact Assessment and summarised in this White Paper are¹⁰⁶:
- option 1 – FiT CfD, Strategic Reserve, EPS;
 - option 2 – FiT CfD, a Reliability Market, EPS;
 - option 3 – PFiT, Strategic Reserve, EPS; and
 - option 4 – PFiT, a Reliability Market, EPS.
- 7.6 We have compared the FiT CfD with the Premium Feed-in Tariff (PFiT), the fall-back option from the Electricity Market Reform consultation document¹⁰⁷, in terms of their relative costs and benefits.
- 7.7 The FiT CfD and PFiT are both assessed with each of the two options for the Capacity Mechanism, set out in Chapter 3 and Annex C for views. For the purposes of this analysis we assess a Capacity Market in the form of a Reliability Market.
- 7.8 The Emissions Performance Standard (EPS), as discussed in Chapter 2, is also included in the package analysis described below. The impacts of the packages are considered against a 'do nothing' baseline¹⁰⁸. This includes, among other policies, the Carbon Price Floor (CPF), following its announcement in Budget 2011, and the Renewables Obligation (RO).
- 7.9 The Government intends to implement one of the FiT CfD packages. We are consulting on the type of Capacity Mechanism, including a targeted mechanism or a market-wide mechanism as set out in Chapter 3.

Overall impacts of Electricity Market Reform on our energy market objectives

Decarbonisation

- 7.10 Our analysis, carried out by Redpoint Energy¹⁰⁹, suggests that all four of the packages set out above are capable of delivering the targets for power sector decarbonisation by 2030 if the incentives are set at the right levels.

105 These four packages are distinct to those packages presented in the Electricity Market Reform consultation document.

106 The figures presented in this White Paper are based on the 'central assumption' compared to the baseline. High and low analytical scenarios are set out in the accompanying Impact Assessment.

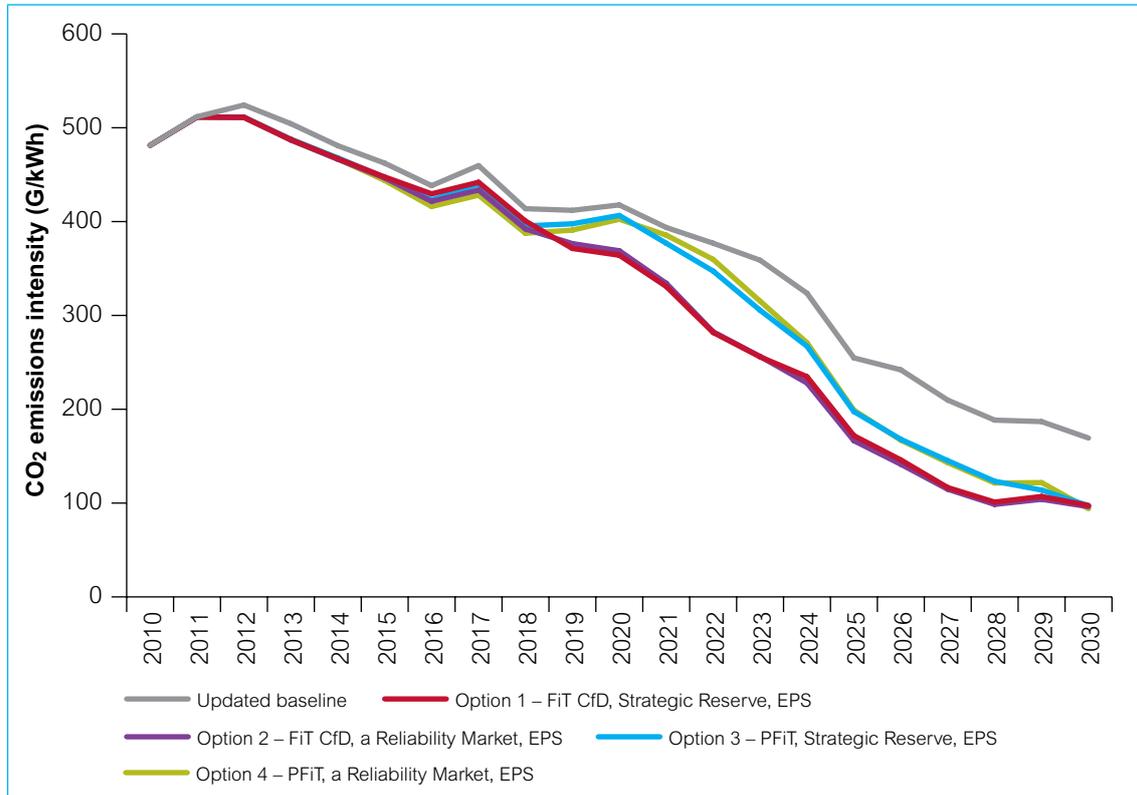
107 <http://www.decc.gov.uk/en/content/cms/consultations/emr/emr.aspx>

108 The baseline in this instance refers to the current market arrangements.

109 We commissioned Redpoint Energy to update the electricity system analysis carried out for the Electricity Market Reform consultation document published in December 2010.

7.11 Figure 18 shows that the FiT CfD options are likely to lead to a more rapid decarbonisation trajectory than the PFiT options. This is because the FiT CfD provides increased revenue certainty for low-carbon technologies, and therefore brings on low-carbon generation plant sooner.

Figure 18: Decarbonisation trajectory to 2030 – central price assumption



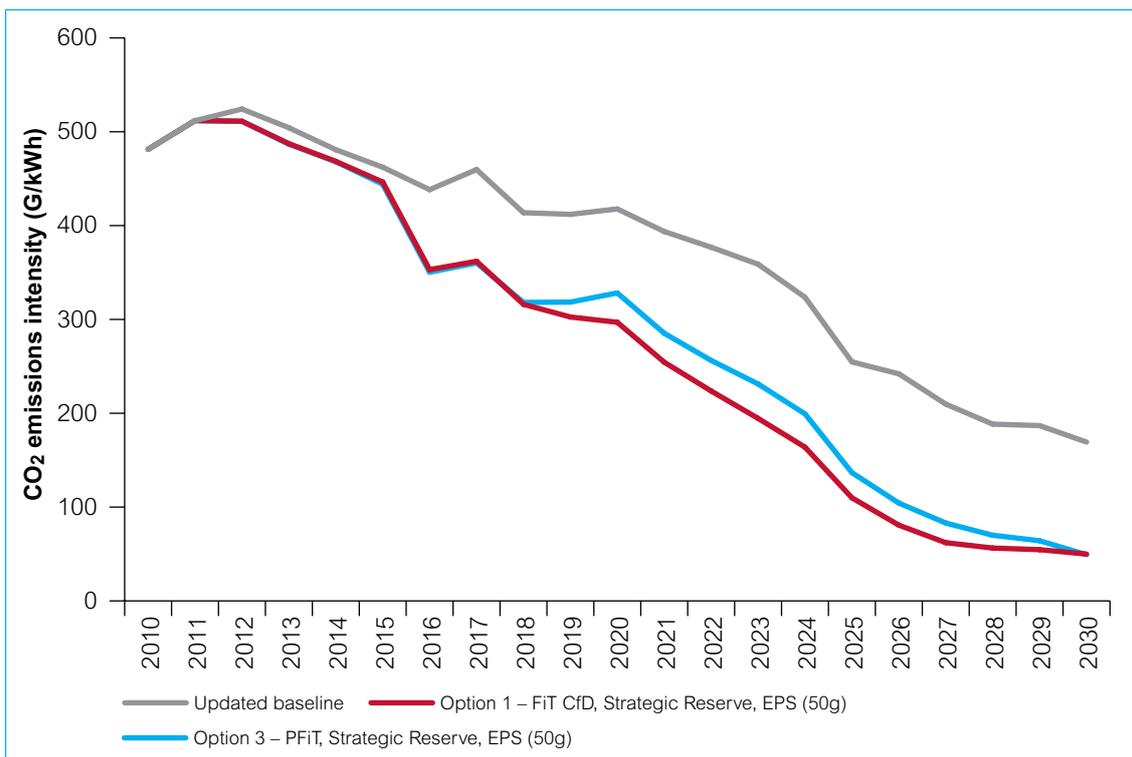
7.12 The Committee on Climate Change (CCC) in its Fourth Carbon Budget Report¹¹⁰ of December 2010 recommended a more challenging decarbonisation target for the UK electricity sector than their previous recommendation of 100gCO₂/kWh by 2030.

