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The Innovation, Universities, Science & Skills Committee

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Summary

In March 2007, the European Union adopted a common Energy Policy. This policy commits the EU to generating 20 per cent of total energy consumption from renewables by 2020. In a draft Directive on the promotion of the use of energy from renewable sources, published January 2008, the European Commission proposed national renewable energy targets for each Member State. It was suggested that 15 per cent of UK energy be derived from renewables by 2020.

Renewable energies comprise three sectors: heating and cooling, transport and electricity. In order to meet the EU Mandated Target of 15 per cent renewable energies by 2020, it will be necessary to generate approximately 35–40 per cent of electricity from renewable sources. This represents a considerable challenge, and one for which the Government's targets for renewable electricity generation are wholly inadequate. Presently, National Targets require 10 per cent of electricity to be sourced from renewables by 2010 rising to 20 per cent by 2020. It is essential that the Government revise these targets, and align them with the UK's EU Mandated Target, as a priority.

Currently, developers of renewable electricity generation projects have to negotiate a crowded funding landscape, a protracted—and often costly—planning system, and a poorly conceived regime for accessing the UK electricity transmission system. Further, the ability of developers to deploy renewable electricity-generation technologies is being hampered by a growing shortage of personnel with the necessary skills to develop, install and maintain these devices. It is essential that the Government engages with the renewables industry in order to remove current barriers to technology deployment, and develop a coherent policy framework to bring on the development of pre-commercial technologies.

In 2006, renewable electricity accounted for 4.6 per cent of gross electricity consumption. Although we believe it is still feasible to meet the 2020 renewable energy targets, we are keenly aware that the finite period of time available to make the necessary change is fast running out. It is therefore critical that the Government take steps to support the widespread deployment of renewable electricity-generation technologies as a priority, both at the level of macro and microgeneration. Throughout this inquiry, however, we have been consistently disappointed by the lack of urgency expressed by the Government—and at times by the electricity industry—in relation to the challenge ahead. We expect the Government to take a greater lead on this matter, and hope that a clear strategy for progress, will be forthcoming.

1 Introduction

Background

1. In 2006, the Government reviewed the UK's energy mix in the face of two long-term challenges – climate change and energy security.[1] The Government's 2007 Energy White Paper, *Meeting the Energy Challenge*, built on the findings of this review and committed the UK to a 60 per cent reduction in carbon dioxide (CO_2) emissions by 2050, with real progress by 2020.[2]

2. Displacing energy produced from fossil fuels with that sourced from renewables will be key to meeting the UK's greenhouse gas emissions targets. Further, the European Union's common Energy Policy, adopted March 2007, mandates a 20 per cent share of renewable energies in overall EU consumption by 2020, together with a 20 per cent reduction in greenhouse gas emissions. Individual country contributions to the overall EU 2020 renewable energy target will vary across Member States. It is proposed by the European Commission that 15 per cent of UK energy be sourced from renewables.[3]

3. Renewable energy is used in three sectors: heating and cooling, transport and electricity. The 2007 Energy White Paper pledged to source 10 per cent of electricity supply from renewables by 2010, with an ambition for this level to double by 2020.[4] The proposed EU Mandated Target of 15 per cent renewable energies by 2020 will require nearer 40 per cent of UK electricity to be sourced from renewables by this date.

4. Critical to meeting the UK's renewable electricity targets will be the widespread deployment of renewable electricity-generation installations. We therefore set out to explore current support for, and barriers to, Research, Development, Demonstration and Deployment of (RDD&D) renewable electricity-generation technologies in the UK.

The inquiry

Terms of reference

5. Witnesses to this inquiry were asked to submit evidence on the following points:

- the current state of UK research and development in, and the deployment of, renewable electricity-generation technologies;
- international collaboration;
- public funding, and other support, for the development of renewable electricity-generation technologies and incentives for technology transfer;

1 Department of Trade and Industry, *The Energy Challenge*, Cm 6887, July 2006

2 HM Treasury, *Meeting the Energy Challenge*, Cm 7124, May 2007

3 Memo on the renewable energy and climate change package (Memo/08/33), January 2008, Commission of the European Communities.

4 HM Treasury, *Meeting the Energy Challenge*, Cm 7124, May 2007, p14

- the establishment and role of the Energy Technologies Institute;
- commercialising renewable technologies;
- intermittency of supply and connection with the national grid;
- Government policy towards enabling existing technologies to meet targets; and
- whether the UK has the skills base to underpin the development of renewable technology.

6. The inquiry also drew upon evidence submitted to the 'renewable energy-generation technologies' inquiry announced by the former Science and Technology Committee. Memoranda received in response to either call for evidence is published in Volume 2 of this report.

Specialist advisers

7. We appointed two specialist advisers to this inquiry.

- Professor Nick Jenkins, Director of the Centre for Integrated Renewable Energy Generation and Supply (CIREGS), Cardiff University. Professor Jenkins was previously Professor of Energy Systems at the University of Manchester.
- Professor Peter Pearson, Director of the Imperial College Centre for Energy Policy and Technology and a Director and member of the Management Board of the Energy Futures Lab, Imperial College London.

