HOUSE OF LORDS

Select Committee on Economic Affairs

2nd Report of Session 2016–17

The Price of Power: Reforming the Electricity Market

Ordered to be printed 8 February 2017 and published 24 February 2017

Published by the Authority of the House of Lords

HL Paper 113

Select Committee on Economic Affairs

The Economic Affairs Committee was appointed by the House of Lords in this session "to consider economic affairs".

Membership

The Members of the Select Committee on Economic Affairs are:

Baroness Bowles of Berkhamsted
Lord Burns
Lord Darling of Roulanish
Lord Forsyth of Drumlean
Lord Hollick (Chairman)
Lord Kerr of Kinlochard
Lord Lamont of Lerwick
Lord Layard
Lord Livermore
Lord Sharkey
Lord Tugendhat
Lord Turnbull
Baroness Wheatcroft

Declaration of interests

See Appendix 1.

A full list of Members' interests can be found in the Register of Lords' Interests:
http://www.parliament.uk/mps-lords-and-offices/standards-and-interests/register-of-lords-interests

Publications

All publications of the Committee are available at:
http://www.parliament.uk/hleconomicaffairs

Parliament Live

Live coverage of debates and public sessions of the Committee's meetings are available at:
http://www.parliamentlive.tv

Further information

Further information about the House of Lords and its Committees, including guidance to witnesses, details of current inquiries and forthcoming meetings is available at:
http://www.parliament.uk/business/lords

Committee staff

The staff who worked on this inquiry were Ayeesha Waller (Clerk), Ben McNamee (Policy Analyst), Oswin Taylor (Committee Assistant) and Dr Aaron Goater and Dr Jonathan Wentworth of the Parliamentary Office of Science and Technology.

Contact details

All correspondence should be addressed to the Clerk of the Economic Affairs Committee, Committee Office, House of Lords, London SW1A 0PW. Telephone 020 7219 5358. Email wallera@parliament.uk

Twitter

You can follow the Committee on Twitter: @LordsEconCom.

CONTENTS

Evidence is published online at http://www.parliament.uk/uk-energy-policy and available for inspection at the Parliamentary Archives (020 7219 3074).

Q in footnotes refers to a question in oral evidence.

SUMMARY

The long-standing objectives of energy policy are to ensure a secure and affordable supply of power. A third objective—the decarbonisation of the power supply—was added in the 21st century as governments adopted long-term carbon emissions targets, culminating in the Climate Change Act 2008 which requires the UK to reduce 1990 levels of carbon emissions by 80 per cent by 2050.

These three objectives are not complementary at present. The generation of electricity from fossil fuels is cheaper than renewable sources. To reduce carbon emissions, governments have subsidised renewables, passing on the cost to consumers in their electricity bills. The average domestic electricity bill was 58 per cent higher in 2016 than it was in 2003; industrial electricity prices in Britain today are higher than anywhere else in Europe. With Hinkley Point C, the Government, in pursuit of decarbonisation targets, is guaranteeing subsidies which could commit future generations to inflated electricity prices.

Some renewable sources of energy do not deliver a consistent supply of electricity. Their generation varies with the weather so as dependence on them has grown, so has the need for reliable back-up generation to ensure that the lights do not go out. Ensuring this back-up is available has added to consumers' bills.

We have taken as given the Government's commitment to the progressive decarbonisation of the power supply. But this report shows how the interventions of successive governments to achieve this have come at a high cost to the consumer. These interventions have also meant that there is no longer a competitive market for electricity generation. Exemplified by the fact that no new power stations have been built without some form of government support since 2012.

There are ongoing concerns about the Hinkley Point deal and other planned new nuclear power stations. It is imperative that the Government publishes it contingency plans for how it will make up the capacity due to be provided by these plants in the event one or more does not succeed or is delayed.

We believe security of supply must be the predominant consideration in energy policy, as confirmed to us by the Secretary of State. Decarbonisation of the electricity supply should be encouraged but in a more cost-effective way than it has been to date. Our report makes recommendations for how this can be achieved.

The Government should use its powers to vary the pace of emissions reductions to achieve the 2050 target rather than adhering to the linear approach mandated by the carbon budgets. Consumers may be paying an unnecessarily high cost to meet the carbon budget interim targets when future technological advances may bring the cost of renewable generation down substantially, as demonstrated by dramatic recent falls in the cost of solar and offshore wind.

To ensure electricity is supplied at the lowest possible cost to consumers, there must be a return to a more competitive market. The best way to do this would be to allow all technologies to compete in a single auction for electricity generating capacity where the desired level of carbon emissions and capacity is fixed. This would enhance security as well as competitiveness. A new Energy Commission

should oversee this auction and advise government on how to achieve the optimum balance between the objectives of energy policy.

The Government has made a welcome commitment to double funding for energy research and development. Much of the increased funding should go to creating a new world-class National Energy Research Centre that would help ensure this funding is directed towards research that could reduce the cost of new technologies and make them commercially viable.

The Price of Power: Reforming the Electricity Market

CHAPTER 1: INTRODUCTION

> *"In the last Parliament, we passed a law to encourage the private generation of electricity. In the next Parliament, we shall seek other means of increasing competition in, and attracting private capital into, the gas and electricity industries." Conservative Party Manifesto, 1983*

> *"We have brought full competition to the gas and electricity markets." Labour Party Manifesto, 2001*

> *"[The Government] has decided to intervene in the market in various ways. Has that changed the idea? Is it less of a competitive market than it was 15 years ago? Undoubtedly, yes." Dermot Nolan, chief executive of Ofgem, November 2016*

1. In 1982, after decades of state planning in British energy markets, the Conservative government sounded a retreat. It would be left to market forces to dictate prices and investment in electricity generation. The role of government would be confined to setting the framework within which a competitive market could operate.[1] This liberalised vision of energy markets had achieved wide acceptance by the end of the 1990s; it was embraced by the Labour government and formed the basis for the European Union's internal energy market.[2]

2. But just over a decade later, a succession of policy interventions has led to the creation of a complex system of subsidies and government contracts at the expense of competition.[3] Nobody has built a power station in Britain without some form of government guarantee since 2012.[4] The current level of intervention cuts across the competitive market.

3. How and why has this happened and what are the consequences for consumers? This report shows how poorly designed government interventions, in pursuit of the decarbonisation of electricity generation, have put unnecessary pressure on the electricity supply and left consumers paying too high a price (Chapter 3). We make recommendations to help the Government reintroduce competition in the market—putting downward pressure on prices—while at the same time ensuring supplies remain secure in a manner consistent with reducing carbon emissions (Chapter 4).

---

1 Nigel Lawson MP, *The Market for Energy*, speech to the British Institute of Energy Economics, Cambridge, June 1982 (reproduced in D Helm, J Kay and D Thompson, *The Market for Energy* (Oxford: Clarendon Press, 1989)

2 Q 3 (Professor Dieter Helm)

3 Written evidence from Good Energy (UEM0038)

4 Q 73 (Peter Atherton)

4. This report concentrates on the electricity market. Electricity represents around 20 per cent of the total energy market and it has been the main focus of public policy since the Second World War.[5] The reduction in the use of petroleum and natural gas necessary to meet long-term carbon emissions targets is likely to lead to electricity becoming the main fuel used by energy consumers. We received some evidence on the challenges of decarbonising heating and transport but feel they warrant the attention of a full inquiry to do them justice. We may return to these areas in a future inquiry.

5. We also received evidence on energy efficiency, in particular the failure of the previous Government's green deal initiative, energy infrastructure, the future of North Sea exploration and development and shale gas. These issues have all been the subject of recent reports and we do not cover them in this report.[6]

6. As stated in the call for evidence for the inquiry, the Committee did not seek evidence relating to the science of climate change and we take as a given that the UK will remain committed to reducing carbon emissions.

5 Electricity accounted for 18 per cent of total fuel consumption by final consumers in 2015 (measured by million tonnes of oil equivalent). Petroleum made up 48 per cent and natural gas 29 per cent.

6 Committee of Public Accounts, *Household energy efficiency measures* (Eleventh Report, Session 2016–17, HC 125); House of Lords Science and Technology Committee, *The Resilience of the Electricity System* (1st Report, Session 2014–15, HL 121); Sir Ian Wood, *UKCS Maximising Recovery Review*, 24 February 2014: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/471452/UKCS_Maximising_Recovery_Review_FINAL_72pp_locked.pdf [accessed February 2017]; Economic Affairs Committee, *The Economic Impact on UK Energy Policy of Shale Gas and Oil* (3rd Report, Session 2013–14, HL 172)

CHAPTER 2: DEVELOPMENTS IN ENERGY POLICY

7. This chapter considers how energy policy in relation to electricity has developed over recent decades. It will use the Hinkley Point C project as a case study to illustrate some of the main issues with present policy.

Government's objectives for energy policy

8. The Department for Business Energy and Industrial Strategy said in their written evidence that the Government's "overarching economic challenge for energy policy" was to ensure that the country's energy is:

- reliable;
- affordable;
- clean.[7]

9. Nearly all our witnesses agreed that these are the correct objectives for energy policy and they are shared by most other developed countries.[8] It is clear though that these objectives can conflict and trade-offs are required when developing energy policies. Matthew Bell, Chief Executive of the Committee on Climate Change, acknowledged these "tensions" between the objectives and pointed out: "In some instances, they will all work in the same direction. In others, the tensions will require choices."[9]

10. Carbon Connect gave two examples of the conflict between the objectives:

> "measures to decarbonise the energy system, such as the progressive removal of coal-fired plants, have arguably threatened the continuity of supply, whilst subsidies to assist the introduction of renewables have led to price rises for consumers."[10]

11. Hinkley Point C, discussed below, offers another example where affordability has not been given sufficient priority. The cost of Hinkley Point C is deferred to the next generation: a child born when the project was confirmed in 2016 will be 44 years old when payments under the contract for difference cease.

12. Chapter 3 explains how British electricity prices, for domestic and business users, have risen sharply in recent years. This is in part due to badly designed policies, pursued by successive governments, which have prioritised decarbonisation. We consider that affordability needs to be given more weight in policy-making and Chapter 4 sets out our thinking and recommendations on this in greater detail.

13. Before examining solutions, however, we need to look in more detail at how government policy moved away from a liberalised market approach that had resulted in Britain having the cheapest electricity prices in Europe by the early 2000s.[11]

---

7 Written evidence from the Department for Business, Energy and Industrial Strategy (UEM0083)
8 Q 1 (Prof Dieter Helm)
9 Q 53 (Matthew Bell). When discussing the tension between the objectives, Mr Bell thought that 'conflict' was "probably the wrong word to use".
10 Written evidence from Carbon Connect (UEM0009)
11 See Figure 3.

Changes in energy policy over recent decades

The market for Energy

14. In 1982, the then Secretary of State for Energy, Nigel Lawson, gave a speech that outlined what he saw as the government's role in the energy market:

> "I do not see the government's task as being to try and plan the future shape of energy production and consumption. It is not even primarily to try to balance UK demand and supply for energy. Our task is rather to set a framework which will ensure that the market operates in the energy sector with a minimum of distortion and energy is produced and consumed efficiently."[12]

15. The electricity supply had been nationalised after the Second World War and was planned centrally by the Central Electricity Generating Board.[13] Ed Miliband, speaking as the Secretary of State for Energy and Climate Change, described his predecessor's speech as "remarkable" in that "it sought to fundamentally challenge received doctrines about the market and state in energy policy … it preceded almost all of the energy privatisations of the Thatcher era and yet foreshadowed them and set out their intellectual framework."[14]

16. Professor Dieter Helm has written that the speech heralded a "radical departure" from the existing approach and he outlined the subsequent action taken by the government as follows:

> "a rolling programme of, first, downsizing the coal industry … pruning back the nuclear programme, liberalising North Sea licensing, privatising the gas and electricity industries, liberalising retail supplies, and then redesigning the electricity market … and finally extending this market into Scotland."[15]

17. The Labour Government in 1997 adopted this liberalising approach and were able to declare in their 2001 manifesto that they had brought "full competition to the gas and electricity markets".[16] The introduction of competition into the market had an effect on the average domestic electricity bill, which decreased from £489 in 1991 to £333 in 2003 (2010 prices, see Figure 1). Professor Helm concluded that "if the objective was cheap energy, then whatever the theoretical advantages of liberalised markets over planning, the new energy policy based upon the Lawson doctrine gradually delivered the results."[17]

---

12 Nigel Lawson MP, *op cit*.

13 Electricity Act 1947. The Central Electricity Generating Board was established by the Electricity Act 1957 and replaced the British Electricity Authority which carried out similar functions.

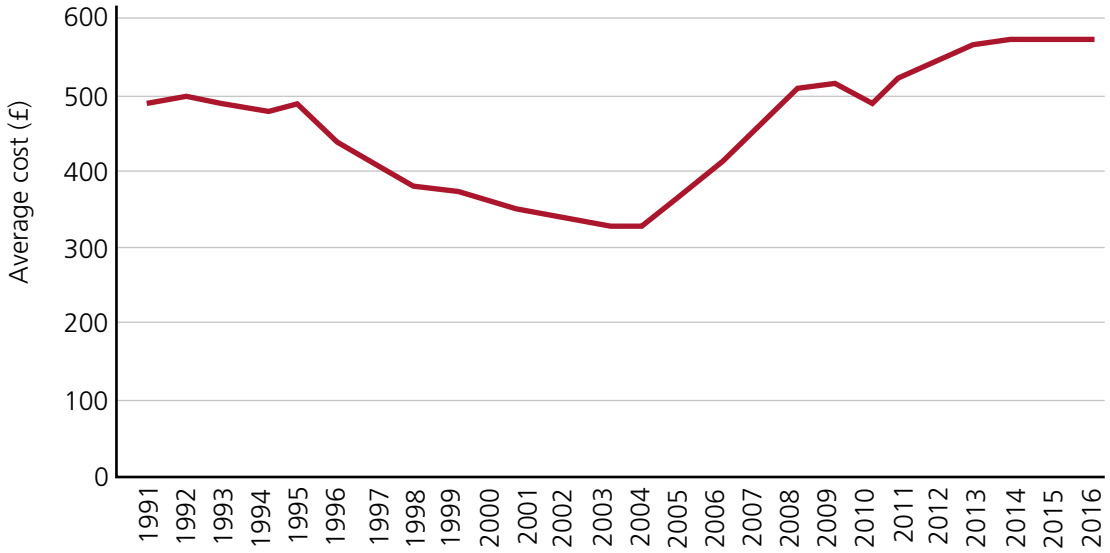
14 Ed Miliband MP, *The Rise And Fall And Rise Again Of A Department Of Energy* (9 December 2008): http://www3.imperial.ac.uk/pls/portallive/docs/1/54221696.PDF [accessed January 2017]

15 Dieter Helm, *The New Energy Paradigm* (Oxford: OUP, 2007), p 19

16 Labour Party, *Ambitions for Britain: Labour's manifesto 2001* (2001): http://www.politicsresources.net/area/uk/e01/man/lab/ENG1.pdf [accessed February 2017]

17 Dieter Helm, *The New Energy Paradigm* (Oxford: OUP, 2007), p 20

Figure 1: Average annual domestic electricity bills for a typical consumer in the UK, 1991 to 2016 (£, 2010 prices)[18]



Source: BEIS, Quarterly energy prices (22 December 2016), Table 2.2.1: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/49371/qep221.xls [accessed February 2017]

The rise and fall and rise again of a Department for Energy

18. The year 2001 perhaps proved to be the high watermark for the liberalised approach. By the end of the decade the Government was once again heavily involved in the market, through instruments such as the Renewables Obligation Certificate that was first introduced in 2002.[19] And a Department for Energy was back in Whitehall: abolished as a separate department in 1992, the 'Department for Energy and Climate Change' was established in 2008. In a speech to mark its creation, the then Secretary of State for Energy, Ed Miliband, said it spoke "to changing times".[20]

19. The department's new name highlighted what was perhaps the biggest change: the reduction of carbon emissions, to address concerns about climate change, had become a government objective of energy policy in the early 2000s. The Climate Change Act 2008 then committed the UK in law to reducing carbon emissions by 80 per cent of 1990 levels by the year 2050. A year before the European Union had set emissions targets for 2020: member states were required to cut emissions by 20 per cent and the UK was required to generate 15 per cent of its electricity from renewable sources by 2020.[21]

20. The other main change concerned security of supply. Capacity margins—the amount of electricity generating capacity relative to demand—were falling as older power stations came to the end of their life.

18 Prices deflated to 2010 terms using the GDP (market prices) deflator.
19 Discussed in Box 1.
20 Ed Miliband MP, *op. cit.*
21 This was the UK's share of the overall target to generate 20 per cent of the EU's energy from renewables by 2020. There was also a target to improve energy efficiency across the EU by 20 per cent by the same year.

21. Mr Miliband said that both of these changes required government to act:

> "These are … challenges where we cannot assume in advance that private incentives add up to the public good. No individual company will fully respond to the public interest in tackling climate change without a price on carbon. Each individual company has an interest in selling power to meet demand, but there is a greater public interest in ensuring security of supply … In a world where carbon didn't seem an issue, Britain had excess supply, and prices were low, it was easier for these market failures to be assumed away. Today, we don't have that luxury. That is why we need both dynamic markets and a strategic role for government".[22]

22. We accept that both of these considerations required a modification of the liberalised approach of the 1980s and 1990s—the market does not give sufficient incentives for generators to reduce emissions and ensure a sufficient level of excess capacity. But have recent governments sought to do this in the most cost-effective way?

Hinkley Point C: a case study

> *"I fundamentally believe that the deal is a fair deal for the investors and the consumers." Vincent de Rivaz, Chief Executive Officer of EDF*[23]

> *"The three Governments—starting with Labour, then the coalition and now the Conservatives—have managed to design possibly the most expensive programme for delivering nuclear power that we could have come up with … we are delivering this in a staggeringly expensive way." Peter Atherton, Cornwall Energy*[24]

23. In September 2016 the Government gave the go-ahead to the proposed Hinkley Point C nuclear power station. The Government had previously agreed to pay EDF, who will construct and operate the power station, £92.50 per megawatt hour for the electricity it produces.[25] This price, which will rise with inflation every year, is guaranteed for 35 years.

24. The agreement was made under a 'contract for difference' (see Box 2). Under EDF's current plans, Hinkley Point is expected to start generating electricity in 2025. Regardless of the changes in the cost of other forms of electricity generation, EDF will receive the inflation-linked strike price for the power it generates until 2060.

Value for money

25. Is this a fair deal for British consumers? The Government believes so. It published a three page document in September 2016 which purported to demonstrate that the strike price was competitive against a selection of other forms of low-carbon energy in 2025. It concluded by saying that the Secretary of State for Business, Energy and Industrial Strategy was "satisfied" that

22 Ed Miliband MP, *op. cit.*
23 Q 61 (Vincent de Rivaz)
24 Q 70 (Peter Atherton)
25 This was agreed in 2013 and the £92.50, index-linked from that date, is in 2012 prices. The price will be reduced to £89.50 per megawatt hour if EDF take a final investment decision on their proposed Sizewell C project.

offering the contract represented value for money.[26] Table 1 reproduces the price comparison made with other sources of low-carbon energy.

Table 1: Estimated cost of low-carbon electricity generation "in the 2020s"[27]

Electricity source	Estimated cost in megawatts per hour
Combined cycle gas turbine	£47 to £96
Onshore wind	£49 to £90
Solar (photovoltaics)	£65 to £92
Offshore wind	£81 to £132
Commercial carbon capture and storage	£77 to £249
Hinkley Point C strike price	*£92.50*

26. The document described the Hinkley Point C strike price as being "within the range of the costs" of the other technologies. We note the Hinkley Point C strike price is at the upper end of most of the estimates, the costs of other technologies, such as offshore wind, are coming down more quickly than anticipated and other technologies do not receive contracts for 35 years (offshore wind currently receives support for 15 years).[28] The value for money assessment pointed out that the estimates for solar and wind did not take account of backup generation costs or grid upgrades that would be required for them to produce the same amount of electricity as Hinkley Point C.