7.13 Figure 18 presents the profile of decarbonisation for the packages¹¹¹, based on meeting the more ambitious decarbonisation target of 50gCO₂/kWh in 2030. The difference between the two packages, in terms of decarbonisation trajectories, is smaller under this scenario. However, the FiT CfD package still shows faster decarbonisation in the medium term compared to the PFiT package.

110 <http://www.theccc.org.uk/reports/fourth-carbon-budget>.

111 The comparison is made between the Feed-in Tariff with Contract for Difference and Premium Feed-in Tariff proposals (both these packages include the targeted capacity tender and EPS).

Figure 19: Rapid decarbonisation path to 2030 – central price assumptions

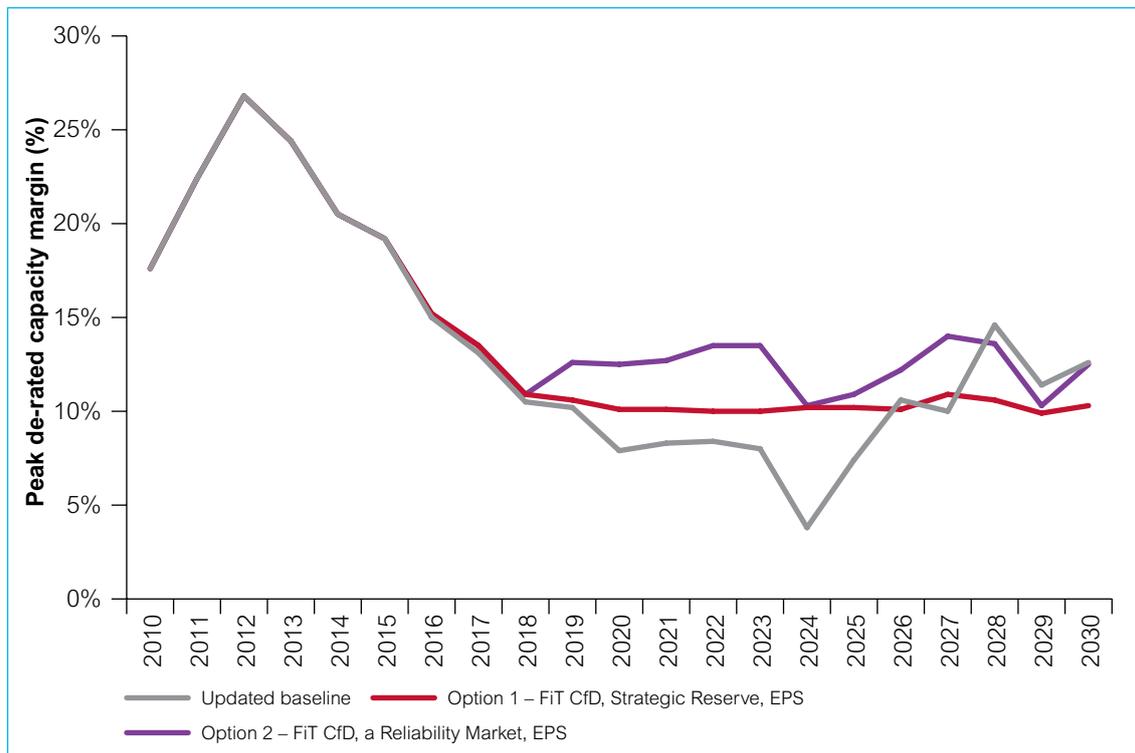


Security of supply

7.14 The analysis undertaken for this White Paper suggests that both the Reliability Market and the Strategic Reserve options for a Capacity Mechanism will have a significant impact on the capacity margin (see Figure 20). Both packages were modelled to ensure a minimum de-rated capacity margin of at least 10 per cent¹¹².

¹¹² De-rated capacity margins in the Reliability Market package are marginally higher than 10 per cent in the modelling. This is a result of a very small amount of capacity remaining outside of the Reliability Market and therefore raising the de-rated margin just above the desired 10 per cent level.

Figure 20: De-rated capacity margin



Net Present Value of packages

7.15 This analysis was carried out by Redpoint Energy using a dynamic economic model of the GB electricity market, which simulates investment and generation behaviour. This model is a simplification of how investment decisions are made in reality. Detailed results, including policy developments since consultation, key assumptions and limitations of the model are presented in the accompanying Impact Assessment. The baseline for the assessment of policies includes the current Renewables Obligation (RO) and has been updated to include the Carbon Price Floor (CPF) announcement at Budget 2011. All analysis is presented relative to this updated baseline.¹¹³

Net benefits

7.16 Our analysis shows that all the Electricity Market Reform packages should lead to a large gain in net benefit compared to the updated baseline (based on current policies including the Renewables Obligation), as shown in Figure 21. There is an overall positive net benefit from the introduction of both FiT CfD packages. This is also true, to a lesser extent, for PFIT packages. Our analysis shows that **the highest gain in net benefits is under the CfD package with a Strategic Reserve Capacity Mechanism**, at £9.1 billion Net Present Value (NPV)¹¹⁴.

¹¹³ For clarity, the baseline is not a 'do nothing' option of no decarbonisation policies.

¹¹⁴ 'Net Present Value' (NPV) is a way of accounting for the sum of a project's future cash flows in today's terms – showing the difference between a future stream of benefits and costs. NPV recognises that society would prefer £1 today to £1 in the future – this is known as 'time preference'. Therefore due to time preference, future cash flows are 'discounted' (using a discount rate) when calculating NPV.

Figure 21: Net benefits of the packages

Central fossil fuel and carbon prices, 100gCO ₂ /kWh carbon intensity in 2030				
NPV, £ billion, real 2009 (2010-2030)	FiT CfD (Strategic Reserve)	FiT CfD (Reliability Markets)	PfiT (Strategic Reserve)	PFiT (Reliability Markets)
Net benefit	9.1	8.9	7.2	7.9

Note: A positive number represents a gain in net benefit to the economy, relative to current policies.

