Department of Energy & Climate Change

Consultation on the draft Electricity Market Reform Delivery Plan

July 2013

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Foreword

Electricity Market Reform is the biggest change to the electricity market since privatisation. Without reform of the electricity market, electricity prices will become increasingly exposed to the risks of high and volatile international gas prices. Reform will deliver the greener energy and reliable supplies that the country needs, at the lowest possible cost.

Now we have a world leading policy framework and a world leading infrastructure investment opportunity. Further, we need a huge investment in our energy infrastructure. We have already seen significant power plant closures in the last two years, with around a fifth of Great Britain's ageing power plants closing by 2020, and further closures in the 2020s. In addition, electricity demand is likely to grow significantly over the next 40 years as we increasingly turn to electricity for heat and transport.

The UK is leading the way in addressing the low carbon and energy security challenge in a way that keeps our economy competitive with 'green growth'. It is crucial to the economy as a whole, as well as to tax payers and consumers, to maintain affordable electricity bills while giving developers and investors the confidence to progress with new projects. Our reforms present an opportunity for growth and jobs, attracting up to £110 billion of investment in our electricity infrastructure, supporting up to 250,000 jobs throughout the supply chain during this decade alone.

We need to provide the most efficient long term support for all forms of low carbon generation: nuclear, renewables and plants fitted with carbon capture and storage technology. We need to make the development of low carbon generation cheaper for both investors and consumers. We also need to ensure that there is sufficient reliable capacity in place to meet demand.

We have spent over two years preparing for this plan – from initial analysis to a White Paper, multiple consultations and the Energy Bill itself. Working with industry, investors, consumers and many other stakeholders, we are now at the implementation stage. This key document for implementing our reforms, published

on schedule, is the first draft Delivery Plan for Electricity Market Reform and once again seeks views of stakeholders before we finalise our decisions. Amongst other things, the draft Delivery Plan consults on proposed strike prices for Contracts for Difference for renewable technologies that will make the UK market one of the most attractive for clean energy developers.

We are also consulting on the Government's plans for secure electricity supplies. To ensure sufficient electricity supplies from 2018/19, I recently confirmed that the Capacity Market will be initiated, with the first auctions taking place in 2014, subject to State Aid approval. To provide the economic incentives needed to attract investment I believe the Capacity Market will give investors the certainty they need to put adequate reliable capacity in place, which will protect consumers against the risk of supply shortages. In this draft Delivery Plan, we are also consulting on the proposed reliability standard that will guide the level of capacity that is contracted within the Capacity Market.

After successful policy, design and legislative phases for Electricity Market Reform, we now want to ensure the implementation phase is equally successful. This draft delivery plan has already benefited immensely from the work of the System Operator (National Grid), the independent Panel of Technical Experts and of many industry and other stakeholders. I am grateful to all who have contributed. I would also like to mention the recent Committee on Climate Change report and its valuable contribution to the dialogue on strike prices.[1] As we enter this critical phase, I am keen to hear your views so we can make our final decision ahead of full implementation, as planned, next year.

I look forward to hearing your views on the proposals and would like to thank you in advance for providing a response to the consultation.

The Rt Hon Edward Davey

Secretary of State

Department of Energy and Climate Change

[1] http://www.theccc.org.uk/publication/next-steps-on-electricity-market-reform-23-may-2013/

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Annex A	Developing the modelling and analysis for the draft Delivery Plan	This annex describes the role of DECC, the System Operator (National Grid), the Panel of Technical Experts, and Ofgem in developing the draft EMR Delivery Plan.
Annex B	Strike price methodology	This annex explains the methodology determining the CfD strike prices.
Annex C	Reliability standard methodology	This annex explains the methodology determining the reliability standard for the Capacity Market.
Annex D	Levy Control Framework	This annex describes in further detail the Levy Control Framework and sets out its profile from 2014/15 to 2020/21.
Annex E	Report from the System Operator (National Grid)	This annex summarises the analysis conducted by the System Operator to inform the draft EMR Delivery Plan.
Annex F	Panel Of Technical Experts Report	This annex is the Panel of Technical Experts' report following scrutiny of the analysis and assumptions underpinning the draft Delivery Plan.

This consultation is also accompanied by the EMR Impact Assessment, including prices and bill analysis, which will be updated by end July 2013 to fully reflect the decisions published in the Delivery Plan. The Impact Assessment can be found at: https://www.gov.uk/government/publications/energy-bill-impact-assessments.

General Information

Purpose of this consultation

The Government is seeking views on two key policy proposals that will be finalised in the first Electricity Market Reform (EMR) Delivery Plan. The two proposals relate to: (1) the strike prices for the Contracts for Difference for renewable technologies; and (2) the reliability standard for the Capacity Market.

This consultation is relevant to energy generators, energy suppliers, energy consumers and their representatives, network owners and operators, finance institutions and other stakeholders with an interest in the energy sector. DECC invites interested parties to submit comments and evidence.

Issued: 17 July 2013

Respond by: 25 September 2013

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Territorial extent:
This consultation applies to England, Scotland, Wales and Northern Ireland.

How to respond:
Your response will most useful if it is framed in direct response to the questions posed, though further relevant comments and evidence received before the closing date are also welcome. We would prefer comments to be submitted via the electronic consultation platform at https://econsultation.decc.gov.uk/. Alternatively comments can be provided by email or hard copy to the addresses below.

EMR Delivery Plan Team
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Email: emrdeliveryplan@decc.gsi.gov.uk

Additional copies:
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Other versions of the document in Braille, large print or audio-cassette are available on request. This includes a Welsh version. Please contact us under the above details to request alternative versions.

Confidentiality and data protection:
Information provided in response to this consultation, including personal information, may be subject to publication or disclosure in accordance with the access to information legislation (primarily the Freedom of Information Act 2000, the Data Protection Act 1998 and the Environmental Information Regulations 2004).

If you want information that you provide to be treated as confidential, please say so clearly in writing when you send your response to the consultation. It would be helpful if you could explain to us why you regard the information you have provided as confidential. If we receive a request for disclosure of the information we will take full account of your explanation, but we cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not, of itself, be regarded by us as a confidentiality request.

We will summarise all responses and place this summary on our website at www.decc.gov.uk/en/content/cms/consultations/. This summary will include a list of names or organisations that responded but not people's personal names, addresses or other contact details.

Quality assurance:
This consultation has been carried out in accordance with the Government's Code of Practice on consultation, which can be found here: https://www.gov.uk/government/publications/consultation-principles-guidance

If you have any complaints about the consultation process (as opposed to comments about the issues which are the subject of the consultation) please address them to:

DECC Consultation Co-ordinator
3 Whitehall Place
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Email: consultation.coordinator@decc.gsi.gov.uk

Executive Summary

The Government's objectives for Electricity Market Reform (EMR) are to:

- ensure a secure electricity supply
- ensure sufficient investment in sustainable low-carbon technologies and
- maximise benefits[2] and minimise costs to taxpayers and consumers.

The benefits of EMR will be delivered through a mechanism to support investment in low-carbon generation (in the form of Feed-in Tariffs using Contracts for Difference – CfDs), a mechanism to support security of supply (the Capacity Market) and the institutional arrangements to support these reforms.

The Government committed to publishing an EMR Delivery Plan every five years. The intention is for the Delivery Plan to contain key decisions on EMR. At this stage, key decisions that need to be reflected in the first Delivery Plan are strike prices for CfDs for renewables and a reliability standard for the Capacity Market.

CfD for Renewable Technologies

CfDs will support low-carbon generation by giving eligible generators increased price certainty through a long-term contract. A CfD will largely remove exposure to volatile wholesale prices and reduce investment risks. Generators will receive revenue from selling their electricity into the market as usual and will also receive a top-up to a pre agreed 'strike price'. If the market price is over the strike price then the generator must pay back the difference.

In this draft first Delivery Plan, we are consulting on proposed strike prices for renewable technologies. The prices are informed by analysis from the System Operator (National Grid), who assessed the impact of different strike prices on the Government's objectives in a process overseen by an independent Panel of Technical Experts.

The strike prices set out in this document have been determined in a way which seeks to maximise the benefits of EMR: affordability, reducing carbon intensity and ensuring the electricity system is contributing appropriately to meeting the UK's

[2] Compared to other policies, such as the Renewables Obligation, which could allow us to meet our legal obligations under the Renewable Energy Directive and the Climate Change Act.

target for renewable energy consumption.[3] The proposed strike prices are consistent with the upper limits on annual spending on low carbon generation (including CfDs, the Renewables Obligation and the small scale Feed-in Tariff) as agreed in the Levy Control Framework.[4]

For the first three years of EMR, the scheme will operate in parallel to the Renewables Obligation, which is the existing support scheme for large-scale renewable generation. The proposed strike prices for this period have been set so that they are comparable to the levels of support available under the Renewables Obligation, adjusted to account for the greater revenue certainty and shorter contract length provided by a CfD. In aggregate, consumers pay less under the CfD than under the Renewables Obligation. The proposed strike prices for a number of key renewable technologies come down over time, reflecting our expectation of costs falling through learning, and meaning consumers will be paying less.

The Capacity Market

The Capacity Market will give investors the certainty they need to put adequate reliable capacity in place and protect consumers against the risk of supply shortages. It does this by providing a predictable revenue stream to providers of reliable capacity. In return they must commit to provide capacity when needed or face financial penalties.

Last month, the Government confirmed that, subject to State Aid approval, the first Capacity Market auction will be run in late 2014, for delivery in 2018/19[5]. This draft Delivery Plan is consulting on the proposed reliability standard for the GB Electricity Market. This standard will be used to inform the amount of capacity to be contracted.

Our Capacity Market proposals for security of electricity supply should be seen alongside the proposals from Ofgem in collaboration with National Grid currently out to consultation, that focus on the immediate and near-term outlook.[6]

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[3] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/80246/11-02-13_UK_Renewable_Energy_Roadmap_Update_FINAL_DRAFT.pdf, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=Oj:L:2009:140:0016:0062:en:PDF

[4] Details on the Levy Control Framework can be found in Annex D

[5] https://www.gov.uk/government/publications/electricity-market-reform-delivering-uk-investment

[6] http://www.ofgem.gov.uk/Markets/WhlMkts/EffSystemOps/Documents1/Consultation%20on%20the%20potential%20requirement%20for%20new%20balancing%20services%20to%20support%20an%20uncertain%20mid.pdf

Prices and Bills

Electricity Market Reform is expected to reduce annual household electricity bills by an average of £62 (9%) over the period 2016 to 2030 (real 2012 prices), relative to achieving the same level of decarbonisation using existing policy instruments. Making the same comparison for businesses shows electricity prices and bills are lower by an average of around 10% to 11% over the period 2016 to 2030. Further information can be found in Chapter 4.

Forward Look

The final Chapter of this draft Delivery Plan describes potential deployment requirements beyond 2020. It explores three levels of carbon intensity and three technology scenarios that illustrate a range of low-carbon generation requirements to 2030.

Chapter 1: Introduction

Electricity Market Reform and Government objectives

1. In November 2012 the Electricity Market Reform policy overview set out the Government's objectives for electricity generation[7]. These were stated to be to (i) keep the lights on; (ii) keep energy bills affordable; and (iii) decarbonise energy generation.

2. Electricity Market Reform (EMR) will provide the tools to meet these objectives by:

    - **Ensuring a secure electricity supply** by incentivising a diverse range of energy sources, including renewables, nuclear, CCS equipped plant, unabated gas and demand side approaches; this will ensure we have sufficient reliable capacity to minimise the risk of supply shortages.

    - **Ensuring sufficient investment in sustainable low-carbon technologies** to put us on a path consistent with our EU 2020 renewables target and our longer term target to reduce carbon emissions by at least 80% of 1990 levels by 2050.

    - **Maximising benefits and minimising costs** to the economy as a whole and to taxpayers and consumers - maintaining affordable electricity bills while delivering the investment needed. EMR minimises costs compared to existing policies because it seeks to use the power of the markets and competition and to reduce administrative intervention and support over time.

3. EMR will deliver the benefits described in paragraph 2 through:

    - A mechanism to support investment in low-carbon generation: the Feed-in Tariffs with Contracts for Difference (CfD);

[7] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65634/7090-electricity-market-reform-policy-overview-.pdf

- A mechanism to support security of supply in the form of a Capacity Market; and
- The institutional arrangements to support these reforms.

4. These mechanisms will be supported by:

- The Carbon Price Floor;
- An Emissions Performance Standard;
- Measures to incentivise Electricity Demand Reduction – the Government has amended the Energy Bill to enable permanent reductions in demand to form part of the Capacity Market and intends to test options through an Electricity Demand Reduction pilot in the near term[8];
- Measures to support market liquidity and access to market for independent generators; and
- Effective transitional arrangements from the Renewables Obligation to Contracts for Difference.

Purpose of the Delivery Plan

5. In November 2012, the Government set out its intention to publish an EMR Delivery Plan every five years, beginning in 2013, and stated that it will consult on each draft Delivery Plan document. Annex E to the EMR Overview document contained the following:

   a. The purpose of the Delivery Plan documents – which is to confirm Government objectives for the electricity system, and to publish key decisions about EMR – notably strike prices for renewable electricity CfDs and information about the budget available to support low-carbon generation. Decisions related to the Capacity Market including the proposed reliability standard will also be set out.

[8] More information on Electricity Demand Reduction, including the Government's response to consultation is available at https://www.gov.uk/government/policies/reducing-demand-for-energy-from-industry-businesses-and-the-public-sector--2/supporting-pages/electricity-demand-reduction-project

b. The process through which the Government will produce the Delivery Plan – using analysis conducted by the System Operator (National Grid), overseen by Ofgem and scrutinised by an independent Panel of Technical Experts.[9]

6. The decisions to be published in the Delivery Plan need to reflect the spending envelope established by the Government, which is set through the Levy Control Framework[10] that sets a cap on the total amount of the levies that can be imposed on consumers through energy bills.

7. Last month, the Government published its policy document 'Electricity Market Reform – Delivering UK Investment'[11]. This gave investors early sight of the principal CfD contract parameters, including an update on key terms and draft strike prices for CfDs for renewable generation.

8. This document is a draft of the first EMR Delivery Plan, being published for consultation. The document includes details of:
   - The Government's proposed CfD strike prices for renewable technologies for the period 2014/15 to 2018/19;
   - Supporting methodology and analysis;
   - The proposed reliability standard for the Capacity Market; and
   - An outlook to 2030.

Annual updates to the Delivery Plan

9. The Government confirmed in 2012 its intention to publish an Annual Update to the Delivery Plan in years between Delivery Plan publications – and that the Annual Updates would include:

   a. Information related to delivery of the EMR mechanisms: the Capacity Market and Contracts for Difference, such as the number and type of contracts allocated;

[9] Annex E EMR Delivery Plan: decision-making process for Contracts for Difference and the Capacity Market https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65639/7081-electricity-market-reform-annex-e.pdf

[10] The LCF is the control framework for DECC's levy-funded spending that forms part of the Government's public spending framework. Full details can be found at Annex D

[11] https://www.gov.uk/government/publications/electricity-market-reform-delivering-uk-investment

b. Updated analysis to reflect new information from the market, for example, on technology costs or key assumptions such as fossil fuel prices projections;

c. Any new decisions taken in that period, for example the annual decision on the volume to procure from a Capacity Market.

10. During the period in which strike prices are set administratively, we intend that each Delivery Plan document will be the primary means of publishing strike prices for renewables for the following five-year period. It is not our intention to use each Annual Update document to publish strike prices for the period beyond that which a particular Delivery Plan relates to, although Government may choose to use individual Annual Update documents to indicate future strike prices or to provide other updates about the way the CfD budget will be used.