27. Most of our witnesses disagreed that the project provided value for money. Professor Michael Grubb, Professor of International Energy and Climate Change Policy at University College London, said that although he had supported the development of new nuclear during his time on the Committee on Climate Change, he felt "times and conditions had substantially changed … renewables are now clearly cheaper. Committing to a 35-year contract at that level was economically inappropriate".[29] Tom Burke, chairman of 3EG, criticised the Government's value for money assessment:

> "There is simply not enough information accessible in that document to come to a reasoned conclusion about whether it provides value for money … there are a number of other ways in which we could go about delivering affordable, low-carbon electricity to Britain's consumers, at lower cost than is proposed in order to support Hinkley".[30]

---

26 Department for Business, Energy and Industrial Strategy, *Hinkley Point C Value for Money* (September 2016): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/556917/3_-_Value_for_Money_Assessment.pdf [accessed February 2017]

27 The value for money assessment did not give a year for the estimates, the time period given was "in the 2020s".

28 The levelised cost of offshore wind in the UK has fallen by 32 per cent since 2012. It is now below the joint Government and industry target of £100 per megawatt hour four years ahead of schedule. Catapult Offshore Wind Programme Board, *Cost Reduction Monitoring Framework 2016* (24 January 2017): https://ore.catapult.org.uk/our-knowledge-areas/knowledge-standards/knowledge-standards-projects/cost-reduction-monitoring-framework/ [accessed January 2017]

29 Q 44 (Prof Michael Grubb). Professor Grubb said he appreciated that "other factors may have driven the final decision … but I do not think history will put that decision in a good light".

30 Q 68 (Tom Burke)

28. There are also a number of risks associated with the project. Comparable nuclear power stations that EDF are constructing in France and Finland are years behind schedule and billions over budget; the completion date for Hinkley Point C has itself been put back a number of times from the original expected opening date of 2017.[31] Further delays would put great pressure on the future supply, given the plant is due to be producing seven per cent of Britain's electricity in 2025.[32]

29. EDF has also suffered from financial problems recently and may not be able to raise capital in the future without further support from the British Government.[33] Its finance director resigned in March 2016 after his request to delay the project by three years was rejected.[34] The current financing model depends on Chinese involvement which is linked to the Government granting permission for the construction of a Chinese-led nuclear power station at Bradwell.[35] David Clarke, the Chief Executive of the Energy Technologies Institute, told us that from an engineering perspective, the project probably had a better than seven in ten chance of being delivered on time: "Does that worry me as an engineer? It ought to be better".[36]

30. Another proposed nuclear power station, by NuGen at Moorside in Cumbria, is also facing difficulties. NuGen's chief executive, Tom Samson, told us the project had a "significant funding gap".[37] NuGen have said Moorside will provide 7 per cent of Britain's electricity when it is expected to open in the mid-2020s.

31. We note that the agreement between the Government and EDF contains a £2 billion HM Treasury guarantee. The Secretary of State told us that EDF have confirmed that it does "not intend to avail itself" of the guarantee and if it changed its mind, "there are wide ranging conditions which would need to be met".[38]

---

31 Emily Gosden, 'Hinkley Point fires up Britain's nuclear ambitions', *Daily Telegraph* (17 September 2016): http://www.telegraph.co.uk/business/2016/09/17/hinkley-point-fires-up-britains-nuclear-ambitions/ [accessed February 2017]

32 EDF Energy, Press release: Agreements in place for construction of Hinkley Point C nuclear power station, 21 October 2015: https://www.edfenergy.com/energy/nuclear-new-build-projects/hinkley-point-c/news-views/agreements-in-place [accessed February 2017]

33 'EDF sees Britain taking £6bn Hinkley stake', *Financial Times* (2 September 2016): https://www.ft.com/content/0b80e672-70ea-11e6-a0c9-1365ce54b926 [accessed February 2017]

34 Robin Pagnamenta, 'EDF executive lobbied to halt £18bn Hinkley Point', *The Times* (5 May 2016): http://www.thetimes.co.uk/article/edf-executive-lobbied-to-halt-18bn-hinkley-point-6kjs015vv [accessed February 2017]. He told a French parliamentary committee in May 2016 that it would have been a professional mistake" to stay on at the company: "Who would bet 60 to 70 per cent of his equity on a technology that has not yet proven that it can work and which takes 10 years to build".

35 Q 7 (Prof Dieter Helm)

36 Q 44 (Dr David Clarke)

37 Q 80. NuGen is a joint venture between Toshiba and Engie. Toshiba have been reported to be under pressure to find investment for the project: 'Toshiba faces pressure to secure funding for UK nuclear project', *Financial Times* (22 January 2017): https://www.ft.com/content/c0b01308-e0aa-11e6-8405-9e5580d6e5fb [accessed February 2017]

38 Letter from the Secretary of State for Business, Energy and Industrial Strategy to the Chairman, 11 January 2017: http://www.parliament.uk/documents/lords-committees/economic-affairs/The-Economics-of-UK-Energy-Policy/170116-SoS-for-Business-Energy-Industrial-Strategy-to-Lord-Hollick.pdf

The cost to consumers

32. When the market price of electricity is below the strike price, the cost of the payments made to EDF will be ultimately paid for by consumers. This subsidy is initially paid for by the Government, who then reclaim the cost from electricity suppliers, who then pass on the cost to the consumer.[39] As this cost is not levied as a tax, it is not clear to customers the extent to which they are subsidising electricity generation. Ecotricity were one of several witnesses who argued that this approach was "regressive and disproportionately hurts those who can least afford it."[40]. It also creates intergenerational unfairness as the costs, spread over many years, will continue to be met by future generations.

33. Officials from the Department for Business, Energy and Industrial Strategy told us that the cost to consumers over the course of the 35 year contract for difference would be between £11 and £21 billion (in 2012 prices).[41] The National Audit Office, however, estimated in July 2016 that the overall cost to consumers would be £30 billion.[42] The figures are different because the Department used the standard discount rate for appraising consumer and society-wide impacts while the National Audit Office used the discount rate appropriate for the accounting treatment of financial assets. [43]

34. The National Audit Office's estimate had increased from £6 billion in October 2013 when the strike price had first been agreed. The large increase was because the Government's projected cost of wholesale electricity prices had fallen by 22 per cent since 2013.[44] Dermot Nolan, Chief Executive of Ofgem, said that in 2013, "people's expectations of energy prices in 10, 20 or 30 years' time were very different from what they are today. That just illustrates the way in which these things can change."[45]

---

39 See Box 2 for further details on how contracts for difference operate.

40 Ecotricity. UKERC, Energy Technologies Institute, UCL Energy Institute and Citizens Advice all made the same point in written evidence.

41 Q 154 (Paro Konar-Thakkar). The Government's 'Value for Money Assessment' quotes the same figures as being in "2012 prices, discounted to 2012". It also says that on its most realistic projections, it means around £12 from consumers' annual energy bills will go towards supporting the plant in 2030.

42 National Audit Office, *Nuclear Power in the UK* (12 July 2016): https://www.nao.org.uk/wp-content/uploads/2016/07/Nuclear-power-in-the-UK.pdf [accessed December 2016]

43 The discount rate is used to convert future costs and benefits into present values. It is a separate concept from inflation and is based on the principle that people prefer to receive goods and services now rather than later. The discount rate used by the Department was 3.5 per cent and the one used by the National Audit Office was 0.7 per cent. Both rates are taken from HM Treasury's Green Book: HM Treasury, *Green Book*, (July 2011): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220541/green_book_complete.pdf [accessed February 2017]

44 The National Audit Office said that the fall in the projected wholesale price was mainly due to reductions in the expected price of fossil fuels and also increased use of renewable sources which produce electricity at near zero marginal cost: National Audit Office, *Nuclear Power in the UK, op cit.*

45 Q 133 (Dermot Nolan)

35. **In the light of the significant and ongoing concerns about the deal, if the Hinkley Point C project is to proceed the Government should:**

    (a) **Explain how it will replace the capacity expected to be provided by Hinkley Point in the event that completion of the project is delayed, given Hinkley Point C is due to provide 7 per cent of Britain's electricity in 2025.**

    (b) **Provide a clearer statement of how the project will provide good value for money for the taxpayer, given concerns over the existing justification.**

The Government's motivation for the deal

36. Why did the Government not try to renegotiate the price when it reassessed the project over the summer of 2016, given the extent to which the circumstances had changed in just three years?

37. Given the involvement of a French state-owned company and investors from China, we acknowledge that political considerations, beyond the scope of this report, may have played some part.[46] But there were arguably two more important factors at play: the Government's commitment to decarbonisation of the electricity supply in line with the carbon budgets[47] and the need to ensure Britain has sufficient generating capacity in the 2020s. The rest of this chapter considers the wider policies that governments have implemented to address these two considerations.

Current energy policies

Subsidies for low-carbon generation

38. Electricity generated by fossil fuels has always been, and remains, cheaper than electricity generated by renewable sources. Renewables generation requires some form of subsidy in order to be competitive (or the application of an appropriately calibrated carbon tax on fossil fuel generation).

39. In order to reduce emissions, the UK therefore introduced support for renewable generation in 2002 in the form of the Renewables Obligation. This was followed by the Feed-in Tariff in 2008. These schemes, the costs of which were ultimately borne by consumers, are explained in Box 1 below.

46 Q 7 (Prof Dieter Helm)

47 The Climate Change Act 2008 mandates the Committee on Climate Change to set five yearly carbon budgets that provide interim targets towards achieving the Act's goal of reducing the 1990 level of carbon emissions by 80 per cent by 2050. See Box 6 for more detail on the carbon budgets.

Box 1: Renewables Obligation and Feed-in Tariff schemes

The **Renewables Obligation** scheme required suppliers of electricity in the UK to source a proportion of their electricity from renewable sources. Suppliers did this by purchasing certificates issued to an accredited generator of renewable electricity. Renewable generators therefore had two sources of income: income generated from the sale of electricity in the wholesale market, and the income from the sale of the certificates. It was expected that suppliers would pass on the costs of purchasing the certificates to customers.

When the scheme was introduced one certificate was issued for each megawatt hour of renewable electricity generated. This encouraged growth in the most developed, cheaper forms of generation such as onshore wind. In 2009, the scheme was altered so that greater levels of support were provided to less well developed technologies: onshore wind generators carried on receiving one certificate per megawatt hour of electricity generated but offshore wind generators received two certificates per megawatt hour. The levels of support for each technology were reviewed every four years.[48]

Each year, the Government sets the proportion of electricity that suppliers must source from accredited renewable generators. This is based on a prediction of the amount of electricity that will be supplied in Britain and the number of certificates that will be issued to accredited generators.

The Feed-in Tariff scheme was aimed at smaller generators of renewable electricity (up to five megawatts of output). Individuals and businesses were paid a set amount for each kilowatt hour of renewable electricity that they generated and used themselves. A smaller payment was available for any surplus electricity sold to the grid. The costs of this scheme would also be passed onto consumers.

The schemes have helped increase the proportion of electricity that is generated from renewable sources: from around 4 per cent in 2002 to 27 per cent in 2015.[49] Chapter 3 looks at how expensive this has been to achieve. Table 2 shows the breakdown of renewable generation by source for 2015.

Table 2: Renewable generation by source for 2015

Source of renewable generation	Percentage of total renewable generation in 2015 (%)
Onshore wind and solar	34
Bioenergy	32
Offshore wind	19
Hydro	7
Pumped storage	3
Other	5

Source: Department for Business, Energy and Industrial Strategy, Energy Trends: electrcity (26 January 2017): https://www.gov.uk/government/statistics/electricity-section-5-energy-trends [accessed February 2017]

48 Department for Business, Energy and Industrial Strategy and Ofgem, *Calculating Renewable Obligation Certificates (ROCs)* (31 March 2013): https://www.gov.uk/guidance/calculating-renewable-obligation-certificates-rocs [accessed January 2017]

49 Department for Business, Energy and Industrial Strategy, *Fuel used in electricity generation and electricity supplied* (22 December 2016), Table 5.1: https://www.gov.uk/government/statistics/electricity-section-5-energy-trends [accessed January 2017]

40. As early as 2007, Ofgem were concerned that the Renewables Obligation was a "very expensive way of reducing carbon emissions compared to other alternatives". Ofgem argued that investors were receiving returns higher than they "expected or required".[50]

41. Lord Turner of Ecchinswell, former Chairman of the Committee on Climate Change, concurred that the "open-ended nature of the [renewables obligation] regime and the fact that it was simply an add-on revenue to the wholesale price that the generators received" was not optimal.[51] The Government identified the limited ability of the scheme to "adjust support levels quickly enough to reflect cost reductions achieved" as one of its major weaknesses.[52]

42. The UCL Energy Institute told us that the clearest example of this was solar power:

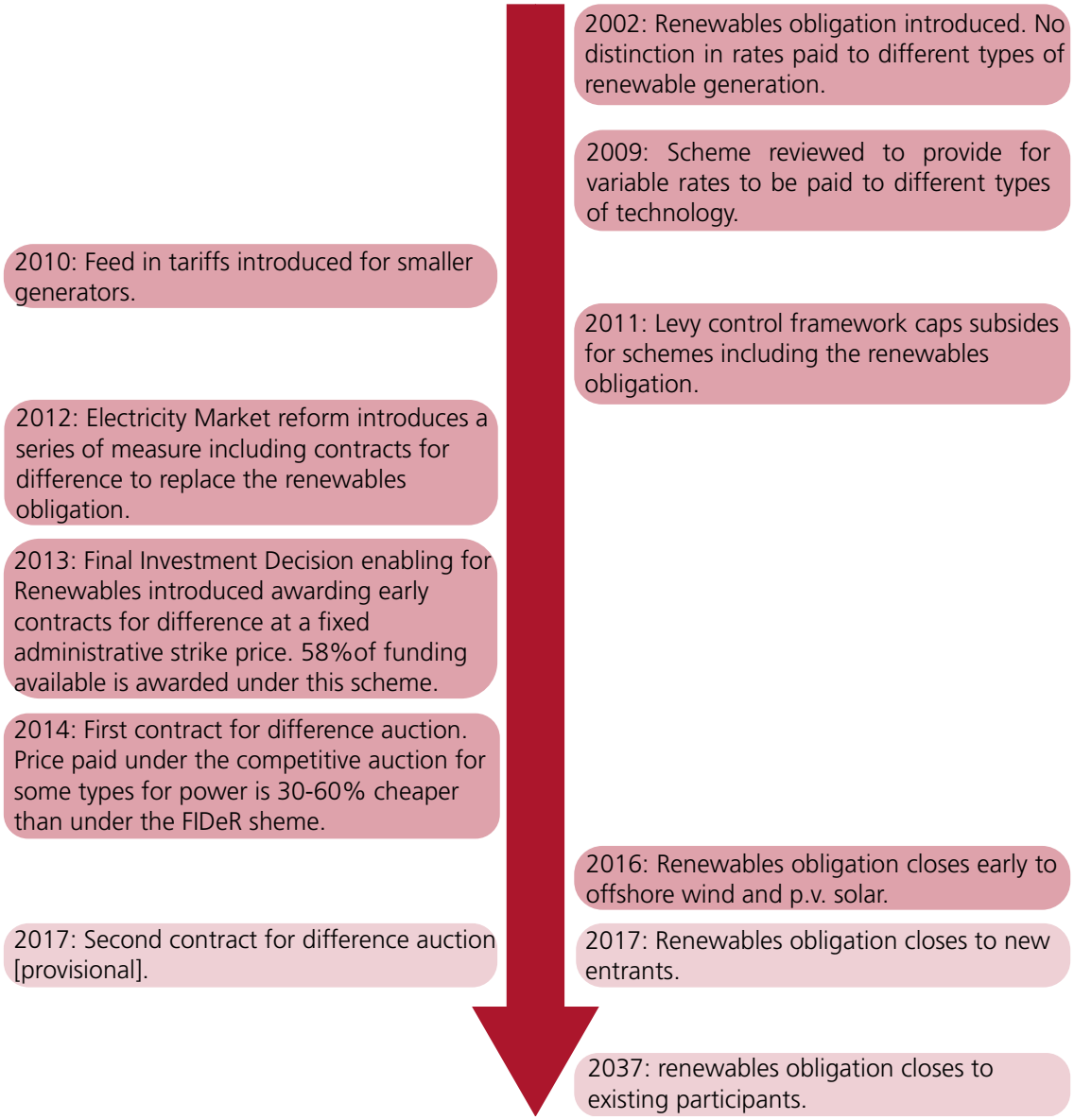
> "Governments in several countries were caught by surprise by its sudden drop in price. This was caused by increasing volume sales driven by the generous feed-in-tariffs offered in several countries, as well as by major investments in manufacturing of the technology in China."

43. Energy UK said that the Feed-in Tariff, a demand-led scheme, "enjoyed a high level of popularity that government had not accurately anticipated … This has led to higher costs on customer bills due to a stronger than expected demand for the scheme."[53]

44. To try and control the costs of subsidies, the previous Government introduced the Levy Control Framework in 2011 which capped the cost of the two schemes. As a result of greater than expected take-up of the schemes, the Office for Budget Responsibility announced in July 2015 that forecast spend under the framework would be £9.1 billion, £1.5 billion more than expected. The schemes are part of the reason for the increase in electricity bills since the early 2000s which are described in the next section.

50 Ofgem, *Ofgem Puts Forward New Approach To Funding Green Generation* (22 January 2007): https://www.ofgem.gov.uk/ofgem-publications/76523/16662-r5.pdf [accessed December 2016]
51 Q 16 (Lord Turner of Ecchinswell)
52 Written evidence from the Department for Business, Energy and Industrial Strategy (UEM0083)
53 Written evidence from Energy UK (UEM0078)

Figure 2: Renewable subsidies timeline



Recent Government policy

45. The Government has taken action to try and reduce the cost of support for renewable generation. On Feed-in Tariffs, the level of support has been reduced and will continue to fall automatically.[54] The Renewables Obligation will be closed to new entrants in April 2017 and its replacement for supporting low-carbon generation is the Contracts for Difference scheme which was launched in 2013. In the period when both schemes have been operating, renewable generators have had the option of choosing which scheme to receive support under. The Renewables Obligation scheme will close to existing participants in 2037.[55]

54 Department of Energy and Climate Change, *Changes to Renewable Subsidies* (17 December 2015): https://www.gov.uk/government/news/changes-to-renewables-subsidies [accessed January 2017]

55 The two schemes will operate alongside each other until 2037 when Renewable Obligation certificates will cease to be awarded to generators. The amount of certificates that electricity suppliers will be required to purchase is adjusted each year to reflect the number awarded. This requirement will therefore reduce as the number of generators receiving certificates decreases as deals under the scheme expire.

Box 2: Contracts for Difference

Contracts for difference work as follows:

- a generator sells electricity to a supplier (such as British Gas who then supplies the electricity to consumers) at the market price for electricity;
- if the market price is below the 'strike price' (£92.50 for the Hinkley Point C contract) agreed in the contract for difference, the Government pays the generator the difference between the two figures;[56]
- if the market price is above the strike price, the generator pays the difference back to the Government;
- the cost of the contracts to Government is met by a levy on electricity suppliers, the cost of which is passed on to consumers.