- 7.17 The estimated change in net benefit as a result of the proposals is primarily driven by the impacts on construction costs, generation costs and carbon costs. Electricity Market Reform proposals encourage investment in low-carbon plant which typically have higher capital costs in comparison to fossil fuel plant. However, a low-carbon generation mix is also associated with relatively lower generation costs and there are savings in carbon costs (as measured by the cost of EU Emissions Trading System (EU ETS) Allowances). These savings mean that overall, the Electricity Market Reform packages lead to a net benefit, compared to the baseline scenario which has a higher share of conventional fossil fuel plant and higher costs associated with the current Renewables Obligation.
- 7.18 There are also important differences between the packages in terms of economic rents¹¹⁵ to new generation plants. Rents are expected to be significantly lower for generators under the Government's preferred choice of FiT CfD compared to the PFiT, because the level of support to generators under FiT CfD automatically adjusts to the level of the wholesale electricity price. Rents for new plant under central assumptions could have an NPV of £17 billion in a PFiT package, compared to £9.5 billion under FiT CfD. If fossil fuel prices rise higher than our central projections, this would increase rents to over £27 billion – potentially more than three times the level under a FiT CfD package.

Sensitivity Analysis

- 7.19 Future fossil fuel prices are inherently uncertain and any change in fossil fuel prices has a significant impact on the costs and benefits of the packages¹¹⁶. Therefore, it is important to test the reform packages against different fossil fuel price scenarios and carbon price scenarios to ensure that our policy is robust under different future scenarios.
- 7.20 In a high fossil fuel price scenario, where oil prices could reach around \$120/barrel in 2020, there is an overall positive net impact of both the FiT CfD (£11.3 billion) and PFiT packages (£5.8 billion), compared to the baseline. In the FiT CfD package in particular, there are significant savings in carbon costs as decarbonisation is much more rapid.

¹¹⁵ 'Economic rent' can be simply explained as excess profitability. In this case we have defined economic rent as the additional revenues earned by investors above the level required to cover long-run marginal costs of their plant.

¹¹⁶ This is because under current market arrangements, fossil fuel plant set the wholesale prices.

- 7.21 In a world with low fossil fuel prices where oil prices are assumed to stabilise at approximately \$60/bbl in 2020, the net benefits of the packages are reduced. In this scenario, both packages become more expensive to fund as more support needs to be provided to low-carbon plant to compensate for relatively lower electricity prices, compared to that required under central fossil fuel price assumptions.
- 7.22 In this scenario, the change in net benefit in the FiT CfD package is slightly negative in NPV terms at -£0.7 billion and the PFiT package is slightly positive at £1.2 billion. However, the difference between the packages and indeed the baseline in the low fossil fuel price world is comparatively small compared to the high fossil fuel price scenario.

Impact on bills

Wholesale prices

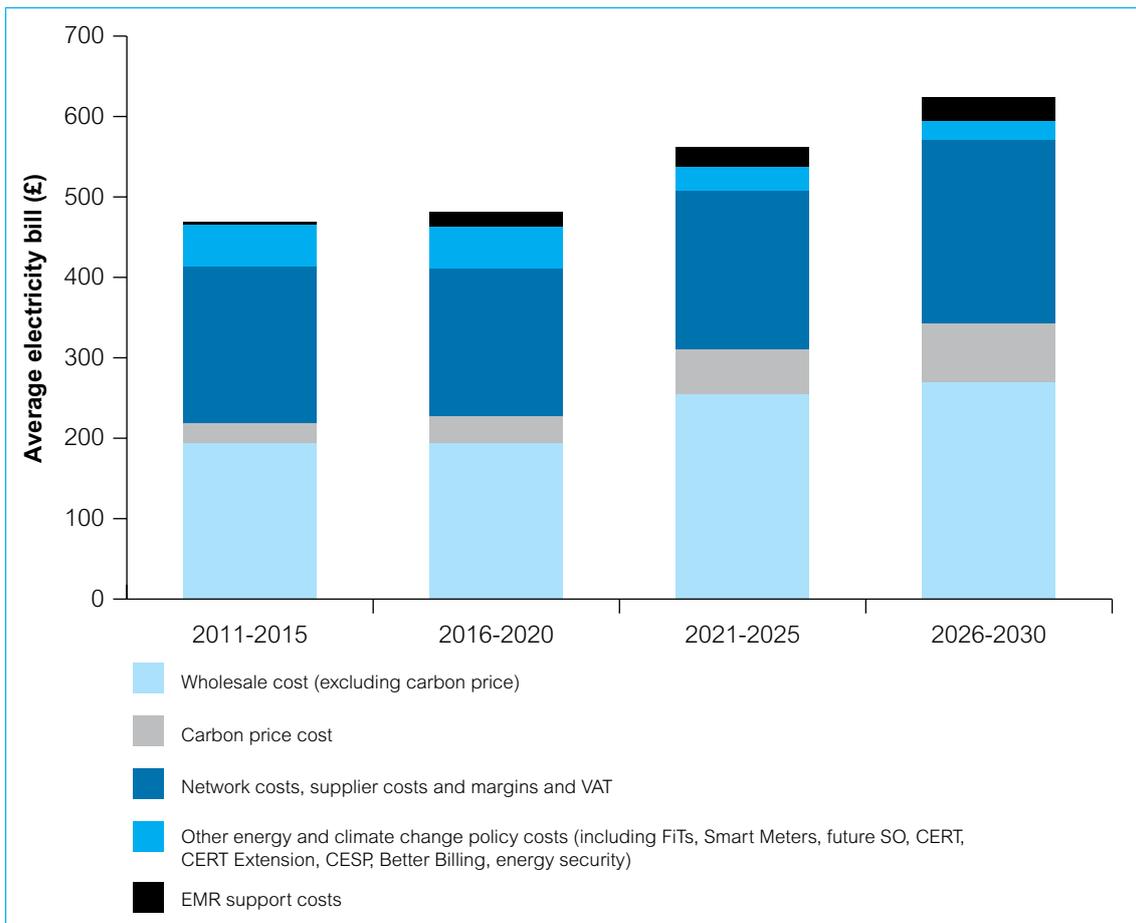
- 7.23 Electricity Market Reform measures have an impact on consumer electricity bills both through their effect on wholesale electricity prices, and through the low-carbon (and Capacity Mechanism) support costs passed on to consumers by suppliers. The support cost is greater under the PFiT packages than under the FiT CfD packages. For the period to 2030, our analysis suggests that on average the impact on the wholesale electricity price is broadly similar between the packages. In the longer term, as the introduction of Electricity Market Reform increases the amount of low-carbon generation, wholesale electricity prices should demonstrate a downward trend. However, year on year volatility remains driven by market dynamics and changes in capacity margins that are not directly a result of the choice of Feed-in Tariff mechanism.