11. We are not setting strike prices for Carbon Capture and Storage (CCS) or nuclear generation through the Delivery Plan. Government's position on allocation and price-setting arrangements for these projects will be set out in early August, alongside contract drafting for key CfD terms and more detail on the "generic" CfD allocation process (i.e. the process applying to renewable technologies).

12. In addition, we have also not set a strike prices for the technologies of large hydro, 'tidal stream' and 'tidal array' (including tidal lagoon and tidal barrage). We will consider how to best price CfDs and the appropriate length of contracts for these projects on a case by case basis.

13. The first Annual Update document is intended to be published in summer 2014, and to contain the volume to be procured through the first Capacity Market auction and the supporting analysis, which will include analysis undertaken by the System Operator (National Grid) and overseen by the Panel of Technical Experts.

14. We intend to publish further information on the timing and content of future Annual Update documents in the final Delivery Plan in December 2013.

Plans for consultation and production of a final Delivery Plan

15. This document forms the basis of the consultation exercise on the draft Delivery Plan. We are inviting comments on the proposed strike prices for CfDs for renewable technologies and the Capacity Market reliability standard. Specific consultation questions are set out in the relevant chapter and summarised in the Catalogue of Consultation Questions found at the end of this document.

16. Following the consultation and by the end of 2013, the Government intends to publish the EMR Delivery Plan with the confirmed strike prices for CfDs for renewable technologies and the reliability standard. The publication of the Delivery Plan is subject to Royal Assent of the Energy Bill as the Delivery Plan's contents are dependent on the EMR framework in the Bill being enacted.

17. Details on the Energy Bill are available through the footnoted link.[12] The Government will consult in October on any issues relating to the design or operation of the CfD or Capacity Market mechanism which it feels it is necessary or appropriate to do so. The October consultation may be accompanied by draft implementing secondary legislation to help illustrate the policy proposals.

18. Decisions which are being consulted upon in this consultation (for example, CfD strike prices and the reliability standard for the Capacity Market) can be expected to be reflected in the secondary legislation which will be produced to implement EMR and laid in early 2014. This legislative framework underpins the decisions contained within this Delivery Plan.

Transition from the Renewables Obligation

19. The Renewables Obligation is the existing financial support mechanism for large-scale renewable generation. Our aim is to ensure a smooth transition for investors from the Renewables Obligation to EMR mechanisms, and to avoid any hiatus in investment. The EMR mechanisms and Renewables Obligation Scheme will, subject to the Energy Bill receiving Royal Assent, run in parallel from 2014/15 until 2017. During that period of parallel running,

[12] https://www.gov.uk/government/organisations/department-of-energy-climate-change/series/energy-bill

developers of new generating capacity will be able to choose whether to apply for a CfD or the Renewables Obligation. On 31 March 2017, the Renewables Obligation will close to new generating capacity. It will then run for a further 20 years for the capacity already accredited for Renewables Obligation support.

20. The Government is consulting in parallel on proposals for the Renewables Obligation transition to the CfD[13], as well as on the arrangements for Renewables Obligation closure to new capacity.

Route to Market for Independent Renewable Generators

21. Investment from independent developers will play a key role in meeting the Government's decarbonisation and security of supply goals in the future. Many independent generators rely on Power Purchase Agreements (PPAs) to participate in the market and sell their power.

22. Although we believe that the CfD will make it easier for independent generators to agree long-term offtake contracts for the electricity they generate, concerns remain over how this market will develop.

23. We are working closely with stakeholders to develop a voluntary code of practice and sample long-term contracts for the sale of electricity, to be used as the basis for commercial negotiations. These initiatives will prepare the market for the introduction of the CfD and help facilitate a smooth transition to the new arrangements.

24. In addition, we are considering the need for further measures to reduce the risks to which independent generators are exposed. The Government will provide more detail on this shortly.

[13] https://www.gov.uk/government/consultations/transition-from-the-renewables-obligation-to-contracts-for-difference

EMR in the Devolved Administrations

25. EMR will benefit consumers in all parts of the UK – delivering green growth and jobs, reliable supplies of electricity and doing so at low cost. It will provide a consistent framework for investors across the UK, which is essential if we are to attract the private capital we need to incentivise the construction of new low carbon generation. The Devolved Administrations will play a very important role given their significant low-carbon potential.

26. The draft strike prices published for consultation are underpinned by analysis conducted by DECC, the System Operator (National Grid) and the System Operator Northern Ireland (SONI), and analysis has been shared and discussed with the Devolved Administrations through the Devolved Administration Consultation Group. We will continue to develop this engagement before the strike prices are set in the final Delivery Plan.

27. We will also be seeking to agree a Memorandum of Understanding on how the UK Government and Devolved Administrations will work together on EMR on an on-going basis.

28. The Government's aim is to attract investment in electricity generation in all parts of the UK, by having in place arrangements which are as consistent as possible, while respecting devolved competencies and minimising market distortions.

Northern Ireland

29. Energy policy is devolved to the Northern Ireland Executive (with the exception of most elements of nuclear power). The Northern Ireland Executive and UK Government have agreed that CfDs will be made available in Northern Ireland. The Department of Enterprise, Trade and Investment in Northern Ireland will determine whether the UK strike prices should apply to Northern Ireland or choose to set them at different levels in Northern Ireland. CfDs will likely only be available in Northern Ireland from 2016.

30. We will continue to work with Department of Enterprise, Trade and Investment in Northern Ireland on their decision on applying these strike

prices in Northern Ireland, as part of our efforts to ensure a coherent UK-wide system for supporting low-carbon generation.

31. The UK Government and Northern Ireland Executive have also agreed that because the Irish Single Electricity Market already uses a capacity mechanism, the Capacity Market will only apply across Great Britain with any associated costs being borne by GB customers.

Scotland

32. All of the policies in EMR extend to Scotland with energy, generation and supply classed as reserved matters, though environment policy is broadly devolved. Scottish Ministers have been consulted throughout the Delivery Plan process on the CfD aspects of the analysis and on the proposals relating to strike prices.

Wales

33. All of the policies in EMR extend to Wales with energy, generation and supply being reserved matters and environment policy being broadly devolved. Welsh Ministers have been consulted throughout the Delivery Plan process on the CfD aspects of the analysis and on the proposals relating to strike prices.

Chapter 2: CfD for Renewables

Introduction

34. The Contracts for Difference (CfD) is a long term private law contract that pays the generator the difference between an estimate of the market price for electricity (the 'reference price') and an estimate of the long term price needed to bring forward investment in a given technology (the 'strike price'). This reduces generators' long term exposure to electricity price volatility, substantially reducing the commercial risk and encouraging investment in low-carbon generation at least cost to consumers.

35. Annex A of the EMR Policy overview published in November 2012[14] set out proposals on the key design features of the CfD and was accompanied by a document setting out heads of terms[15] setting out the more fundamental terms of the contract. In the Government's recent publication 'Electricity Market Reform - Delivering UK Investment'[16] we set out the principal contract parameters, including terms and the proposed strike prices for CfDs. Draft contract drafting for all the key terms which go to the value of the CfD contract will be published in early August.

36. In this document, we are consulting on the strike prices that will be made available to renewable developers through CfDs.

How CfD Strike Prices for renewable technologies have been developed

37. The Government's proposed strike prices have been set with the aim of maximising the delivery of Government objectives for the electricity system – reducing the carbon intensity of the electricity sector, ensuring the electricity

[14] Annex A Feed-in Tariff with Contracts for Difference: Operation Framework https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65635/7077-electricity-market-reform-annex-a.pdf

[15] Annex B Feed-in tariff with Contracts for Difference: Heads of terms https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65636/7078-electricity-market-refrom-annex-b.pdf

[16] https://www.gov.uk/government/publications/electricity-market-reform-delivering-uk-investment

system is contributing appropriately to meeting the Government's renewable energy targets, ensuring affordable energy for consumers and maintaining a secure electricity supply.

38. In order to understand how various strike prices would impact on the Government's objectives, the Government commissioned analysis from the System Operator (National Grid). The initial commission set out the Government's objectives for EMR and a description of the required analysis, including the data, assumptions, models and scenarios to be used or developed. Full details of the commission were set out in Annex E of the EMR Policy overview published in 2012.[17]

39. The modelling was conducted with an extended form of DECC's power sector model, the Dynamic Dispatch Model (DDM), which models both investment in generation capacity, and generation decisions by plant operators. It provides an indication of what different strike prices imply for the levels of deployment and generation achieved, the resultant carbon-intensity of generation, and the implied cost. Further information on the role of the System Operator and the Panel of Technical Experts can be found at Annex A. Further detail on the analytical process underpinning the CfD strike prices and reliability standard can be found in Annexes B and C, respectively. The Report from the System Operator (National Grid) is reproduced at Annex E.

40. The modelling is based on a number of assumptions: including assumed technology costs and hurdle rates. Further information on these assumptions is presented in Box 2. More information is also provided in the report from the System Operator (National Grid) at Annex E.

41. The strike prices set out below for consultation are those that we consider best balance performance against the Government's objectives. We propose to set strike prices that will enable sufficient deployment of renewable technologies to contribute to meeting the renewable energy target and to reduce the carbon intensity of the electricity sector, while curbing the cost to consumers by maintaining spend within the Levy Control Framework limits (LCF)[18]. The strike prices proposed could help achieve total renewable deployment of around 37GW by 2020 generating around 102TWh (or 32% of

[17] Annex E EMR Delivery Plan: decision-making process for Contracts for Difference and the Capacity Market
[18] Details on the Levy Control Framework can be found in Annex D

electricity). This could lead to levies on suppliers under the LCF of up to £7.6bn in 2020/21 depending on the evolution of, among other things, deployment and electricity prices.

42. The proposed strike prices also reflect choices on how to set prices that work effectively alongside the Renewables Obligation, and how the profile of strike prices should develop over time.

43. On the first of these, we propose that strike prices are set at a comparable level to that provided by the Renewables Obligation scheme taking into account the differences between the two support schemes. Given that Contracts for Difference will be offered alongside the Renewables Obligation for generation commissioning before the end of 2016/17, setting strike prices that are less attractive than the Renewables Obligation during this period would cause developers to adopt the Renewables Obligation instead, leaving no demand for support with CfDs. Since we expect the CfD to be a more cost-effective instrument, this would be an inefficient outcome for incentivising low-carbon deployment. Conversely, setting strike prices that are more attractive than Renewables Obligation support could result in developers favouring the CfD, but delivering less value for money than is achieved under the Renewables Obligation.

44. Because of this, the recommended strike prices were developed from a default position that strike prices for those years in which developers may choose either scheme should be as attractive to developers as Renewables Obligation support. In making this calculation, we have taken into account our expectation that a CfD provides developers with greater revenue certainty than Renewables Obligation support, which we expect to be reflected in lower costs of capital.

45. The second design choice concerns how the profile of strike prices should develop over time. Government support for a range of low-carbon technologies is predicated on the basis that deployment today will help realise cost reductions tomorrow, and that costs will fall as a technology matures. This is supported by industry. Where appropriate, we have therefore opted to set strike prices that decline over the Delivery Plan period. This decline has been set to reflect the expected cost reductions that deployment will bring and to help ensure value for money.

46. These design principles imply strike prices that are set at a level comparable to the Renewables Obligation initially (see Box 1), but which then, where appropriate, decline for projects commissioning later at a rate based on achievable technology cost reductions. They have led the Government to propose the strike prices in Table 1.

Box 1: Calculating Renewables Obligation-comparable strike prices

Renewables Obligation-comparable strike prices have been calculated based on the premise that generators will receive the same net total discounted cash flows under CfDs as they would have done under the Renewables Obligation arrangements, while the schemes operate in parallel. The modelling methodology is the same for all technology groups.

The methodology has been set to incentivise the same proportion of the supply chain under CfDs that would be incentivised under the Renewables Obligation. This involves first calculating, for each technology in each year, an 'Renewables Obligation supply curve' based on pre-development, plant capital, operating, fuel and financing cost estimates. These are then combined with revenue assumptions to determine the discounted net present value (NPV) at each point on the supply curve. The last point on the supply curve with a positive NPV is called the marginal investment under the Renewables Obligation, and is the developer with the highest costs that we expect would be incentivised to generate under the Renewables Obligation.[19]

We then calculate a 'CfD supply curve' based on the same cost assumptions, except for lower financing costs. These are combined with revenue assumptions under the new EMR arrangements, which account for differences in contract length, inflation indexation arrangements, etc., to calculate what CfD strike price would be required so that the NPV of the marginal investment under CfDs matches the NPV of the marginal investment under the Renewables Obligation. This leaves the marginal investor as attracted to a CfD as to the Renewables Obligation, given the lower cost of capital assumed for CfDs.

[19] The marginal investment is based on the Renewables Obligation support levels for England and Wales.

Box 1: Calculating Renewables Obligation-comparable strike prices
Further detail on how Renewables Obligation-comparable strike prices are calculated is set out in Annex B.

Consultation Questions: Strike price methodology	
1.	Do you agree that CfD strike prices should be set comparable to the Renewables Obligation for the period 2014/15-2016/17? If not, why and what alternative would you propose?
2.	The methodology for setting Renewables Obligation-comparable strike prices is described in Box 1 and the resulting strike prices are in Table 1. Do you agree that the strike prices we have set offer support that is comparable with the Renewables Obligation? Please provide evidence to support your position
3.	We propose that where technology costs are expected to decline, strike prices should decline over time to reflect technology cost reductions and ensure value for money. Do you agree that this the most appropriate basis on which strike prices should change over time? If not, why and what alternative would you propose?
4.	Do you believe that the recommended strike prices shown in Table 1 change over time in a way that appropriately reflects technology cost reductions and ensures value for money? Please provide evidence to support your position

Box 2: Technology cost and hurdle rate assumptions
Technology Costs A number of data sources were considered in developing a dataset for technology costs in the analysis and modelling of the draft Electricity Market

Box 2: Technology cost and hurdle rate assumptions

Reform Delivery Plan. These data sources are summarised below. Further detail on the assumptions used and their sources are set out in the DECC report 'Electricity Generation Costs 2013.[20]

Technology Costs for Non – Renewable Technologies:

Underlying data on non-renewable technologies has been provided by Parsons Brinckerhoff. The underlying data and assumptions can be found in the Parsons Brinckerhoff (2013) report.[21]

Technology Costs for Renewable Technologies:

The following data sources for various renewable technologies have been used and/or considered by DECC. These are:

1. Government Response to the Banding Review (GRBR) - data and evidence underpinning the 'Government response to the consultation on proposals for the levels of banded support under the Renewables Obligation for the period 2013-17 and the Renewables Obligation Order 2012' for renewable technologies.[22]
2. Solar PV data (250-5000kW roof-mounted/ sub-5000kW ground-mounted solar PV) - data and evidence on the costs and performance of large-scale solar PV underpinning 'Government response to further consultations on solar PV support, biomass affordability and retaining the minimum calorific value requirement in the Renewables Obligation'.[23]
3. FITs data (PV, wind, hydro and AD under 5MW): Data and evidence from Parsons Brinckerhoff (PB) (2012) published as part of the government response to Phase 2A and 2B comprehensive review of feed in tariffs.[24,25]

[20] https://www.gov.uk/government/organisations/department-of-energy-climate-change/series/energy-generation-cost-projections

[21]: https://www.gov.uk/government/organisations/department-of-energy-climate-change/series/energy-generation-cost-projections

[22] http://www.decc.gov.uk/assets/decc/11/consultation/ro-banding/5936-renewables-obligation-consultation-the-government.pdf. This is referred to as the 'Government Response to the Renewables Obligation' throughout this report. Please note that the data has been inflated from 2010 to 2012 prices and heat revenues have been updated to reflect DECC's 2013 fuel and carbon prices when compared to those published as part of the Government Response to Renewables Obligation.