The Government explained the rationale for these arrangements as follows:

> "This mechanism allows for payments to generators to provide increased certainty around revenue levels, in order to bring forward investment, while retaining the need for the generator to sell its electricity in the commercial market."[57]

46. Early contracts for difference, like the one agreed for Hinkley Point C, were awarded without price competition: the £92.50 strike price was just agreed between EDF and the Government. The National Audit Office criticised the awards of these contracts in a June 2014 report:

> "The contracts have been awarded without price competition and with administratively set strike prices which may provide higher returns than needed to secure investment. We are not convinced that it was essential to award so much consumer support to early contracts in order to meet the 2020 renewables target. Awarding so many early contracts of this scale in this way has limited the Department's opportunity to secure better value for money."[58]

47. Since then there have been moves to introduce some competition for particular technologies. These are discussed in Chapter 3.[59]

Tight capacity margins

48. The growth of renewable energy, supported by contracts that guarantee a given price for a fixed period, has left the UK facing a possible shortage of capacity as private investors have not been willing to build new conventional power plants. STAG Energy explained the cause of the problem in their written evidence:

> "This has been caused by the growth in renewable energy which has been supported by contracts outside the wholesale electricity market and has undermined the price transparency that this used to bring.

56 The Government created a company (Low Carbon Contracts Company Ltd) which acts as the counterparty to the contract for difference. For the purposes of calculating the difference, the market price is determined by reference to a "composite of wholesale price indices": Department for Business, Energy and Industrial Strategy, *Hinkley Point C* (29 September 2016): https://www.gov.uk/government/collections/hinkley-point-c [accessed December 2016]

57 Department for Business, Energy and Industrial Strategy, *Hinkley Point C*, *op cit.*

58 National Audit Office, *Early contracts for renewable electricity* (27 June 2014): https://www.nao.org.uk/wp-content/uploads/2014/06/Early-contracts-for-renewable-electricity1.pdf [accessed January 2017]

59 See from para 148.

> The combination of unpredictable demand and revenue has resulted in conventional fossil fuel plant becoming uneconomic without some form of capacity payment to allow existing plant to run when needed and facilitate the building of new plant to ensure adequate capacity to meet demand."[60]

49. The lack of new power stations being built was another factor behind the decision to proceed with Hinkley Point C. Lord Lawson of Blaby described it as "a ridiculous white elephant" which the coalition government had originally agreed to because "they were so desperate about running out of electricity capacity in this country."[61]

50. The previous government acknowledged the problem and introduced the Capacity Market in 2014 to provide stand by generation. The Capacity Market allows the Government to buy generating capacity in advance for use from 2017/18. The cost of the scheme is ultimately paid for by consumers. The Government decides how much capacity it will need and an auction then takes place. Those generators who successfully bid are then guaranteed there will be demand for the power that they produce.

51. The scheme has meant that the last power station to be built without some form of government guarantee was in 2012.[62]

A new direction for energy policy

52. Electricity generation policy is, and always has been, a combination of public policy and private activity. The balance between the two has varied over time. In the 1980s government policy shifted clearly in favour of a market-based approach with minimal government interference. This has been reversed in the 21st century, with government applying indirect control over the market as a result of policies designed to increase renewable generation.

53. A shift was necessary. Policy must adapt to the circumstances of the time: what was appropriate when decarbonisation and security of supply were not substantial concerns will require some modification today.

54. Nevertheless, Lord Lawson's enunciation of the Government's task in energy—to set a framework which will ensure that the market operates in the energy sector with a minimum of distortion—remains relevant. Recent decarbonisation policies, as shown above, have not been achieved with the minimum of distortion: as Professor Dieter Helm said, "the degree of state intervention we now have is more akin to the nationalised model … than it is to the market process."[63]

55. Substantial progress has been made in renewable energy generation but this has been expensive for consumers and distorted the wholesale market for electricity to the extent that nobody will build power stations without government guarantees. A plethora of new and sometimes conflicting mechanisms have distorted the market and raised prices with limited effect on the capacity margin. We explore both of these problems in more depth in the next chapter.

---

60 Written evidence from STAG Energy (UEM0026)
61 Q 20 (Lord Lawson of Blaby)
62 Q 73 (Peter Atherton). It was Carrington Power Station in Manchester.
63 Q 3 (Prof Dieter Helm)

CHAPTER 3: FAILURES IN THE MARKET

56. This chapter outlines two failures arising from the structure of the market and government interventions: first the potential insecurity of supply and second the impact on energy prices.

Failure 1: Insecurity of supply

57. The core purpose of government intervention in the market is to ensure that the supply of electricity is secure. The Secretary of State told us that: "Security is the sine qua non … That has to be the first duty of any Secretary of State who is responsible for energy."[64] This part of our report will consider the security of the electricity supply and in particular two issues that affect that security:

    (a) Is there sufficient capacity generated to meet demand?

    (b) Is the electricity supply consistent and reliable?

58. The section concentrates on security of electricity generating capacity. Whilst some witnesses raised concerns about the security of the gas supply and availability of gas storage this report concentrates on the electricity market and electricity supply only.[65]

The capacity margin

59. When considering the possibility of blackouts, or the 'lights going out', most witnesses were referring to the capacity margin. The capacity margin is the extent to which there is sufficient generating capacity to supply the projected demand for electricity. It is expressed as a percentage and is the average excess of available generation over peak demand. The types of available generation are adjusted to take account of the fact that not all theoretical generation will be available all of the time.[66]

The current capacity margin

60. In its Winter Outlook for 2016/17, National Grid predicted a capacity margin of 6.6 per cent when emergency measures to increase capacity are taken into account.[67] Whilst this is slightly higher than the predicted margins in 2014 and 2015, it is considerably lower than the margins of more than 10 per cent of 2009 to 2012.[68] As outlined in paragraph 22 above, the tightening of the capacity margin is due in part to the lack of incentives to private investors to build new conventional power plant.[69]

61. Witnesses were divided on whether the current margin was a cause for concern. Professor Dieter Helm, Professor of Energy Policy at the University of Oxford, said that "the capacity margins are effectively nought, so the security of supply problem is back with a vengeance."[70] Tony Lodge, of the

64 Q 158 (Greg Clark MP)
65 Written evidence from STAG Energy (UEM0026) and the British Ceramics Association (UEM0039)
66 References to the capacity margin in this report are to the de-rated margin unless otherwise stated.
67 National Grid, *Winter Outlook Report 2016/17* (14 October 2016): http://www2.nationalgrid.com/UK/Industry-information/Future-of-Energy/FES/Winter-Outlook/ [accessed January 2017]. This margin is greater than the Grid's July 2016 prediction of 5.5 per cent. The difference is due partly to lower gas exports via one of the UK's interconnectors (see Box 4).
68 *Ibid.*
69 See written evidence from STAG Energy (UEM0026)
70 Q 4 (Prof Helm)

Centre for Policy Studies, saw the possibility of blackouts in the near future and considered that a series of mild winters had suppressed demand and prevented any serious shortages.[71] National Grid acknowledged this factor had helped them meet demand in the winter of 2015/16.[72]

62. National Grid themselves described the current 6.6 per cent margin as "manageable but tight".[73] The Secretary of State considered this level to be "more than adequate".[74] Martin Pibworth of SSE found the current margin to be "reassuring".[75] Mr Pibworth based his confidence on the tools available to National Grid to manage times of tight demand.[76]

Managing the Capacity Margin

63. In 2014, due to a sharp fall in the forecast capacity margin, the Government introduced two new balancing services to boost capacity (see Box 3 below). The Government credited the recent increase in the margin to these schemes.[77] These tools are in addition to other measures already available to the Grid which include the ability to procure electricity through the interconnectors with other European countries (see Box 4).

Box 3: Contingency Balancing Services

Supplemental Balancing Reserve: the Government pays generators to make additional capacity available in winter, for example, by keeping on power stations that would otherwise be closed, mothballed or generally unavailable to the market. The costs of the service are recovered from generators and suppliers and then passed on to consumers.

Demand Side Balancing Reserve: the Government pays larger companies to reduce their demand for electricity in winter by, for example, only turning on energy intensive machines at times of low demand on the Grid. The companies participating in the scheme are chosen through a tender process and payments (save for set up costs) are only made if the service is used.[78] In the year to March 2016, National Grid spent £2.31 million on this service.[79] In August 2016 National Grid announced that it would not be using the Demand Side Balancing Reserve in the winter of 2016/17.[80]

71 Q 33 (Tony Lodge); see also Tony Lodge, Centre for Policy Studies, *The Great Green Hangover* (18 November 2015): http://www.cps.org.uk/publications/reports/the-great-green-hangover/ [accessed January 2017]; written evidence from Energy Saving Catapult (UEM0030)

72 National Grid, *Winter Review 2016* (26 May 2016): http://media.nationalgrid.com/media/1293/ng-winter-review-2016.pdf: [accessed January 2017]

73 Q 118 (Phil Sheppard)

74 Q 166 (Greg Clark MP)

75 Q 88 (Martin Pibworth)

76 *Ibid.*; see also written evidence from the UCL Energy Institute and Institute for Sustainable Resources (UEM0064)

77 Q 148 (Dan Monzani)

78 National Grid, *Service Overview, Demand Side Balancing Reserve* (2 March 2015): http://www2.nationalgrid.com/UK/Services/Balancing-services/System-security/Contingency-balancing-reserve/ [accessed January 2017]

79 Additional written evidence from National Grid (UEM0095). The Demand Side Balancing Reserve is a (relatively small) part of wider policy of managing demand which is discussed further in paragraph 67.

80 National Grid, letter on 'Decision on DSBR Procurement', 22 August 2016: http://www2.nationalgrid.com/UK/Services/Balancing-services/System-security/Contingency-balancing-reserve/DSBR-Tender-Documentation/ [accessed January 2017]

64. As well as the above short term measures, the Government has introduced the Capacity Market as a longer-term solution.

65. This policy will come into full effect in 2018. Under the scheme, the Government decides how much capacity it will need and a two-stage auction then takes place. Suppliers first bid to supply reserve power four years in advance, based on projected demand. A second auction is held a year before the power is needed to meet any change in the forecast. Those generators who successfully bid are then guaranteed there will be demand for the power that they produce.

66. Three auctions have been held to date for supply in 2018, 2019 and 2020. The ultimate cost of the Capacity Market is borne by consumers. In oral evidence Jeremy Pocklington estimated that the auctions to date have cost £1 billion.[81]

Reducing demand

67. As well as increasing supply the Government has sought to manage the capacity margin by reducing demand at peak times. The 'Demand Side Response'—described by National Grid as "services that enable businesses and consumers to turn up, turn down or shift demand in real-time"—is an increasingly important tool in managing peaks and troughs in demand.[82] The Demand Side Balancing Reserve (see Box 3) is one such scheme which aims to reduce heavy industrial use at peak times.

68. The Capacity Market explicitly includes demand side products. The importance of these services is projected to increase. For the year 2018/19, £3.4 million of the Capacity Market auction was spent on demand side response schemes. In the auction for capacity for 2020/21 these services accounted for £31.7 million.[83]

69. In the longer term, to work most effectively these services will rely on developments in storage technology to allow excess generation to be stored for use at times of high demand.[84] We explore ways to encourage research and development in this, and other areas, in Chapter 4.

Criticism of the Capacity Market

70. The Government stated in its written evidence that the Capacity Market is "at the heart" of its plans to ensure a reliable electricity supply and designed to attract "sufficient investment in new generation capacity".[85] Dermot Nolan, the Chief Executive of Ofgem, described the Market as "well designed" and was hopeful that it would "bring on new forms of generation".[86]

81 Q 168
82 National Grid, 'Demand Side Response: 2017': http://www2.nationalgrid.com/UK/Services/Balancing-services/Demand-Side-Response/ [accessed January 2017]
83 Letter from Rt Hon Greg Clark to Lord Hollick, 16 January 2017; The total cost of the auctions to date is £1bn.
84 Written evidence from the Institute of Engineering and Technology (UEM0020) and written evidence from Dr John Rhys (UEM0011)
85 Written evidence from the Department for Business, Energy and Industrial Strategy (UEM0083)
86 Q 142 (Dermot Nolan)

71. The auctions held under the Capacity Market so far have successfully procured capacity but only one new power plant. The auctions in 2014 and 2015 produced no new power stations. Finally, in the 2016 auction, one new combined cycle gas turbine station was approved. Defending this record, Jeremy Pocklington, Director General for Energy Security at the Department of Business, Energy and Industrial Strategy, stated that it is:

> "important not to misunderstand exactly what the role of the capacity market is. We don't want to use the capacity market to bring forward new investment before it is needed."[87]

72. The main beneficiaries of the auctions to date have been existing generators. The Global Warming Policy Foundation was concerned that the effect was to keep "old power plants on grid" and this was not a long-term solution.[88] The energy generator Drax Group (the operator of one of the last coal fired power stations) pointed out that this had the effect of "relegating" gas and coal plants to a "peaking role" and meant that operators had a very limited window in which to cover their costs. Drax considered that this led to a risk of under investment in the maintenance of such facilities.[89]

73. Finally, the supply secured so far is from fossil fuels and includes a large number of small diesel generators. Professor Hepburn, Professor of Environmental Economics at the University of Oxford, noted that this is "inconsistent with ultimate decarbonisation objectives".[90]

74. **The UK currently has a slim capacity margin. The emergency tools available to the Grid to manage the margin have been effective in the short term. The Government has struggled to procure sufficient numbers of new power stations through the mechanism to ensure longer-term security of supply.**

Box 4: Interconnectors

Interconnectors are electricity generation cables that allow the cross-border transfer of electricity. Electricity may be exported as well as imported via the interconnector.

The UK has four such cables and a further seven are at various stages of planning as illustrated on the map below. Currently, two of the four existing interconnectors are not operating at full capacity and problems in the French electricity market call into question whether the interconnector to France will allow as much electricity to be imported as originally envisaged.[91]

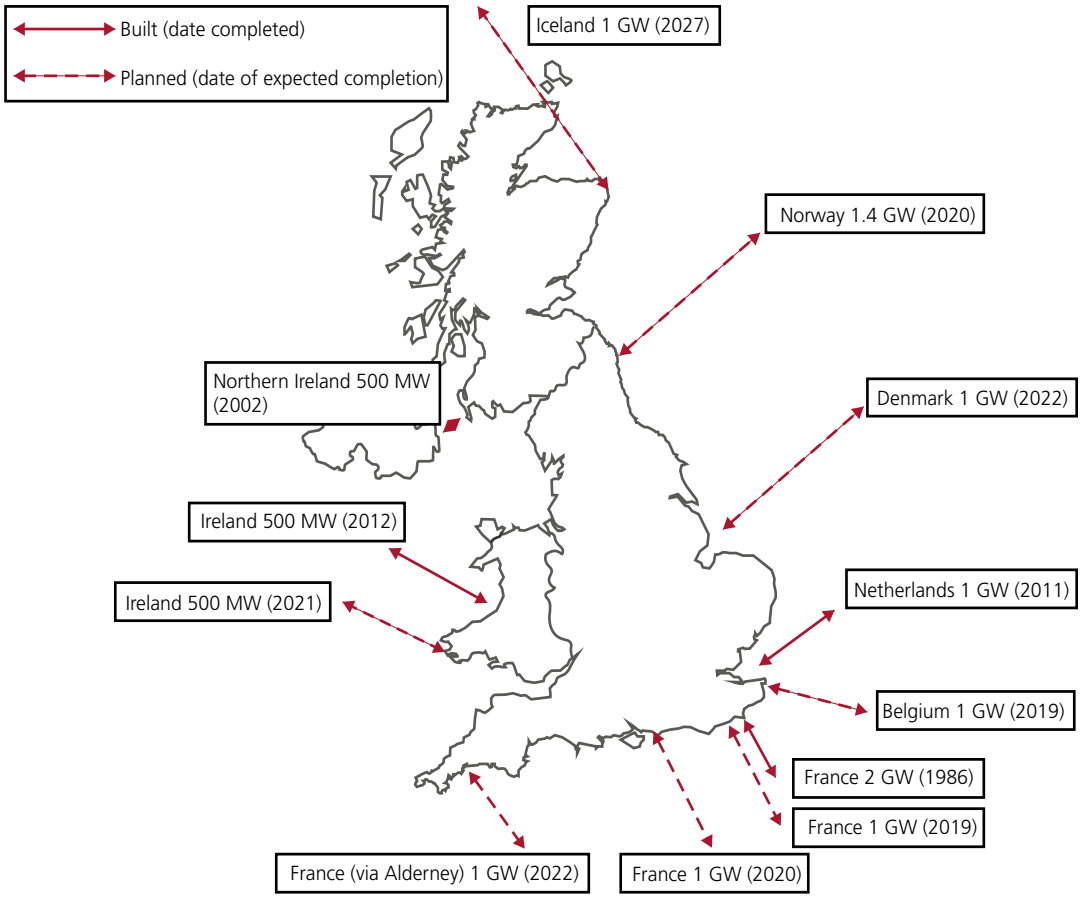
Interconnectors are both a tool for managing supply and a source of potential future uncertainty. National Grid said that the interconnectors system:

> "allows the UK access to cheaper energy for consumers, provides the [systems operator] access to a wider suite of balancing tools to manage the network more efficiently and support the UK's security of electricity supply at least cost."[92]

87 Q 168 (Jeremy Pocklington)
88 Written evidence from the Global Warming Policy Forum (UEM0047)
89 Written evidence from the Drax Group (UEM0010)
90 Written evidence from Professor Hepburn (UEM0029)
91 The 'Moyle' interconnector to Northern Ireland has been operating at half capacity since 2010. The IFA connector to France was damaged during Storm Angus in November.
92 Additional written evidence from National Grid (UEM0095)

Under normal circumstances, electricity flows automatically from the market with the lowest price to the market with higher prices via the interconnector.[93] There is, however, no guarantee of supply frm the interconnectors. The House of Lords Science a Technology Committee considered there was "a worrying lack of clarity" about how the interconnectors would operate if a number of interconnected countries simultaneously experienced a shortage of supply.[94] Ofgem and National Grid told this Committee that in the event of such an emergency they could intervene and manage the flow of the interconnectors.[95]

National Grid, in written evidence, pointed out that the current interconnector arrangements rely on the European Union's Internal Energy Market.[96] National Grid considered that alternative arrangements would need to be negotiated when the UK leaves the European Union. National Grid expressed concern that these methods were "unlikely to be as effective or efficient" as the developing Internal Energy Market, presumably this would also be the case for other countries.[97]



Source: Map adapted from House of Lords Science and Technology Committee, The Resilience of the Electricity System (1st Report, Session 2014–2015, HL Paper 121)[98]

93 National Infrastructure Commission, *Smart Power* (March 2016) https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/505218/IC_Energy_Report_web.pdf [accessed January 2017]

94 House of Lords Science and Technology Committee, *The Resilience of the Electricity System*

95 *Ibid.*

96 National Grid explained that this "allow[s] the UK to trade efficiently with neighbouring countries without being subject to tariffs". Additional Written evidence from National Grid (UEM0095)

97 *Ibid.*

98 Updated using: National Grid, 'Interconnectors': http://www2.nationalgrid.com/About-us/European-business-development/Interconnectors/; Ofgem, 'Electricity Interconnectors': https://www.ofgem.gov.uk/electricity/transmission-networks/electricity-interconnectors; France-Alderny-Britain, The Project: http://www.fablink.net/; Statnett, 'North Sea Link': http://www.statnett.no/en/Projects/Cable-to-the-UK/; Nemo Link, 'Interconnector Locations': http://www.nemo-link.com/the-project/locations/; Greenlink Interconnector, 'The Project': http://www.greenlinkinterconnector.eu/project; Mutual Energy, 'Moyle Interconnector': http://www.mutual-energy.com/electricity-business/moyle-interconnector/history-and-development/ [accessed January 2017]

Intermittency and reliability

75. The second aspect of security of supply raised in evidence before us was the reliability and consistency of existing forms of generation. Ofgem stated that this was a different, but possibly equally significant, aspect of security of supply:

> "Historically, capacity margins were the main security of supply indicator. However, they fail to fully take into account the variability of supply, especially when the share of intermittent power generation sources increases in the system."[99]

76. Dr John Rhys, former Chief Economist for the Electricity Council, also saw "different kinds of supply shortfall crises". He suggested that "a system heavily dependent on renewables … could face longer periods of sustained shortage".[100]

77. The price of this intermittency—the cost of ensuring back-up generation in the event that renewable energy cannot be generated—was estimated to be "certainly less" than £10 per megawatt hour.[101] Rupert Darwall considered that the design of the system and the fact that the renewable generators themselves do not directly pay this cost had far reaching consequences:

> "[wind and solar] have very high fixed costs and negligible marginal costs. That means that when the wind blows and the sun shines they flood the wholesale market with near zero-cost power, but the weather risk, the intermittency risk, because they have prior access, is transferred to the rest of the system. It is transferred to dispatchable generators, gas and coal-fired generators, which has made it increasingly difficult to get that capacity renewed."[102]

78. Some witnesses considered that it was unfair to brand renewables as more unreliable than other source of electricity generation. Michael Liebreich, founder of Bloomberg Energy Finance, pointed out that "every form of generation has times when it does not generate."[103] Phil Sheppard of National Grid stated that the "market manages most of the intermittency" using gas power plant and the interconnectors.[104]

79. Tom Burke, Chairman of 3EG, argued that National Grid has an "enormously sophisticated package of measures available" to deal with a situation where there is limited or no renewable generation.[105] Professor Grubb, of University College London, stated that these tools were preferable to each intermittent source paying for its own back-up capacity. He considered this would result in a "vast amount of overcapacity and redundancy".[106]

---

99 Written evidence from Ofgem (UEM0090)
100 Written evidence from Dr Rhys (UEM0011)
101 Written evidence from the UCL Energy Institute and Institute for Sustainable Resources (UEM0064); Q 41 (Prof Michael Grubb)
102 Q 48
103 Q 104 (Michael Liebreich)
104 Q 122 (Phil Sheppard)
105 Q 70 (Tom Burke)
106 Q 42 (Prof Michael Grubb)

80. **The increased amount of electricity generated from intermittent sources presents new challenges for security of supply. As the proportion of electricity from these sources is projected to increase, tools to ensure cost effective back-up must be available and the cost of appropriate back-up incorporated into estimates of the cost of renewable generation.**

Failure 2: Energy prices

81. Consumers ultimately pay for the climate change policies that have been outlined above through their electricity bills. This section will examine those bills, see how they compare with similar countries and attempt to identify how much domestic and industrial users are paying for those climate change policies.