8. We are grateful to the advisers for their expert advice throughout the course of this inquiry.

Conduct of inquiry

9. The inquiry comprised four oral evidence sessions. During the course of these sessions we heard from representatives of the UK renewables industry, Regional Development Agencies and Research Councils, together with individuals from organisations involved in the transmission, distribution and supply of electricity. We also took evidence from Malcolm Wicks MP, Minister for Energy, BERR.

10. We benefited from an informal seminar at the start of this inquiry. We would like to thank the UK Energy Research Centre for hosting the event, and Dr David Clarke, Dr Rob Gross, Professor Jim Skea, John Loughhead and the specialist advisers for their participation. In addition, we undertook a visit to Berlin where we spoke with policy makers and policy analysts in the energy field. Germany is often held up as a role model for the deployment and encouragement of renewable energy and we appreciated the opportunity to explore what could be learned from their experience and applied in the UK.

Structure of report

11. In this report, we first consider UK and EU targets for renewable electricity production. We then discuss a range of renewable electricity-generation technologies, and examine

available funding and support for technology research, development, demonstration and deployment. Finally we consider barriers to the deployment of renewable technologies – gaining access to the UK electricity transmission system and current planning regulations, for example – together with the potential for social scientists to contribute to the renewables policy arena and the growing skills shortage in this sector.

2 Renewable energy and the UK

Context

12. There are a variety of benefits to be gained from increasing the proportion of electricity the UK generates from renewable sources. These range from environmental benefits such as lower greenhouse gas emissions, to socio-economic ones (reducing the UK's dependence on fossil fuel imports, for example).

13. The arguments in favour of renewable energy generation have been well rehearsed and we do not attempt to discuss them further in this report. Indeed, the assumption that it is desirable to increase renewable energy production is central to UK and EU energy policy.[5] The question in hand is not whether the UK should increase renewable energy production per se, but to what level it needs to be increased, and how the country might best facilitate the deployment of renewable energy technologies in the UK.

14. It is important, however, to understand the costs of renewables to the Exchequer and the consumer, as with all electricity-generation technologies. Ofgem has estimated that renewable energy subsidies added £60 to consumer bills in the last financial year and that this will keep increasing. Dieter Helm, Professor of Energy Policy at Oxford University, has calculated that it costs consumers £510 for each tonne of CO_2 avoided through wind energy.[6]

Targets

15. In March 2007, the European Council agreed an Energy Policy for Europe. This policy set a number of energy targets, including a commitment to increase the share of renewables in EU energy consumption from 8.5 per cent in 2005 to 20 per cent in 2020.[7]

16. As a means to achieving the 2020 renewable energy target, the European Commission (EC) proposed a draft Directive on the promotion of the use of energy from renewable sources.[8] Published on 23 January 2008, the Directive recommends renewable energy targets for each Member State. As described previously, the Directive proposes that 15 per cent of UK energy be sourced from renewables by 2020, a more than ten-fold increase on the 1.3 per cent recorded in 2005. At 15 per cent, the EC Mandated Target proposed for the UK is less than half that of Sweden (49 per cent), Latvia (42 per cent), Austria (34 per cent) and Portugal (31 per cent). The differences between Member States' targets, in part, corrects for a nation's starting point—the percentage of renewable energies in 2005—and

5 DTI, *Our energy future – creating a low carbon economy*, CM 5761, p12, HM Treasury, *Meeting the Energy Challenge*, Cm 7124, May 2007; Commission of the European Communities, Memo on the renewable energy and climate change package (Memo/08/33), January 2008

6 http://www.timesonline.co.uk/tol/news/environment/article3257728.ece, *The Sunday Times*, 27 January 2008

7 Commission of the European Communities, Memo on the renewable energy and climate change package (Memo/08/33), January 2008

8 Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources, COM(2008) 19

"provides for a fair distribution of effort".[9] The Directive is expected to come into effect in 2010.

17. The Government is currently negotiating the proposed EC Mandated Target of 15 per cent renewable energy in gross UK consumption by 2020. Malcolm Wicks MP, Minister for Energy, Department for Business, Enterprise and Regulatory Reform (BERR), told us "this is a perfectly reasonable negotiation"[10] and that the final target will be "there or thereabouts".[11] We find the decision to negotiate with the EU for a lower target surprising given that the Renewable Energy Association, for example, believe that with appropriate policy support the 15 per cent target is achievable.[12]

18. The Government's argument for a lower EU Mandated Target appears to be predicated on cost. In evidence to the BERR committee, the Minister said:

> I do not want to reveal our negotiating hand. One of the things we have pointed out to the Commission is that when you look at […] our share of the costs (because costs are quite considerable in Britain) [they] will be really very high compared with other Member States, and I think it is perfectly proper that we feed that into the equation.[13]

19. Renewable electricity is currently more expensive to produce than electricity sourced from fossil fuels.[14] It is therefore essential that the cost of attaining the UK's EC Mandated Target is properly understood. To this end, the Government commissioned research to determine the financial implications of compliance with the proposed target of 15 per cent renewable energy by 2020. The estimated costs, and carbon savings, to the UK are summarised in Table 1.