[23] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/66516/7328-renewables-obligation-banding-review-for-the-perio.pdf

[24] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/43083/5381-solar-pv-cost-update.pdf

Box 2: Technology cost and hurdle rate assumptions

4. Onshore Wind Call for Evidence - Data received in response to DECC's Onshore Wind Call for Evidence and published in June 2013.[26]
5. NG Call for Evidence - Data received as part of National Grid's Call for Evidence[27] (2013).
6. PB 2013 - a DECC commissioned report from Parsons Brinckerhoff (2013) on renewable technologies.[28]
7. TNEI offshore wind costs assessment.[29]
8. The Crown Estate Offshore wind cost reduction pathways study.[30]
9. Offshore Wind Cost Reduction Task Force Report June 2012.[31]

Build Constraints

Build constraints for renewable technologies are broadly consistent with those used in the Renewables Obligation Banding Review Government Response (2012), which are based on Arup (2011)[32] and information obtained during the Renewables Obligation Banding Review Consultation.[33,34] Projects already in the pipeline are consistent with DECC's latest view on what is in construction, based on planning consent databases and industry intelligence.

Further information is available in section 7.8 of the System Operator (National

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[25] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/42912/5900-update-of-nonpv-data-for-feed-in-tariff-.pdf

[26] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/205423/onshore_wind_call_for_evidence_response.pdf

[27] https://www.gov.uk/government/organisations/department-of-energy-climate-change/series/energy-generation-cost-projections

[28] https://www.gov.uk/government/organisations/department-of-energy-climate-change/series/energy-generation-cost-projections

[29] https://www.gov.uk/government/organisations/department-of-energy-climate-change/series/energy-generation-cost-projections

[30] http://www.thecrownestate.co.uk/news-media/news/2012/reducing-the-lifetime-costs-of-offshore-wind-pathways-to-success/

[31] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/66776/5584-offshore-wind-cost-reduction-task-force-report.pdf

[32] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/42843/3237-cons-ro-banding-arup-report.pdf

[33] https://www.gov.uk/government/consultations/supporting-large-scale-renewable-electricity-generation

[34] Build constraints for large solar photo-voltaic reflect assumptions underpinning analysis for the *Renewables Obligation Banding Review for the period 1 April 2013 to 31 March 2017: Government Response to further consultations on solar PV support, biomass affordability and retaining the minimum calorific value requirement in the RO* (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/66615/7328-renewables-obligation-banding-review-for-the-perio.pdf), and build constraints for tidal stream and wave technologies reflect DECC's current understanding.

Box 2: Technology cost and hurdle rate assumptions

Grid) report at Annex E.

Hurdle Rates

The pre-tax real hurdle rates used in the draft EMR Delivery Plan analysis are calculated from the post-tax nominal hurdle rates underlying the Renewables Obligation Banding Review Government Response (2012). These post-tax nominal rates are based on evidence from Arup (2011)[35], Oxera (2011)[36] and Redpoint (2010).[37]

In order to convert the post-tax nominal rates into pre-tax real rates, we have used updated effective tax rate assumptions from work undertaken by KPMG (2013)[38] (further explained below) and a 2% inflation assumption consistent with the Government's inflation target.

The estimated hurdle rate reductions due to the introduction of CfDs draw on analysis by Redpoint (2010).[39]

The resulting pre-tax real hurdle rates for technologies for which strike prices are proposed are shown in Annex 3 of the DECC report 'Electricity Generation Costs 2013'.[40]

Effective Tax Rates

For strike price setting, we have updated our assumptions on the level of tax paid by developers – expressing these as effective tax rates (ETRs) which take into account the effect of capital allowances. This update is based on advice from KPMG.[41]

The KPMG report derives indicative ETRs for three electricity generating technologies: onshore wind, offshore wind and biomass conversions. The

[35] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/42843/3237-cons-ro-banding-arup-report.pdf
[36] http://hmccc.s3.amazonaws.com/Renewables%20Review/Oxera%20low%20carbon%20discount%20rates%20180411.pdf
[37] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/42638/1043-emr-analysis-policy-options.pdf
[38] https://www.gov.uk/government/consultations/consultation-on-the-draft-electricity-market-reform-delivery
[39] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/42638/1043-emr-analysis-policy-options.pdf
[40] https://www.gov.uk/government/organisations/department-of-energy-climate-change/series/energy-generation-cost-projections
[41] https://www.gov.uk/government/consultations/consultation-on-the-draft-electricity-market-reform-delivery]

Box 2: Technology cost and hurdle rate assumptions

report then applies a high-level qualitative analysis for other renewable technologies to assess whether the ETR for offshore wind or biomass conversions is an appropriate proxy. For technologies that do not show similar characteristics to either offshore wind or biomass conversions the 20% corporation tax rate[42] is proposed.

The ETRs which have been used in setting strike prices are shown in Annex 3 of the DECC report 'Electricity Generation Costs 2013'.[43]

Power Purchasing Agreements (PPAs)

It is not possible to assess with a high degree of certainty what level of discounts will be available in PPAs for CfD-holding generators since, by definition, such PPAs are not currently available. We have therefore estimated potential discounts for renewable generators by reference to discounts available in the market for Renewables Obligation generators today, adjusted to reflect likely changes in the market following the move to CfDs.

The estimate for discounts for current Renewables Obligation plant is based on the evidence underpinning the Renewables Obligation banding review[44] together with evidence provided by market participants through a call for evidence over the summer of 2012.[45] These were then adjusted to reflect the likely changes in the market as a result of the move from the Renewables Obligation to CfDs reflecting the changing risk landscape, in particular:

- Removal of price risk through guaranteed top-up payment against reference price;
- Removal of exposure to ROC price volatility;
- Removal of risk of carrying ROCs; and
- Application of discounts to wholesale price only, rather than the entire revenue stream.

[42] http://www.hmrc.gov.uk/rates/corp.htm
[43] https://www.gov.uk/government/organisations/department-of-energy-climate-change/series/energy-generation-cost-projections
[44] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/42846/4081-poyry-revised-ro-bands-review.pdf
[45] https://www.gov.uk/government/consultations/barriers-to-long-term-contracts-for-independent-renewable-generation-investment

Box 2: Technology cost and hurdle rate assumptions
These discounts assume efficient pricing of imbalance risk and route to market costs. DECC is actively considering interventions to promote competition in the PPA market. More information is available in section 7.7 of the System Operator (National Grid) report at Annex E.

Consultation Question	
5.	Do you agree with the key assumptions underpinning the strike price analysis, as described in Box 2, and in particular: • The technology costs • The build constraints • The hurdle rates • The decision to update our assumptions on the level of tax paid by developers, based on advice from KPMG • The Power Purchasing Agreement discounts Please provide evidence to support your position

CfD Strike Prices for renewable technologies 2014/15-2018/19

47. Table 1 sets out the proposed CfD strike prices for renewable technologies for 2014/15 to 2018/19 (with each year defined on the basis of a financial year beginning on 1 April). The relevant year is determined by the project's target commissioning date. Support will be paid based on net renewable electricity generated.

48. Strike prices for those technologies which can be used in Combined Heat and Power (CHP) stations are based on the assumption that generators will be able to apply for the Renewable Heat Incentive (RHI) tariff as well as CfD

support. We are offering the same strike price for both CHP and non-CHP generation for certain technologies, in recognition of the fact that CHP generation will also receive support and revenue for the heat element of their generation, therefore overall they will receive greater support than non-CHP generators. This is intended to incentivise CHP generation. Revised RHI tariffs, including a specific tariff for CHP, were consulted on in September 2012 and a Government response is pending. DECC may adjust the relevant strike prices depending on the outcome of the RHI consultation.

Table 1: CfD Strike Prices (£/MWh, 2012 prices)

Technology	2014/15	2015/16	2016/17	2017/18	2018/19
Advanced Conversion Technologies[46] (with or without CHP)	155	155	150	140	135
Anaerobic Digestion (with or without CHP) (>5 MW)	145	145	145	140	135
Biomass Conversion[47]	105	105	105	105	105
Dedicated Biomass (with CHP)	120	120	120	120	120
Energy from Waste (with CHP)[48]	90	90	90	90	90
Geothermal (with or without CHP)[49]	125	120	120	120	120
Hydro[50] (>5 MW)	95	95	95	95	95
Landfill Gas	65	65	65	65	65
Offshore Wind	155	155	150	140	135
Onshore Wind (>5 MW)	100	100	100	95	95
Sewage Gas	85	85	85	85	85

[46] Standard and advanced gasification and pyrolysis, including advanced bioliquids.
[47] Based on biomass contracts ceasing to pay in 2027.
[48] Energy from waste without CHP is not supported under CfDs, which is consistent with the position under the Renewables Obligation.
[49] The proposed strike prices for geothermal have been set with the aim of giving comparable returns from investment as could be accrued under the Renewables Obligation. The Government has commissioned an external report on the potential of geothermal power in the UK – due to conclude in July – and its findings will be incorporated in setting the final strike prices.
[50] For larger hydro projects, DECC will consider how best to price CfDs and the appropriate length of contracts on a case by case basis, similar to the proposed approach for Tidal Range.

Solar Photo-Voltaic (>5MW)	125	125	120	115	110
Tidal Stream[51] [52]	305	305	305	305	305
Wave[53]	305	305	305	305	305

49. Table 2 sets out the projected total capacity by technology for Great Britain. The capacities shown are taken from the System Operator (National Grid) modelling described above. The ranges reflect different underlying assumptions about future technology costs, fossil fuel prices, biomass conversions, and the commissioning dates for new CCS and nuclear plants. Although the ranges shown do not cover the full range of possible outcomes, they do provide a useful indication of what the modelling suggests is possible assuming strike prices like those in Table 1. These figures are dependent on industry cost reductions over time. The figures are not Government forecasts and do not include deployment supported under the small-scale Feed-In Tariff.

50. The generation capacity built given these strike prices will depend to a large extent on the costs faced by developers and on future changes to these costs. As such, the upper ends of the ranges shown in Table 2 typically reflect scenarios in which developer costs are lower and/or decline more rapidly than under central estimates.

Table 2: Projected Total Capacity (GW, Great Britain, excl. small-scale deployment)[54]

Technology	**2020**
Advanced Conversion Technologies (with or without CHP)	c. 0.3
Anaerobic Digestion (with or without CHP) (>5 MW)	c. 0.2
Biomass Conversion	1.2 – 4

[51] 'Tidal stream' includes 'tidal stream' and 'tidal array'. 'Tidal range' projects, which include both 'tidal lagoon' and 'tidal barrage' technologies, do not have a published strike price. Instead, given the lack of cost data available, DECC will consider how best to price CfDs and the appropriate length of contracts for these projects on a case by case basis.
[52] The strike prices for Tidal Stream and Wave are intended for the first 30 MW capacity of any project. For higher capacity projects, the additional MWs are expected to be offered a strike price of £155/MWh.
[53] As per previous footnote.
[54] The ranges shown assume that if technology costs are higher than expected, the 2018/19 strike prices for onshore and large solar PV are increased above those shown in Table 1.

Dedicated Biomass (with CHP)	c. 0.3
Energy from Waste (with CHP)	c. 0.5
Geothermal (with or without CHP)	< 0.1
Hydro (>5 MW)	c. 1.7
Landfill Gas	c. 0.9
Offshore Wind[55]	8 – 16
Onshore Wind (>5 MW)	10 – 12
Sewage Gas	c. 0.2
Solar Photo-Voltaic (>5 MW)[56]	1.8 – 3.2
Tidal Stream	c. 0.1
Wave	

51. The range of 2020 renewable generation implied by these alternative assumptions is around 94-113 TWh (including around 9 TWh of small-scale renewables), and represents around 30-35% of total generation.

52. These indicative ranges are aligned with the expected deployment rates published previously and ensure the electricity system is contributing to the UK's target of 15% renewable energy by 2020, which we expect to include over 30% renewable electricity.

Analysis by the System Operator to inform strike price setting

53. The System Operator conducted analysis to test the implications of strike prices for the Government's objectives – in particular through three core scenarios:
    (a) Core scenario 32%;
    (b) Core scenario 35%; and
    (c) Core scenario 30%.

[55] The upper end of the offshore wind range is reached if costs come down to meet industry aspirations and there is some delay to nuclear and CCS build and prices do not reduce with costs.
[56] The solar range has been updated to reflect additional scenario analysis covering further uncertainties on fossil fuel prices from National Grid. This does not imply any lowering of ambition by the Government and the strike price remains the same as it was in the June 27 publication.

54. These scenarios are described in National Grid's report at Annex E and show the policy choices Ministers could make on setting CfD strike prices.

55. The analysis has suggested that setting strike prices at the levels set out in **Core scenario 32%** in National Grid's report best balances the Government's objectives. This scenario both enables delivery of the electricity portion of the renewable energy target in 2020, and keeps costs to consumers in check by remaining within the Levy Control Framework spending limits. The strike prices shown in Table 1 are consistent with this scenario.

56. **Core scenario 30%** of National Grid's report has lower strike prices for a number of technologies in individual years, and achieves lower total projected renewables deployment. The report from the System Operator shows that if strike prices were set significantly lower than this the amount of renewable electricity in 2020 might be lower than 30%, and the other scenarios run by National Grid illustrate that if technology costs were higher and deployment consequently lower this percentage might fall by up to 2% points. In addition, if electricity demand were higher than current central projections this might also reduce the percentage of renewable electricity by up to another 2% points. Hence, if the Government were to set strike prices at the levels shown in Scenario (c), there would be greater risk to delivery of the renewable energy target.

57. On the other hand, the Government may wish to consider setting strike prices higher than in Table 1. This is illustrated in **Core scenario 35%** in National Grid's analysis, which has higher strike prices for a number of technologies in individual years. In this scenario, the amount of renewable deployment would be expected to be higher, but this deployment would on central projections already spend up to the limit of the Levy Control Framework (£7.6bn), hence there would be greater risk (if technology costs fell faster than expected, or if fossil fuel prices were lower than central projections, or if wind speeds were higher than average) of overspending the Levy Control Framework upper limit and having a greater impact on consumer bills. In order to avoid this, the Government has chosen to set the strike prices for consultation as set out in **Core scenario 32%**.

Consultation Questions: Analysis from the System Operator	
6.	Do you agree with our judgement that setting strike prices consistent with Core Scenario 32% (described above and in the Report from the System Operator at Annex E) is the best way to balance the Government's objectives of renewables deployment and affordability? If not, please state why.

Scrutiny from the Panel of Technical Experts

58. The Government appointed a Panel of Technical Experts to scrutinise the analysis carried out by the System Operator (National Grid) to ensure it is robust and fit for purpose. The Panel is made up of experts with knowledge across sectors of the electricity market and who have both analytical and technical modelling skills. The Panel has been working alongside the System Operator and reporting informally to DECC throughout the analytical process. The Panel's report is published at Annex F. More information on the members of the Panel and its terms of reference is available on the Government web pages.[57]

An explanation of strike prices by technology

Advanced Conversion Technologies (gasification and pyrolysis)

59. The Advanced Conversion Technologies (ACT) strike price is for technologies previously eligible for the Renewables Obligation support bands for both standard and advanced gasification and pyrolysis. ACTs, such as the gasification of waste and biomass, are developing technologies which have potential for higher deployment in the future. Cost reductions

[57] https://www.gov.uk/government/policy-advisory-groups/electricity-market-reform-panel-of-technical-experts

are expected over time as the technology matures; therefore strike prices have been set to reduce in parallel with those for offshore wind.

Anaerobic Digestion

60. Anaerobic digestion is a sustainable way to produce energy (both electricity and heat) from food and farm waste. Strike prices have been set to incentivise some cost reductions towards the end of the Delivery Plan period. The Renewable Heat Incentive consultation in September 2012 proposed introducing support for heat output of biogas, including anaerobic digestion and ACTs over 200kW thermal capacity. The Government response to this consultation is pending.