Consumer and business prices and bills

- 7.24 As Figure 22 shows, electricity bills are likely to rise relative to today with or without reform. This is due to increases in wholesale costs, the carbon price, network costs and environmental policies. Electricity Market Reform support costs are around five per cent of consumer bills in 2030.
- 7.25 With an illustrative decarbonisation target of 100gCO₂/kWh in 2030, the FiT CfD packages (including either Capacity Mechanism option as well as the EPS) will result in a period of higher investment in low-carbon plant in the 2020s and as a result could lead to slightly increased bills in the short term, compared to the increase in bills in the absence of the Electricity Market Reform package.
- 7.26 In estimating the impact of Electricity Market Reform packages on bills, we have assumed that the low-carbon support costs will be paid for by consumers via a levy on their electricity bills. Due to the cost-effectiveness of the CfD instrument, we expect this cost to be lower under a FiT CfD than a PFiT¹¹⁷.

¹¹⁷ This is based on a central fossil fuel price scenario.

Figure 22: Illustrative breakdown of bills for option 1



7.27 Average consumer bills are estimated to rise by around £200 from 2010 to 2030 without reform. Electricity Market Reform will limit this increase in bills to around £160, a saving of £40 per customer on the average bill.

Figure 23: Snap-shot of average annual domestic consumer electricity bills

Consumer bills – domestic	Baseline bill	FiT CfD (Strategic Reserve)	FiT CfD (Reliability Markets)	PfIT (Strategic Reserve)	PfIT (Reliability Markets)
2010	£485	£485	£485	£485	£485
2030	£682	£643	£642	£647	£674
Average 2010-30	£538	£532	£527	£538	£544

7.28 As shown in Figure 24, average household bills under the FiT CfD packages could be approximately four per cent, around £25 per year, lower in the five-year period up to 2030 than they would be under current policies. For the period to 2030 as a whole, average bills could be around one to two per cent (or £6 to £10) lower under the FiT CfD packages.

Figure 24: Impact of Electricity Market Reform packages on average annual electricity bills for domestic consumers (real 2009 £), relative to an estimated baseline bill

Consumer bills – domestic	Baseline bill	FiT CfD (Strategic Reserve)	FiT CfD (Reliability Markets)	PfIT (Strategic Reserve)	PfIT (Reliability Markets)
2011-2015	£468	–	–	0% (£1)	0% (£1)
2016-2020	£486	–1% (–£4)	0% (–£1)	1% (£4)	2% (£11)
2021-2025	£560	0% (£2)	–3% (–£16)	0% (£2)	1% (£3)
2026-30	£648	–4% (–£24)	–4% (–£27)	–1% (–£4)	2% (£10)
Average 2010-30	£538	–1% (–£6)	–2% (–£10)	0% (1)	1% (£6)

Note: negative figures show a reduction in bills, while positive figures show an increase in bills, relative to the baseline.

7.29 Overall, consumers could benefit from relatively lower bills by the late 2020s and beyond. Individual bill impacts in any given year are less insightful because they are affected by other issues such as the capacity margin which also affects wholesale prices.

- 7.30 As our analysis does not model an impact on electricity consumption¹¹⁸, the price impact of policies are the same in percentage terms as the impact on bills. Electricity prices for domestic and business users, relative to baseline prices for the period to 2030 as a whole, could be £2/MWh lower under the FiT CfD with a Strategic Reserve and £3/MWh lower under the Reliability Market package. A detailed breakdown of the price impacts is presented in the accompanying Impact Assessment.
- 7.31 On average business prices and bills are one to two per cent lower, compared to what they would be without the package, for the period to 2030. Electricity prices and bills go up slightly (less than one per cent) in the shorter term. In the longer term, business bills¹¹⁹ could be four to five per cent lower in the five-year period to 2030 in the two FiT CfD packages compared to baseline bills, while also delivering a higher level of decarbonisation.

Impact on energy intensive industry

- 7.32 Changes to average annual electricity bills are similar in percentage terms between non-domestic consumers and energy intensive industries (EII). However, the impact on EIIs could be greater than on less energy intensive sectors as their energy costs are a more significant share of their operating costs. The impact on prices for EIIs is also the same in percentage terms as the impact on bills. For the period to 2030 as a whole, electricity prices for an EII user could be £2/MWh lower under the FiT CfD with Strategic Reserve and £3/MWh lower under the Reliability Market package.
- 7.33 Under the FiT CfD packages for reform, average EII bills¹²⁰ could be around two to three per cent lower on average for the period to 2030, compared to the baseline. As with the other consumers, EIIs will benefit from relatively lower bills in the late 2020s and beyond. Further details on the impact on EIIs bills are presented in the accompanying Impact Assessment.
- 7.34 The combined impacts of all Government climate change and energy policies on electricity prices and bills, including bills of EIIs, will be published alongside DECC's Annual Energy Statement later this year.

Distributional analysis of impact on bills

- 7.35 In general, increases in average domestic electricity bills can have disproportionate impacts on consumers on low incomes. This is because they spend a larger proportion of their income on electricity than the average household.

118 We anticipate that demand side response will participate through the Capacity Mechanism. However, this impact on energy consumption has not been included in the estimates of energy bills.

119 Non-domestic users are assumed to have an annual baseline electricity consumption before energy efficiency policies of 11,000 MWh.

120 Energy intensive industries are assumed to have an annual baseline electricity consumption before energy efficiency policies of 100,000 MWh.

- 7.36 In each of the scenarios within our analysis, the highest impact – either positive or negative – is on households in the lowest income deciles, although the impact compared to the updated baseline is very small (less than one per cent increase in expenditure on electricity). However, in the Government’s chosen Electricity Market Reform package (under FiT CfD) consumers could save money on bills relative to the baseline, and therefore the saving in terms of expenditure as a proportion of income on electricity, although only marginal, would be greatest for the lowest income group. As such, the FiT CfD package will mean that the number of households in fuel poverty could be between 175,000-300,000 lower in 2030 compared to what could otherwise be without Electricity Market Reform. Impacts in the initial years of reform are expected to be negligible.
- 7.37 The Government is also taking steps to help mitigate the impacts of energy costs on the low income and vulnerable households through initiatives such as the Energy Company Obligation (ECO)¹²¹ and the Warm Home Discount¹²². Under the latter scheme, the six largest energy suppliers are required to provide support with energy costs to eligible households worth up to £1.1 billion over the next four years; and we expect that around 2 million households will be supported annually. The Government is also taking action to ensure low income and vulnerable households are able to heat their homes affordably and access energy efficiency measures through the ECO, which will run alongside the Green Deal.

Implications for the wholesale market

- 7.38 The Electricity Market Reform packages do not seek to directly change wholesale market rules. However, they do have implications for and interactions with the wholesale market, with the potential to influence activity across investment, trading and operational timescales.
- 7.39 The packages influence generation investment decisions. To varying degrees and differing extents across technologies, the packages provide reduced exposure to wholesale price volatility and/or improved price certainty for non-energy products (such as capacity). This reduction in uncertainty should, if coupled with adequate revenue expectations, trigger increased investment in low-carbon generation technologies, altering the generation mix that currently operates within the wholesale market.
- 7.40 Trading strategies and operational incentives within the market will also be affected by the packages. For instance, patterns of trading activity are expected to be affected by the choice of reference prices within the individual policy instruments, potentially diverting trades into these markets. Similarly, operational behaviour will be affected by the nature of the low-carbon support mechanisms and the incentives they create.