Table 1. Costs and benefits to the UK of meeting the proposed EC Mandated Target

Annual cost in 2020	At least £5 billion
Lifetime cost	£70 billion
Carbon saved in 2020	67 $MtCO_2$
Value of carbon saved in 2020	>£1 billion
Lifetime carbon saved	1628Mt CO_2
Value carbon saved	£29 million
Cost effectiveness (£ per tonne of carbon – lifetime)	£43 per tonne CO_2

Source: Poyry Energy (Oxford) Ltd, Compliance costs for meeting the 20% renewable energy target in 2020 (2008)

20. In considering the economic cost of increasing renewable energy-generation, it should be remembered that there are also economic benefits to be gained from supporting a burgeoning renewables industry. Germany, for example, has a strong history of promoting renewable energy and, in 2006, domestic turnover in this sector totalled €21.6billion, an increase of 19 per cent on the previous year.[15] The increased turnover of the German

9 Commission of the European Communities, Memo on the renewable energy and climate change package (Memo/08/33), January 2008

10 Q 345

11 *Ibid.*

12 Q 8

13 Uncorrected transcript of oral evidence taken before the Business Enterprise and Regulatory Reform Committee on 31 January 2008, HC (2007-08) 293-i,Q 150.

14 Ev 382

15 Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, *Development of renewable energies in 2006 in Germany*, February 2007

renewables industry has been matched by an increase in jobs. Between 2004 and 2006 the number of people employed in the sector rose from 157,000 to 230,000. Current estimates indicate up to 500,000 people will be employed in the sector by 2020.[16]

21. **We are disappointed that the Government is seeking to lower the target of 15 per cent renewable energies by 2020, as proposed in the EU Draft Directive on the promotion of energy from renewable sources.**

Renewable electricity

22. It will be up to Member States to decide on the mix of contributions from the heating and cooling, transport and electricity sectors necessary to reach their EC Mandated Target for renewable energy consumption. We note, however, that the draft Directive on the promotion of the use of energy from renewable sources mandates that Member States source at least 10 per cent of transport fuel from biofuels by 2020.

23. John Loughhead, UK Energy Research Centre (UKERC), told us that it would be technically difficult to substantially increase the share of renewables in the UK's heat sector by 2020.[17] Although some renewable heat technologies are now cost effective in some situations (such as large scale biomass heating off the gas grid), most are not commercially competitive with gas heating.[18] At present the amount of renewable heat in the UK is extremely low (0.6 per cent of heat demand[19]). Based on the assumption that 10 per cent of transport fuel will be derived from renewables, UKERC calculated the contribution required from the renewable electricity sector necessary for the UK to meet the overall EC Mandated Target of 15 per cent renewable energies by 2020. Two situations were considered: either 5 per cent or 10 per cent renewable heat energy. In the former situation, UKERC estimate that 54.5 per cent of electricity will need to be renewable, in the latter, 42.8 per cent renewable electricity will be required[20]. All the witnesses we spoke to expected that it will be necessary to source 35–40 per cent of electricity from renewables if the UK is to generate 15 per cent of energy from renewables by 2020[21]. In light of the estimates from UKERC, however, it is possible that the share of renewable electricity required to meet the UK's 2020 targets will increase beyond 40 per cent.

National targets for renewable electricity generation

24. In 2006, 4.55 per cent of the UK's electricity was generated from renewables.[22] Increasing renewable electricity production to 35–40 per cent of supply by 2020 represents a significant challenge, particularly as the Government's targets for renewable electricity are completely inconsistent with this ambition. National Targets are to:

16 Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, *EEG – the renewable energy sources act*, July 2007