Domestic electricity prices

82. Average domestic electricity bills in Britain, adjusted for inflation, were 58 per cent higher in 2016 than they were in 2003.[107] This increase has been mainly driven by rising international prices for fossil fuels. The cost to consumers of low carbon policies has also been a factor: estimates from the Committee on Climate Change indicate that climate change policies accounted for around two per cent of the average domestic bill in 2004 and 10 per cent in 2013.[108]

83. It is difficult to find reliable estimates for the proportion of electricity bills that relate to climate change policies: the Government does not include it as part of its regular energy price statistics. In 2014 the Department for Energy and Climate Change did however publish a stand-alone report which concurred with the estimate above that around 10 per cent of bills relate to climate change policies. Table 3 reproduces the breakdown of the average 2014 electricity bill from the report.

Table 3: Breakdown of the average household electricity bill for 2014[109]

Component	Cost (and percentage of total bill)
Wholesale energy costs	£235 (40%)
Network costs	£139 (24%)
Supplier costs and margins	£124 (21%)
Energy and climate change policies	£59 (10%)
VAT (at 5%)	£29 (5%)
Total	**£586**

Source: Department of Energy & Climate Change, Estimated impacts of energy and climate change policies on energy prices and bills: 2014 (6 November 2014): https://www.gov.uk/government/publications/estimated-impacts-of-energy-and-climate-change-policies-on-energy-prices-and-bills-2014 [accessed February 2017]

107 The average electricity bill increased from £333 in 2003 to £572 in 2016 (both in 2010 prices). Taken from Figure 1 above.

108 Committee on Climate Change, *Energy Prices and Bills, impacts of meeting carbon budgets 2014* (December 2014): https://www.theccc.org.uk/wp-content/uploads/2014/12/Energy-Prices-and-Bills-report-v11-WEB.pdf [accessed January 2017]

109 These figures are taken from data published alongside the report. The report itself only published the breakdown for a combined gas and electricity bill where climate change policies accounted for 4.5 per cent of the total.

84. The report also made projections as to how bills would look in 2020 and 2030. It estimated that the proportion of bills relating to climate change policies would increase to 24 per cent in 2020 and 26 per cent by 2030.

Competition and Markets Authority investigation

85. Last year the Competition and Markets Authority concluded an investigation into the electricity market which found that around 70 per cent of domestic consumers of the six largest energy firms are on the more expensive 'default' standard variable tariff. They estimated that on average between 2012 and 2015, customers had been paying around £1.4 billion a year more than they would have done in a more competitive market.[110]

86. The CMA recommended that Ofgem should "establish a programme to provide customers with information to prompt them to engage and switch supplier" and "create a database of 'disengaged customers' on default tariffs, to allow rival suppliers to prompt these customers to switch; and a short term price cap for those on pre-pay meters." The Government has yet to respond to the CMA's recommendations.

87. Professor Helm disapproved of the notion that a database and greater switching would solve the problem. He said that people "do not have to spend their nights on the computer working out the latest complex deal offered by whichever energy company it happens to be. People just want a standard variable tariff that charges a reasonable margin and passes through the wholesale cost and the fixed costs that they have to pay." He also pointed out that wholesale prices had fallen substantially in recent years but "retail electricity prices have gone down not one iota to reflect that massive cost fall, but the Competition and Markets Authority thinks that is fine or at least it thinks that it is solved by switching."[111]

88. Electricity companies argued that the failure to pass on the fall in wholesale costs was due to them buying electricity in advance. Dermot Nolan, Chief Executive of Ofgem, was quoted in January 2017 as saying that "if that argument is true on the way down, it has to be true on the way up as well."[112] Wholesale costs are now rising again. EDF Energy will raise variable electricity prices by 8.4 per cent from March this year but said that this was due to rises in non-wholesale costs with advance purchasing of electricity protecting customers from rising wholesale prices.[113]

---

110 Competition and Markets Authority, *Energy Market Investigation, Final Report* (24 June 2016): https://assets.publishing.service.gov.uk/media/5773de34e5274a0da3000113/final-report-energy-market-investigation.pdf [accessed January 2017]

111 Q 12 (Professor Dieter Helm)

112 Emily Gosden, 'Ofgem warns Big Six firms against raising energy prices', *The Times* (20 January 2017): http://www.thetimes.co.uk/edition/business/ofgem-warns-big-six-firms-against-raising-energy-prices-tbxx9j8c3 [accessed February 2017]

113 EDF Energy, 'EDF Energy cuts variable and prepayment gas prices this winter, variable electricity prices forzen until March' (16 December 2016): http://media.edfenergy.com/r/1189/edf_energy_cuts_variable_and_prepayment_gas_prices_this [accessed February 2017]. Npower announced in February 2017 that bills on its standard variable tariff would rise by an average of 9.8 per cent a year from March 2017. A statement on their website said this was because "the cost of supplying energy to your home has increased, as well as the amount we need to pay towards government schemes": npower, 'Our price increase': https://www.npower.com/home/electricity-and-gas/price-change/?AG=003&CH=PPC&REF=GOOGB&WT.mc_id=RESPPCGOOGB&WT.srch=1&gclid=CJTagsm5g9ICFeyT7Qodyn8B7Q [accessed February 2017]

89. The Secretary of State told us that he felt an obligation to consider the interests of those people who wouldn't switch:

> "One of the things on which I wish to reflect in considering the CMA remedies is whether the pro-switching recommendations, which may be important, are sufficient to deal with the detriment being suffered by people who do not switch. I was interested in the evidence you heard that, even in optimistic scenarios, it was felt there would still be large proportions of people who do not switch. I feel an obligation to consider what would be in their best interests as well."[114]

90. Stephen Littlechild, a former Head of the Office of Electricity Regulation (a predecessor to Ofgem), submitted written evidence, signed by other former regulators[115], that described the CMA's estimate—that customers were paying £1.4 billion a year more than they needed to—as "implausible" and "based on a series of guesses rather than reality". They thought the idea that more switching would translate into benefits for customers was "illusory" and did not think the fact that standard variable tariffs are higher than fixed tariffs was a problem:

> "Existing customers may be on a standard variable tariff that will have to cover overhead costs as well as incremental costs. So the standard variable tariff will be higher than the fixed tariff. But this is not at the expense of existing customers: if suppliers lost existing customers and did not attract new customers by offering lower prices, then prices to existing customers would have to increase, not decrease, in order to spread overhead costs across fewer customers."[116]

91. **The Committee did not take extensive evidence on this topic and the evidence we did receive is contradictory. This is an unsatisfactory state of affairs. We welcome the Secretary of State's commitment to consider this matter further.**

Comparisons with other European countries

92. Domestic bills in Britain are around the average for similar European countries, as shown in Figure 3. The cost of subsidies for low-carbon generation in the UK are included in the cost of electricity bills.[117] In most other European countries, these subsidies are levied on electricity bills as explicit taxes.

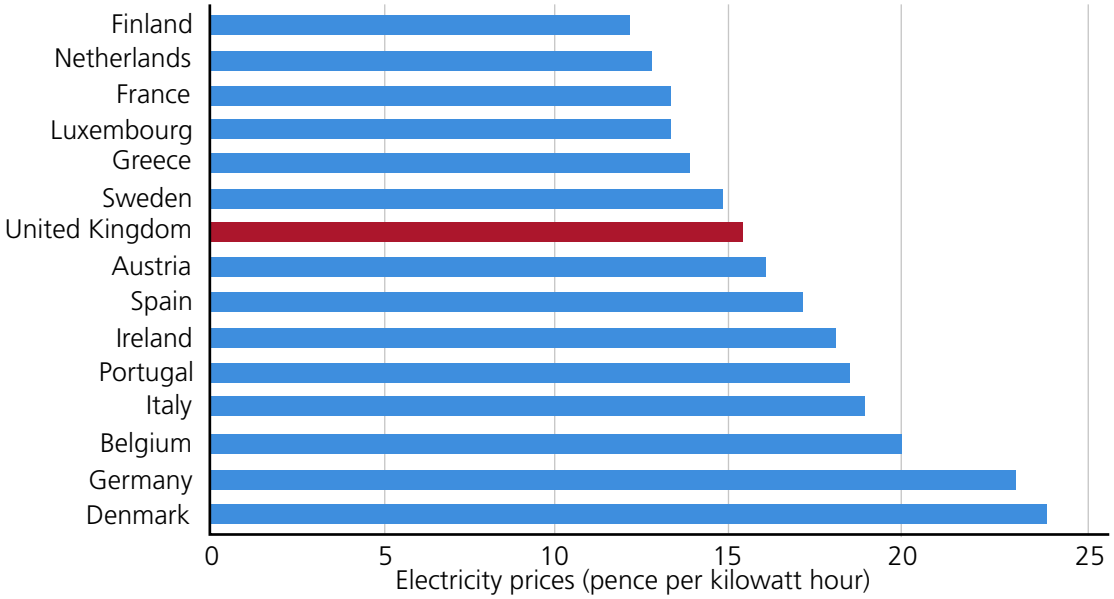
114 Q 167 (Greg Clark MP)

115 The other signatories to the letter were Sir Callum McCarthy, former chairman and chief executive of Ofgem and the Gas and Electricity Markets Authority, Eileen Marshall CBE, former managing director of Ofgem, Stephen Smith, former managing director of the markets division at Ofgem and Clare Spottiswoode CBE, former head of the office of Gas Regulation.

116 Written evidence from Professor Stephen Littlechild (UEM0096)

117 The Government reclaims the cost of low-carbon generation support by levying electricity suppliers who then pass on those costs to consumers in electricity bills. See Box 2 for further explanation.

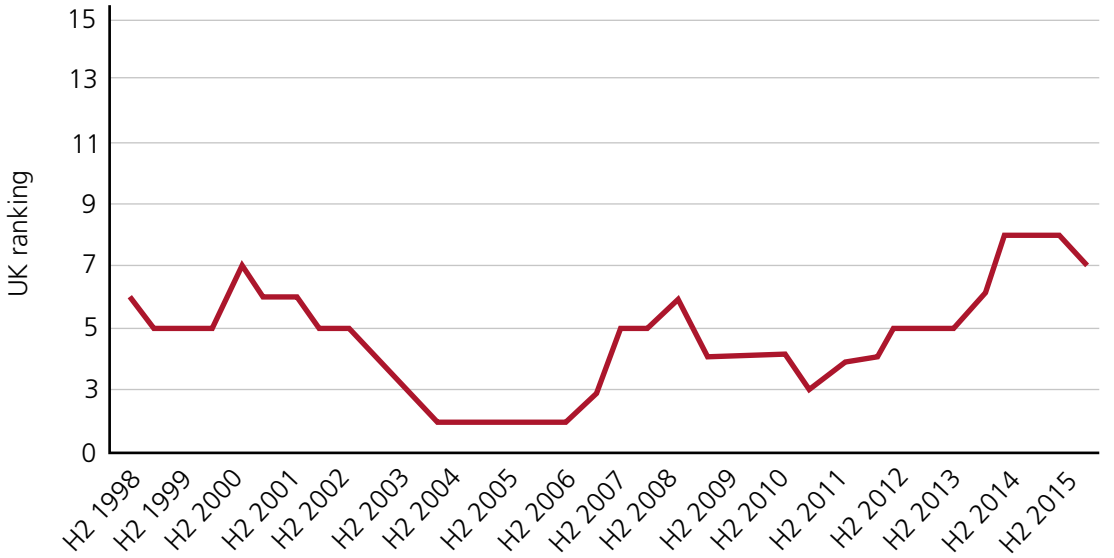
Figure 3: Domestic electricity prices for the average consumer[118] across EU15 countries, including taxes, January to June 2016 (pence per kilowatt hour)



Source: BEIS, Domestic electricity prices in the EU (24 November 2016), Table 5.6.2: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/580186/QEP_Q316.pdf [accessed December 2016]

93. For much of the first decade of the 21st century, Britain had some of the cheapest domestic electricity bills amongst similar European countries: in the first half of 2011, bills for the average consumer in Britain were 25 per cent below the EU 15 median, today they are 4 per cent below the EU 15 median. Figure 4 shows how British domestic bills have gone from being the second cheapest in Europe in the mid-2000s to the seventh cheapest today.

Figure 4: UK ranking against EU 15 countries, where 15 is the most expensive domestic electricity prices for the average consumer and 1 is the cheapest, H2 1998 to H1 2016[119]



Source: Department for Business, Energy & Industrial Strategy, Domestic electricity prices in the EU (24 November 2016), Table 5.6.2: https://www.gov.uk/government/statistical-data-sets/international-domestic-energy-prices [accessed February 2017]

118 Medium consumers are defined as having an annual consumption of 2,500 to 4,999 kilowatt hours per year.

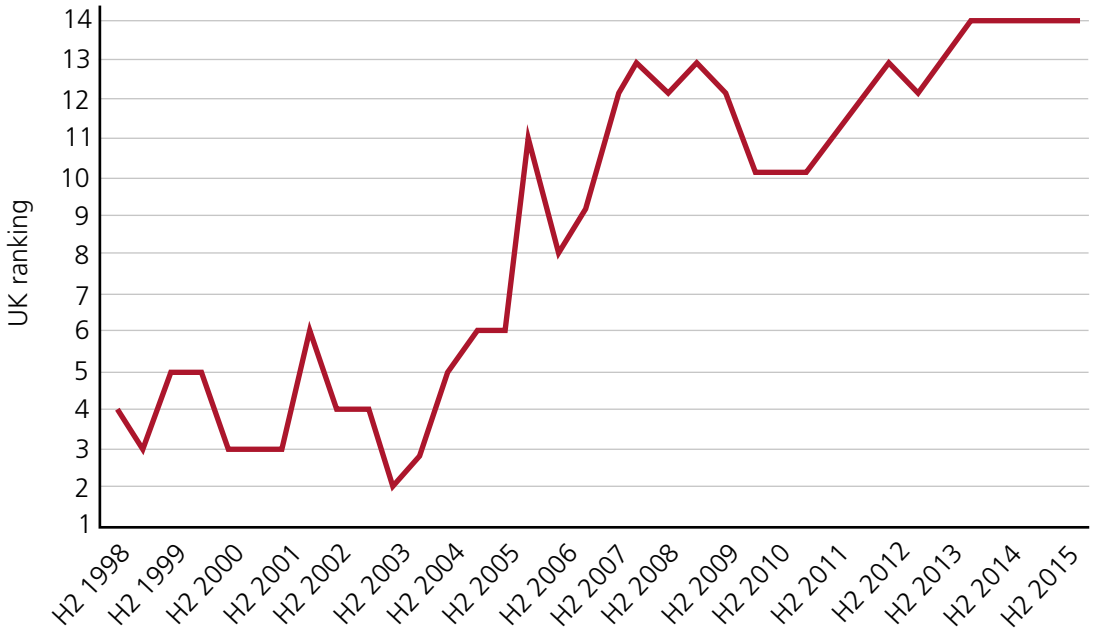
119 There was a change in methodology in calculating prices in 2007 which means prices before 2007 are not directly comparable to prices after. But prices as compared to other countries remains comparable before and after 2007.

94. **In 2014 10 per cent of the cost of electricity for domestic users was due to climate change policies. The Government's own analysis indicated that this is expected to rise to around a quarter by 2020.[120] This is not transparent however as the cost of the policies is incorporated into electricity bills, making it difficult to scrutinise with any certainty. The Government should provide estimates for the cost to consumers of climate change policies as part of its quarterly energy prices publication and require providers to include a summary of this information on electricity bills.**

Industrial energy prices

95. Britain is however at a substantial disadvantage in terms of industrial electricity prices when compared with similar European countries. Figure 5 below shows that electricity prices for energy intensive industries[121] in Britain have gone from being amongst the cheapest in EU 15 countries in 2003 to the most expensive today.

Figure 5: UK ranking against EU 15 countries[122] where 15 is the most expensive industrial electricity prices for energy-intensive users (including taxes) and 1 is the cheapest, H2 1998 to H1 2016

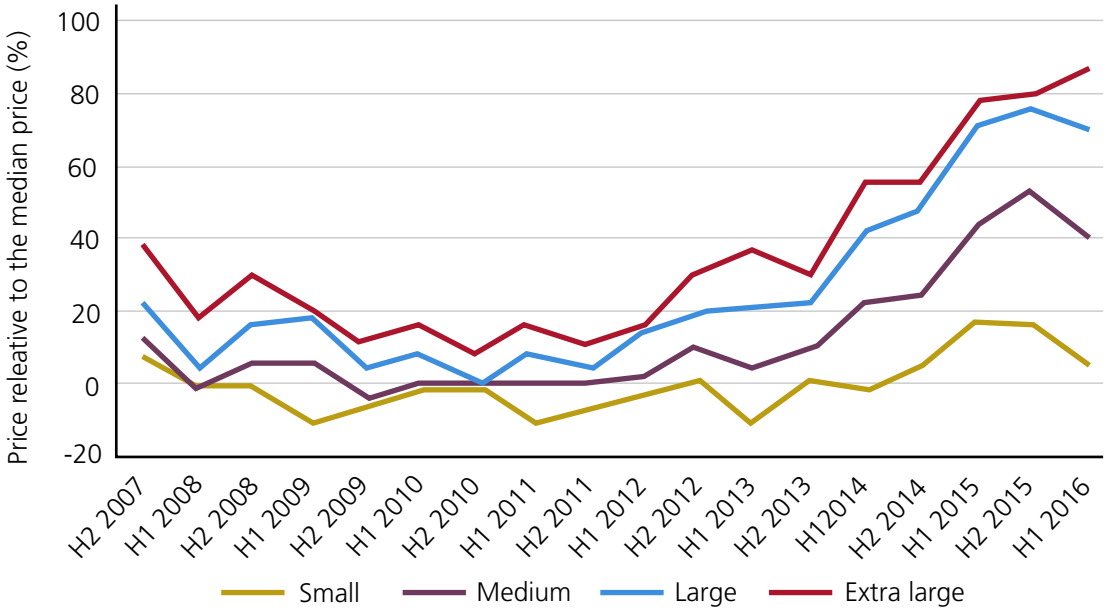


Source: Source: BEIS, International Industrial Energy Prices (24 November 2016), Tables 5.4.1 to 5.4.4: https://www.gov.uk/government/statistical-data-sets/international-industrial-energy-prices [accessed December 2016]

96. Prices for energy intensive users have increased rapidly since 2011, as shown in Figure 6: prices in the first half of 2016 for the most energy-intensive industries in Britain were 86 per cent above the EU 15 median (labelled as extra-large in Figure 6).