¹²¹ http://www.decc.gov.uk/en/content/cms/legislation/energy_bill/energy_bill.aspx

¹²² <http://www.decc.gov.uk/en/content/cms/consultations/warmhome/warmhome.aspx>

- 7.41 While there are multiple interactions, the arrangements contained within the packages can, in principle, be developed to work effectively alongside the wholesale market. This will require careful development of the detailed design features during the next phase to ensure that the packages and the wholesale market, as well as related initiatives such as cash out and liquidity (see Chapter 3 and Chapter 5), are complementary to the Electricity Market Reform package.

Chapter 8 – Managing the transition

Summary

- Electricity Market Reform will mean significant changes to the electricity system. Maintaining stable market conditions and industry confidence throughout this period of change is a key objective.
- To secure this objective, we support the principle of no retrospective changes for all low-carbon investments.
- We have developed detailed proposals to provide new renewable generators with a period of choice between the existing Renewables Obligation (RO) and the new Feed-in Tariff with Contract for Difference (FiT CfD).
- To ensure the continuity of all low-carbon development, we will work actively with relevant parties to enable early investment decisions to progress to timetable wherever possible, including those required ahead of implementation of the FiT CfD.
- Annex D sets out the detailed conclusions on the RO transition.

Introduction

- 8.1 The Government is keen to ensure that the period of transition between the current and new market arrangements set out in this White Paper runs smoothly and allows investment to continue.
- 8.2 This section covers the transitional arrangements for:
- transitioning renewables funding from the RO to FiT CfD;
 - projects requiring final investment decisions ahead of implementation of the FiT CfD; and
 - an indicative timetable for implementation and transition.

Context

Transition arrangements for renewable investments

- 8.3 Renewable electricity is key to our low-carbon energy future and is a vital component of the UK's diverse energy mix. We recognise the importance of maintaining industry confidence and creating stable conditions for investment, in order to deploy renewable electricity to the levels needed to meet our 2020 targets and beyond.

- 8.4 The Electricity Market Reform consultation document¹²³ set out proposals for a transitional framework from the current RO system to FiT CfD. The aim of our proposals was to protect existing investments under the RO, and provide investors with confidence that projects currently under development would not be delayed and that investment would be able to continue in the transition period.
- 8.5 Most respondents to the consultation agreed that these were the key issues and therefore supported ‘grandfathering’ existing investments under the RO. They also called for RO ‘vintaging’¹²⁴ arrangements to be clarified as early as possible. Given the size and scale of many projects under development, there was however some concern that a 2017 cut-off date proposed for the RO may not allow a long enough lead-in time for such projects, and a number of stakeholders supported a choice between the RO and FiT CfD.
- 8.6 The Government has listened to these concerns and Annex D gives more detail about our proposed arrangements for renewable generation. The desirability of avoiding triggering change in law clauses or other default provisions was one of our considerations when designing these transition arrangements.
- 8.7 In summary these arrangements are:
- to ensure ongoing RO stability, existing accredited generation will continue to be supported under the RO and will not be permitted to transfer to the new scheme;
 - once the FiT CfD is introduced and until 31 March 2017, new renewable generation will have a choice between the RO and FiT CfD. This choice will extend to any FiT CfD eligible additional capacity commissioned at RO-accredited generating stations in the period from the introduction of the new scheme to 1 April 2017. The original capacity however will continue to be supported by the RO;
 - the RO will close to new accreditations (and additional capacity commissioned at existing stations) on 31 March 2017. No generation will be able to accredit under the RO from that date; and
 - we do not intend to extend the lifetime of the RO beyond the current 2037 end date. Generation for which a FiT CfD is in place will not be eligible to accredit under the RO.
- 8.8 The proposed arrangements for the operation of the RO during the transition include:
- **Calculating the obligation:** during the transition period to 2017, the level of obligation under the RO will continue to be calculated annually on the present basis;

123 <http://www.decc.gov.uk/en/content/cms/consultations/emr/emr.aspx>

124 ‘Vintaging’ the Renewables Obligation (RO) system means that it will no longer be open to accreditation for new stations. The closure of the RO to new stations will create a closed pool of capacity which will decrease over time as we approach the end date for the RO of 31 March 2037.

- **Grandfathering:** all technologies currently grandfathered will remain grandfathered in the vintaged RO. Support for any technology that is not covered by our grandfathering policy, will be grandfathered at the support level applicable on 31 March 2017. This will remove the need for further banding reviews, reducing the costly administration burden, and is intended to provide industry with revenue certainty. We are still considering whether any uplifts not covered by our grandfathering policy as at 31 March 2017 should be grandfathered in a similar way;
- **Offshore wind phasing:** consistent with our intention to close the RO to new accreditation from 31 March 2017, no new offshore wind turbines will be able to register under the RO after 31 March 2017. Operators of accredited generating stations will be able to register some or all of their remaining unregistered turbines that constitute the consented capacity of the generating station under the RO by 31 March 2017, in order to receive support under the RO mechanism for those turbines. The 20-year support period will begin from the point of registration. Offshore wind generators accredited under the RO will be able to sign a FiT CfD for any turbines that on 1 April 2017 are not registered;
- **Additional capacity added after 2017:** we want to continue to provide support to stations that add new capacity after 31 March 2017. Once the RO has closed to new accreditations, generators who add additional capacity that is greater than 5 MW will be eligible to participate in the FiT CfD mechanism. Additional capacity of less than 5 MW which is, at the same time, eligible for the small-scale Feed-in Tariff (FiT) will not be eligible for a FiT CfD. The Government is minded to ensure that any generation which is ineligible for small-scale FiT, will be eligible to access the FiT CfD on the same terms as other technologies. This is consistent with our intention to close the RO to new generation after 31 March 2017; and
- **Grace periods:** some respondents to the consultation suggested grace periods should apply, under certain conditions, to projects wanting to accredit under the RO before 1 April 2017. We intend to offer some limited grace periods to generation which was due to accredit on or before 31 March 2017, but which was delayed through no fault of their own, by either a change in grid connection date instigated by the transmission or distribution operator, or a delay in the agreed installation of radar. Developers would be required to demonstrate that they have met a number of criteria if these grace periods are to be exercised. We intend that these generators may accredit under the RO and will remain subject to the 2037 end date for the RO. Further details, including the evidence requirements for exercise of the grace period, are still being considered.

Devolved Administrations

8.9 The Northern Ireland RO is a devolved matter in Northern Ireland. In addition, Scottish Ministers have executively devolved functions in respect of the RO in Scotland. The proposals for RO transition have been discussed by a Steering Group comprising policy advisors and technology experts from the UK Government and the Devolved Administrations. We will continue to work closely with the Devolved Administrations to ensure that the transition arrangements are simple and transparent across all three RO schemes. We have also discussed the proposals with a wide range of industry stakeholders, including utility companies, independent generators, supply chain manufacturers and existing and potential investors. The proposals have been broadly welcomed.

Arrangements for early projects: enabling investment to continue

8.10 A large number of consultees raised concerns around uncertainty for large capital projects that require final investment decisions ahead of implementation of the FiT CfD, such as some new nuclear, some Round 3 offshore and Scottish Territorial Waters (STW) wind farms and Carbon Capture and Storage (CCS) demonstration projects.