17 Q 2

18 http://www.berr.gov.uk/files/file43609.pdf

19 http://www.berr.gov.uk/energy

20 Ev 383

21 Qq 2, 7, 66, 67, 348

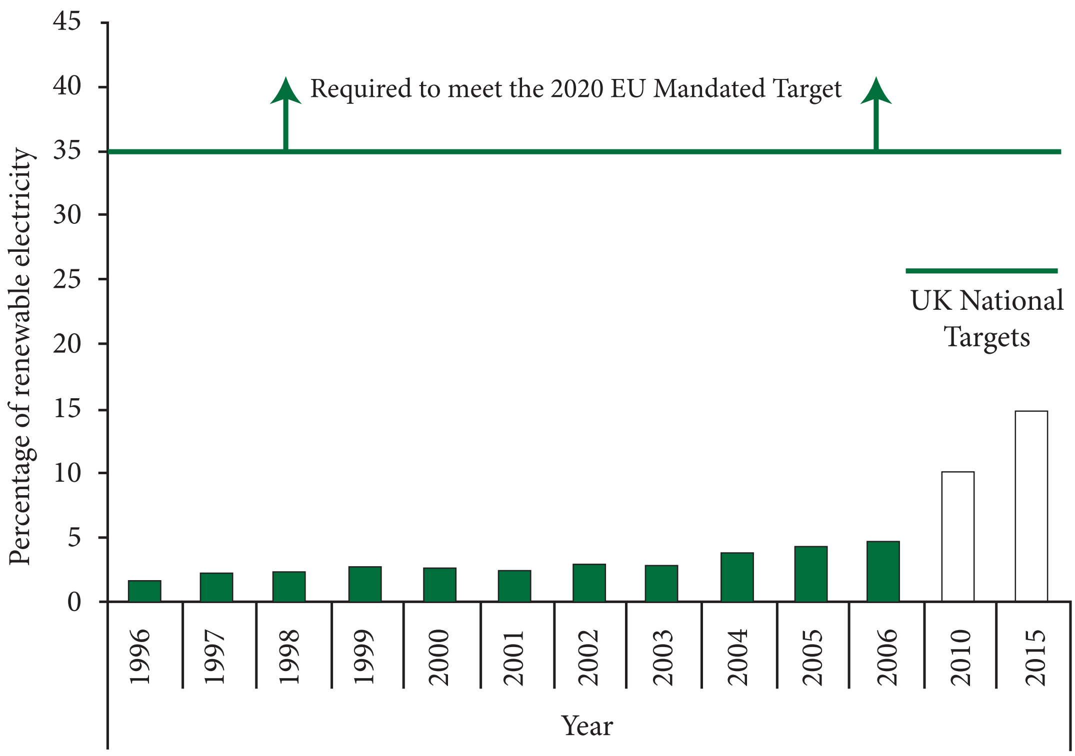
22 http://restat.org.uk/electricity.htm

- increase the share of renewable electricity to 10 per cent of total supply by 2010, with an aspiration for this to double by 2020;[23] and
- triple renewable electricity to approximately 15 per cent of supply by 2015.[24]

25. As shown in Figure 1, the UK's National Targets are clearly inadequate to meet the proposed EC Mandated Target for the UK. The 2010 target would generate only half of the renewable electricity required, and meeting the 2015 target would require renewable electricity production to double in the following five years.

Figure 1

The share of renewables in gross UK electricity consumption and targets for renewable energy generation



Source: ec.europa.eu/eurostat/

26. When asked to comment on the adequacy of the Government's renewable electricity targets, the Minister told us that:

> We had a strategy in place that was already delivering against the UK targets, but […] that given the goal posts have changed […], because of the new European

23 HM Treasury, *Our energy future – creating a low carbon economy*, Cm 5761, February 2003

24 HM Treasury, *Budget 2008*, HC 388, March 2008

> targets, we need to ask are our existing policies adequate? No they are not. Do we need to review to make sure that we can get to the 15 per cent target, or whatever it is, yes we do, and that is why we are now developing a new Renewable Energy Strategy.[25]

27. The Minister went on to tell us that "the momentum in terms of our total energy coming from renewables is increasing, I would argue, quite dramatically year by year".[26] Similarly Michael Duggan, Deputy Director of the Renewables Obligation team, BERR, reported a "tripling of the deployment" of renewable technologies over the last five years.[27] We note, however, that Mr Duggan's statement is predicated on a low baseline – 1.8 per cent renewable electricity in 2002 (excluding large-scale hydro) – and that it will be necessary to double the current level of renewable electricity-generation if the UK is to achieve its 2010 target of 10 per cent of supply from renewables (see Figure 1).

28. We appreciate that the UK renewables targets laid out in the May 2007 Energy White Paper were set prior to the publication of Member States' proposed EC Mandated Targets in January 2008. However, the European Commission proposed the overall target of 20 per cent renewable energies by 2020 in January 2007, and Member States accepted the proposal in March of the same year.[28] Given that the UK Government has expressed its commitment to the EU 2020 renewables target[29], we find it disappointing that it has not acted to update its own Renewable Energy Strategy sooner, and further, that it maintained its commitment to the targets laid out in the 2007 Energy White Paper in Budget 2008.

29. **We do not consider current UK targets for renewable electricity generation to be of sufficient scale or ambition. The Government's commitment to triple renewable electricity production by 2015 will equate to the production of approximately 15 per cent of total electricity supply. If the UK is to meet the proposed EC Mandated Target of 15 per cent renewable energy by 2020, it would then become necessary to more than double renewable electricity-generation capacity between 2015 and 2020.**

30. It is not only the adequacy of the UK's targets for renewable electricity generation that concerns us, but also the lack of progress that has been made towards achieving them. Take the Government's ambition to source 10 per cent of electricity from renewables by 2010. Since this target was announced in January 2000[30], the share of renewable electricity in overall UK consumption has increased from 2.7 per cent of supply in 2000 to 4.6 per cent in 2006.[31] Based on current rates of progress, it is forecast that renewable electricity will constitute 6 per cent of gross electricity supply in 2010.[32] **We find it highly unlikely that, given current progress, the UK will meet the Government's ambition for 10 per cent of**

25 Q 346

26 Q 343

27 Q 79

28 http://europa.eu/rapid/pressReleasesAction.do?reference=IP/07/29&format=HTML &aged=0&language=EN&guiLanguage=en

29 http://www.berr.gov.uk/energy/sources/renewables/strategy/page43356.html

30 DTI, *Our energy future – creating a low carbon economy*, Cm 5761, p12

31 http://ec.europa.eu/eurostat

32 Cambridge econometrics, *UK energy and the environment*, (2008)

electricity to be generated from renewables by 2010, let alone the EC Mandated Target for 15 per cent renewable energies by 2020.

Rationalising the targets

31. Targets for renewable energy generation comprise two tiers. The first tier, or 'headline' target, stipulates the proportion of total energy to be generated from renewable sources, whereas the second tier outlines the contribution required from the electricity, heating and cooling and transport sectors to meet the overall target. In the case of the UK's EC Mandated Target for renewable energy, the headline target will be determined by the European Commission, and the form of the second tier by the Government.