120 See para 83.
121 Defined as using between 70,000 and 150,000 megawatt hours a year.
122 Excluding Luxembourg.

Figure 6: UK industrial electricity prices relative to the median price, including taxes, in the EU 15 countries by size of energy user, H2 2007 to H1 2016



Source: BEIS, International Industrial Energy Prices (24 November 2016), Tables 5.4.1 to 5.4.4: https://www.gov.uk/government/statistical-data-sets/international-industrial-energy-prices [accessed December 2016]

97. We heard evidence that high electricity prices have been a factor in decisions taken to move industrial activity from Britain to other countries. Jeremy Nicholson from the Energy Intensive Users Group said it was "one of the biggest factors" and while not the only consideration, it was increasingly becoming the "dominant" one "particularly for energy-intensive industries that are also worried about their own carbon costs in the long run."[123]

98. Richard Warren from EEF, the manufacturers' organisation, discussed the example of the steel industry:

> "The reasons underlying the steel crisis have been well discussed: global overcapacity in steel production and cheaper imports from places such as China. That has affected steel companies across Europe, but one has to ask the question: why has the steel sector in the UK suffered particularly badly? One reason that comes up consistently from steel companies is energy prices and, specifically, electricity prices."[124]

99. Depending on the type of furnace, he thought the cost of electricity in the steel industry amounted to between 11 and 20 per cent of overall costs. In written evidence EEF said that these high prices had "undermined the sector's ability to operate competitively" and "diminished the UK's attractiveness as a place for inward investment."[125]

123 Q 97 (Jeremy Nicholson)
124 Q 97 (Richard Warren)
125 Written evidence from UK Steel and EEF (UEM0052)

100. Industrial electricity prices in the UK also compare unfavourably with fellow members of the International Energy Agency: when taxes are included, the UK had the third highest prices in the G7 in 2015 with prices 46 per cent above the EU median.[126]

The cost of climate change policies

101. In written evidence the Energy Intensive Users Group claimed that "the impact of climate policies, and the extent to which their costs affect industrial supplies, is the single biggest reason for the disparity in EU electricity prices."[127]

102. As with domestic bills, we have struggled to find a reliable breakdown for the components of industrial electricity bills. An added complication is that since 2013 the Government has been compensating those energy-intensive industries who are "most exposed to international competition" for the cost of climate change policies.[128] The various methods of compensation, as described to us by the department, are set out in Box 5.

Box 5: Government compensation schemes for energy-intensive industries

Climate Change Levy: As of 2013/14 the Climate Change Levy discount for sectors with Climate Change Agreements increased to 65 per cent for gas and 90 per cent for electricity. In addition, sites in the mineralogical and metallurgical sectors are fully exempted from the Climate Change Levy.

Renewable and low-carbon electricity support programmes: Eligible industries can currently receive compensation for up to 85 per cent of the costs of the Renewables Obligation and Feed-in Tariffs backdated to 14 December 2015. In addition, eligible industries are being exempted from up to 85 per cent of the costs of Contracts for Difference.

Carbon costs: Eligible industries can claim compensation for the indirect costs of the EU Emissions Trading Scheme (as of August 2013) and Carbon Price Support (as of April 2014) on their electricity prices. The exact rate of compensation varies by sector, but is currently around 64 per cent on average.

Source: Written evidence from the Department for Business, Energy and Industrial Strategy (UEM0083)

103. We received some estimates from Mr Nicholson as to the proportion of industrial bills that relate to climate change policies. The Department subsequently took these figures and provided an estimate of the extent to which the compensation schemes offset the cost of those policies. Their analysis, set out in Table 4, found that the schemes reduced the proportion of industrial bills relating to climate change policies from 44 per cent to 13 per cent of the total.

126 Department for Business, Energy and Industrial Strategy, *International industrial energy prices* (22 December 2016), Table 5.3.1: https://www.gov.uk/government/statistical-data-sets/international-industrial-energy-prices [accessed February 2017]

127 Written evidence from Energy Intensive Users Group (UEM0051). Mr Nicholson also told us that "virtually all the increase in costs is attributable to climate policy". (Q 97)

128 Written evidence from the Department for Business, Energy and Industrial Strategy (UEM0083)

Table 4: Effect of the Government's compensation scheme on industrial electricity prices in 2016 (analysis carried out by BEIS)

Components of industrial electricity bills	Mr Nicholson's figures for costs[129] (£/MWh nominal)	Mr Nicholson's figures, adjusted by BEIS for compensation measures (£/MWh nominal)
Wholesale energy excluding carbon, network, and metering costs	50	50
Carbon costs	13	5
Support for renewables	20	3
Climate change levy[130]	5.6	0
Total price	88.6	58
Of which: energy and climate change policies	38.6 (44%)	8 (13%)

Source: Additional written evidence from the Department for Business, Energy and Industrial Strategy (UEM0091)

104. The Committee on Climate Change claimed in a November 2015 paper that when compensation was taken into account, only around one per cent of the blast furnace costs for steel were related to climate change policies. They noted that the global price of steel had fallen by 60 per cent in the preceding four years and sterling had appreciated by 15 per cent in the preceding two years: "Of course, when margins are tight even an impact of the order of 1% might be said to be material, but this is clearly a different order to the impacts deriving from the reduced international price of steel and sterling appreciation."[131]

105. When asked about the discrepancy between his figures and those of the Committee on Climate Change, Mr Warren said his figures had been produced in 2016 by steel companies and he would "perhaps question all the figures that come out of the climate change committee on this."[132]

129 As provided to the Committee in oral evidence and reproduced by the Department for Business, Energy and Industrial Strategy in written evidence.

130 Mr Nicholson did not provide a figure for the climate change levy but the Department for Business, Energy and Industrial Strategy added it on.

131 Committee on Climate Change, *Technical note: low-carbon policy costs and the competitiveness of UK steel production* (November 2015): https://www.theccc.org.uk/publication/technical-note-low-carbon-policy-costs-and-the-competitiveness-of-uk-steel-production/ [accessed January 2017]

132 Q 97 (Richard Warren)

The effect of prices on industry

106. Other witnesses thought the claims of industry were exaggerated. The UCL Energy Institute described the "substantial industrial lobbying effort" as "disingenuous": "There is no overall risk to competitiveness, and moreover, those sectors potentially exposed in practice are largely either exempt from or are compensated for those costs."[133] They cited a 2015 study that had concluded that energy price differences between countries "explain less than 0.01 per cent of the variation in trade flows."[134]

107. Mr Nicholson said that like-for-like comparisons with other countries were "not straightforward and I sympathise with the Government in trying to find official international data that make that transparent."[135]

108. It is therefore difficult to understand the extent to which industrial activity is affected by climate change policies. The compensation arrangements add further obscurity. With different levels of compensation for different industries, it is perhaps impossible to calculate what the average cost is to industry. The analysis by the Department—based only on figures given to us in oral evidence—is the best estimate we have been provided with.

109. Comparisons with industrial users in other countries are similarly difficult. It is hard to find accurate statistics on industrial energy prices that take full account of the effect of rebates that are offered in countries such as Germany. The Government nevertheless acknowledges that there is a problem: it said in its January 2017 'Building our Industrial Strategy' green paper that "electricity costs have moved out of line with other European countries."[136] A "long-term roadmap to minimise business energy costs" is due to be published later this year.[137]

110. **There is little transparency around the cost of climate change policies for industrial users. The Government should publish what effect the policies have on industrial energy bills—taking into account taxes, industry levies and the operation of the compensation schemes—and on industrial location.**

111. The Department's analysis does highlight that without the compensation schemes, the cost of climate change policies would have been very substantial at around 44 per cent of bills. As the schemes were only introduced in 2013, the compensation may have come too late for some. Many industries—aluminium, chemicals, glass, paper—have already moved plants abroad.[138]

133 Written evidence from the UCL Energy Institute and Institute for Sustainable Energy Resources (UEM0064)
134 *Ibid.*
135 Q 100 (Jeremy Nicholson)
136 HM Government, *Building our Industrial Strategy* (January 2017): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/586626/building-our-industrial-strategy-green-paper.pdf [accessed February 2017]
137 *Ibid.*
138 Written evidence from the Major Energy Users' Council (UEM0065)

112. The Secretary of State for Business, Energy and Industrial Strategy told us that he wanted to make the industrial implications of energy policy into a fourth objective:

> "In the balance between the three components of the trilemma, we should add a fourth, which is that increasingly we should consider the industrial implications of energy policy, perhaps in a way that has not been considered before, as regards both the cost of energy to industry and the industrial opportunities that arise from decisions we make on energy policy. [139]

113. While this will be too late for those industries that have already moved, it would provide assurance that the Government is bearing in mind the effect that climate change policies have on international competitiveness.

114. **Comparisons with other countries are difficult but the Government itself has acknowledged that electricity prices for energy intensive industries in the UK are amongst the highest in Europe. The Government has estimated that even with its compensation schemes taken into account, around 13 per cent of industrial electricity bills for energy intensive industries are the result of climate change policies. This is a disincentive for such businesses to remain or to relocate operations to the UK.**

115. **The move of the energy portfolio to the Department for Business, Energy and Industrial Strategy offers an opportunity to make sure that the costs to business are taken into account when making energy policy. We welcome the Secretary of State's recent commitment to ensuring electricity is affordable for industry.**

139 Q 158 (Greg Clark MP)

CHAPTER 4: REFORMS TO RESTORE COMPETITION

116. In this chapter we set out five reforms to make the market more competitive and improve the security and affordability of the electricity supply.

Reform 1: Reprioritise the objectives of energy policy

117. In Chapter 2 we set out the three objectives that make up what is referred to as the 'trilemma' of energy policy: affordability, security of supply and decarbonisation. We also considered how policy has developed to include decarbonisation and the tension between this objective, security of supply and affordability.

118. This section will examine the impact of having a statutory target for one of the three objectives and set out how the Government should approach future conflicts between the objectives.

Effect of a statutory target

119. The Climate Change Act 2008 mandates the reduction of carbon emissions.[140] This, witnesses considered, gave decarbonisation a different status from issues of affordability and security of supply.[141] Decarbonisation is the only objective which has the backing of a statutory target.

120. Ashley Ibbett, Director of Clean Electricity at the Department for Business, Energy and Industrial Strategy, partially acknowledged this:

> "The challenge for us is that we have a legally binding decarbonisation target for 2050. That is, in a way, a given. We look at how we can minimise the burden and cost to the consumer and to business of achieving that 2050 objective and commitment."

121. As discussed above, the achievement of the target has been at the forefront of the minds of successive governments in taking many of the policy decisions discussed in this report: the last Labour government's preferential support for certain technologies within the Renewables Obligations; the coalition government's administratively set prices of early Contracts for Difference; the present Government's decision to proceed with Hinkley Point C. These are all examples where the trade-off between objectives has come down on the side of decarbonisation.

Achieving the correct balance

122. In Chapter 2 we considered the implementation of renewables policies and noted that these have not been achieved at the lowest cost to taxpayers and consumers.

123. Lord Turner of Ecchinswell suggested that a willingness to "pay a certain cost to get to a low-carbon economy" was needed, with compensation for those who were most adversely affected by this cost.[142] Lord Lawson of Blaby disagreed: he stated that decarbonisation should be "subordinate to the objective of supplying the British economy and households with cheap and reliable energy".[143]

---

140 See para 128
141 Q 9 (Prof Dieter Helm); Q 42 (Rupert Darwall)
142 Q 24 (Lord Turner of Ecchinswell)
143 Q 27 (Tony Lodge) and Q 16 (Lord Lawson of Blaby)

124. Some witnesses suggested that each aspect of the 'trilemma' should be given equal weight. Jimmy Aldridge of the IPPR stated that whilst security of supply is "extremely important", decarbonisation:

> "is tackling an issue that is very significant for future generations as well. … It is important that there is cross-generational balancing of those different objectives … they should be given equal weight."[144]

125. We do not agree. The overarching aim of energy policy must be to keep the lights on. Low carbon but chronically unreliable electricity is not acceptable. Similarly very cheap prices at the expense of frequent shortages would be unacceptable.

126. **Security of supply should be the first and most important consideration in energy policy. Decarbonisation and affordability must be taken into account, but should not be prioritised ahead of security where there is any conflict. Successive governments are perhaps guilty of overlooking security at times: for example, the disincentives for private investment in electricity generation created by the growth of intermittent renewables. Moreover, affordability should not be neglected in the pursuit of decarbonisation.**

Reform 2: Manage the path to decarbonisation

127. Professor Helm observed that the issue of the UK's approach to decarbonisation is a "complicated political, economic and moral problem".[145] In this section we examine the route successive governments have chosen to lead to a lower carbon economy and consider what reforms would ensure future decarbonisation measures achieve the correct balance with cost and security of supply.

The Climate Change Act 2008

128. The Climate Change Act received Royal Assent on 26 November 2008. The Act received wide, cross-part support during its legislative passage.[146] It provided for legally binding emissions targets and a new independent Committee on Climate Change to advise the Government and to set five yearly carbon budgets.[147]

144 Q 27 (Jimmy Aldridge)
145 Q 10 (Prof Dieter Helm)
146 At third reading in the Commons the Climate Change Bill was approved by 463 votes to three. HC Deb, 28 October 2008, col 835; CJ (Vol 264) (p 645)
147 Climate Change Act 2008, Part 1 and Part 2

Box 6: Targets in the Climate Change Act 2008[148]

The Climate Change Act 2008 imposes a duty on the Secretary of State to ensure that:[149]

- net UK carbon emissions are reduced by 80 per cent by 2050; and
- by 2020 net carbon emissions are reduced by 34 per cent.

Both reductions are measured against a baseline of emissions in 1990. The Secretary of State has some powers to change these targets (see paragraph 143 below).[150]

The Secretary of State is also required to set a carbon budget for each five yearly period and lay this before Parliament. To date five carbon budgets have been set and approved exactly as recommended by the Climate Change Committee.

Global action on climate change

129. Prior to the introduction of the Climate Change Bill, the government considered whether it should include a clause making the Act's provisions conditional on a global agreement.[151] Lord Turner of Ecchinswell accepted that part of the background to the Climate Change Act 2008 was the expectation of a global agreement on reducing greenhouse gas emissions.[152] The 2009 Copenhagen Conference did not produce the hoped for legally binding co-ordinated international action.[153] At the 2015 Paris conference some global agreement was achieved. Following the conference, the then Prime Minister stated that "the whole world [is] now signed up to play its part in halting climate change".[154]

148 Although climate change policy is set at a UK level, the Scottish and Welsh legislatures have passed their own legislation and receive advice from the Climate Change Committee on their progress. The Scottish legislation commits the Scottish government to a, more ambitious, 42 per cent reduction by 2020. Climate Change Act (Scotland) Act 2009, section 1 and section 2; Environment (Wales) Act 2016, section 29

149 Climate Change Act 2008, sections 1(1) and section 5 as amended by the Climate Change Act 2008 (2020 Target, Credit Limit and Definitions) Order 2009 (SI 2009/1258)

150 These powers have been used once: to change the interim 2020 target from a 26% reduction to a 34% reduction. This change was a technical one and designed to ensure the methodology for calculating 2020 and 2050 target were consistent, Explanatory Memorandum to the Climate Change Act 2008 (2020 Target, Credit Limit and Definitions) Order 2009 (SI 2009/1258)

151 Institute for Government, *The 'S' Factors lessons from policy success reunions, case study: The Climate Change Act 2008* (April 2012): https://www.instituteforgovernment.org.uk/sites/default/files/climate_change_act.pdf [accessed December 2016]

152 Q 17 (Lord Turner of Ecchinswell)

153 United Nations, *Copenhagen Accord* (18 December 2009): http://unfccc.int/resource/docs/2009/cop15/eng/l07.pdf [accessed February 2017]

154 David Cameron, *Historic global deal on climate change* (12 December 2015): https://www.linkedin.com/pulse/historic-global-deal-climate-change-david-cameron [accessed January 2017]

Box 7: The Paris Agreement

The main elements of the Paris Agreement are:

- countries agreed to keep global temperature "well below" 2.0C and "endeavour to limit" temperatures to 1.5C;
- countries set and publish their 'Intended Nationally Determined Contributions' for reducing emissions which will be subject to review every five years;
- a legal requirement on nations to publicly monitor and report on their emission reduction plans;
- an enhanced transparency and accountability framework for monitoring emission reduction plans. There is no legal requirement for nations to meet their 'Intended Nationally Determined Contributions' and no independent body monitoring compliance with these targets.

130. Professor Helm considered that result of the lack of a legally binding global agreement is that the UK has a "unilateral climate change policy" with "our own unilateral targets and our own unilateral carbon floor price".[155] The concern about the unilateral target was that it is self-defeating: energy intensive industries move abroad leaving the UK with all the costs of the policy, but having little effect on global emissions.[156] This led witnesses to question whether the UK policy reduced global emissions or simply redistributed UK emissions to other countries.[157] The Energy Intensive Users Group considered that the "absence of meaningful global action on carbon emissions" meant that:

> "emissions associated with industrial production and energy use are simply transferred onto other countries' environmental balance sheets."[158]

131. Richard Warren, former Senior Energy and Environment Policy Adviser at EEF, acknowledged that providing "exact figure on the level of carbon leakage" is tricky and would require much more detailed analysis by the Government.[159]

132. **There is currently no robust and reliable data on whether measures to reduce the UK's carbon emissions have in fact resulted in the same emissions being exported to other countries due to the closure or relocation of energy intensive industries. We therefore recommend that the Government conducts and publishes such an analysis to assess the success of existing policy and plan future measures.**

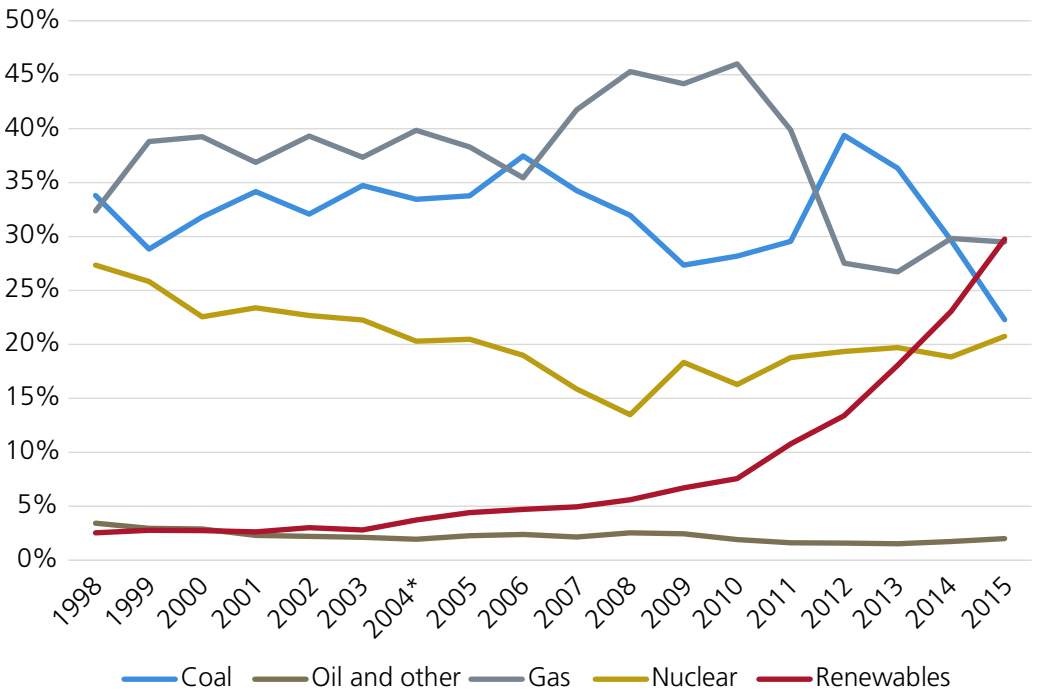
155 Q 9 (Prof Dieter Helm)
156 *Ibid.*
157 Q 98 (Jeremy Nicholson)
158 Written evidence from the Energy Intensive Users Group (UEM0051)
159 Q 98 (Richard Warren); Mr Warren was referring specifically to the steel sector.