Biomass Conversions

61. Conversion of coal power or biomass co-firing stations or units to sustainable biomass offers a quick, cost-effective way to rapidly decarbonise electricity generation in the short to medium term, as well as contributing to security of supply through the extension of the lifetime of generating assets, during our transition to other more sustainable low-carbon generation. We are offering a flat strike price throughout this Delivery Plan period, instead of reducing strike prices, to take account of the shorter contract term being offered to biomass conversions and expected increases in imported fuel costs due to our proposed changes in sustainability standards. The decision to end payments to biomass conversions in 2027,[58] which results in the shorter contract term, is in line with Government's longer-term sustainability objectives as set out in the Bioenergy Strategy[59].

Dedicated Biomass with CHP

62. Dedicated Biomass Combined Heat and Power (CHP) is exempt from the cap under the Renewables Obligation; the UK Bioenergy Strategy identified dedicated biomass CHP as a low-risk pathway for the use of bioenergy to 2030 in view of its higher efficiency. We are offering a flat strike price for good quality CHP throughout this Delivery Plan period because fuel costs are a large share of the overall costs of biomass generation. Dedicated energy

[58] p.15, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/209276/EMR_Spending_Review_Announcement_-_FINAL_PDF.pdf

[59] https://www.gov.uk/government/publications/uk-bioenergy-strategy

crops, which are supported separately under the Renewables Obligation, will also be eligible for the Dedicated Biomass CHP strike price but will not receive any additional support. Revised Renewable Heat Incentive tariffs supporting provision of heat from biomass CHP were consulted on in September 2012 and a Government response is pending.

Energy from Waste CHP

63. We are offering a strike price for Energy from Waste CHP, rather than Energy from Waste alone, in line with the current support provided via the Renewables Obligation. Energy from Waste CHP offers cost effective low-carbon electricity and heat production concurrently, as well as waste disposal, and is a valuable element of our technology mix. Analysis indicates that there is limited scope for further cost reduction, for example due to the potential for fluctuations in fuel costs, therefore we are proposing a flat strike price throughout this Delivery Plan period. The Renewable Heat Incentive consultation in September 2012 proposed expanding the support offered to heat from waste to include a wider range of feedstocks, using the same eligibility criteria for the waste streams as the Renewables Obligation.

Geothermal

64. Although the UK does not have the geothermal resource potential of volcanic regions, for example in New Zealand and Iceland where geothermal is an established technology, in some locations in the UK underground temperatures have the potential to support deep geothermal projects. Despite earlier grant awards no deep geothermal power projects have commenced in the UK. The proposed strike prices for geothermal have been set with the aim of giving comparable returns from investment as could be accrued under the Renewables Obligation. The Government has commissioned an external report on the potential of geothermal power in the UK and its findings will be incorporated in setting the final strike prices. A revised Renewable Heat Incentive tariff to support deep geothermal for direct heat use was consulted on in September 2012 and a Government response is pending.

Hydro

65. Hydropower can be an efficient and cost effective way of producing renewable energy. While most of the UK's existing large scale sites have already been exploited, modelling by the Environment Agency suggests that there is still resource available, for example at a smaller level in run-of-river applications. The Renewables Obligation-comparable strike price is already relatively low for this technology, as cost reductions are well advanced,

therefore we are maintaining a flat strike price rather than making further reductions to support levels.

Landfill Gas

66. The strike price for landfill gas covers both the closed site and heat recovery bands under the Renewables Obligation, as the difference between the costs is minimal. Having one strike price per technology will help us move towards a technology-neutral approach in the longer term. The strike price has been set close to the reference price to offer developers certainty of income, while acknowledging that landfill gas technologies are well-advanced and there is no evidence to demonstrate that substantial support is required.

Offshore Wind

67. Offshore wind is the most scalable of the renewable technologies and also offers an opportunity to develop a competitive and quality UK based supply chain. We expect costs of offshore wind to fall. The industry-led Cost Reduction Task Force concluded that a levelised cost reduction of around 30% by 2020 was challenging but achievable. We have set the draft strike prices at a level and trajectory which we consider will bring forward generation, and which reflect the expectation that the cost of offshore wind will fall by the end of the decade. We have set up an industry led Offshore Wind Industry Council to bring together different parts of the offshore wind industry to drive the work on reducing costs. The Offshore Wind Industrial Strategy, to be published in the course of the summer, will set out ambitions in more detail.

Onshore Wind

68. Onshore wind is one of the lowest cost large scale renewable technologies, and we remain committed to supporting its deployment on appropriate sites. Support under the Renewables Obligation was reduced by 10% in April 2013, in line with cost reductions. More recently, the onshore wind Call for Evidence found that onshore wind costs have not changed significantly since the reduction to Renewables Obligation support was announced. We have therefore based strike prices on the Renewables Obligation level of support, using the Call for Evidence data, with some further reductions later in the Delivery Plan period to incentivise cost reduction.

Sewage Gas

69. Sewage gas is formed from the anaerobic digestion of sewage and has benefits and policy outcomes similar to the anaerobic digestion of food and

farm waste. The Renewables Obligation-comparable strike price is already relatively low for this technology, as cost reductions are well advanced, therefore we are maintaining a flat strike price rather than making further reductions to support.

Solar PV

70. Small-scale Solar PV will continue to be supported under the small-scale Feed-In Tariff, therefore strike prices and deployment figures in this document relate to large-scale Solar PV only. The strike price covers both the building-mounted and ground-mounted Solar PV bands under the Renewables Obligation. Decisions on the siting of installations will be made through the planning system, using appropriate guidance, ensuring that local communities are properly consulted on developments that affect them.

71. We continue to be of the view that large scale Solar PV has the potential to play a significant role if there are continued cost reductions and innovation in both technology and business models and measures. The strike price trajectory has been set to incentivise those continued cost reductions and innovation.

Tidal Range

72. Tidal Range includes both tidal barrage and tidal lagoon projects. There is no published strike price for Tidal Range. Instead, given the lack of cost data available, and the variations between projects, DECC will consider how best to price CfDs and the appropriate length of contracts for tidal range projects on a case-by-case basis.

Tidal Stream and Wave

73. Tidal stream includes both tidal stream and tidal array projects. We are maintaining our support for tidal stream and wave technologies to incentivise further development of these early-stage technologies. Given the high level of revenue support needed, the high strike prices being offered will only be made available up to a certain capacity cap: that is, for the first 30MW of any project. This is to encourage the move towards commercialisation for the sector whilst managing overall costs to consumers. Additional capacity in excess of this cap will be supported at a lower strike price.[60] This is consistent with the support provided under the Renewables Obligation. We

[60] The lower strike price is expected to be comparable to offshore wind but is under review.

do not anticipate any significant cost reduction to either technology within the first Delivery Plan period (2014/15 to 2018/19).

Consultation Questions: Strike prices by Technology	
7.	Do you agree with our proposed approach by technology? Please provide evidence to support your position

Other renewable technologies without a CfD strike price

74. There are several technologies which currently receive support under the Renewables Obligation, for which we are not currently setting a strike price or offering the option of bespoke negotiations. These technologies are:
    - Biomass co-firing;
    - Dedicated biomass;
    - Standard bioliquids; and
    - Geopressure.

    The reason for this position is set out for each of these technologies below.

Biomass Co-firing

75. We are not offering CfDs for co-firing plants because, as outlined in the Renewables Obligation Banding Review Government Response, our preference is for full biomass conversions. Conversions are more sustainable and provide higher levels of renewable generation. Significant support for biomass co-firing under CfDs could potentially destabilise the plans for those seeking to make full unit or plant conversions.

Dedicated Biomass

76. We took the decision to constrain deployment of Dedicated Biomass in line with the conclusions of the 2012 UK Bioenergy Strategy; in the medium to long term, new build electricity-only biomass plant do not offer as cost-effective a means of decarbonising the electricity grid as other renewables technologies, including offshore wind. However, we were aware that several

plans for projects were well advanced, having invested heavily in getting their projects “shovel-ready”. For this reason, we decided to provide a mechanism to allow those projects to come forward and introduced a 400MW non-legislative cap with a notification procedure. In line with the conclusions of the Bioenergy Strategy, we have decided not to offer a strike price for dedicated biomass. We are aware that several projects have asked for FID-enabling and are looking at the CfD route, but this would circumvent our policy intent to discourage electricity-only new build and to encourage more resource-efficient technologies such as CHP and heat.

Standard Bioliquids

77. We are not offering a strike price for bioliquids at this time, as we believe that sustainable waste oils, such as used cooking oil, are better suited to other sectors such as transport. The UK is taking an active role in discussions on proposed amendments to the Renewables Directive to address sustainability issues such as indirect land use change. There is already a cap on the amount of support for bioliquids in electricity production under the Renewables Obligation, to direct sustainable biofuels into other sectors such as transport, where there are limited options for decarbonisation. As we do not see bioliquids playing an important part in our future renewable electricity mix, we have chosen not to offer a strike price for bioliquids at this time, rather than instituting a similar cap for CfDs. The strike price for Advanced Conversion Technologies will cover advanced bioliquids. None of the other strike prices will cover bioliquids.

78. We recognise that CHP use of bioliquid produces the most energy per unit of input fuel leading to high levels of efficiency. However, bioliquids are one of the few sources of renewable fuel available for transport and to be consistent with the bioenergy strategy we must be mindful to not divert significant volumes of bioliquids from the transport sector. For this reason, the Renewables Obligation has a supplier cap to limit the amount of support for bioliquids and proposals for supporting bioliquid CHP in the RHI are to link support to the Renewables Obligation and its supplier cap.

Geopressure

79. We are not offering a strike price for geopressure at this time as this technology is at an early developmental stage. Although geopressure is eligible for support under the Renewables Obligation, there are no geopressure projects currently receiving or seeking that support. On that

basis, we have no means to set a reliable strike price that will incentivise cost-effective deployment. We will keep this position under review in future Annual Updates.

Consultation Questions: Other renewable technologies without strike prices	
8.	We have not set a strike price for co-firing plants because our preference is for conversions, which are more sustainable and provide higher levels of renewable generation. Do you agree with this approach? Please provide evidence to support your position
9.	Government's 2012 Bioenergy Strategy concluded that support for new dedicated biomass should be treated with caution given the lock-in risks for this technology and its relatively high costs of carbon abatement compared to biomass co-firing/conversions. In line with this conclusion, we have not set a strike price for dedicated biomass without CHP. Do you agree with this approach? Please provide evidence to support your position.
10.	We have not set a strike price for standard bioliquids, as we do not wish to divert this technology from more suitable sectors such as transport. Do you agree with this approach? Please provide evidence to support your position
11.	We have not set a strike price for geopressure since the technology is at development stage, and no geopressure projects have come forward through the Renewables Obligation. Do you agree with this approach? Please provide evidence to support your position

Renewables projects on islands

80. In early 2013, the Government, in conjunction with the Scottish Government, commissioned independent analysis of the potential contribution that could be made to renewable and low carbon targets by renewables located on the Scottish islands.[61] The report of this analysis was made available on the DECC and Scottish Government websites in May 2013.[62]

81. The report's analysis demonstrated that because of the high cost of transmission links to connect to the main GB electricity grid and other factors such as load factors, the economics of developing renewables projects on the Scottish islands is significantly different to that of projects on the mainland. As a result of this analysis and further modelling we have concluded that large-scale renewable energy projects may be unlikely to proceed on the Scottish islands, based on a strike price set at an appropriate level for mainland projects. However, if they could be delivered, they could make a significant, cost-effective contribution to renewables and low carbon targets. In light of the further analysis that has been undertaken and the potential that exists for additional cost-effective renewable electricity, the Government is considering providing additional support.

82. We are therefore committed to taking forward work to consider how to provide additional support for such projects. The strong emerging option is to provide a separate strike price for renewables projects located on such islands (where these have clearly distinct characteristics to typical mainland projects). We expect further consideration of this emerging option to feed into a consultation on this issue in the summer. This consultation will consider what level of additional support would be appropriate, as well as deliverability, the potential impact on deployment, and affordability. We will take forward this work in time to allow a differential strike price to be set for such projects in the final Delivery Plan in December.

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[61] The study focused on potential onshore wind and marine projects on the island groups of Shetland, Orkney and the Western Isles.

[62] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/199038/Scottish_Islands_Renewable_Project_Baringa_TNEI_FINAL_Report_Publication_version_14May2013__2_.pdf

83. The strike prices published for consultation in Table 1 of this draft EMR Delivery Plan show a single strike price for each technology, regardless of such distinct characteristics. The consultation on island-based projects will include consideration of how the distinct characteristics of these projects could merit a departure from this approach, allowing a specific strike price to be set for these projects. The consultation will seek views on such a change in approach, and the implications both for projects on islands and for renewables projects which are not located on islands. Responses to this forthcoming consultation will be considered in advance of finalising the strike prices to be published in the final Delivery Plan.

Renewables Trading

84. The Government recognises that there is a potential contribution to be made from sources of renewable energy that are located in other countries, such as Ireland. Further detail on the Government's position is set out in the response to the Call for Evidence on Renewable Energy Trading[63].

Allocation Rounds

85. DECC has a responsibility to ensure that the levies raised to support low-carbon generation comply with the limits set out as part of Government's Levy Control Framework. Further information on how the Levy Control Framework has been extended for electricity sector policy is set out in Annex D.

86. In order that DECC maintains appropriate cost control, it is expected that CfDs will initially be issued through a First Come First Served process before moving to Allocation Rounds when a material portion of the CfD Budget has been committed. We are also examining how the CfD allocation process can support supply chains whilst maintaining value for money for consumers. We will publish proposals on the detailed allocation process later this summer.

[63] https://www.gov.uk/government/publications/response-to-call-for-evidence-on-renewable-energy-trading

Chapter 3: Capacity Market – Reliability Standard

Introduction

87. The Capacity Market will protect consumers against the risk of supply shortages by giving investors the certainty they need to put adequate reliable capacity in place. It will do this by providing a predictable revenue stream to providers of reliable capacity. In return, they must commit to provide capacity when needed or face financial penalties. The Government confirmed in its publication of 27 June 2013 its intention to run the first Capacity Market auction in late 2014, for delivery in the winter of 2018/19, subject to State Aid clearance.

88. The decision on how much capacity to contract in each capacity auction will be informed by an enduring reliability standard. A reliability standard is an objective level of security of electricity supply, and will be the basis for establishing a demand curve in advance of each capacity auction.

89. More detail on the Capacity Market and how the reliability standard feeds in to the wider design process can be found on the DECC website.[64] In designing our Capacity Market proposals we have not only worked with stakeholders, but we have drawn on the historical experience of Capacity Markets in the UK and on current experience with Capacity Markets in Europe and a number of American states.

90. This document proposes a draft reliability standard, and a draft methodology for setting the demand curve, for consultation.

[64] https://www.gov.uk/government/publications/electricity-market-reform-capacity-market-proposals

The reliability standard and why it is needed

91. The Capacity Market is intended to ensure 'resource adequacy'. In other words, to ensure sufficient investment in the total reliable capacity needed to meet demand.[65]

92. A reliability standard is needed to set a target level of resource adequacy to be provided through the Capacity Market.

93. No electricity system can ever be 100% reliable, and there is always some trade-off between the cost of providing additional back up capacity, and the level of reliability achieved. The reliability standard allows this trade-off to be made. Each additional unit of capacity contracted through the auction brings an increased security of supply benefit; it is the reliability standard that will suggest the point at which this additional security benefit is outweighed by the costs of providing that capacity.

94. Establishing an enduring reliability standard gives investors and market participants clarity over the Government's long term security of supply objectives and will help market participants price their bids in an auction (because they will know that from year to year there should be roughly the same proportion of demand and supply in the electricity market). Reducing uncertainty for investors should reduce their costs, benefitting consumers.

95. Whilst the reliability standard is intended to be enduring, it is important that it can reflect future changes in the metrics which underpin it – notably the cost of new entrant capacity or the value of lost load. As such, we propose to review the reliability standard, along with the Capacity Market, every five years.