8.11 We recognise these concerns and our transition plans and timetable are aimed at providing stability for investors and building confidence in the new regime quickly. We support the principle of no retrospective changes to low-carbon investments.

8.12 An indicative timeline for transition and implementation of Electricity Market Reform is presented in Figure 25. The timeline may need to change to reflect future work on the legislative timetable, State Aid, institutional framework and other factors. This White Paper aims to:

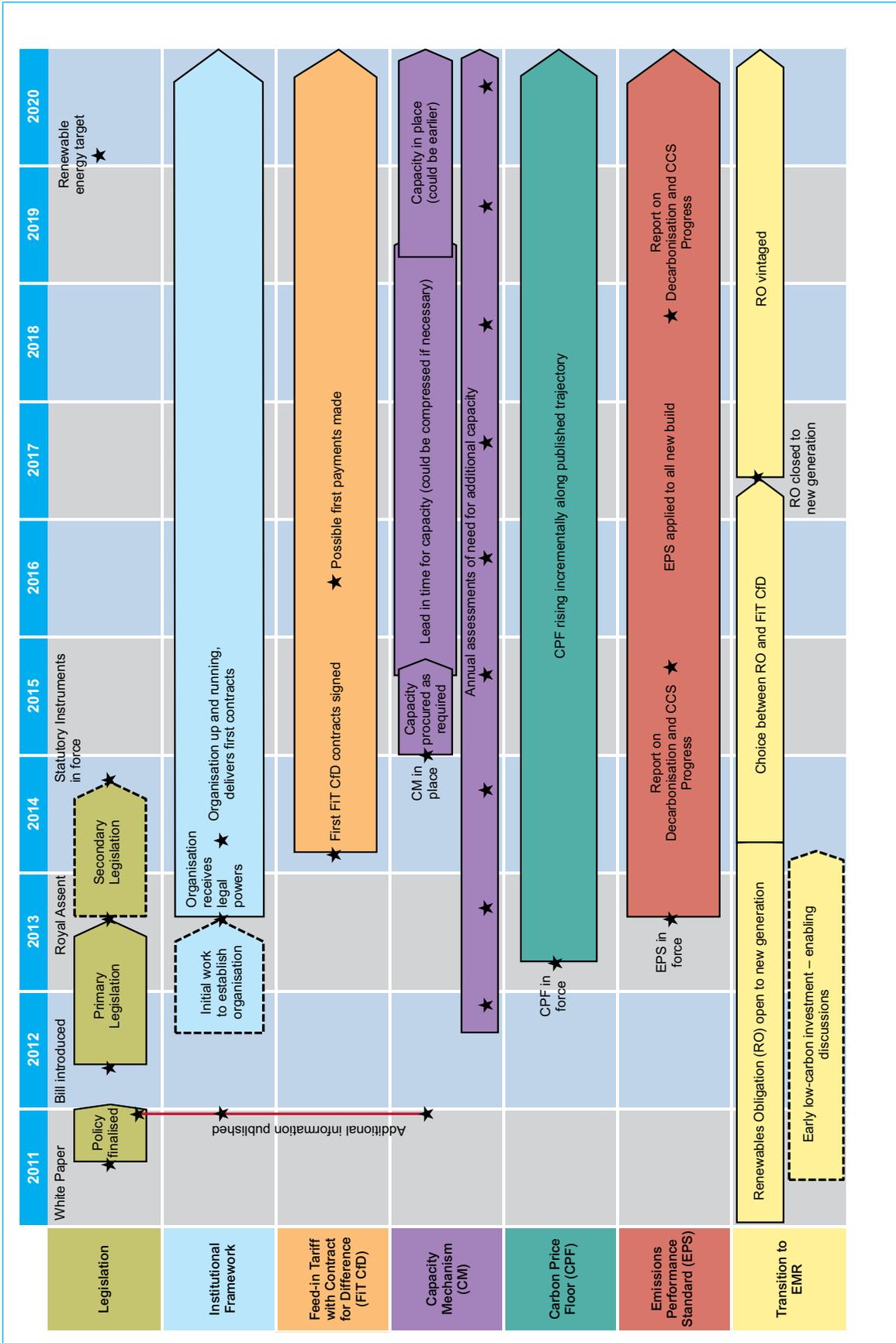
- provide reassurance for current renewables projects through the detailed transitional arrangements for the RO set out above and in Annex D;
- give as much certainty as possible on how the FiT CfD will operate; and
- provide a high-level implementation timetable to full implementation of FiT CfD and other Electricity Market Reform measures.

Next Steps

8.13 We will work closely with relevant parties to explore the means by which we can provide early certainty to low-carbon projects that are intended to benefit from the FiT CfD scheme, but that require a final investment decision before the scheme is implemented. This work will include assessing the feasibility of supporting CCS demonstration projects, potentially through a FiT CfD in combination with other funding approaches.

- 8.14 Any arrangements reached as a result of this work will be subject to the Government's obligations under EU law, including the terms of any necessary state aid approvals. In addition, any options proposed will clearly need to be compliant with existing domestic law.

Figure 25: An indicative timetable for implementation and transition



Chapter 9 – Devolved Administrations and the European Union

9.1 Devolved Administrations

Summary

- Electricity Market Reform is important for all parts of the UK. Recognising this, we have been working closely and collaboratively with the Devolved Administrations in developing this policy.
- Together, the UK Government, Scottish and Welsh Governments and Northern Ireland Executive are committed to continue to work closely to ensure that Electricity Market Reform is consistent with devolution arrangements. In particular, devolution issues will be respected in the legislation needed to implement Electricity Market Reform.
- Whether or not aspects of the Electricity Market Reform package are devolved or reserved will only become clear once the details of implementation have been decided. Where aspects are devolved they will be legislated either through Legislative Consent Motions or through Parallel Legislation across the four legislatures in the UK.

Introduction

- 9.1.1 Electricity Market Reform is vital for helping the UK increase low-carbon generation, ensure security of supply, which is in the interest of all four nations of the UK, and protect UK consumers, as well as ensure the continued successful functioning of the GB electricity market. The Government recognises the importance of devolution in the UK and is concerned to ensure the proper functioning of devolved arrangements. We are therefore strongly committed to working closely with the Devolved Administrations as we develop our proposals for Electricity Market Reform with the shared aim of delivering a coherent package of reforms across the whole of the UK. As part of this commitment, Northern Ireland Executive, Scottish and Welsh Government officials will continue to sit on the Electricity Market Reform steering group.
- 9.1.2 These proposals have been developed following detailed discussion with the Northern Ireland Executive, and Scottish and Welsh Governments. We will continue to work closely on developing the details of implementation to ensure that the proposals will operate across the different parts of GB to deliver effective and enduring reforms to the GB electricity market.

- 9.1.3 We are also working closely with the Northern Ireland Executive to consider the best approach for increasing low-carbon generation and improving security of supply in Northern Ireland, which takes account of existing market arrangements and is at least cost to the consumer.
- 9.1.4 Significant parts of the UK's generation capacity are located in Northern Ireland, Scotland and Wales. They also have significant potential onshore and offshore renewable resources, and the finance and development communities are committed to developing future low-carbon generation in each of these nations of the UK. It is only by harnessing natural resources and technical expertise from across the UK that we will be able to deliver the required new generation of secure low-carbon power sources.
- 9.1.5 By working together, the four nations of the UK aim to deliver the required new generation of secure low-carbon power sources. Successful delivery of the Electricity Market Reform package will come through the different governments working towards a set of shared goals. We will therefore continue to work together to design and deliver relevant elements of the Electricity Market Reform package.
- 9.1.6 This section sets out:
- interaction between Electricity Market Reform and the Devolved Administrations; and
 - next steps.