Achieving the Climate Change Act 2008 target

133. The UK has met the interim targets for emissions reductions set out in the Act and its associated carbon budgets. This is due to the "great progress" made in the decarbonisation of electricity.[160] Martin Pibworth, Managing Director, Wholesale at SSE plc, called this a "remarkable transition to a lower-carbon, lower-emitting system … that is to the country's credit."[161]

134. The decarbonisation achieved in the electricity sector is due to the decline in coal and the rapid growth of renewable technologies. Figure 7 shows the increase in generation from renewable sources since the late 1990s.

Figure 7: Energy Generation Shares, 1998 to 2015 (TWH)



Source: Department for Business, Energy and Industrial Strategy, Energy Trends: electrcity: https://www.gov.uk/government/statistics/electricity-section-5-energy-trends [accessed December 2016]

The path to the 2050 target

135. The UK is not on track to meet the targets set out in the fifth carbon budget. Matthew Bell, of the Committee on Climate Change, acknowledged that:

> "The ones where we look like we are off track right now are the fourth carbon budget, in the mid-2020s, and the fifth carbon budget, which was passed by Parliament only in July. We are off track to those—unsurprisingly, when you look out at those time periods."[162]

136. Professor Richard Green, Professor of Sustainable Energy Business at Imperial College, stated that the 2050 carbon target requires "transformative change across several sub-sectors of energy production and use. The largest in scale are the power sector, transport … and the heat sector."[163] The Drax Group noted that:

160 Q 124 (Phil Sheppard)
161 Q 87 (Martin Pibworth)
162 Q 54 (Matthew Bell)
163 Written evidence from Professor Richard Green (UEM0058); see also written evidence from Dr John Rhys (UEM0011) and Q 141 (Dermot Nolan)

> "Whilst the UK has made steady progress in recent years decarbonising the power sector, by comparison the heat and transport sectors continue to lag behind."[164]

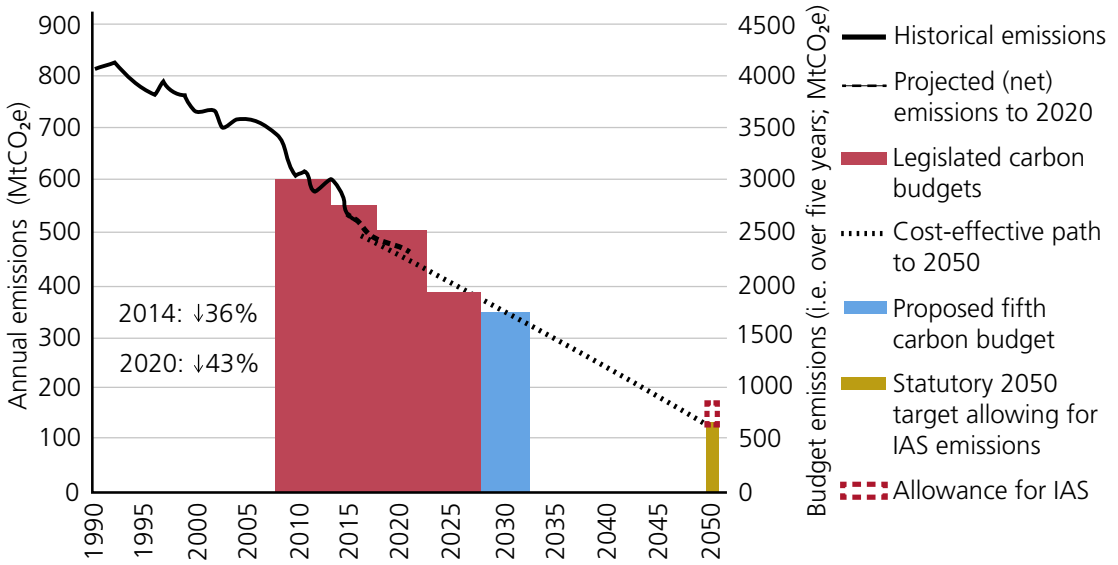
137. The progress made to date on decarbonising heating and transport has been "nowhere near as much" as the change in the electricity sector.[165] Jimmy Aldridge of the IPPR pointed out that it was easier to "decarbonise a small number of very large units" in the electricity sector than "to go into individual homes" and change the operation of domestic heating.[166]

138. **In the longer term the UK will not meet the 2050 target without substantial progress in the decarbonisation of heating and transport. The development of new technologies will be an important element of this. We consider further how to encourage research below.**

Introducing greater flexibility

139. The Committee on Climate Change's projection for the most cost-effective path to the 2050 target is a steady, consistent reduction as illustrated in Figure 8.

Figure 8: Path to the 2050 target



Source: The Committee on Climate Change, Fifth Carbon Budget (November 2015): https://www.theccc.org.uk/wp-content/uploads/2015/11/Committee-on-Climate-Change-Fifth-Carbon-Budget-Report.pdf [accessed December 2016]

140. The rigidity of the proposed pathway, and the intermediate targets it sets, were questioned by witnesses. Peter Atherton of Cornwall Energy considered that hard targets were "counter-productive":

> "a lot of our really poor policy decisions have been driven by the fact that we set very hard timetables in law—that we have to hit certain targets by 2020, 2030 and, subsequently, 2050."[167]

164 Written evidence from the Drax Group (UEM0010)
165 Q 124 (Phil Sheppard)
166 Q 32 (Jimmy Aldridge)
167 Q 74 (Peter Atherton)

141. Similarly, Rupert Darwall, of the Centre for Policy Studies, argued that setting a hard target for renewables led to "the system [saying] it is going to bury the costs and achieve the target at whatever cost".[168]

142. The Secretary of State defended the targets stating that industry had "commended" their adoption. He stated that businesses benefited from "knowing the trajectory" as it allowed them to plan ahead.[169]

143. The Act itself does allow limited discretion to the Secretary of State to amend the targets and path to decarbonisation. He may amend the percentage reduction to be achieved by 2020 or 2050.[170] These powers may be exercised if there have been "significant developments" since the Act received Royal Assent in scientific knowledge about climate change, or in European or international law.[171] The explanatory notes accompanying the Act indicate that the latter reasons "might be used in the event of a new international treaty on climate change".[172] Following the Paris Agreement (see Box 7), the Committee on Climate Change advised that the UK should not immediately revise the emissions target. It argued that:

> "The UK already has stretching targets to reduce greenhouse gas emissions. Achieving them will be a positive contribution to global climate action. In line with the Paris Agreement, the Government has indicated it intends at some point to set a UK target for reducing domestic emissions to net zero. We have concluded it is too early to do so now, but setting such a target should be kept under review. The five-yearly cycle of pledges and reviews created by the Paris Agreement provides regular opportunities to consider increasing UK ambition."[173]

144. Alternatively, the Act allows the Government to "bank and borrow" between budget periods to meet emissions targets.[174] The Secretary of State may "borrow" part of the next budget thus increasing the emissions target. This is limited to no more than one per cent of the carbon budget.[175]

145. A further option for flexibility lies in the hands of Parliament which could reject future carbon budgets.[176] The Climate Change Act 2008 specifies that the level at which a carbon budget is set must be fixed by legislation.[177]

146. **The Government should use the powers provided in the Act to vary the required pace of emissions reductions in the electricity supply. This flexibility would allow time for the development of new technologies which will increase efficiency and reduce emissions in a cost effective way.**

---

168 Q 42 (Rupert Darwall)
169 Q 161 (Greg Clark MP)
170 Climate Change Act 2008, section 2(1) and section 6(1)
171 Climate Change Act 2008, section 2(2)(a) and section 6(2)(a)
172 Climate Change Act 2008, Explanatory Notes
173 Committee on Climate Change, *UK climate action following the Paris Agreement* (13 October 2016): https://www.theccc.org.uk/wp-content/uploads/2016/10/UK-climate-action-following-the-Paris-Agreement-Committee-on-Climate-Change-October-2016.pdf [accessed January 2017]
174 Q 161 (Jeremy Pocklington); Climate Change Act 2008, section 17
175 In the event of an emissions surplus the Secretary of State may 'bank' the capacity and add it to the next carbon budget.
176 Q 10 (Prof Dieter Helm)
177 Climate Change Act 2008, section 4; the Act specifies that that this is to be achieved by laying a draft statutory instrument before Parliament, sections 8 and 9.

Reform 3: Hold a neutral, fully competitive supply auction

147. In November 2015, the then Secretary of State for Energy and Climate Change, Amber Rudd MP, said she wanted to see "a competitive electricity market, with government out of the way as much as possible, by 2025."[178] The Government reiterated this wish, albeit without a target date, in its January 2017 'Building our Industrial Strategy' green paper:

> "Subsidies and other forms of state support have played an important role in creating markets for new technologies and driving down their costs. But it is important that we move steadily to an operating model in which competitive markets deliver the energy on which our country depends."[179]

148. We would similarly like to see the return of competition to the electricity market. We accept that a return to the approach of the 1980s and 90s is not possible given decarbonisation and security of supply concerns—these aren't problems a fully market-led approach can solve. Nevertheless, the Government can set a framework within which a competitive market can operate to achieve its energy policy objectives.

149. The Government has already made some welcome moves. The second Contracts for Difference allocation round, due to open in April 2017, will include competitive auctions for some technologies including offshore wind. Contracts for Difference compare favourably with the Renewables Obligation. BEIS said that the maximum price offshore wind will receive in 2020/21 is £105 and in 2025 is £85: "This compares to a Renewables Obligation equivalent reserve price in the first Contracts for Difference auction of £145."[180]

150. Technologies however are not able to compete against each other in an auction. Several witnesses criticised this aspect of the scheme. The Drax Group PLC said it did not provide value for money:

> "Renewables are not currently competing on a level playing field for government support. This does not lead to efficient economic outcomes in terms of value for money for bill payers or achieving the lowest strike price possible for successful bids. Instead it leads to government 'picking winners and losers', which creates regulatory uncertainty and risks undermining investor confidence."[181]

151. The second auction for Contracts for Difference is due to start in April 2017. Solar and onshore wind, the two cheapest renewable technologies, will not be able to compete for contracts alongside other technologies. Box 8 explains how the auction process for Contracts for Difference works.

178 Amber Rudd MP, Speech on a new direction for UK energy policy, 18 November 2015: https://www.gov.uk/government/speeches/amber-rudds-speech-on-a-new-direction-for-uk-energy-policy [accessed December 2015]

179 HM Government, *Building our Industrial Strategy*, January 2017: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/586626/building-our-industrial-strategy-green-paper.pdf [accessed February 2017]

180 Written evidence from the Department for Business, Energy and Industrial Strategy (UEM0083)

181 Written evidence from Drax Group PLC (UEM0010)

Box 8: The Contracts for Difference auctions

The first Contracts for Difference auction was held by the Government in 2014. Technologies were divided into two 'pots': established technologies ('Pot 1', which included onshore wind and solar) and less established technologies ('Pot 2').[182] A budget was assigned to each pot. The budget split is displayed in the table below.

Table 5: Contracts for Difference allocation, first round proper[183]

	2015/16	2016/17	2017/18	2018/19	2019/20	2021/22
Overall budget	£50m	£205m	£205m	£205m	£205m	£205m
Pot 1	£50m	£50m	£50m	£50m	£50m	£50m
Pot 2	-	£155m	£155m	£155m	£155m	£155m

Source: Department of Energy & Climate Change, Draft Budget Notice for CFD Allocation Round 1 (29 September 2014): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/336101/draft_cfd_budget_notice.pdf [accessed February 2017]

The budget listed for a particular year is available for projects that will deliver electricity in that year; for example, £155 million was available for projects that would complete in 2019/20.

Projects were invited to submit bids and an auction was ran on a pay-as-clear basis. This means that all successful bidders are paid the clearing price set by the most expensive successful bid (rather than paying the price that they bid). No technology however could receive a price that was above its 'administrative strike price'.

The administrative strike prices for each technology are set by the Government. Its stated aim is to set the price at such a level as to allow the cheapest 19 per cent of projects for any technology to qualify. The strike prices for some technologies decreased over the period: the strike price for offshore wind was set at £155 per megawatt hour for projects that would deliver in 2015/16 and £140 per megawatt hour for projects that would deliver in 2018/19.

An example from the results of the Pot 2 auction illustrates how this works. The clearing price for 2018/19 was £114.39 per megawatt hour. An offshore wind project and an advanced conversion technologies project received this price (both had strike prices of £140 per megawatt hour). An 'energy from waste' project was also a successful bidder but as the strike price for that technology was £80 per megawatt hour, it will be paid its strike price rather than the clearing price. A link to the full results of the auction is available in the footnote.[184]

A draft budget for the second allocation round was announced in November 2016. The Government only included a budget for Pot 2 technologies. This was £290 million for delivery in 2021/22 and £290 million for delivery in 2022/23.[185]

182 The technologies listed as being able to compete are offshore wind, advanced conversion technologies (with or without combined heat and power), anaerobic digestion (with or without combined heat and power), dedicated biomass with combined heat and power, wave, tidal stream and geothermal.

183 Contracts for Difference, *Allocation Round One Outcome* (26 February 2015): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/407059/Contracts_for_Difference_-_Auction_Results_-_Official_Statistics.pdf [accessed February 2017]

184 All prices are in 2012 prices. This was the first round following the Energy Act 2013 which introduced Contracts for Difference but the Government had already awarded some contracts for difference without price competition (discussed at para 46).

185 Pot 1 technologies were onshore wind, solar photovoltaic, energy from waste with combined heat and power, hydro, landfill gas and sewage gas. Pot 2 technologies were offshore wind, wave, tidal stream, advanced conversion technologies, anaerobic digestion, dedicated biomass with combined heat and power, geothermal and Scottish islands onshore wind.

Reasons for not holding open auctions

152. The main justification for not holding open auctions is that less developed technologies need support if they are ever to become competitive. Hugh McNeal from RenewableUK said that UK support for offshore wind had enabled large cost reductions:

> "Some of what we have seen in offshore wind, because of UK leadership, has been pretty remarkable in recent years. The doubling in the size of turbines and the 40% reduction in cost are not what you associate with multi-billion pound infrastructure projects; it is what you associate with TVs and computers."[186]

153. Dermot Nolan said he was "not a fan of subsidies" but acknowledged that given there are now 11 gigawatts of solar power in the UK when the expectation for the period had been 3 gigawatts, "you could argue … that the subsidies seem to imply some learning by doing … there is some possibility that new technologies, if they are given a temporary leg-up, will be innovative—as long as ultimately that subsidy is removed."[187]

154. Professor Helm thought however that the money that has gone towards subsidies for renewables would have been better spent on research and development:

> "You have to ask how many tens of billions you want to spend to work out how to erect an offshore wind turbine compared with the other alternatives that are available, such as investing in opening up the light spectrum, developing solar film, and thinking about graphene and nanotechnologies for next generation solar."[188]

155. Mr Nolan agreed that it was an exciting time for new technologies and despite the possibility that subsidies may allow the reduction of costs through learning by doing, he thought open competition between technologies was the best way to encourage their development:

> "We are possibly on the cusp of a great degree of innovation in the energy sector in a way that we have not seen for 30 or 40 years, and I must say that I welcome that. It could be quite an exciting time. My instincts are that the best way for that to happen is through competitive technologies against a relatively fixed carbon price."[189]

186 Q 109 (Hugh McNeal)
187 Q 135 (Dermot Nolan)
188 Q 4 (Prof Dieter Helm)
189 Q 135 (Dermot Nolan)

Designing an auction

156. Several witnesses agreed with Mr Nolan that open competition was the preferred solution. Professor Helm proposed a compelling design similar to that suggested by many other witnesses:

> "I prefer the market route and I have proposed a way of balancing what the state needs to do, which is to fix the amount of carbon and to fix the quantity to ensure the lights stay on and we have a decent capacity margin, and then let the market get on with the component parts. That is a perfectly plausible public/private partnership."[190]

157. We agree with this approach and with the greater support for research and development into energy technologies that we set out below (paragraphs 187–194), new technologies should receive the support they require.

158. **The Government should set out plans to achieve its aim, as set out in 2015, of getting the government out of the electricity market as much as possible by 2025. The best way to do this would be through a single auction, designed to comply with the following principles:**

- **the required capacity is identified prior to the auction;**
- **the desired level of carbon emissions is fixed;**
- **all technologies are able to compete;**
- **an appropriate levy on intermittent generators is designed to reflect the cost of back-up generation;**
- **the cost of any updates to transmission networks are reflected in bids;**
- **the auction is overseen by an independent body who, in light of the results of the auction, could make any necessary adjustments to the targets.**

159. **An auction run on the basis of these principles would ensure that consumers are paying the lowest prices for low-carbon electricity.**

160. **The challenge is not to remove all government involvement. This is not possible given the present objectives of energy policy, which we accept as the correct ones. Our aim with the recommendation above is to identify a way for the necessary involvement of government to be limited to setting the parameters within which a market is left to identify the most cost-effective solutions. We believe our recommendation would lead to outcomes which would improve security, protect competitiveness and allow emissions reductions to be achieved more efficiently and at lower cost.**

---

190 Q 4 (Prof Dieter Helm). For example RenewableUK said "Ultimately the role of Government should be to set the overall objectives on decarbonisation and security of supply – most likely in the form of a carbon intensity target and a Loss of Load Expectation (LOLE) respectively – and then task agencies with delivering these objectives by procuring the volumes of low-carbon generation and capacity services needed to meet those targets". Written evidence from RenewableUK (UEM0075)

Reform 4: Greater scrutiny and independent oversight of competitive auctions

Current system

161. Numerous bodies have roles in overseeing and implementing energy policy. The main relationships, categorised by the Government's objectives, are summarised below.

Security of supply

162. National Grid is responsible for ensuring there is a sufficient supply of electricity. The Government, through the Department for Business, Energy and Industrial Strategy, sets the security standard that National Grid has to meet. Ofgem ensures that National Grid meets the standard and does so in a cost-effective way.

163. The operation of the capacity market provides an example. The Government, advised by National Grid, identifies future capacity requirements. The National Grid then runs the auction to find generators who can provide that capacity. Ofgem is responsible for the rules of the auction and makes any changes.

Decarbonisation

164. The Committee on Climate Change was established to set five-yearly carbon budgets that would ensure a steady reduction in carbon emissions to meet the 2050 target. The Committee advises the Government on what the targets for each budgetary period should be and how they can be met. The Government then proposes draft legislation on that basis.

Affordability

165. Ofgem regulates the wholesale and retail markets for electricity. It has powers to address anti-competitive behaviour. The Committee on Climate Change, when advising on carbon budgets, is mandated by the Climate Change Act to take into account economic, fiscal and social circumstances when making its decisions.[191]

166. As part of its role in scrutinising the value for money of Government expenditure, the National Audit Office examines energy policy decisions.[192]

191 Climate Change Act 2008, section 10(2): "economic circumstances, and in particular the likely impact of the decision on the economy and the competitiveness of particular sectors of the economy"; " fiscal circumstances, and in particular the likely impact of the decision on taxation, public spending and public borrowing;" "social circumstances, and in particular the likely impact of the decision on fuel poverty".