96. The reliability standard will express the desired level of risk that electricity demand is not met in a given year as a result of having insufficient capacity to meet demand on the system, resulting in voltage reductions or, in exceptional circumstances, electricity customer disconnections. The standard is expressed as a loss of load expectation (LOLE), i.e. the number of hours/periods per annum in which, over the long-term, it is statistically

[65] This is distinct from 'operational security', which is dependent on the moment to moment balancing of supply and demand. Operational security will continue to be managed by the System Operator. The Capacity Market is also not designed to improve the physical resilience of the electricity network.

expected that supply will not meet demand, and which reflects the economically efficient level of capacity. [66] This does not mean that we would have this level of blackouts in a particular year; in the vast majority of cases, loss of load would be managed without significant impacts on consumers. [67]

How the reliability standard will be used in practice

97. The reliability standard will guide how much capacity is auctioned in the Capacity Market. The System Operator (National Grid) will set out how much capacity to issue capacity agreements for, in order to meet the reliability standard, and will provide advice to the Secretary of State who will in turn take the decision over how much capacity to procure.

98. The precise amount of capacity required to meet the standard will vary depending on how we expect demand to vary in the coming years. For example, under a scenario with high economic growth and high electricity demand growth over the next four years, we will need more capacity to meet the same reliability standard. Similarly the level of installed capacity needed will also depend on the underlying technology mix of system generation. For example, we would likely want a higher total installed capacity in a system with lots of intermittent capacity than in a system with more reliable generation.

99. The System Operator (National Grid) will set out the analysis of how much capacity we will need to meet the reliability standard through the EMR Delivery Plan process.

The proposed reliability standard

100. The proposed reliability standard for the GB electricity market is a LOLE of **3 hours/year**. This translates as a system security level of 99.97%.[68] This

[66] The choice of LOLE as a metric for security of electricity supply is discussed in Annex C

[67] A discussion of what Loss of Load Expectation means in practice; the range of tools available to the System Operator, and; how to interpret the risks to security of electricity supply can be found on pages 25-27 of Ofgem's Electricity Capacity Assessment: http://www.ofgem.gov.uk/Markets/WhlMkts/monitoring-energy-security/elec-capacity-assessment/Documents1/Electricity%20Capacity%20Assessment%20Report%202013.pdf

[68] 99.97% of the year there will be no expected lost load through insufficient generating capacity, i.e. 1 – 3/(24*365).

proposal is the result of an analytical approach to identify the most cost effective reliability standard for the GB market, and comparison with standards in neighbouring countries.

Calculating the proposed reliability standard

101. The Government has analysed the costs (of providing capacity) and benefits (in terms of security of supply) to determine the most efficient reliability standard.

102. Annex C lays out this analytical approach in more detail. The calculation is based on two key assumptions:

    a. The cost of new entry (CONE) which describes the cost to society of building new capacity. We have used the cost of an open cycle gas turbine to calculate the costs of additional capacity as this is the cheapest way of providing capacity. This is estimated to be around £47,000/MW-year, which is the annual revenue required in each year of a plant's lifetime to cover the initial cost of building the capacity.[69]

    b. The value of lost load (VoLL), which is the value that consumers place on avoiding loss of electricity supply. We have commissioned a joint study together with Ofgem to estimate this VoLL, which has concluded that the average value to consumers of preventing disconnections at times of system peak is around £17,000/MWh.[70]

103. We consider the most economically efficient reliability standard is to the ratio of the cost of avoiding blackouts (CONE) to the value consumers place on avoiding disruption (VoLL).[71] The full derivation of this is presented in Annex C, but the high-level calculation is presented in Box 3.

[69] Parsons Brinkerhoff (PB) 'Electricity Generation Model – 2013 Update of Non Renewable Technologies
[70] London Economics 'The Value of Lost Load (VoLL) for Electricity in Great Britain' (2013)
[71] Steven Stoft, 'Power System Economics' (2002), pg. 138

Box 3: Calculating the reliability standard

The reliability standard is the result of the calculation:

$$\frac{cost\ of\ new\ entry}{value\ of\ lost\ load}$$

The lowest cost of reliable generation capacity – assumed to be an Open Cycle Gas Turbine plant – is around £47,000/MW-year.

The reason that we have chosen this is type of plant is that it should be the marginal plant on the system. This means it should only be dispatched once other plants are already operating and the system is running out of capacity. This is because, although it is the cheapest type of capacity to construct, it has very high running costs.

If it is assumed that wholesale prices can match the value that consumers place on electricity or the value of lost load (£17,000/MWh), then the plant can cover its costs by running for around 3 hours per year. For example, a 1MW peaking plant will serve roughly 3 MWh of load at a cost of £17,000/MWh, thus earning around £47,000 in the process.[72]

If more capacity were installed (i.e. if we had a more secure system than implied by the reliability standard), then the marginal peaking plant would run less often and therefore would serve less than 3 MWh of load per MW of capacity. The cost of serving this load would therefore exceed the value that customers place on electricity and it would represent poor value for money for customers.

If less capacity was installed (i.e. if we had a less secure system than implied by the reliability standard), then the marginal peaking plant would serve more than 3 MWh of load per MW of capacity. The cost of serving this load would therefore be less than VoLL and so building more capacity

[72] To five significant figures, we have estimated the cost of new entrant capacity to be £47,177/MWh and the value of lost load to be £16,940 and therefore the Reliability Standard would be around 2 hours, 47 minutes and 6 seconds. However, given the level of uncertainty in estimating the associated parameters, it would not be appropriate to express a reliability standard to such a degree of accuracy which is why we have chosen to express it to 1 significant figure as is common elsewhere.

would offer value for money for customers.

Reliability standards in other electricity markets

104. Reliability standards are a relatively common feature of electricity markets across the world. The proposed reliability standard is comparable to others we are aware of in Europe. In general, it is helpful if interconnected countries aim for similar levels of reliability in order that wholesale electricity price distortions as a result of strategically different levels of desired security are avoided.

Country	**Reliability standard** (hours of Expected Lost Load)
France	3 hours
Ireland	8 hours
Netherlands	4 hours

Consultation Questions – Capacity Market	
12.	Do you agree with our proposed reliability standard of 3 hours LOLE?
13.	Do you agree with the methodology underpinning the reliability standard – that is to calculate this using the value of lost load and the cost of new entry? If not, please explain why and provide supporting evidence
14.	Do you agree with the analysis of the value of lost load as described above and in Annex C? If not, please explain why and provide supporting evidence.
15.	Do you agree with our estimate of the cost of new entry as described above and in Annex C? If not, please explain why and provide

	supporting evidence.
16.	Do you agree the reliability standard should be reviewed every five years to reflect any future evidence in the value of lost load and the cost of new plant entry?

Capacity Market auction demand curve: methodology

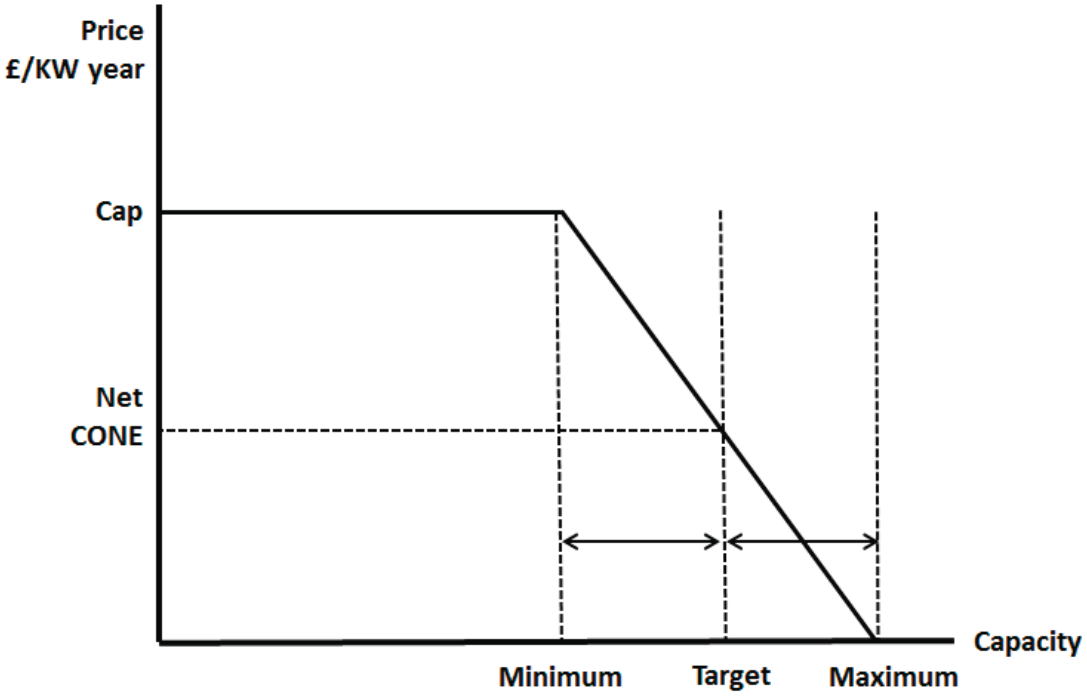
105. Once the reliability standard is set, National Grid will use it to advise Government on the volume of capacity to be procured through the Capacity Market in each capacity auction. The Government will select a target level of capacity to obtain.

106. This document also sets out the methodology to be used by the System Operator (National Grid) in setting a demand curve for each capacity auction.

107. At a high level, the demand curve sets out the conditions under which the amount of capacity contracted in an auction may deviate from the amount required to exactly meet the reliability standard.

108. A demand curve is important since it allows a trade-off to be made between reliability and cost (e.g. we might ideally want 45GW but if the 45th GW is very expensive, entering into capacity agreements for only 44GW might be better value). A demand curve also helps mitigate manipulation or "gaming" because it provides an auction price cap, and flexibility to procure less capacity if the price is high – both of which reduce opportunities for participants to push up prices by exercising market power.

Chart 1: Illustrative Capacity Market Demand Curve



109. Two important parameters for the demand curve are the target capacity level and the net cost of new entry (net-CONE). The target sets the estimate of the optimal level of capacity to obtain to deliver the reliability standard, and the net-CONE is the estimate of the reasonable cost of new capacity. Net-CONE sets the price at which the target level of capacity would be auctioned and the price cap in the auction will be set at multiple of net-CONE. Net-CONE will be determined from the cost of a new build open cycle gas turbine (OCGT) plant (i.e. gross-CONE) minus expected electricity market revenue, and will be revised if necessary for each auction.

110. Government proposes that the demand curve in the auction will be set using the following methodology:

a. The Government picks the target level of capacity to obtain to ensure the reliability standard is met in the delivery year based on analysis from the System Operator (National Grid).
b. Capacity agreements will be signed for this target level if the price in the auction is equal to net CONE.
c. The slope of the demand curve will be set according to a set formula. Government proposes that the minimum amount of capacity will be

target minus X GW capacity. Government proposes that the maximum amount of capacity will be target plus X GW of capacity.

d. A price cap is to be set at a fixed multiple of net-CONE.

111. The exact parameters which will determine net-CONE, the price cap, and the slope of the demand curve will be set out in the consultation on secondary legislation later this year.

Consultation Questions – Capacity Market	
17.	Do you agree with the proposed methodology for the auction demand curve? If not, please explain why and provide supporting evidence.

Chapter 4: Summary of Price and Bills Impact

112. Electricity Market Reform should benefit consumers in two key ways. It dampens the effect of volatile fossil fuel prices on electricity bills and it allows low-carbon generation to be more cost-effectively supported. By providing generators support that falls as electricity prices rise, consumers avoid overpaying generators while also helping smooth the effect of electricity price movements on their bills.

113. More cost-effective support for low-carbon generation means that the same amount of low-carbon generation can be funded for less. As a result, bills can be lower than if this generation were funded through existing policies.

114. This chapter looks at the price and bills impact of Electricity Market Reform in two ways:
    - As savings relative to a scenario in which existing policies are used to achieve similar levels of decarbonisation; and
    - As absolute costs.

    Further detail on this analysis can be found in the EMR Impact Assessment, which will be updated during July 2013 to incorporate the decisions contained in the draft EMR Delivery Plan.[73]

Relative savings

115. In order to assess the costs of Electricity Market Reform relative to the costs of achieving similar levels of decarbonisation[74] using existing policy instruments, an existing policy instruments scenario (the counterfactual) has been developed as part of the Government's Impact Assessment.[75]

[73] https://www.gov.uk/government/publications/energy-bill-impact-assessments
[74] A decarbonisation target for electricity for 2030 has not yet been set by the Government. The results presented here are for an illustrative average grid emission intensity of 100gCO2/kWh in 2030. Results for grid intensity levels of 50gCO2/kWh and 200gCO2/kWh in 2030 are also presented in the Impact Assessment.
[75] This is a different comparison than made in DECC's March 2013 report on the *Estimated Impacts of Energy and Climate Change Policies on Energy Prices and Bills* (https://www.gov.uk/government/publications/estimated-

Relative to the counterfactual, Electricity Market Reform is expected to reduce annual household electricity bills by an average of £62 (9%) over the period 2016 to 2030 (real 2012 prices). Making the same comparison for businesses shows electricity prices and bills lower by an average of around 10% to 11% over the period 2016 to 2030.[76]

116. In order to help show the drivers of this net impact, Electricity Market Reform's price and bill impacts have been disaggregated into three distinct effects:
    - **EMR support costs**: The EMR package affects bills most directly through the CfD and Capacity Market payments paid to generators. These payments are levied on electricity suppliers and assumed to be passed through to consumers (both households and businesses) by energy suppliers.
    - **Lower Renewables Obligation support costs**: The introduction of CfDs requires less new generation to be supported by the Renewables Obligation. This results in lower Renewables Obligation costs relative to the counterfactual. CfDs also provide a more cost-effective means of support than the Renewables Obligation for renewable generation.
    - **Wholesale price effect**: In general, an electricity system with more low-carbon generation results in lower average wholesale prices, because low-carbon capacity typically has very low, or no, fuel costs. A higher carbon price, while supporting low-carbon investment, pushes up wholesale prices, and tighter capacity margins similarly push up wholesale electricity prices. In the counterfactual, a higher carbon price is needed to achieve a similar level of decarbonisation in the absence of CfDs.

117. Chart 2 shows how EMR affects household electricity bills relative to the counterfactual. As can be seen, the direct effect of the support costs is more than offset by the reductions resulting from lower Renewables Obligation support costs and lower average wholesale prices. The estimated savings

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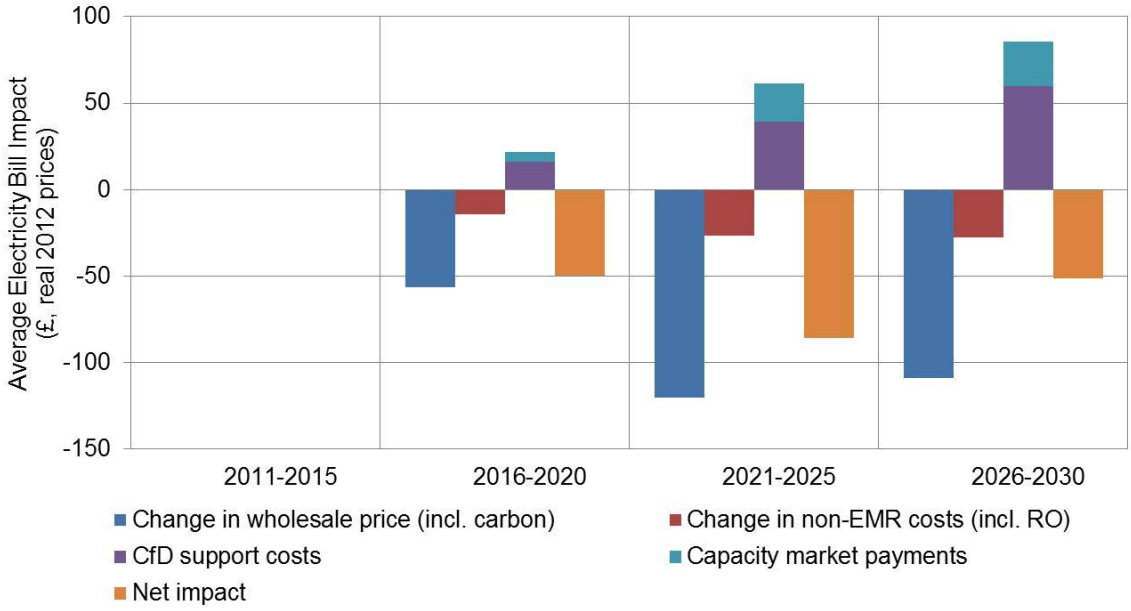
impacts-of-energy-and-climate-change-policies-on-energy-prices-and-bill) which compares the cumulative impact of all policies against a scenario with no policies.