Northern Ireland

- 9.1.7 Electricity is essentially a devolved matter in Northern Ireland, and we are therefore working closely with the Northern Ireland Executive to consider the best approach for increasing low-carbon generation and improving security of supply at least cost to the Northern Ireland consumer.
- 9.1.8 Our preference remains a UK-wide Feed-in Tariff with Contract for Difference (FiT CfD). However we recognise that this will require working in partnership with the Northern Ireland Executive. The Northern Ireland Executive is conducting further analysis of options, and we will engage constructively with the Executive on its preferred solution, and ensure that where appropriate, any Northern Ireland solution can work alongside the FiT CfD in a UK-wide context. We also undertake to have further discussions on how any Northern Ireland mechanism will work alongside the Electricity Market Reform institutions.
- 9.1.9 As part of this discussion, Northern Ireland will also give consideration to how any mechanism can operate within the island of Ireland Single Electricity Market (SEM), how it can best meet its aspiration that 40 per cent of electricity consumed will come from renewable sources by 2020, and balance these considerations against wider fuel poverty goals.

- 9.1.10 The UK Government and the Northern Ireland Executive have also agreed that because the SEM already uses a capacity mechanism, the Capacity Mechanism proposed in this White Paper would apply across GB only.
- 9.1.11 The Government is keen that the framework of the Emissions Performance Standard (EPS) should, as far as possible, cover the whole of the UK. The Northern Ireland Executive has said that it would, in principle, consider participating in a UK-wide EPS regime. We will continue working closely with the Northern Ireland Executive alongside the other Devolved Administrations to achieve this in a way which takes account of their policy preferences and the devolution settlements as appropriate.

Scotland

- 9.1.12 The interface between reserved and devolved areas of competence for Scotland is not straightforward. Detailed consideration of the Scottish Government's devolved competence will be needed as details of the mechanisms are developed. While the Scottish Government is supportive of the need for reform of the GB electricity market, discussion of these considerations will be important in regard to how we finalise details of the operation of the mechanism and the associated institutional arrangements.
- 9.1.13 While energy policy is reserved in Scotland, environment policy is broadly devolved, and a number of aspects of energy policy are executively devolved (for example certain aspects relating to consents of electricity generation and transmission infrastructure under Section 36 and Section 37 of the Electricity Act 1989). Similarly, certain aspects of Carbon Capture and Storage (CCS) policy are also devolved, in so far as they relate to the environment.
- 9.1.14 Scottish Ministers have also been given executively devolved powers in respect of the Renewables Obligation (RO) in Scotland and we have been working closely with the Scottish Government regarding how transitional arrangements for the RO in Scotland would apply. Further details are set out in Chapter 8 and Annex D.
- 9.1.15 The Scottish Government is committed to working in partnership to deliver a coherent and seamless package of reforms across the UK. The UK Government will continue to involve the Scottish Government in further work on Electricity Market Reform, in particular on our work on institutions, in the design and operation of the FiT CfD and in managing a smooth transition from the RO to the FiT CfD.
- 9.1.16 As part of our future work on options for a Capacity Mechanism, we will involve the Scottish Government in further discussions on how the mechanism should apply in Scotland. We will also continue to discuss with the Scottish Government the application of the EPS in Scotland.

Wales

- 9.1.17 The Welsh Government is supportive in principle of the Electricity Market Reform proposals. It would like to see significant amounts of new low-carbon generation developed within Wales, and sees that the Electricity Market Reform package has the potential to support this expansion.
- 9.1.18 We will continue to work closely with the Welsh Government to drive a successful low-carbon economy transition which delivers secure and affordable energy for all.
- 9.1.19 As part of our further work on options for a Capacity Mechanism, we will involve the Welsh Government in discussions on how the mechanism should apply in Wales. We will also continue to discuss with the Welsh Government the application of the EPS in Wales.

Next steps

- 9.1.20 Following publication of this White Paper, we will continue to work closely with the Devolved Administrations as we develop more detailed design of the proposals. In particular this will mean:
- Coordinating further work with the Northern Ireland Executive and Scottish Government on transition arrangements for the RO;
 - Supporting the Northern Ireland Executive as it considers options for how a FiT CfD could be successfully integrated within a UK-wide FiT CfD; and
 - Involving the Devolved Administrations in further discussions on Electricity Market Reform, including institutions, the design of the FiT CfD, the Capacity Mechanism and the EPS.

9.2 European Union

Summary

- The EU and the UK share common energy policy objectives. We consider that the approach being adopted under the GB Electricity Market Reform is broadly in line with the EU vision for decarbonisation and security of supply.
- We support full integration of the UK energy market with the broader EU electricity market and consider that, in principle, the challenges the UK energy market faces are best addressed through European efforts.
- We are working with the European Commission and other EU stakeholders to ensure that the Electricity Market Reform package is consistent with, and complementary to, developing EU energy policy.

Introduction

- 9.2.1 The EU and the UK share common energy policy objectives around delivering sustainable electricity generation, while seeking to minimise costs to consumers and ensuring security of supply. In seeking to radically reduce emissions in the electricity sector by 2050, the EU considers that an approach based on innovative solutions to mobilise investment is appropriate¹²⁵. In line with this, the Electricity Market Reform package is providing incentives to industry to deliver an appropriate generation mix, using competition to ensure least cost to consumers. As recognised in the Electricity Market Reform consultation document, the Government fully supports further integration of the EU electricity market and believes that, in principle, the challenges the UK energy market faces are best addressed through European efforts.
- 9.2.2 Indeed, EU efforts to promote liberalisation and sustainability in Europe's energy markets are proving successful. The internal energy packages¹²⁶ have led to more open, transparent and competitive European markets, resulting in the potential for lower prices and greater choice. Similarly, policies such as the EU Emissions Trading System (EU ETS) and the EU's Climate Action and Renewable Energy package (the Green Package) have provided a framework for investment in sustainable forms of energy. Interconnection between Member States has also integrated our markets further, and will do so even further in the future, bringing potential for increased liquidity and lower prices.

¹²⁵ See, for example, Communication from the Commission entitled "A Roadmap for moving to a competitive low carbon economy in 2050", March 2011: http://ec.europa.eu/clima/policies/roadmap/index_en.htm

¹²⁶ The 1998 First Package Directive 96/92/EC (concerning common rules for the internal market in electricity) and Directive 98/30/EC (concerning common rules for the internal market in natural gas). The 2003 Second Package Directive 2003/54/EC (concerning common rules for the internal market in electricity and repealing Directive 96/92/EC) and Regulation 1228/2003 and the Directive on Gas 2003/55/EC and the Gas Regulation 1775/2005.

