

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 (EIIs) 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 EIIs 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 EIIs 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