[76] The percentage reductions are larger for businesses than households because electricity prices are lower for businesses meaning a comparable £/MWh reduction in price results in a larger percentage reduction for businesses. It does not reflect any exemptions from CfD costs for electro-intensive industries, the details of which are still under consideration and have therefore not been factored into this analysis.

are higher than in previous estimates owing to revisions to the counterfactual.[77]

Chart 2: Net Impact of EMR on Household Electricity Bills Relative to Achieving Similar Levels of Decarbonisation Using Existing Policy Instruments



Absolute costs

118. As noted above, we expect the payments paid to generators as part of EMR to be passed onto consumers (households and businesses) through their electricity bills. In 2020, our analysis suggests that around £28 and £13 of the annual household energy bill will go towards CfD and Capacity Market payments respectively (real 2012 prices, excluding VAT). These estimates have been made using DECC's standard prices and bills methodology and involve spreading the expected aggregate payments across total electricity sales (for all consumers) on a £ per MWh basis.

[77] Input assumption changes in the updated analysis have pushed up the relative cost of achieving decarbonisation using alternative policies, such as the carbon price floor.

Further information

119. Further information on the overall impacts of Electricity Market Reform can be found in the associated Impact Assessment, available at https://www.gov.uk/government/publications/energy-bill-impact-assessments. This Impact Assessment will be updated during July 2013 to reflect the decisions published for consultation in the draft EMR Delivery Plan.

Chapter 5: Forward Look to 2030

120. In the Carbon Plan of 2011, Government confirmed its commitment to finding a sustainable pathway for the decarbonisation of our electricity system. We will need a new generation of secure, low carbon electricity, powered by a mix of renewable energy, new nuclear power and fossil fuel power stations fitted with new Carbon Capture and Storage (CCS) technology capable of locking away carbon dioxide emissions, and reusing as far as possible the waste heat that is generated. It identified that much of this change is likely to need to happen between now and 2030.[78]

121. Earlier chapters and the accompanying analysis describe how the decisions published in this draft Delivery Plan are expected to influence the generation mix to 2020/21, and how deployment may diverge from these central projections in response to changes such as fuel price or demand. This chapter provides indicative illustrations of deployment requirements beyond this period.

122. The strike prices published in this draft Delivery Plan reflect the spending envelope established by the Government, which is set through the Levy Control Framework.[79] This Framework, which sets a cap on the total amount of the levies that can be imposed on consumers, is currently set to 2020/21, and arrangements are yet to be made for the Framework beyond this period.

Decarbonisation of the electricity sector during the 2020s

123. The Government is committed to ensuring a cost-effective approach to meeting the UK's legally binding target to reduce greenhouse gas emissions by 80% of 1990 levels by 2050. In order to drive progress and keep the UK on a pathway to achieve our 2050 target, the Climate Change Act introduced a system of Carbon Budgets, which provide legally-binding limits on the amount of emissions that may be produced in successive five year

[78] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/47613/3702-the-carbon-plan-delivering-our-low-carbon-future.pdf

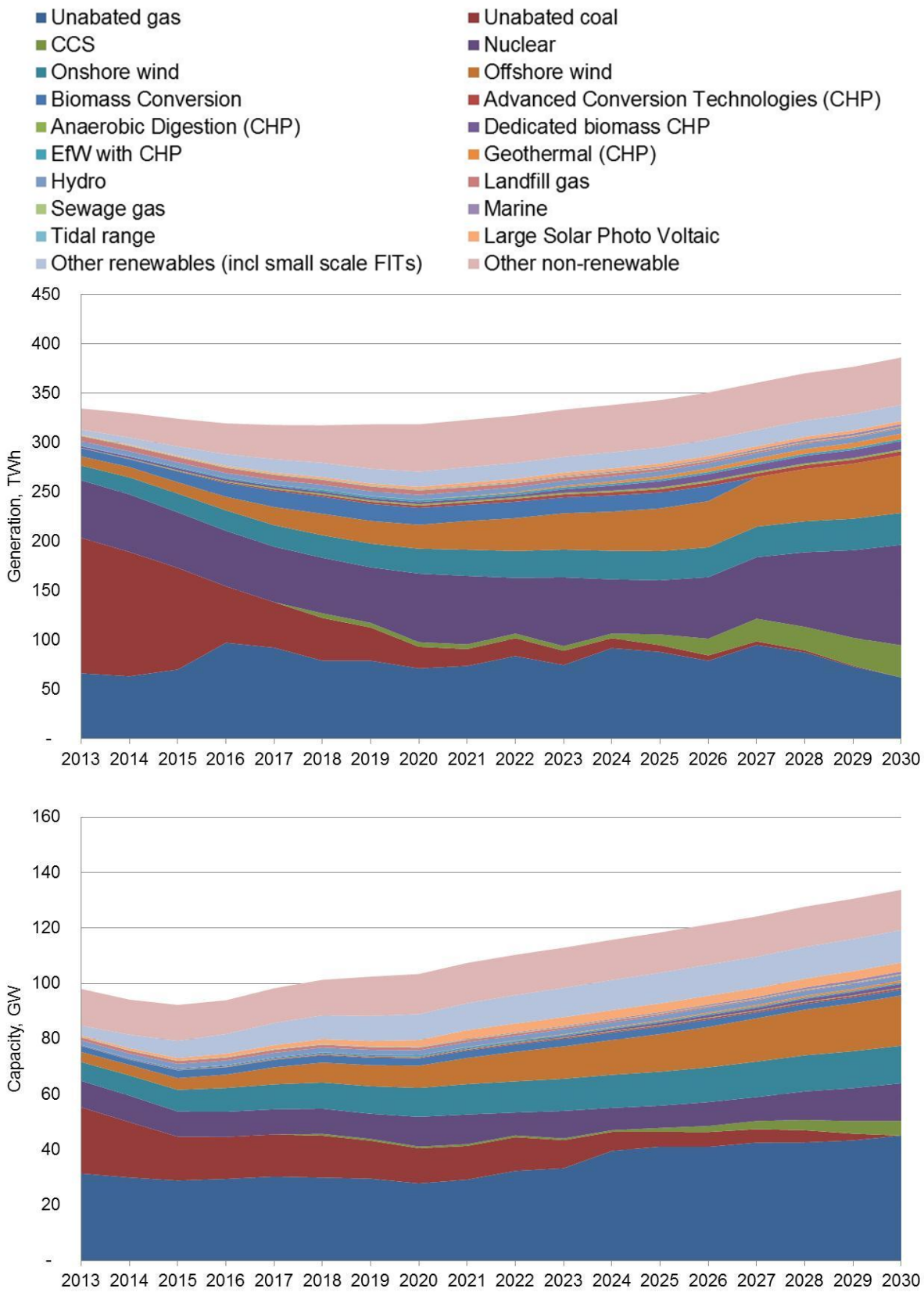
[79] The Control framework for DECC levy-funded spending that forms part of the Governments public spending framework. Full details can be found at Annex D

periods. More information on Carbon Budgets can be found on the Government web pages.[80]

124. This chapter considers three different decarbonisation trajectories to 2030. The main analysis reflects the central assumption used consistently in analysis of Electricity Market Reform by DECC, namely a trajectory to around 100g CO_2/kWh grid emissions intensity in 2030. The second is a sensitivity analysis based on a trajectory to around 50g CO_2/kWh in 2030 and the third is a sensitivity analysis based on a trajectory to around 200g CO_2/kWh in 2030.[81]

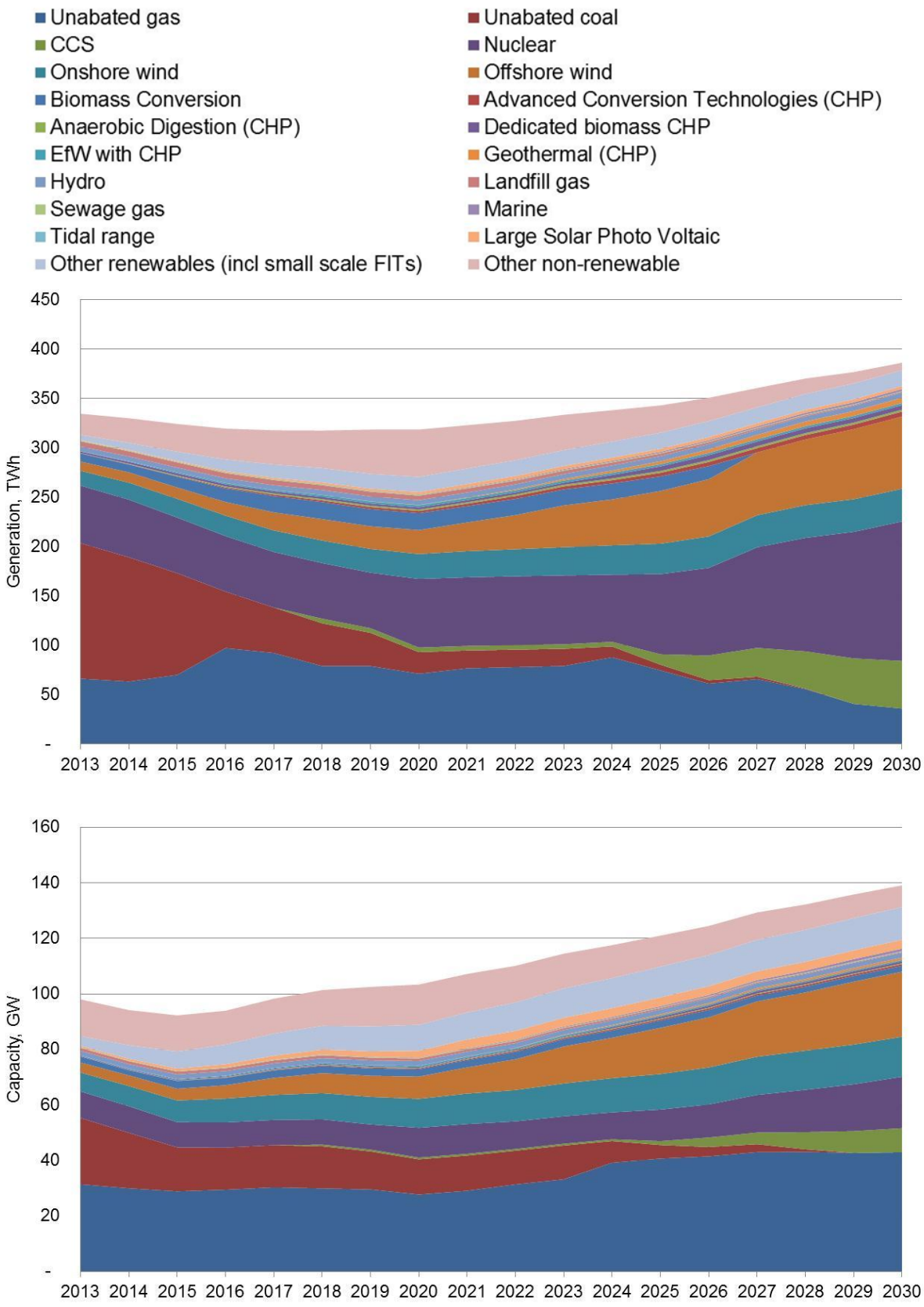
[80] https://www.gov.uk/government/policies/reducing-the-uk-s-greenhouse-gas-emissions-by-80-by-2050
[81] This approach is consistent with that of the Gas Generation Strategy published in December 2012 and available at https://www.gov.uk/government/publications/gas-generation-strategy

Chart 3: Scenario with 100g CO_2/KWh in 2030[82]



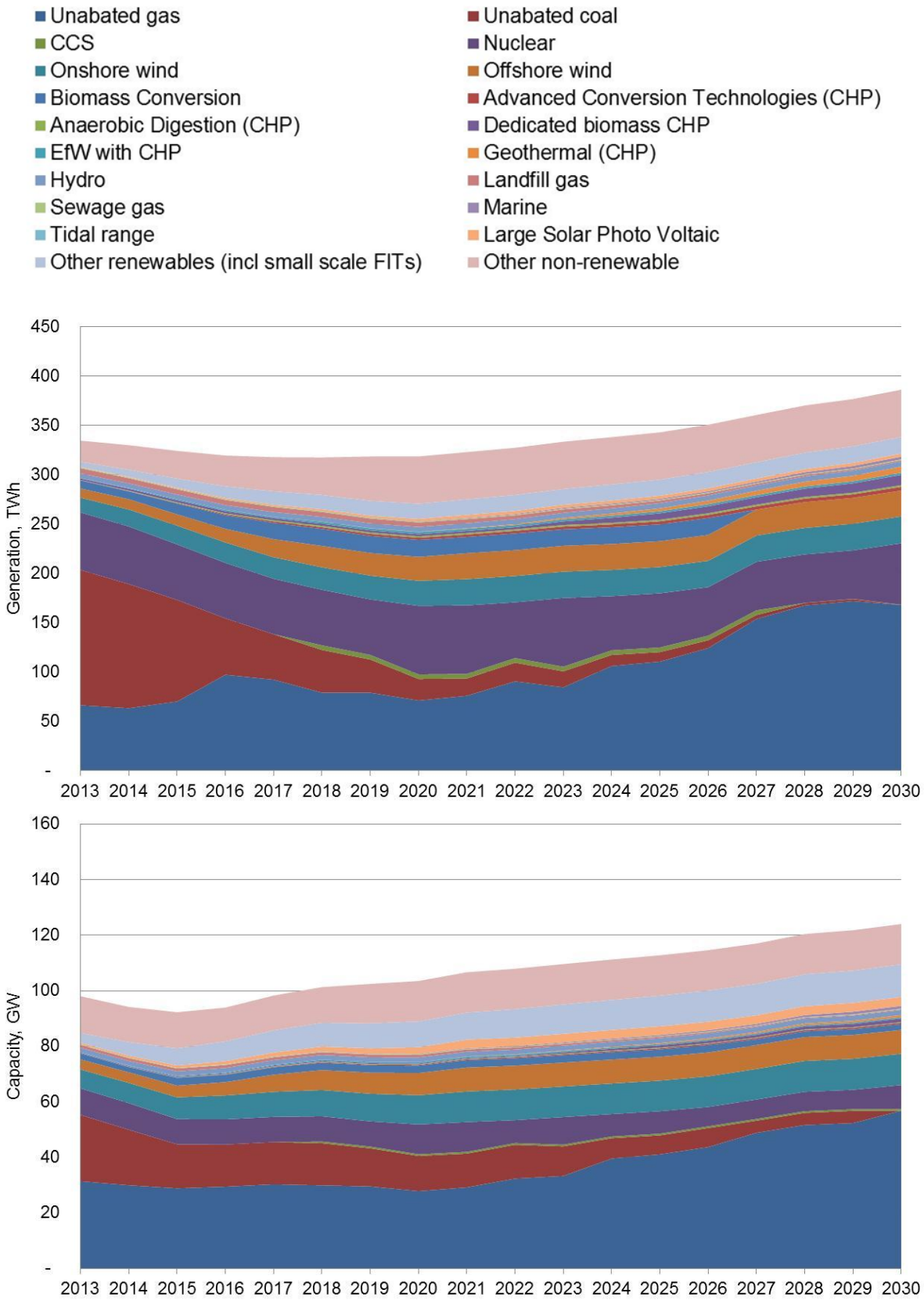
[82] Other renewables includes: small scale FiTs, small and large dedicated biomass, bioliquids, bioliquids CHP and EfW (renewable % only for generation charts); Other non-renewable includes: pumped storage, interconnectors, autogeneration, oil and, for generation charts only, EfW (non-renewable %).