192 For example, its recent report on Hinkley Point C. See para 33.

Scrutiny of Government policy

167. The Competition and Markets Authority, following its recent investigation of the energy market, concluded that the existing structure set out above failed to provide sufficient independent scrutiny of government policy and called for greater transparency:

> "In relation to the impact of government policies, we have considered whether there is a lack of independent and authoritative assessment of the costs and benefits of different proposed and existing policies, including the trade-offs between different policy objectives, and/or a lack of information and analysis regarding the energy markets on which to base robust decisions. While we noted that there are already several independent institutions that scrutinise these costs and benefits, we consider that clearer communication around these issues is necessary to increase the transparency of the information already available. This would improve the quality of the public debate and policy decision-making."[193]

168. In particular they highlighted "the absence of any formal mechanism through which Ofgem can set out its views on particular DECC policy proposals." They concluded this was "likely to harm transparency, the independence of regulation, and consumers' confidence in the regulatory and policy decisions that are taken. This in turn is likely to undermine the robustness of policy decision making and implementation."

169. We asked Dermot Nolan, Chief Executive of Ofgem, whether Ofgem should be able to scrutinise government decisions:

> "Would I welcome it? That is a delicate question. Again, if government accepted that there was a role for the regulator, we would take it very seriously. "Welcome" is a strong word. I personally think that there is a role for a body to scrutinise such decisions. The CMA thought that Ofgem was a logical enough entity to do it and I would tend to concur with that."

170. Neither Ofgem nor any other advisory body was involved in the decision by the Government to enter into bilateral negotiations with EDF over Hinkley Point. The involvement of an independent body—with a mandate to assess policy decisions against all three energy policy objectives—would have provided reassurance that Hinkley Point C did provide value for money.

A new Energy Commission

171. **The Government should establish an Energy Commission to provide greater scrutiny of energy policy decisions. This would be an independent advisory body, reporting to the Secretary of State, tasked with advising on the best way for all the objectives of energy policy to be delivered.**

193 Competition and Markets Authority, *Energy Market Investigation, Final Report* (24 June 2016): https://assets.publishing.service.gov.uk/media/5773de34e5274a0da3000113/final-report-energy-market-investigation.pdf [accessed January 2017]

172. **It would be expected to monitor and advise on:**

- **security of supply, assessing changing patterns of demand and the balance of that demand with anticipated supply;**
- **investment in new electricity generation and the adequacy or otherwise of the incentives in place to induce necessary future investments;**
- **independent forecasts for supply and demand;**
- **developments in new energy technologies and their possible impact;**
- **oversight of the technology-neutral, competitive auction process recommended above; and**
- **prices and affordability.**

173. **The Commission would cover all aspects of the energy market. It would work with those institutions that have been established through legislation such as the Committee on Climate Change. It would produce an annual report and studies of particular aspects of the market.**

Reform 5: Fund research and development

174. "The prospect for the commercial development of electricity is boundless", The Times' engineering correspondent wrote in 1910, referring to the potential uses for the technology: "in opportunities for general industrial advance there is no trade … that can compare".[194]

175. Advances in energy research and innovation could spur great progress towards low carbon electricity generation. In this section we consider how the Government can best facilitate and promote energy research and development.

The case for research and development

176. "We are in a period of extraordinary technical change", Professor Helm told us.[195] Scientists studying potential innovations agreed. Professor Peter Littlewood, Director of the Argonne National Laboratory in the United States, wrote that "it is clear that a renewable revolution is already upon us and that it has considerable momentum."[196]

177. Professor Richard Friend, Cavendish Professor of Physics at the University of Cambridge, and Professor Richard Jones, of the University of Sheffield, wrote that a period of "disruptive change" in the energy industry was primarily driven by new technologies "that are … bringing unprecedented cost reductions and new business opportunities".[197]

---

194 'Electrical Notes', *The Times* (14 September 1910): http://www.thetimes.co.uk/tto/archive/article/1910–09-14/13/6.html#start%3D1879–01-01%26end%3D1910–12-31%26terms%3Delectricity%26back%3D/tto/archive/find/electricity/w:1879–01-01%7E1910–12-31/3%26prev%3D/tto/archive/frame/goto/electricity/w:1879–01-01%7E1910–12-31/27%26next%3D/tto/archive/frame/goto/electricity/w:1879–01-01%7E1910–12-31/29 [accessed December 2016]

195 Q 5 (Prof Dieter Helm)

196 Written evidence from Prof Peter Littlewood (UEM0093)

197 Written evidence from Prof Richard Friend and Prof Richard Jones (UEM0088) and (UEM0094)

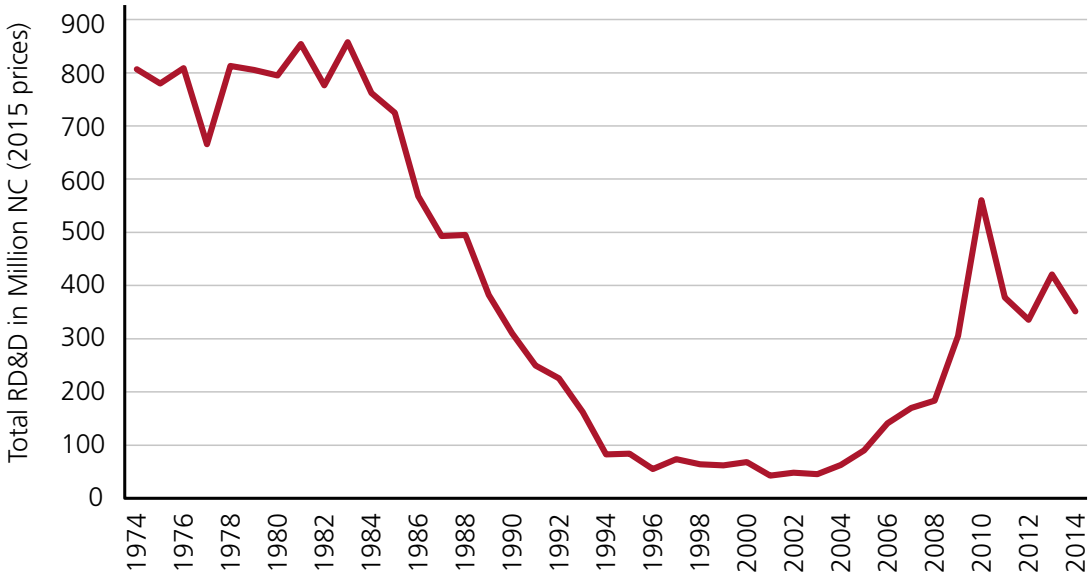
178. Whilst there are clearly exciting developments in a number of fields, there is also a danger of placing too much reliance on new technologies to solve future problems. Professor Grubb, Professor of International Energy and Climate Change Policy at University College London, cautioned, "there tends to be a caricature about existing technology not being very good and new technologies being wonderful".[198] Michael Liebreich, founder of Bloomberg New Energy Finance, considered technology would not create a "sudden rupture" but the current pace and direction of development would continue.[199]

179. We received evidence from companies and industry groups about the potential of individual technologies from anaerobic digestion to small nuclear reactors.[200] Proponents of new technologies argued they present an opportunity for UK industry. For example, using the case of offshore wind, RenewableUK stated that new technology presented "opportunities, capitalising on the UK's global lead to develop globally competitive businesses in key low-carbon technologies."[201]

Funding for energy research and development

180. In 2014 the UK spent £377 million on energy research and development.[202] Professor Sir Richard Friend explained that "the UK disinvested from R&D in energy in the early 1980s". He attributed this to the "run down of nuclear technology and loss of R&D function after privatisation of the energy utilities."[203] Figure 9 below illustrates the fluctuations in investment in the sector since 1974.

Figure 9: Total energy technology research development and demonstration expenditure 1974–2014 (in £ million, 2015 prices)

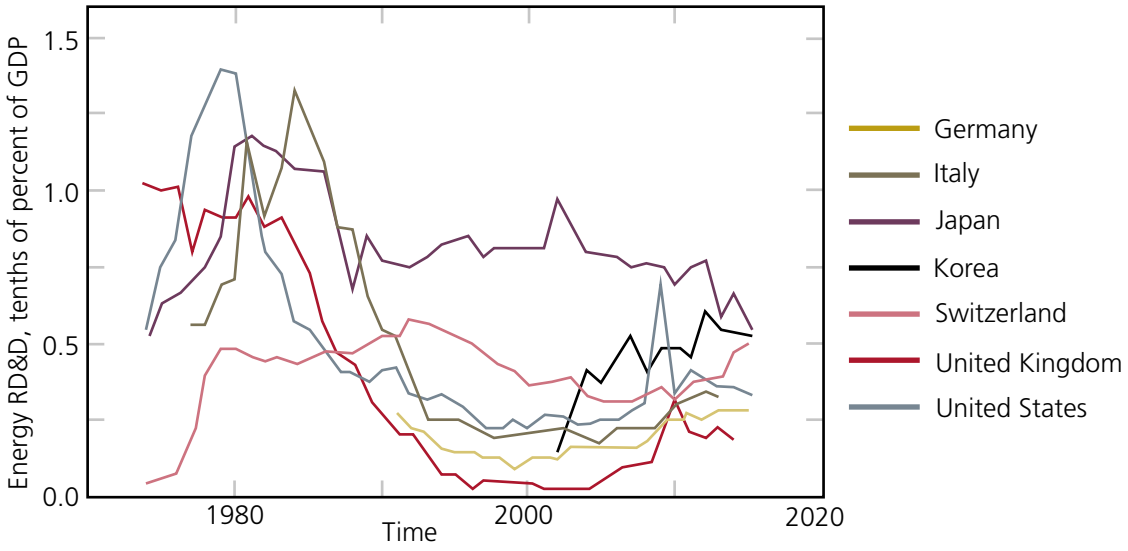


Source: International Energy Agency, 'Data Services: RD&D statistics database': http://www.iea.org/statistics/RDDonlinedataservice/ [accessed December 2016]

198 Q 45 (Prof Michael Grubb)
199 Q 109 (Michael Liebreich)
200 The Anaerobic Digestion and Bioresources Association told us that this technology could "reduce the UK's carbon emissions by 4%" (UEM0034). The Department for Business, Energy and Industrial Strategy stated that small modular reactors offered a "different route" to nuclear powered electricity that could "transform the economics of heat networks" (UEM0083)
201 Written evidence from RenewableUK (UEM0075)
202 International Energy Agency, 'Research Development and Demonstration Statistics': http://www.iea.org/statistics/topics/rdd/ [accessed December 2016]
203 Written evidence from Prof Richard Friend and Prof Richard Jones (UEM0088) and (UEM0094)

181. The UK still lags behind other comparable countries in terms of the percentage of GDP spent on energy research (see Figure 10 below). The Government has "pledged to double spending on research and development in energy technologies" by 2021.[204] Nonetheless, as Professor Littlewood pointed out, to match the US government's level of investment the UK Government would need to double this pledge.[205] The Government's industrial strategy acknowledges that the level of investment in the UK in research and development generally is "below the OECD average" and "far behind" leading nations such as Japan, South Korea and Finland.[206]

Figure 10: Public Sector Energy Research and Development, international comparison



Source: Written evidence from Professor Sir Richard Friend and Professor Richard Jones (UEM0088); data from the International Energy Agency

Deployment of funding

182. As well as sufficient funding, scientists in this field identified two, linked, issues. First the difficulty of translating university research into commercially viable technology. Dr David Clarke, the Chief Executive of the Energy Technologies Institute, said that in his experience "once you get into the commercialisation space it is really difficult, almost impossible".[207] Professor Grubb and others from the UCL Energy Institute explained:

> "The challenge here is that technology proven at lab-scale requires further scale-up and commercial demonstration. However, private investors are typically unwilling to support projects at this stage, preferring to wait until they are demonstrably market-ready."[208]

204 Q 156 (Ashley Ibbett)
205 Written evidence from Prof Peter Littlewood (UEM0093)
206 HM Government, *Building Our Industrial Strategy* (January 2017): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/585273/building-our-industrial-strategy-green-paper.pdf [accessed January 2017]. The UK invests 1.7 percent of GDP; the OECD average is 2.4 percent and South Korea, Israel, Japan, Sweden, Finland and Denmark invest over 3 per cent of GDP.
207 Q 45 (Dr David Clarke)
208 Written evidence from the UCL Energy Institute and Institute for Sustainable Resources (UEM0064)

183. The Government appears to recognise this issue and the first pillar of it recent Industrial Strategy is research and development. The Green Paper states that the Government's aim is for the UK to "become a more innovative economy and do more to commercialise our world leading science base to drive growth."[209]

184. The second issue identified was the need for co-ordination and oversight of funding. This is currently channelled through a number bodies including the research councils, Innovate UK and Ofgem. Professor Sir Richard Friend told us that the current system lacks "clear ownership or a clear determination of that government spend".[210] RWE agreed that there is "a case for rationalising and streamlining the many sources of energy R&D funding to ensure better prioritisation and utilisation".[211]

Recent and forthcoming reforms

185. In scientific research generally the Government has initiated reforms to the system of funding. The seven research councils and Innovate UK[212] will be integrated under one body called UK Research and Innovation (UKRI).[213] The Government has stated that this new body offers:

> "an opportunity to strengthen the strategic approach to future challenges and maximise value from Government's investment of over £6 billion per annum in research and innovation."[214]

186. In the field of energy research the Government has announced a number of changes:

(a) In November 2015, the UK joined Mission Innovation, an international collaboration for clean energy research and development.[215] 22 large economies have promised to double their own public expenditure on energy research and development by 2020.[216] In the 2015 Autumn Statement, the Chancellor stated that he was "doubling spend on energy innovation, to boost energy security and bring down the costs of decarbonisation."[217]

209 HM Government, *Building Our Industrial Strategy*
210 Written evidence from RWE (UEM0050)
211 Q 113 (Prof Richard Friend)
212 Formerly the Technology Strategy Board, Innovate UK aims to accelerate economic growth by stimulating and supporting business-led innovation.
213 Higher Education and Research Bill, Part 3 [Bill 97 (2015–16)]
214 Department for Business, Innovation and Skills, *Case for the creation of UK Research and Innovation UK* (June 2016): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/527803/bis-16-291-ukri-case-for-creation.pdf [accessed January 2017]
215 Department of Energy and Climate Change, 'UK joins new international clean energy initiative' (30 November 2015): https://www.gov.uk/government/news/uk-joins-new-international-clean-energy-initiative [accessed February 2017]
216 Mission Innovation, 'About Mission Innovation': http://mission-innovation.net/about/ [accessed February 2017]
217 HM Treasury, *Autumn Statement 2015*, Cm 9162: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/479749/52229_Blue_Book_PU1865_Web_Accessible.pdf [accessed February 2017]

(b) In November 2016 the Government announced the formation of an Energy Innovation Board chaired by the Chief Scientific Advisor.[218] The Board's role is to provide "strategic oversight of public programmes on energy innovation".[219] The Board has no power to distribute funding or "direct decisions on the use of individual funds or policies".[220]

(c) In its Industrial Strategy, published in February 2017, the Government announced the creation of an 'Industrial Challenge' fund. One of the proposed "priority challenges" for this fund are "smart, flexible and clean energy technologies" (such as storage, including batteries, and demand response).[221]

187. The Government is also reviewing the case for a new research institute to "act as a focal point" for research on battery technology, energy storage and grid technology.[222]

A new Energy Research Centre

188. Professor Michael Grubb and others from the UCL Energy Institute stated that:

> "The relevant challenge is to develop an effective integrated industrial strategy to accelerate both development and deployment of technology improvements as well as more radical, but plausible, innovations."[223]

189. Drawing on his experience in the United States, Professor Peter Littlewood drew attention to the "flexible mechanism" of the national laboratory system which allows collaboration between academia and industry working on projects not suitable for a university environment.[224]

190. In written evidence Professor Friend and Professor Jones sought to translate this into a UK context. They considered that the UK needed an overarching body in the form of a new Energy Institute or National Energy Research Centre. Professors Friend and Jones emphasised that this new institute would need to have physical research facilities which would focus on research to "drive down the cost of new energy technologies and implement them at scale."[225]

191. The closest analogy for such an institute in the UK is perhaps the Francis Crick Institute. Created in 2015, 'the Crick' is an interdisciplinary medical research institute formed by a partnership between the Wellcome Trust, the Medical Research Council and Cancer Research UK, together with King's, University and Imperial Colleges, London.

---

218 Department of Business, Energy and Industrial Strategy, 'Greg Clark speech at Energy UK' (11 November 2016): https://www.gov.uk/government/speeches/greg-clark-speech-at-energy-uk [accessed February 2017]

219 Energy Innovation Board, 'Role of the Board': https://www.gov.uk/government/groups/energy-innovation-board [accessed December 2016]

220 Energy Innovation Board, *Terms of Reference*: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/567858/Energy_Innovation_Board_-_Terms_of_Reference.pdf [accessed December 2016]

221 HM Government, *Building Our Industrial Strategy*

222 HM Government, *Building Our Industrial Strategy*

223 Written evidence from UCL (UEM0064)

224 Written evidence from Prof Peter Littlewood (UEM0094)

225 *Ibid.*

192. Professor Friend stated that the purpose of a similar institute in the energy field would be to:

> "produce a pipeline of investable opportunities. It will do this by driving the flow from science to engineering of new energy technologies, by supporting the underpinning technology competences and by providing trained technologists that together present the UK as a globally attractive investment destination."[226]

193. **The UK lags behind other countries in the proportion of its GDP it spends on energy research and development. The Government needs to ensure that the additional money pledged for energy research is used in the most cost effective way.**

194. **The recognition of the need for some oversight of research funding is welcome. Nonetheless we consider the policies put forward do not address the fundamental concerns about the co-ordination of funding and research.**

195. **Funding should be directed towards research that seeks to reduce the cost of new technologies and make them viable on a large scale. We support the proposal for a National Energy Research Centre, which would provide key leadership in the search for new methods of producing cheap clean energy and translating them into commercial applications. Much of the additional public funding for energy research should go into creating a world-class centre of this kind.**

226 Additional written evidence from Professor Richard Friend and Professor Richard Jones (UEM0094)

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Hinkley Point C

1. In the light of the significant and ongoing concerns about the deal, if the Hinkley Point C project is to proceed the Government should:

   (a) Explain how it will replace the capacity expected to be provided by Hinkley Point in the event that completion of the project is delayed, given Hinkley Point C is due to provide 7 per cent of Britain's electricity in 2025.