32. In conducting this inquiry we found the plethora of UK renewables targets to be confusing and unnecessary. Possible targets for renewable electricity-generation now range from 10 per cent of supply by 2010[33] to 40 per cent of supply by 2020.[34] The forthcoming consultation on a new renewables strategy for the UK represents an opportune time to revisit these targets and to promote a unified message.

33. **We recommend that, as soon as the UK's EC Mandated Target is known, the Government outline the UK's renewable energy targets in a single statement. This statement should set the context for the Government's new Renewable Energy Strategy, stipulating the country's 2020 target for renewable energy generation, and signposting the contribution required from the electricity, heating and cooling and transport sectors required to meet the headline target. In addition to setting targets for each renewable energy sector, it is vital that the Government's Renewable Energy Strategy provides a clear policy framework for achieving them.**

33 HM Treasury, *Meeting the Energy Challenge*, Cm 7124, May 2007, p14

34 Q 348

3 Renewable electricity-generation technologies

Current capacity

34. In 2006, the UK produced 395 terrawatt hours (TWh) of electricity.[35] Renewable sources were used to generate 18.1 TWh of electricity, which equates to 4.55 per cent of all electricity generated. The largest renewable source was biofuels, followed by hydro and wind (Table 2).

Table 2. Electricity-generation in 2006

Generation technology		**TWh**
Wind	Onshore	3.574
	Offshore	0.651
Solar PV		0.007
Hydro	Small-scale	0.477
	Large-scale	4.128
Biofuels	Landfill gas	4.424
	Sewage sludge digestion	0.463
	Municipal solid waste combustion	1.083
	Co-firing with fossil fuels	2.528
	Other	0.797
Total		18.133
Share of gross electricity consumption		4.55%

Source: Table 7.4, Digest of UK Energy Statistics (DUKES), July 2007, BERR.

The technologies

35. There are a wide range of renewable electricity-generation devices at various stages of Research, Development, Demonstration and Deployment (RDD&D) in the UK, and with differing levels of commercial and technical risk. We would like to thank everyone who provided us with detailed information relating to these technologies.

36. Mature technologies, such as onshore and offshore wind, are capable of generating sufficient energy to meet the UK's 2020 renewable energy targets.[36] The primary challenge in meeting these targets will be deploying these technologies in sufficient volume and, as we discuss later, obtaining both planning consent and connection to the electricity transmission system. The UK's renewable energy targets do not stop at 2020, however. By 2050 the Government hope to cut CO_2 emissions by 60 per cent.[37] It is therefore essential that the UK takes a long-term view of RDD&D into renewable electricity-generation devices—considering each technology's potential together with its resource limits—and invests in the development of 'emerging' technologies.

37. Before considering the prospect of several emerging technologies, we briefly outline the those currently contributing to UK electricity supply, together with the technologies we

35 http://restats.org.uk/electricity/htm

36 Q 8

37 HM Treasury, *Meeting the Energy Challenge*, Cm 7124, May 2007, p 8

expect to be deployed by 2020 (e.g. wave energy devices). **We believe that it will be essential to deploy a portfolio of technologies to meet our renewable electricity targets.**

Large-scale renewable electricity-generation technologies.

Solar

Photovoltaics

38. Photovoltaic (PV) devices convert photons into an electric current. At least seven times the solar radiant energy falls on buildings in the UK than the electricity consumed within them.[38] Despite having sufficient solar resource to make PV technologies viable[39], the UK sources relatively little electricity from this sector (Table 4).

39. The majority of solar cells on the market today are 'first-generation' products, made from monocrystalline silicon. Physicists are working on 'second' and 'third-generation' technologies, such as quantum solar cells. First and second generation products have conversion efficiencies ranging between 13 per cent and 17 per cent. Third generation cells are expected to be 2–3 times more efficient.[40] Possible applications for third generation solar cells include transparent lenses on smart windows, which have the potential to generate electricity and reduce air-conditioning and interior illumination demand.

40. PV devices have a very long life, up to 3 times longer than other renewable technologies.[41] However, electricity generated from PV systems currently costs around 55 pence/kWh, a factor of at least 10 times greater than current gas, coal and nuclear power plants.[42] The most commonly cited development needs for PV were innovations to bring down the costs of manufacturing the cells and increased conversion efficiencies.[43]

Wind

41. There are currently 169 wind farms operating in the UK, seven of which are offshore. An additional 374 wind farms are currently in the pipeline. If each proposed wind farm were constructed, the UK would have an installed capacity of approximately 18 GW (see Table 3).

Onshore wind

42. The UK's first commercial wind farm, Delabole in Cornwall, opened in 1991. The British Wind Energy Association (BWEA) informed us that:

> […] onshore wind particularly is quite technologically mature and therefore the contribution of the UK at the R&D level is going to be relatively limited and we are

38 Ev 321

39 Ev 371

40 Ev 321

41 Ev 166

42 Ev 198

43 Ev 136,158, 198, 220, 321, 313

> into therefore the areas of industrial policy and looking to encourage companies in the UK, the manufacturing industry, into making components for large-scale wind turbines and therefore bringing in foreign investment to make turbines.[44]

43. Despite its technological maturity, the UK only achieved 2 GW installed onshore wind capacity in 2007.[45] Germany leads the deployment of onshore wind, with 20.6 GW installed.[46] We heard that the principal barrier to the deployment of onshore wind in the UK is "nothing to do with the technology and everything to do with our very sclerotic planning system"[47], and that there is currently 9.3MW of capacity awaiting connection to the UK electricity transmission system in Scotland.[48] These are both issues we will return to later.