Chart 4: Deployment Mix with Lower Grid Carbon Intensity in 2030 (50g CO_2/KWh)[83]



[83] Other renewables includes: small scale FiTs, small and large dedicated biomass, bioliquids, bioliquids CHP and EfW (renewable % only for generation charts); Other non-renewable includes: pumped storage, interconnectors, autogeneration, oil and, for generation charts only, EfW (non-renewable %).

Chart 5: Deployment Mix with Higher Grid Carbon Intensity in 2030 (200g CO_2/KWh)[84]



[84] Other renewables includes: small scale FiTs, small and large dedicated biomass, bioliquids, bioliquids CHP and EfW (renewable % only for generation charts); Other non-renewable includes: pumped storage, interconnectors, autogeneration, oil and, for generation charts only, EfW (non-renewable %).

Technology deployment in the electricity sector during the 2020s

125. The generation mix beyond the period of the first Delivery Plan, from 1st April 2019, will be influenced by how individual technologies develop in the coming decade. We are committed to maximising value for money for consumers. Our intent is to move to a competitive price discovery process for new generation for all low-carbon technologies as soon as practicable though we may still need to set prices administratively for some or all technologies from 1st April 2019 onwards.

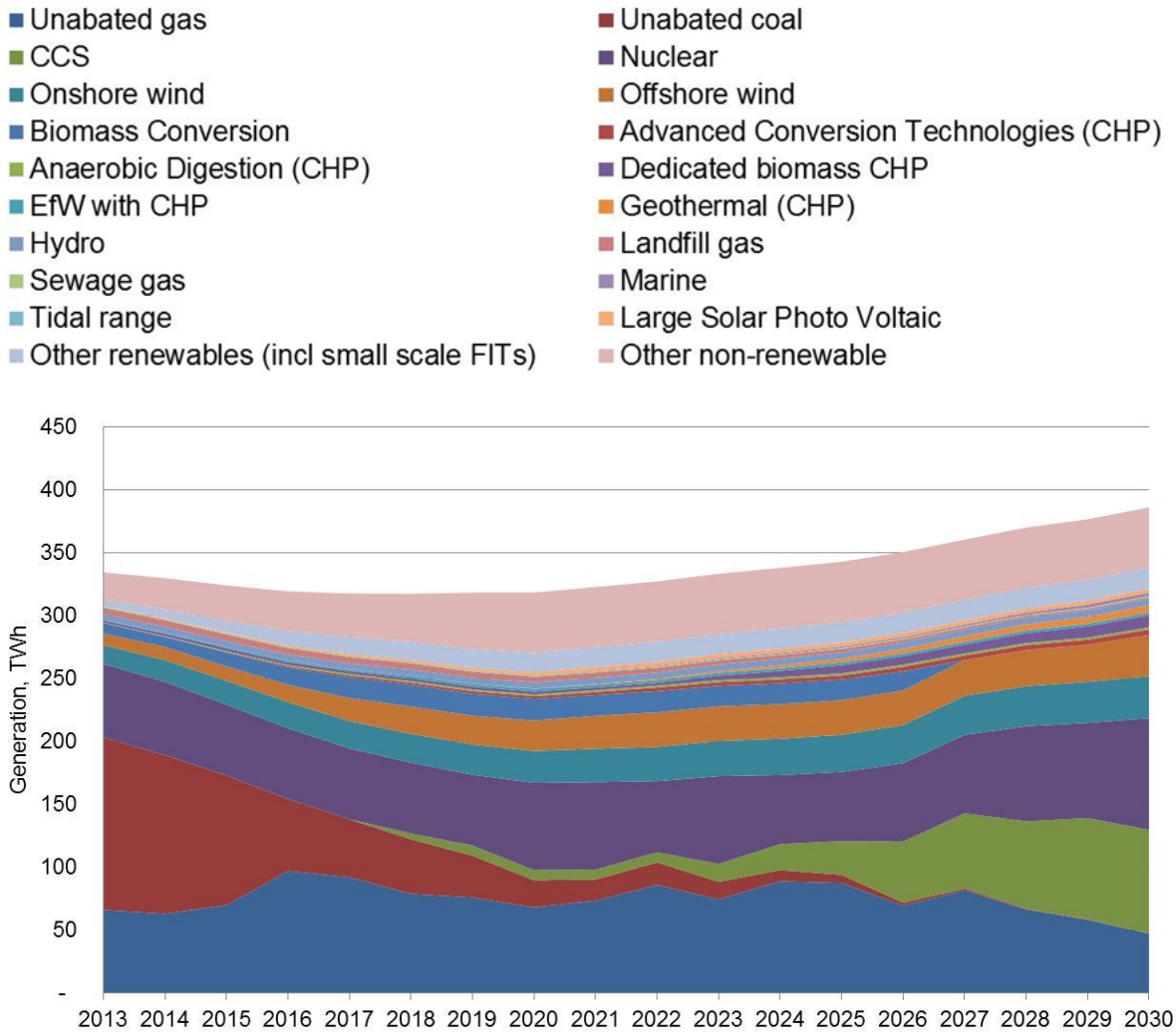
126. Initially, these competitive processes will differentiate between technologies, recognising that technologies will be at different stages of development, but the Government believes that it can introduce competitive tension between low-carbon technologies during the 2020s, with low-carbon technologies competing increasingly on price alone as the 2020s progress.

127. In accordance with this approach, we have explored three technology scenarios, to illustrate a range of low-carbon generation requirements. These scenarios are indicative: the electricity generation mix through the 2020s is unlikely to match any one of these scenarios exactly. All these scenarios are based on central assumptions of demand and grid intensity in 2030 (100g CO_2/KWh).

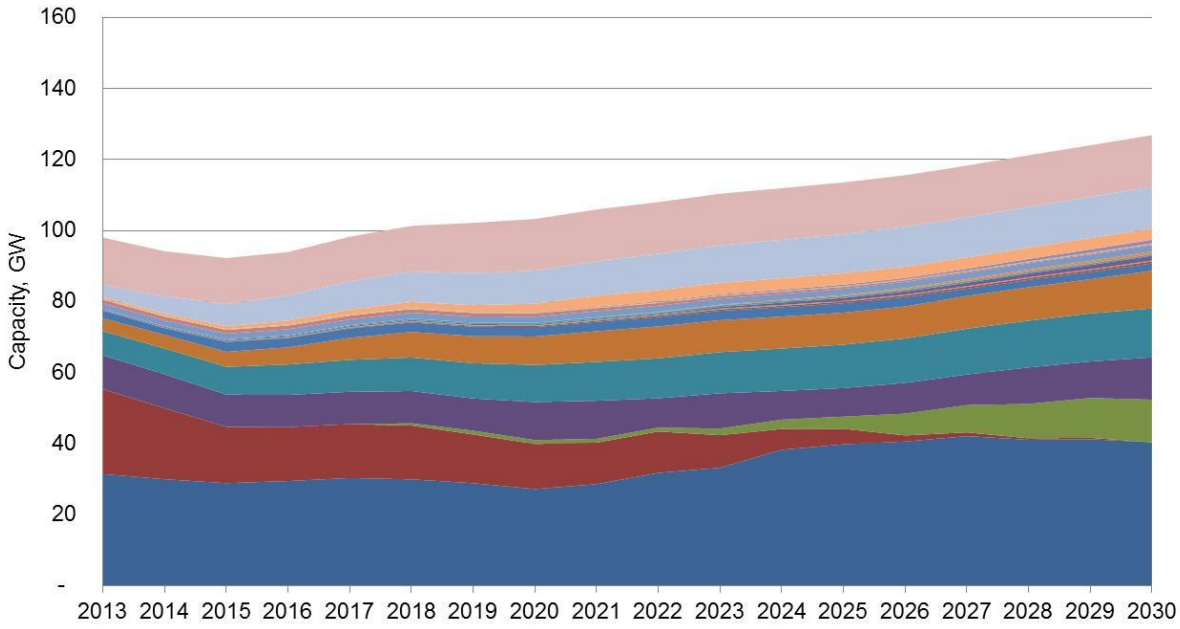
Scenario showing higher deployment rates of CCS

This scenario is based on central demand and decarbonisation assumptions (100g CO_2/KWh) and illustrates a generation mix that would be consistent with CCS costs and deployment circumstances being favourable compared to other technologies. In this scenario, three CCS plants are built by the end of 2020, with commercial deployment of both gas and coal CCS throughout the 2020s- leading to deployment of around 12 GW CCS in 2030.

Chart 6: Higher Deployment Rates of CCS[85]



[85] Other renewables includes: small scale FiTs, small and large dedicated biomass, bioliquids, bioliquids CHP and EfW (renewable % only for generation charts); Other non-renewable includes: pumped storage, interconnectors, autogeneration, oil and, for generation charts only, EfW (non-renewable %).


160
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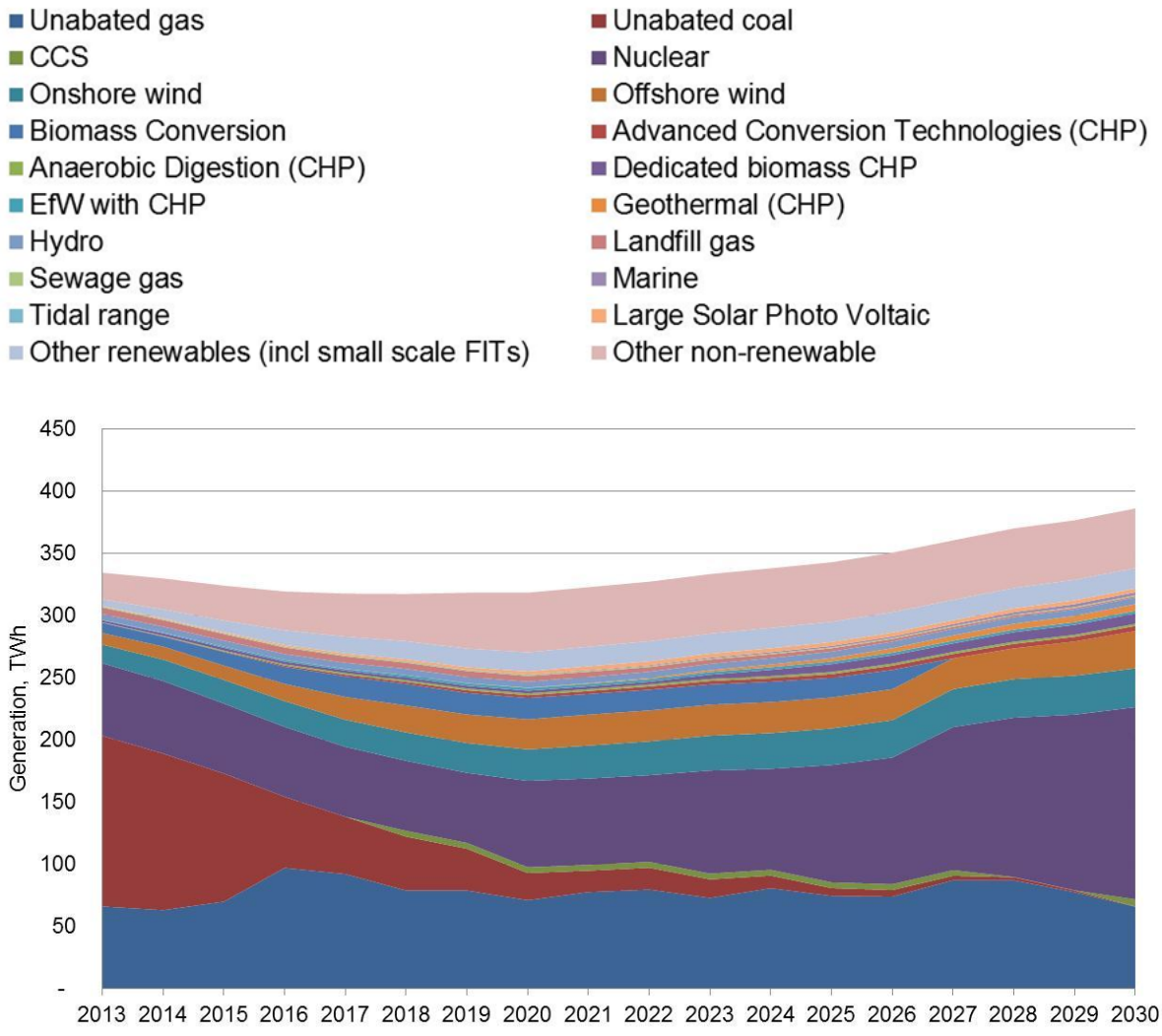
-
Capacity, GW
2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030

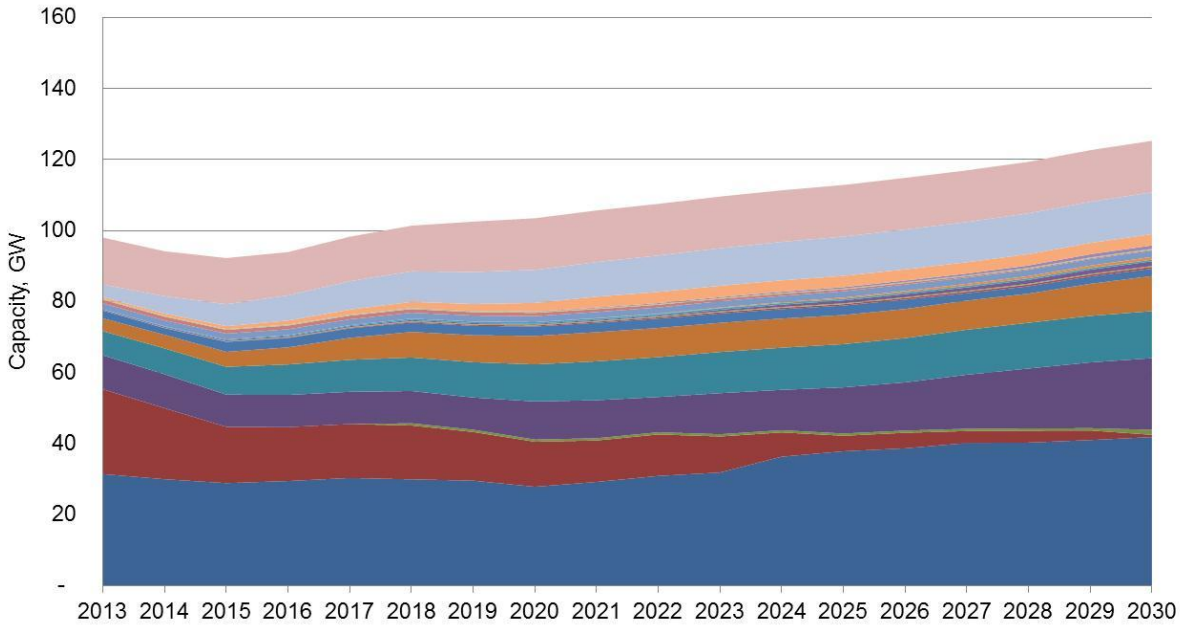
Scenario showing higher deployment rates of nuclear generation

This scenario is based on central demand and decarbonisation assumptions (100g CO_2/KWh) and illustrates a generation mix that would be consistent with nuclear costs and deployment circumstances being favourable compared to other technologies and high nuclear build throughout the 2020s - leading to deployment of around 20GW of nuclear generation in 2030.