   (b) Provide a clearer statement of how the project will provide good value for money for the taxpayer, given concerns over the existing justification; (Paragraph 35)

Market Failures

Security of Supply

2. The UK currently has a slim capacity margin. The emergency tools available to the Grid to manage the margin have been effective in the short term. The Government has however struggled to procure sufficient numbers of new power stations through the mechanism to ensure longer-term security of supply. (Paragraph 75)

3. The increased amount of electricity generated from intermittent sources presents new challenges for security of supply. As the proportion of electricity from these sources is projected to increase, tools to ensure cost effective back-up must be available and the cost of appropriate back-up incorporated into estimates of the cost of renewable generation. (Paragraph 81)

Energy Prices

4. In 2014 10 per cent of the cost of electricity for domestic users was due to climate change policies. The Government's own analysis indicated that this is expected to rise to around a quarter by 2020. This is not transparent however as the cost of the policies is incorporated into electricity bills, making it difficult to scrutinise with any certainty. The Government should provide estimates for the cost to consumers of climate change policies as part of its quarterly energy prices publication and require providers to include a summary of this information on electricity bills. (Paragraph 95)

5. There is little transparency around the cost of climate change policies for industrial users. The Government should publish what effect the policies have on industrial energy bills—taking into account taxes, industry levies and the operation of the compensation schemes—and on industrial location. (Paragraph 111)

6. Comparisons with other countries are difficult but the Government itself has acknowledged that electricity prices for energy intensive industries in the UK are amongst the highest in Europe. The Government has estimated that even with its compensation schemes taken into account, around 13 per cent of industrial electricity bills for energy intensive industries are the result of climate change policies. This is a disincentive for such businesses to remain or to relocate operations to the UK. (Paragraph 115)

7. The move of the energy portfolio to the Department for Business, Energy and Industrial Strategy offers an opportunity to make sure that the costs to business are taken into account when making energy policy. We welcome the Secretary of State's recent commitment to ensuring electricity is affordable for industry. (Paragraph 116)

Market Reforms

Objectives

8. The overarching aim of energy policy must be to keep the lights on. Low carbon but chronically unreliable electricity is not acceptable. Similarly very cheap prices at the expense of frequent shortages would be unacceptable. (Paragraph 126)

9. Security of supply should be the first and most important consideration in energy policy. Decarbonisation and affordability must be taken into account, but should not be prioritised ahead of security where there is any conflict. Successive governments are perhaps guilty of overlooking security at times: for example, the disincentives for private investment in electricity generation created by the growth of intermittent renewables. Moreover, affordability should not be neglected in the pursuit of decarbonisation. (Paragraph 127)

Path to decarbonisation

10. There is currently no robust and reliable data on whether measures to reduce the UK's carbon emissions have in fact resulted in the same emissions being exported to other countries due to the closure or relocation of energy intensive industries. We therefore recommend that the Government conducts and publishes such an analysis to assess the success of existing policy and plan future measures. (Paragraph 133)

11. In the longer term the UK will not meet the 2050 target without substantial progress in the decarbonisation of heating and transport. The development of new technologies will be an important element of this. We consider further how to encourage research below. (Paragraph 139)

12. The Government should use the powers provided in the Climate Change Act to vary the required pace of emissions reductions in the electricity supply. This flexibility would allow time for the development of new technologies which will increase efficiency and reduce emissions in a cost effective way. (Paragraph 146)

Competitive auction

13. The Government should set out plans to achieve its aim, as set out in 2015, of getting the government out of the electricity market as much as possible by 2025. The best way to do this would be through a single auction, designed to comply with the following principles:

    - the required capacity is identified prior to the auction;
    - the desired level of carbon emissions is fixed;
    - all technologies are able to compete;
    - an appropriate levy on intermittent generators is designed to reflect the cost of back-up generation;
    - the cost of any updates to transmission networks are reflected in bids;
    - the auction is overseen by an independent body who, in light of the results of the auction, could make any necessary adjustments to the targets. (Paragraph 158)

14. An auction run on the basis of these principles would ensure that consumers are paying the lowest prices for low-carbon electricity. (Paragraph 159)

15. The challenge is not to remove all government involvement. This is not possible given the present objectives of energy policy, which we accept as the correct ones. Our aim with the recommendation above is to identify a way for the necessary involvement of government to be limited to setting the parameters within which a market is left to identify the most cost-effective solutions. We believe our recommendation would lead to outcomes which would improve security, protect competitiveness and allow emissions reductions to be achieved more efficiently and at lower cost. (Paragraph 160)

Scrutiny and oversight

16. The Government should establish an Energy Commission to provide greater scrutiny of energy policy decisions. This would be an independent advisory body, reporting to the Secretary of State, tasked with advising on the best way for all the objectives of energy policy to be delivered. (Paragraph 171)

17. It would be expected to monitor and advise on:

    - security of supply, assessing changing patterns of demand and the balance of that demand with anticipated supply;
    - investment in new electricity generation and the adequacy or otherwise of the incentives in place to induce necessary future investments;
    - independent forecasts for supply and demand;
    - developments in new energy technologies and their possible impact;
    - oversight of the technology-neutral, competitive auction process recommended above; and
    - prices and affordability. (Paragraph 172)

18. The Commission would cover all aspects of the energy market. It would work with those institutions that have been established through legislation such as the Committee on Climate Change. It would produce an annual report and studies of particular aspects of the market. (Paragraph 173)

Research and development

19. The UK lags behind other countries in the proportion of its GDP it spends on energy research and development. The Government needs to ensure that the additional money pledged for energy research is used in the most cost effective way. (Paragraph 193)

20. The recognition of the need for some oversight of research funding is welcome. Nonetheless we consider the policies put forward do not address the fundamental concerns about the co-ordination of funding and research. (Paragraph 194)

21. Funding should be directed towards research that seeks to reduce the cost of new technologies and make them viable on a large scale. We support the proposal for a National Energy Research Centre, which would provide key leadership in the search for new methods of producing cheap clean energy and translating them into commercial applications. Much of the additional public funding for energy research should go into creating a world-class centre of this kind. (Paragraph 195)

APPENDIX 1: LIST OF MEMBERS AND DECLARATIONS OF INTEREST

The Members of the Economic Affairs Committee which conducted this inquiry were:

Baroness Bowles of Berkhamsted
Lord Burns
Lord Darling of Roulanish
Lord Forsyth of Drumlean
Lord Hollick (Chairman)
Lord Kerr of Kinlochard
Lord Lamont of Lerwick
Lord Layard
Lord Livermore
Lord Sharkey
Lord Tugendhat
Lord Turnbull
Baroness Wheatcroft

Declared interests

Baroness Bowles of Berkhamsted
No relevant interests declared
Lord Burns
Shareholdings in National Grid, Royal Dutch Shell, and BHP Billiton
Lord Darling of Roulanish
Director of Morgan Stanley
Lord Forsyth of Drumlean
No relevant interests declared
Lord Hollick (Chairman)
Director, Honeywell International
Shareholding in Honeywell
Lord Kerr of Kinlochard
Deputy Chairman of Scottish Power
Shareholdings in Royal Dutch Shell and Rio Tinto
Lord Lamont of Lerwick
No relevant interests declared
Lord Layard
No relevant interests declared
Lord Livermore
No relevant interests declared
Lord Sharkey
No relevant interests declared
Lord Tugendhat
Shareholdings in Nextera Energy, General Electric Company, National Grid,
Royal Dutch Shell, and Exxon Mobil
Lord Turnbull
Trustee of the Global Warming Policy Foundation
Baroness Wheatcroft
No relevant interests declared

A full list of Members' interests can be found in the Register of Lords Interests: http://www.publications.parliament.uk/pa/ld/ldreg.htm

Specialist Adviser

Nick Butler
Strategic Advisory Council of Statoil

APPENDIX 2: LIST OF WITNESSES

Evidence is published online at http://www.parliament.uk/uk-energy-policy and available for inspection at the Parliamentary Archives (020 7219 3074).

Evidence received by the Committee is listed below in chronological order of oral evidence session and in alphabetical order. Those witnesses marked with * gave both oral evidence and written evidence. Those marked with ** gave oral evidence and did not submit any written evidence. All other witnesses submitted written evidence only.

Oral evidence in chronological order

**	Professor Dieter Helm	QQ 1-15
**	The Rt. Hon. the Lord Lawson of Blaby, Founding Chairman, Global Warming Policy Foundation	QQ 16-26
**	The Lord Turner of Ecchinswell, Chairman of the Governing Body, Institute for New Economic Thinking	
*	Professor Richard Green, Professor of Sustainable Energy Business, Imperial College London	QQ 27-39
**	Mr Tony Lodge, Political and Energy Analyst, Centre for Policy Studies	
**	Mr Jimmy Aldridge, Acting Associate Director for Energy, Transport & Climate, Institute for Public Policy Research (IPPR)	
*	Mr Rupert Darwall, Corporate strategist, Centre for Policy Studies	QQ 40-52
*	Dr David Clarke FREng, Chief Executive Officer, Energy Technologies Institute (ETI) and Royal Academy of Engineering	
*	Professor Michael Grubb, Professor of International Energy and Climate Change Policy, University College London (UCL)	
**	Mr Matthew Bell, Chief Executive, Committee on Climate Change	QQ 53-60
**	Mr Vincent de Rivaz, Chief Executive, EDF Energy	QQ 61-67
**	Mr Paul Spence, Director of Strategy and Corporate Affairs, EDF Energy	
**	Mr Humphrey Cadoux-Hudson, Managing Director of Nuclear New Build, EDF Energy	
**	Mr Peter Atherton, Associate, Cornwall Energy	QQ 68-74
*	Mr Tom Burke, Chairman, E3G, Third Generation Environmentalism	
**	Mr Tom Samson, Chief Executive Officer, NuGen	QQ 75-86
**	Mr David Stearns, Business Development Director, Horizon Nuclear Power	

*	Mr Martin Pibworth, Managing Director of Wholesale, Scottish and Southern Energy plc (SSE plc)	QQ 87-96
**	Mr Francis Egan, Chief Executive, Cuadrilla Resources	
*	Mr Tor Martin Anfinnsen, Senior Vice President, Marketing & Trading, Statoil U.K. Ltd	
*	Mr Richard Warren, Senior Energy & Environment Policy Adviser, Engineering Employers' Federation UK (EEF)	QQ 97-102
*	Mr Jeremy Nicholson, Director, Energy Intensive Users Group	
*	Mr Andrew Buckley, Director General, Major Energy Users' Council	
*	Mr Hugh McNeal, Chief Executive, RenewableUK	QQ 103-110
**	Mr Michael Liebreich, Chairman of the Advisory Board and Founder, Bloomberg New Energy Finance	
*	Professor Sir Richard Friend, Cavendish Professor of Physics, Cambridge University	QQ 111-117
**	Mr Simon Daniel, Chief Executive Officer, Moixa Energy	
*	Mr George Grant, Managing Director, Stag Energy	
**	Mr Stephen Tindale, Director, Alvin Weinberg Foundation	
*	Mr Phil Sheppard, Director of Systems Operation, National Grid plc	QQ 118-143
*	Mr Dermot Nolan, Chief Executive, Office of Gas and Electricity Markets (Ofgem)	
*	Mr Ashley Ibbett, Director of Clean Electricity, Department for Business, Energy and Industrial Strategy	QQ 144-157
*	Mr Dan Monzani, Head of Energy Security, Department for Business, Energy and Industrial Strategy	
*	Ms Paro Konar-Thakkar, Head of Energy Economics and Analysis, Department for Business, Energy and Industrial Strategy	
*	The R.t Hon. Greg Clark MP, Secretary of State for Business, Energy and Industrial Strategy, Department for Business, Energy and Industrial Strategy	QQ 158-169
*	Mr Jeremy Pocklington, Director General, Energy and Security, Department for Business, Energy and Industrial Strategy	

Alphabetical list of all witnesses

	Alderney Renewable Energy	UEM0019
**	Alvin Weinberg Foundation (QQ 111-117)	
	Anaerobic Digestion & Bioresources Association (ADBA)	UEM0034
	ASEA Brown Boveri (ABB)	UEM0057

	Association for Environment Conscious Building (AECB)	UEM0037
**	Mr Peter Atherton, Associate, Cornwall Energy (QQ 68-74)	
	Avich Kilchrenan Community Council	UEM0017
	Doosan Babcock	UEM0040
	Emeritus Professor Keith Barnham	UEM0067
	The Big Deal	UEM0059
**	Bloomberg New Energy Finance (QQ 103-110)	
	British Ceramic Confederation	UEM0039
	Carbon Capture & Storage Association (CCSA)	UEM0045
	Carbon Connect	UEM0009
	Mr Brian Catt	UEM0013
	CELSA Manufacturing UK Limited	UEM0001
	Centre for Competition Policy, University of East Anglia	UEM0071
**	Centre for Policy Studies (QQ 27-39)	
	Dr Peter Chester	UEM0027
	Citizens Advice	UEM0054
*	The Rt. Hon. Greg Clark MP, Secretary of State for Business, Energy and Industrial Strategy, Department for Business, Energy and Industrial Strategy (QQ 158-169)	UEM0083 UEM0091
**	Committee on Climate Change (QQ 53-60)	
	Ms Susan Crosthwaite	UEM0068
**	Cuadrilla Resources (QQ 87-96)	
*	Mr Rupert Darwall (QQ 40-52)	UEM0084
*	Department for Business, Energy & Industrial Strategy (QQ 144-157) (QQ 158-169)	UEM0083 UEM0091
	Dong Energy Power Ltd.	UEM0070
	Drax Group plc	UEM0010
*	E3G, Third Generation Environmentalism (QQ 68-74)	UEM0082
	Ecotricity Group Ltd	UEM0072
**	EDF Energy (QQ 61-67)	
	Electricity Storage Network	UEM0030
	Energy & Utilities Alliance (EUA)	UEM0031
	Energy Action Scotland	UEM0004
*	Energy Intensive Users Group (QQ 97-102)	UEM0051
	Energy Research Accelerator	UEM0046
	Energy Research Partnership	UEM0043

	Energy Systems Catapult	UEM0035
*	Energy Technologies Institute (ETI) (QQ 40-52)	UEM0076
	Energy UK	UEM0078
	ENGIE UK	UEM0048
*	Engineering Employers' Federation (EEF) (QQ 97-102)	UEM0052
	E.ON UK plc	UEM0080
*	Professor Sir Richard Friend, Cavendish Professor of Physics, Cambridge University (QQ 111-117)	UEM0088 UEM0094
	The Global Warming Policy Forum	UEM0047
	Good Energy	UEM0038
	Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science	UEM0069
*	Professor Richard Green (QQ 27-39)	UEM0058 UEM0092
**	Professor Dieter Helm (QQ 1-15)	
	Mr Alex Henney	UEM0085
	Professor Cameron Hepburn	UEM0029
	Mr George Herraghty	UEM0003
**	Horizon Nuclear Power (QQ 75-86)	
**	Institute for Public Policy Research (IPPR) (QQ 27-39)	
	The Institution of Engineers & Shipbuilders in Scotland Limited (IESIS)	UEM0022
	Institution of Engineering and Technology	UEM0020
	Dr Andrew Jarvis (Lancaster University)	UEM0063
	Professor Richard Jones, Professor of Physics, Sheffield University	UEM0088 UEM0094
	Professor Roger Kemp	UEM0061
	Mr Ross King	UEM0005
	Mr Bruce Laird	UEM0033
**	The Rt. Hon. the Lord Lawson of Blaby, Founding Chairman, Global Warming Policy Foundation (QQ 16-26)	
	Professor Stephen Littlechild	UEM0096
	Dr Peter Littlewood	UEM0093
*	Major Energy Users Council (QQ 97-102)	UEM0065
	Dr Eileen Marshall CBE	UEM0036 UEM0096

	Sir Callum McCarthy	UEM0096
	Mineral Wool Insulation Manufacturers' Association (MIMA)	UEM0049
**	Moixa Energy (QQ 111-117)	
	Mutual Energy Ltd	UEM0056
*	National Grid (QQ 118-143)	UEM0074
		UEM0095
	Natural Resources Defense Council (NRDC)	UEM0032
	Nuclear Industry Association (NIA)	UEM0042
**	NuGen (QQ 75-86)	
*	Office of Gas and Electricity Markets (Ofgem) (QQ 118-143)	UEM0090
	Oil & Gas UK	UEM0073
	Open Energi	UEM0066
	Dr Steve Parlour	UEM0024
	Ms Jacquelyn Pless	UEM0029
	Renewable Energy Systems (RES) Limited	UEM0077
*	RenewableUK (QQ 103-110)	UEM0075
	Rheinisch-Westfälisches Elektrizitätswerk Group (RWE Group)	UEM0050
	Dr John Rhys	UEM0011
	Professor Colin Robinson	UEM0036
	Royal Society for the Protection of Birds (RSPB)	UEM0053
*	Scottish and Southern Energy (SSE) (QQ 87-96)	UEM0086
	Scottish Renewables	UEM0041
	Siemens plc	UEM0044
	Smart Energy GB	UEM0021
	Mr Stephen Smith	UEM0096
	Ms Clare Spottiswoode CBE	UEM0096
	Mr Tomas Stanger	UEM0006
*	Statoil U.K. Ltd (QQ 87-96)	UEM0089
*	Storage Transmission And Generation Energy (STAG Energy) (QQ 111-117)	UEM0026 UEM0087
	Storengy UK	UEM0028
	Sustainable Energy Association	UEM0060
	Sustainable Shetland	UEM0018
	Mr Alexander Teytelboym	UEM0029

**	The Lord Turner of Ecchinswell, Chairman of the Governing Body, Institute for New Economic Thinking (QQ 16-26)	
	UK Energy Research Centre (UKERC)	UEM0079
	UK Power Reserve	UEM0023
	UK Steel	UEM0052
	United Kingdom Onshore Oil and Gas	UEM0015
*	University College London (UCL) Energy Institute and Institute for Sustainable Resources (QQ 40-52)	UEM0064 UEM0081
	Vivergo Fuels	UEM0008
	Dr Geoffrey Wood	UEM0062
	Wood Panel Industries Federation	UEM0025

APPENDIX 3: CALL FOR EVIDENCE

The Economic Affairs Committee of the House of Lords, chaired by Lord Hollick, is conducting an inquiry into The Economics of UK Energy Policy.

Background to the inquiry

The energy sector is hybrid and its development is the product of a complex mix of public policy, subsidies and private funding. The Government does not own or control major parts of the sector. The market is open and substantial proportions of the energy market, including much of the North Sea, the retail electricity market, and the development of wind and new nuclear, rely on international investment. Technical advances have shaped the sector but many of the advances have come from work initiated outside the UK.

UK energy policy over the last decade has focused on three objectives:

- maintaining continuous supplies of energy and minimising threats to energy security;
- ensuring that the costs of energy supply are competitive for business and individual users; and
- progressively decarbonising the mixture of energy used in the UK as a contribution to the international effort to minimise the risks of climate change.

The accelerated closure of coal-fired plants, and subsidies for renewables, have been the principal means of securing decarbonisation. Paying for subsidies by charges on consumers, rather than from taxes, has meant that prices have risen while the resultant lack of investment in baseload capacity means that continuity of supply is now seriously threatened. This suggests a dysfunctional energy market or a conflict of government policies.

The core question for the Committee is are there failures in the energy market and what measures are needed in the future to correct them?

Evidence sought

The Committee invites interested individuals and organisations to submit evidence to this inquiry. The Committee would welcome written evidence on any or all of the issues set out below. Written evidence does not need to address every question. The questions are not listed in any particular order of importance.

Witnesses are asked to note that the focus of this inquiry is not climate change or arguments relating to climate change science and the Committee takes as given the Government's commitment to reduce carbon emissions.

The specific questions the inquiry will seek to address are:

- What are the key economic challenges for the energy market which the Government must address over the next decade?
- Has the market and the Government responded effectively to changes in external circumstances, such as significant shifts in technology and prices?
- What are the emerging technologies which could materially change the energy market over the next decade and beyond? How should the Government promote research and development- could any shift in public

funding improve the efficiency of the energy market? How long might it take for new technologies to displace the established capital stock?

- What should the future balance between the roles of the public and the private sector be? Is further expertise needed within Government to understand the issues and to negotiate with external investors and suppliers?
- Are returns for private investment in the sector adequate or excessive? How should the Government attract sufficient investment?
- What is the relationship between high energy costs and the loss of industrial capacity in the UK? What measures should be taken to address this?
- What preparations could be made to cope with the risk of a shortfall in energy supply? What would be the cost to the economy of the breakdown of the existing system?
- What alternate ways of pricing energy should be considered to reduce the burden of high energy bills, in particular on less well-off consumers?

The deadline for written evidence is 30 September 2016. The written submissions will guide the Committee's deliberations in oral evidence sessions and inform the Committee's final conclusions and recommendations.

Public hearings will be held between September 2016 and December 2016. The Committee aims to report to the House, with recommendations, in early 2017. The report will receive a response from the Government, and may be debated in the House.

The remit of the Economic Affairs Committee is to consider economic affairs. Information including membership and recent inquiries can be found on this link: http://www.parliament.uk/business/committees/committees-a-z/lords-select/economic-affairs-committee/

20 July 2016