Offshore wind

44. In 2007, John Hutton MP (Secretary of State, BERR) announced plans to allow companies to develop 25 GW of offshore wind by 2020. This proposal builds on the 8 GW of offshore wind capacity already planned. Dr Edge, BWEA, told us that the ambition to install 33 GW of offshore wind by 2020 gives the industry "something extra to aim for", but that it would be more realistic to expect the delivery of 20 GW in this timescale.[49]

45. There are a number of R&D challenges to the large-scale deployment of offshore wind. These include cost reduction, improved turbine design, increased turbine capacity (5 MW plus), and issues related to deep-sea reliability, access and maintenance.[50]

Table 3. Current and planned wind farms in the UK

	Onshore		**Offshore**	
	Number of wind farms	Total MW	Number of wind farms	Total MW
Operational	162	2026.5	7	403.8
Under construction	32	936.95	5	457
Consented	118	2390.76	9	2770
In planning	214	7313.18	5	2085

Source: http://www.bwea.com/statistics/

46. **Given the relative maturity of the wind sector, and the continuing construction of new wind capacity, we believe that wind energy will make the greatest contribution to meeting our 2020 renewable energy targets. In order for the full potential of wind power to be realised, it is essential that the Government takes urgent steps to address operational barriers to its deployment.**

44 Q 38

45 Ev 279

46 Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, *Development of renewable energies in 2006 in Germany*, February 2007

47 Q 47

48 Sustainable Development Commission, *Lost in transmission: the role of Ofgem in a changing climate* (2007)

49 Q 39

50 Ev 158, 252, 271, 318

Wave and tidal

47. The UK's wave and tidal resources have the potential to provide up to 20 per cent of total electricity demand[51], and it is feasible that 2 GW of marine energy could be deployed by 2020.[52] There are currently over 50 marine electricity-generation devices being developed with no single device architecture as yet pre-eminent.[53] While the variability of the marine environment makes it unlikely that any single device will be optimal across all installation sites, UKERC expect that winning technologies will emerge through a process of natural selection following field trials.[54] Wave and tidal energies are considered separately below.

Tidal

48. The Sustainable Development Commission estimate that it would be possible to meet at least 10 per cent of UK electricity need by exploiting tidal power.[55] There are two categories of tidal resource: tidal stream and tidal range. Tidal stream technologies make use of the kinetic energy of moving water to power turbines. Tidal range systems exploit the potential energy in the difference in height between high and low tides in estuarine areas. Tidal stream devices are modular, like wind turbines, whereas tidal range energy is generated from large, single installations such as barrages.

49. Tidal barrage installation is a proven technology and the La Rance scheme in France has been generating 240 MW for over 40 years. The University of Liverpool predict that a barrage on the Severn Estuary could generate sufficient power to meet 5–6 per cent of the UK's current electricity demand, and that, if constructed together with installations on seven of the UK's other major estuaries, 10–12 per cent of present electricity demand could be met.[56] Following a report by the Sustainable Development Commission on the sustainability of a Severn barrage[57], BERR is conducting a feasibility study into the development's potential.

50. There are a number of prototype tidal stream devices currently being tested in the UK. For instance, Marine Current Turbines (MCT) has been operating a prototype 350kW tidal current device in the Bristol Channel since 2003, and Open Hydro is testing a 250kW tidal stream generator at the European Marine Energy Centre (EMEC). The largest tidal current device developed to date (1.2MW, Seagen, MCT), is currently being installed in Strangford Lough, Northern Ireland.

51 Sustainable Development Commission, *Turning the tide: tidal power in the UK* (2007), p 5

52 UKERC, *UKERC marine (wave and tidal current) renewable energy technology roadmap; summary report* (2008), p 3

53 Ev 254

54 Ev 248

55 Sustainable Development Commission, *Turning the tide: tidal power in the UK* (2007), p 5

56 Ev 86

57 Sustainable Development Commission, *Turning the tide: tidal power in the UK* (2007)

Wave

51. The potential for offshore wave energy in the UK has been estimated to be 50TWh/year—equivalent to 12.7 per cent of current electricity production—with nearshore and shoreline wave energy adding another 8TWh.[58]

52. Although wave power is scientifically mature, Professor Peter Bruce, Royal Society of Edinburgh, described it as "technologically adolescent".[59] At present, only one wave energy device—'Pelamis' (750kW) developed by Ocean Power Delivery—has been demonstrated at near full scale in the open sea. Pelamis technology is currently being deployed off the Portuguese coast, where it will generate sufficient energy to power circa 1,500 homes.

53. Wavegen operates the only commercial wave energy device in the UK. The Limpet device, a shoreline converter on the Scottish island of Islay, has a capacity of 0.5 MW. Future developments in the offshore wave sector include Scottish Power's project off Leith (3 MW) and E.ON and Ocean Prospect's project off the north Cornwall coast (5.25 MW). Both projects will connect to the UK's electricity transmission system via sub-sea connections; the European Marine Test Centre in Orkney and WaveHub off the north Cornwall coast respectively.