- 9.2.3 We welcome the fact that further efforts towards an integrated EU electricity market are continuing. The EU Third Internal Energy Package¹²⁷, and the new European network codes¹²⁸, will provide a new and deeper framework for cross-border interactions.
- 9.2.4 Further interconnection with other markets, which we expect to be facilitated by Ofgem's new investment regime for interconnection (see Chapter 6), and market coupling (which links separate wholesale markets to determine efficient cross-border power flows), will lead to more competition and liquidity in GB markets. We will ensure that the Electricity Market Reform package supports these developments, and will be working closely with the European Commission and other European stakeholders to help ensure this.
- 9.2.5 This section sets out:
- an overview of Electricity Market Reform consultation responses on EU issues;
 - the role of non-GB electricity generation;
 - how the EU ETS and the Carbon Price Floor (CPF) will help us deliver our decarbonisation goals; and
 - the relationship between EU law and the Electricity Market Reform package.

Consultation Responses

- 9.2.6 In responding to the consultation, many stakeholders recognised that consideration of the interaction between European developments and the Electricity Market Reform package is increasingly necessary as implementation issues are considered.
- 9.2.7 A number of respondents stressed that it will be important that the package in general, and the design of the Feed-in Tariff with Contract for Difference (FiT CfD) in particular, provides reliable market signals in choosing between different generation types and/or interconnection.
- 9.2.8 Some respondents argued that a Capacity Mechanism could weaken the stimulus for interconnector investment and distort cross-border flows, while another respondent suggested that the proposals are, overall, likely to promote interconnection.

¹²⁷ The 2009 Third Package comprises two Directives (Directive 2009/72/EC concerning common rules for the internal market in electricity ('the Electricity Directive') and Directive 2009/73/EC concerning common rules for the internal market in gas (the 'Gas Directive')) and three Regulations (Regulation (EC) No 714/2009 on conditions for access to the network for cross-border exchanges in electricity (the 'Electricity Regulation'), Regulation (EC) No 715/2009 on conditions for access to the natural gas transmission networks (the 'Gas Regulation') and Regulation (EC) No 713/2009 establishing an Agency for the Co-operation of Energy Regulators (the 'ACER Regulation')).

¹²⁸ The Third Package provides for new European network codes which will set minimum rules for cross-border arrangements for gas and electricity. These are intended to cover issues such as balancing, capacity allocation for interconnectors and transparency.

- 9.2.9 Respondents expressed some concerns over the CPF, arguing that it could incentivise electricity to be imported into GB or that it could increase the risk of carbon leakage due to higher electricity prices.
- 9.2.10 A few respondents highlighted state aid rules as a potential risk.

Impact on interconnectors and cross-border flows

- 9.2.11 We consider that current and future interconnection will continue to play a key role in providing secure and sustainable sources of electricity.

Decarbonisation

- 9.2.12 We are considering the role low-carbon generation from outside the UK can play in delivering our carbon emission reduction targets. As set out in our Renewables Roadmap published alongside this document¹²⁹, we intend to provide for two-way trade in renewable energy with other Member States, where appropriate, and possible, for the purposes of the renewable energy targets set out in the Renewables Directive. Similarly we will need to consider whether there may be circumstances in which it is appropriate to allow other forms of low-carbon generation, developed outside the UK, to be supported by our package of reforms.
- 9.2.13 As set out in Chapter 2, the trading of renewable effort presents opportunities for the UK. We recognise the value that generation based outside the UK could have in meeting domestic UK needs. We also have an abundant offshore wind resource and should explore the possibility of exporting energy generated in UK waters direct to neighbouring Member States.
- 9.2.14 It may be possible to have offshore wind projects connected to both the UK and other Member States, increasing our security of supply. Exploiting our North Seas resources together, we could provide new manufacturing and jobs in the UK. We will look to ensure that we have powers that will enable the UK to potentially export renewable energy for the purposes of the renewable energy targets set under the Renewables Directive.

Security of Supply

- 9.2.15 In Chapter 3 we describe two potential Capacity Mechanisms designed to ensure security of supply. Within this context, we recognise that GB is becoming increasingly interconnected, which can play an important role in contributing towards our energy security. We would expect that cross-border flows – under market coupling arrangements – would continue to be determined by the price difference between the two energy markets. This should allow interconnectors to be used fully and efficiently.

¹²⁹ http://www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/renewable_ener.aspx

9.2.16 Furthermore, we envisage that a Capacity Mechanism could allow non-GB generation (for example, a generator based in France) to participate and could potentially encourage interconnection, but we recognise that there may be potential technical constraints with this. Further detail can be found in Annex C.

European Union Emissions Trading System

9.2.17 We remain fully committed to the EU ETS, and consider it the primary vehicle through which to deliver our carbon emission reduction targets.

9.2.18 However, as set out in Chapter 2, the current level of the EU ETS cap (and associated carbon price) is not consistent with the low-carbon investment required for the UK to meet its 2050 targets. The Government supports an increase in the EU carbon emission reduction target to 30 per cent by 2020. If we are to meet our long-term carbon and security of supply objectives, which we also share with the EU, we need to reform the market now, and make investment in low-carbon generation in the UK more attractive. This is no different to measures put in place by other EU Member States to encourage investment in line with their domestic priorities.

9.2.19 As set out in Chapter 2, the CPF complements the EU ETS by strengthening the carbon price signal in the UK electricity generation sector, enabling higher levels of investment in low-carbon infrastructure and therefore a faster rate of decarbonisation.

9.2.20 Going forward, we would support an EU-wide tightening of the EU ETS in order to meet ambitious carbon emission reduction targets in the EU, and to meet the long-term EU objective of reducing emissions by 80-95 per cent by 2050.

9.2.21 Furthermore, there are no plans to impose a surcharge on imported electricity. We will continue to ensure consistency with EU excise and energy tax Directives.

State Aid

9.2.22 We are considering how the Electricity Market Reform package interacts with State Aid rules, and will engage closely with the European Commission to ensure the policy is consistent with the appropriate rules. All mechanisms will need to be compliant with State Aid rules, where relevant.

Financial regulations

9.2.23 As wholesale energy markets become increasingly integrated, there will be more cross-border trading and a corresponding need for strong cross-border market monitoring. As such, we await new rules¹³⁰ on

¹³⁰ The new rules relate to REMIT (The Commission Proposal for a Regulation of the European Parliament and of the Council on Energy Market Integrity and Transparency, COM (2010) 726), which was recently agreed by the European Parliament and European Council Representatives, and Markets in Financial Instruments Directive (MIFID), 2004/29/EC, which we expect to be amended to next year.

wholesale energy market integrity and transparency, and on financial markets, which will be designed to make the European energy wholesale markets less vulnerable to market abuse. We are considering closely what impact these rules may have on the Electricity Market Reform proposals.

Environmental law

- 9.2.24 The Electricity Market Reform package will need to be consistent with relevant EU environmental law and we will ensure that all of the implications of this are fully worked through.
- 9.2.25 In the Government's view, the provisions of EU law do not impose any bar in principle to the implementation of an EPS of the kind outlined in this White Paper, provided that it does not, for example, undermine the EU ETS (which in our view it will not). We will continue to engage with the European Commission over the coming months to help ensure that the EPS is implemented in a way that fully complies with EU law.

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