Chart 7: Higher Deployment Rates of Nuclear[86]



[86] Other renewables includes: small scale FiTs, small and large dedicated biomass, bioliquids, bioliquids CHP and EfW (renewable % only for generation charts); Other non-renewable includes: pumped storage, interconnectors, autogeneration, oil and, for generation charts only, EfW (non-renewable %).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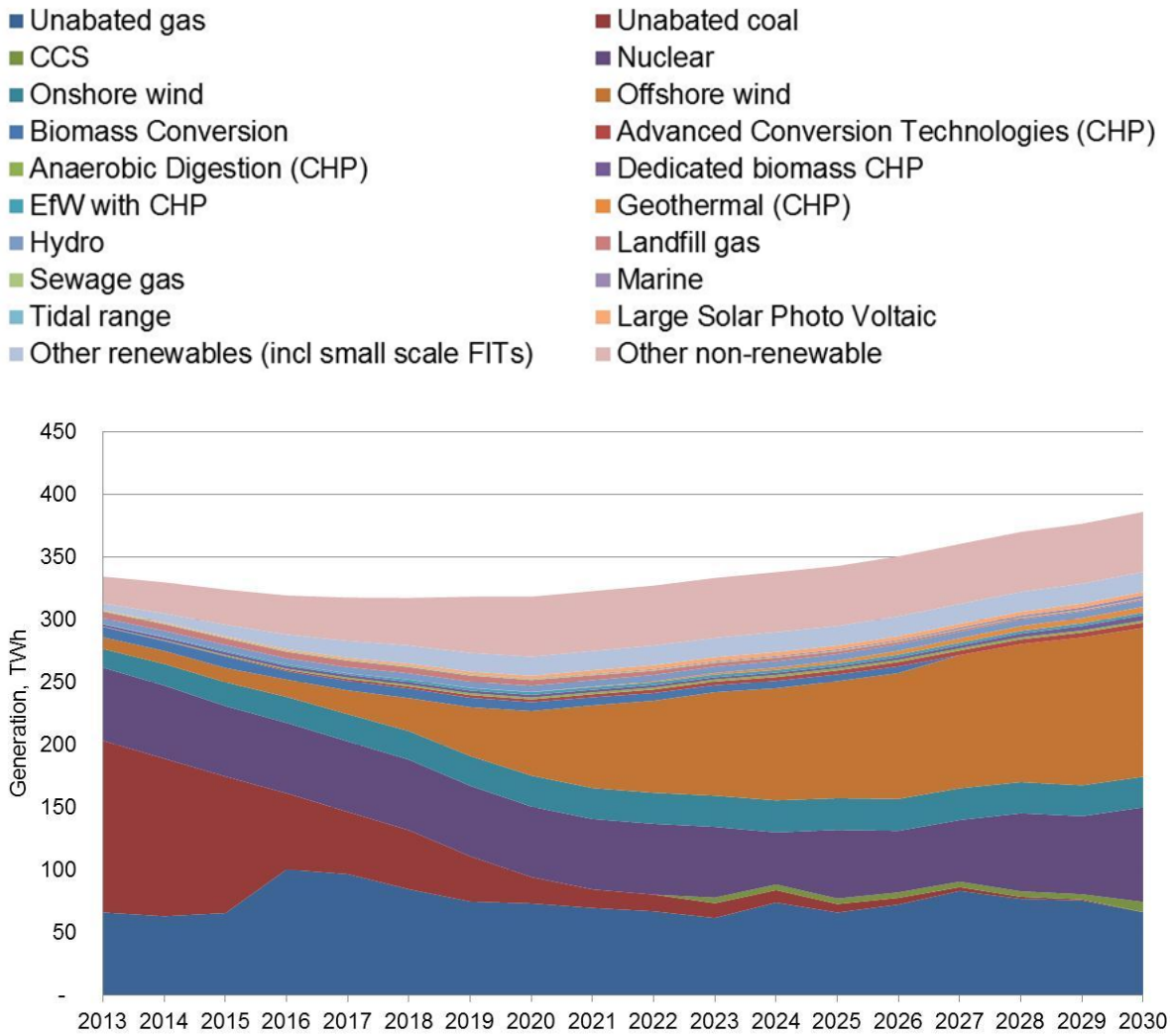
Capacity, GW
2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030

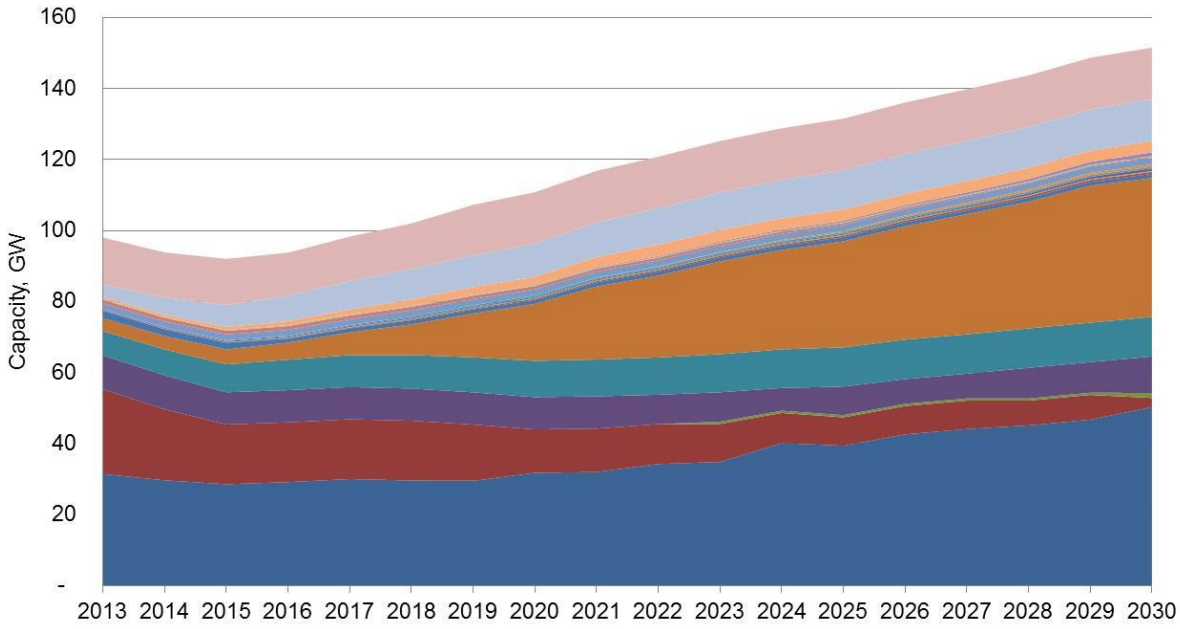
Scenario showing higher deployment rates of offshore wind

This scenario is based on central demand and decarbonisation assumptions (100g CO2/KWh) and illustrates the generation mix that would be consistent with the costs and deployment circumstances of offshore wind being favourable compared to other technologies. Under this scenario, the costs of offshore wind fall more rapidly than support levels, and offshore wind deployment rises to 39GW by 2030 (compared to 3.3GW of fully operational offshore wind now). In this scenario, CCS and nuclear plants do not come forward before 2020.

Chart 8: Higher Deployment Rates of Offshore Wind[87]



[87] Other renewables includes: small scale FiTs, small and large dedicated biomass, bioliquids, bioliquids CHP and EfW (renewable % only for generation charts); Other non-renewable includes: pumped storage, interconnectors, autogeneration, oil and, for generation charts only, EfW (non-renewable %).



Summary of scenarios[88]

128. It should be noted that the scenarios shown above are illustrative: the actual deployment levels realised in this period will depend on cost reductions, support levels and other factors. For example, in the high offshore wind scenario, central offshore wind costs are assumed to fall to around £95/MWh in the mid-2020s, with support levels falling significantly less quickly than costs. This would have to be a policy decision for the Government of the day.

129. Our modelling suggests deployment of roughly 39GW of offshore wind in 2030 would be consistent with those assumptions. In the first scenario shown below (100g/CO_2 per KWh), offshore wind costs are assumed to fall less quickly than this – to around £125/MWh in the mid-2020s, which leads to modelling projections of around 18GW offshore wind deployment in 2030[89]. The range of nuclear deployment in 2030 (9-20 GW) is consistent with central costs estimate

[88] All cost estimates quoted here refer to levelised costs presented at technology-specific hurdle rates in line with the modelling approach. More information can be found in Table 7 of DECC's Electricity Generation Cost Report. Levelised costs (which summarise generation cost data) are not strike prices, as strike-price setting may reflect other factors including: other revenue assumptions; costs not included in DECC's definition of levelised costs; CfD contracting terms; financing arrangements; and wider policy considerations.

[89] These cost estimates refer to deployment of Round 3 offshore wind at technology-specific hurdle rates; they are illustrative and do not account for full cost uncertainties. More information can be found in Table 7 of DECC's Electricity Generation Cost Report https://www.gov.uk/government/organisations/department-of-energy-climate-change/series/energy-generation-cost-projections.

of around £85/MWh in the mid-2020s[90]. Similarly, the range of CCS deployment in 2030 is consistent with CCS costs in the range of between £95-125/MWh in the mid 2020s, depending on scenario and technology[91]. The Government has not yet agreed an LCF cap beyond 2020/21. More information on cost estimates can be found in DECC's "Electricity Generation Cost Report 2013".

Capacity and generation (rounded by GW or TWh as appropriate)

	Installed capacity in 2030 (GW)			
	Offshore wind	**Onshore wind**	**CCS**	**Nuclear**
100g CO_2/kWh scenario[92]	18	14	5	14
50g CO_2/kWh scenario	23	14	9	19
200g CO_2/kWh scenario	9	11	1	9
High CCS deployment scenario	11	14	12	12
High nuclear deployment scenario	10	13	1	20
High offshore wind deployment scenario	39	11	1	10

[90]. This analysis uses generic generation cost estimates for nuclear power, as opposed to any site-specific nuclear cost discovery exercises. A fuller range of uncertainty on the generic nuclear levelised costs in the mid-2020s is around £75-100/MWh as presented in the levelised cost report. For the reasons listed above, This data should in no way be seen as a guide to potential strike prices for early new nuclear power plants.

[91] There is considerable uncertainty at this stage of CCS development as to which technologies will prove the most cost-effective in the long-term. There is also a wider range of uncertainty presented in the levelised cost report, relating to future capital costs, which widens the range to around £85-210/MWh

	Annual generation in 2030 (TWh)			
	Offshore wind	**Onshore wind**	**CCS**	**Nuclear**
100g CO_2/kWh scenario	58	32	33	102
50g CO_2/kWh scenario	73	33	48	141
200g CO_2/kWh scenario	26	27	<1	62
High CCS deployment scenario	33	33	83	89
High nuclear deployment scenario	30	31	6	154
High offshore wind deployment scenario	119	24	8	76

Chapter 6: Next Steps

130. In light of the responses to the consultation the Government may commission further analysis from the System Operator (National Grid).

131. We will continue to consult with the Devolved Administrations and the Panel of Technical Experts in the further development of the final Delivery Plan.

132. Following consultation and by the end of 2013, the Government intends to publish the EMR Delivery Plan with the confirmed strike prices for CfDs for renewable technologies and the reliability standard. The publication of the Delivery Plan is subject to Royal Assent of the Energy Bill as the Delivery Plan's contents are dependent on the EMR framework in the Bill being enacted.

Other forthcoming EMR publications

133. In the recent publication 'Electricity Market Reform – Delivering UK Investment' we set out our next steps in EMR, and forthcoming publications. We will publish further detail on the CfD contract terms in early August, including draft contract terms for all the key terms which go to the value of the CfD contract. At the same time, we will set out more detail on the allocation of CfDs, and the Government response to the call for evidence on the CfD supplier obligation.

134. We will engage with interested stakeholders on the detailed drafting of the CfD contract. The final contract drafting is expected to be published in December alongside the final strike prices, and implemented through regulations laid before Parliament in 2014.

135. In parallel, the Government will consult in October on any issues relating to the design or operation of the CfD or Capacity Market mechanism which it feels it is necessary or appropriate to do so. The October consultation may be accompanied by draft implementing secondary legislation to help illustrate the policy proposals. The EMR programme is on track to be implemented in 2014, with the first CfDs under the generic regime expected to be signed in the second half of 2014, and the first capacity auction at the end of 2014.

136. These timelines are subject to State Aid approval. The Government is in discussion with the European Commission to secure this.

List of Consultation Questions

Consultation Questions – CfD for Renewables	
1.	Do you agree that CfD strike prices should be set comparable to the Renewables Obligation for the period 2014/15-2016/17? If not, why and what alternative would you propose?
2.	The methodology for setting Renewables Obligation-comparable strike prices is described in Box 1 and the resulting strike prices are in Table 1. Do you agree that the strike prices we have set offer support that is comparable with the Renewables Obligation? Please provide evidence to support your position
3.	We propose that where technology costs are expected to decline, strike prices should decline over time to reflect technology cost reductions and ensure value for money. Do you agree that this the most appropriate basis on which strike prices should change over time? If not, why and what alternative would you propose?
4.	Do you believe that the recommended strike prices shown in Table 1 change over time in a way that appropriately reflects technology cost reductions and ensures value for money? Please provide evidence to support your position
5.	Do you agree with the key assumptions underpinning the strike price analysis, as described in Box 2, and in particular: • The technology costs • The build constraints • The hurdle rates • The decision to update our assumptions on the level of tax paid by developers, based on advice from KPMG • The Power Purchasing Agreement discounts

	Please provide evidence to support your position
6.	Do you agree with our judgement that setting strike prices consistent with Core Scenario 32% (described above and in the Report from the System Operator at Annex E) is the best way to balance the Government's objectives of renewables deployment and affordability? If not, please state why.
7.	Do you agree with our proposed approach by technology? Please provide evidence to support your position
8.	We have not set a strike price for co-firing plants because our preference is for conversions, which are more sustainable and provide higher levels of renewable generation. Do you agree with this approach? Please provide evidence to support your position
9.	Government's 2012 Bioenergy Strategy concluded that support for new dedicated biomass should be treated with caution given the lock-in risks for this technology and its relatively high costs of carbon abatement compared to biomass co-firing/conversions. In line with this conclusion, we have not set a strike price for dedicated biomass without CHP. Do you agree with this approach? Please provide evidence to support your position.
10.	We have not set a strike price for standard bioliquids, as we do not wish to divert this technology from more suitable sectors such as transport. Do you agree with this approach? Please provide evidence to support your position
11.	We have not set a strike price for geopressure since the technology is at development stage, and no geopressure projects have come forward through the Renewables Obligation. Do you agree with this approach? Please provide evidence to support your position
	Consultation Questions – Capacity Market

12.	Do you agree with our proposed reliability standard of 3 hours LOLE?
13.	Do you agree with the methodology underpinning the reliability standard – that is to calculate this using the value of lost load and the cost of new entry? If not, please explain why and provide supporting evidence.
14.	Do you agree with the analysis of the value of lost load as described on Page 48 and in Annex C? If not, please explain why and provide supporting evidence.
15.	Do you agree with our estimate of the cost of new entry as described on page 49 and in Annex C? If not, please explain why and provide supporting evidence.
16.	Do you agree the reliability standard should be reviewed every five years to reflect any future evidence in the value of lost load and the cost of new plant entry?
17.	Do you agree with the proposed methodology for the auction demand curve? If not, please explain why and provide supporting evidence.

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