Wave and tidal - common issues

54. The challenge of siting offshore electricity-generation devices is not insignificant. To better understand the seabed, seabed sediments, and sediment movement, the British Geological Survey (BGS) is currently undertaking a seabed-mapping programme. The data from this research programme are critical to understanding the impacts of tidal stream and barrage development, and have relevance for all marine renewables developments and marine environmental and conservation issues.[60]

55. Identifying the optimal location for a marine energy device is not the only operational barrier to deployment. At the current time, the deployment of marine technologies is being hampered by the limited availability of installation equipment.[61] Originally scheduled for August 2007, installation of MCT's SeaGen project finally commenced in April 2008, a delay partially caused by the extended need for the installation cranes on another project. Further, a number of submissions identified a need for research into the survivability and maintenance of generators in the marine environment.[62] For example, the Royal Society of Chemistry cited a need to develop protective coatings to prolong the operating life of wave and tidal energy devices.

56. **We recommend that the Government review the barriers to the deployment of marine technologies as a priority, and that it engages with device developers in order to identify the most appropriate means of supporting technology development and deployment.**

58 Ev 254

59 Q 178

60 Ev 219

61 Ev 151

62 Ev 99, 151, 201, 254, 288, 368

Hydro power

57. Hydro power schemes convert the potential energy of the water flowing with a certain fall into usable energy, and can be categorised as 'small-scale' and 'large-scale'. Under the Renewables Obligation small-scale projects are defined as those of 20 MW or less. We discuss the role of the Renewables Obligation later in this report.

58. Large-scale hydro electricity is a mature technology but possibilities to increase its deployment in the UK are limited.[63] However, the development of a new Thames Barrage may provide such an opportunity as research conducted by the London Climate Change Agency suggests it could be designed to generate hydro electricity.[64]

59. There is potential to increase the deployment of small-scale hydro in the UK, particularly 'run of river' developments.[65] The Natural Environment Research Council's (NERC) Centre for Ecology and Hydrology is undertaking research into the potential of this resource both within UK and abroad.[66]

Bioenergy

60. Biomass resource can be used for a number of energy applications including electricity generation, heat, Combined Heat and Power (CHP), [67] and the production of fuels for transport. The co-firing of biomass in existing plants, particularly coal, is already done and a dedicated biomass plant is under construction at Lockerbie in Scotland. The UK biomass resource is limited at present and it often has to be imported.[68]

61. One disadvantage of biomass is that it has a lower energy density than conventional fossil fuels.[69] The Royal Society of Edinburgh suggest that the high cost of transport, and relatively low energy content, of woody biomass means that it should be converted within 50km of its source.[70]

Fuel cells and hydrogen

62. A fuel cell is a device that converts the chemical energy of a fuel directly into electrical energy. In some ways analogous to a battery, fuel cells can be recharged with fresh reactant. Unlike batteries, however, fuel cell reactants are stored outside the cell and are fed to the cell only when power generation is required.[71]

63 Ev 242

64 Ev 167

65 Ev 130, 167

66 Ev 225, 237

67 Combined Heat and Power (CHP) technology utilises waste heat produced as a by-product of the electricity generation process.

68 Qq 56-58

69 Q 58

70 Ev 121

71 Ev 78

63. Fuel cells can be run on a wide range of fuels, including bio-fuels. Hydrogen fuel cells produce electricity by means of an electrochemical reaction between hydrogen and oxygen (air), with water as the only by-product.

64. Fuel cells can be grouped into 3 sectors:

- portable (e.g. generators, battery re-charging devices in the field, battery replacements in portable electronic devices such as mobile phones);
- mobile (e.g. marine and aviation power, propulsion systems for cars, trucks, buses and bikes); and
- stationary (commercial and residential distributed generation, combined heat and power, remote power generators for non-grid connected sites).

65. In order to move from a carbon-based (fossil-fuel) economy to a hydrogen-based economy a number of technological barriers must be overcome. According to UKERC, these include reducing the cost of hydrogen production and the development of a new generation of hydrogen storage systems for vehicular and stationary applications.[72]

66. As hydrogen is a vector, rather than an energy source, it has to be sourced/created. Currently the bulk of hydrogen is made from natural gas, raising questions as to its status as a 'renewable' technology. Hydrogen can be produced in a number of ways, however, utilising chemical, biological, electrolytic[73], photolytic[74] and thermo-chemical[75] process technologies.[76]

Emerging technologies

67. A number of renewable electricity-generation technologies are in early stage R&D. We outline three emerging technologies in the bioenergy sector below: anaerobic digestion, second generation biofuels and the use of microalgae in hydrogen production.

Anaerobic digestion

68. Anaerobic digestion is the process by which organic materials are broken down in the absence of oxygen. This biological process produces biogas, principally composed of methane and carbon dioxide, which can be used to produce electricity.

69. There are a number of research challenges that need to be overcome prior to the large-scale deployment of this technology. These include greater understanding of the basic processes, genetic manipulation, and process intensification. Projects designed to explore this technology include the East of England Energy Group's BioREGen project, and a study

72 Ev 254

73 The process of using electricity to split water into hydrogen and oxygen.

74 The process of using the energy in sunlight to separate water into hydrogen and oxygen.

75 These processes use heat, in combination with closed chemical cycles, to produce hydrogen from feed stocks such as water.

76 Ev 161

funded under the Research Council's Rural Economy and Land Use programme examining anaerobic digestion in on-farm energy production.[77]

Second generation biofuels

70. First generation and second generation biofuels are distinct energy sources. First generation biofuels use agricultural crops developed as food resource, for example sugar beet and wheat grain, whereas second generation biofuels will use lignocellulose, a complex matrix which forms the structural components of plants and trees. The production of second generation biofuels is not yet commercially viable.[78] However, as reported by UKERC, "all evidence suggests that in comparison to arable crops, deployment of perennial second generation crops will give positive benefit to the environment".[79] Areas of development include whole-system understanding—where spatial supply and demand are considered together in relation to the emerging technology deployment—increasing crop yields, and cost reductions.[80]

Microalgae

71. Microalgae have very high growth rates (they have up to 40 times more yield per unit area compared to land plants), utilise a large fraction of incident solar energy and can grow in conditions that are not favourable for terrestrial biomass growth.[81] Photosynthetic microbes have the potential to produce biofuel (biodiesel and biogas), and some species of microalgae generate hydrogen. These algae can be grown in a photobioreactor (a bioreactor which incorporates a light source). While research in this field is relatively immature, there is already industrial interest in the technology: Shell has started work on related topics.[82] NERC is funding R&D into a photobioreactor at Plymouth Marine Laboratory.[83]

72. The path from the laboratory to the commercial sector can take many years. It is therefore essential that fundamental research into emerging technologies be supported in parallel to the deployment of relatively mature technologies. **We urge the Government to ensure that, in acting to meet the UK's 2020 renewable energy targets, support for near-to-market technologies does not come at the expense of support for basic long-term research into emerging technologies.**

Nuclear power

73. The UK Government is committed to including nuclear power in its future energy 'mix'. On 10 January 2008, John Hutton, Secretary of State, BERR, said that:

77 Ev 127, 222

78 Ev 243, 121

79 Ev 255

80 Ev 121, 255

81 Ev 261

82 Q 61

83 Ev 268, 233

> Giving the go ahead today that new nuclear power should play a role in providing the UK with clean, secure and affordable energy is in our country's vital long term interest.[84]

74. Although recognised as a low-carbon energy source, no legislative body has categorised nuclear energy as 'renewable'. Section 32 of the UK Electricity Act 1989 makes clear that nuclear energy is distinct from renewables when it defines renewable energies as "sources of energy other than fossil fuel or nuclear fuel… [including] waste of which not more than a specified proportion is waste which is, or is derived from, fossil fuel". We believe renewable energy sources to be those which occur naturally in the environment (e.g. wind, wave and tidal), and that do not deplete in scale when their energy is converted into electricity.

75. Nevertheless, nuclear energy has been referred to as 'renewable' by politicians such as US President George W. Bush[85], and, in his former position as Parliamentary Under-Secretary, Department of Trade and Industry, Lord David Sainsbury.[86] We asked the Minister whether the Government considers nuclear energy to be renewable. He replied "because it requires uranium it cannot be regarded as renewable".[87] **We agree that nuclear energy is not a form of renewable energy, whatever its advantages in carbon-saving, as it relies on uranium as a fuel source.**

76. We asked the Minister whether the Government's commitment to nuclear power would require the expenditure of financial resource that might otherwise have been available to support the deployment of renewable technologies. He replied:

> we are not in the business of paying for new nuclear and we made it absolutely clear, and the Energy Bill is partly about this, that the companies will pay the full cost of new nuclear, including their appropriate share of disposing of nuclear waste at the end of the day.[88]

77. It is not only the potential cost of the nuclear industry to the public purse that concerns us, however, but also the fact that nuclear energy and renewable energy are 'uneasy bedfellows'. Nuclear power plants generate a constant supply of energy that cannot be reduced to accommodate increased production of electricity by other sectors. If nuclear generators are given long-term contracts for electricity production, and particularly if these contracts guarantee the purchase of electricity produced, the potential for renewable installations to contribute to the UK's electricity supply may be restricted. Asked to comment on this matter, the Minister asserted that there would be "plenty of room for everyone" and that:

> The renewables industry have reasons to be cheerful. They are not the happiest bunnies I meet, I must admit; they need to cheer up a bit, because never before has there been a time when a government has been so committed to renewables. When

84 http://nds.coi.gov.uk/environment/fullDetail.asp?ReleaseID=343892&NewsAreaID=2

85 http://www.msnbc.msn.com/id/14668738/

86 Ev 190

87 Q 366

88 Q 371

> faced with a situation where we need to move from 2 per cent of all energy coming from renewables to, say, 15 per cent in twenty years, would not most industries be rather cheerful about that?[89]

78. **We believe it essential that the deployment of nuclear energy does not compromise the ability for the UK transmission system to accommodate all electricity generated by renewable technologies, and that the Government should guarantee there will be no nuclear blight on the renewables industry.**

Microgeneration

79. Microgeneration is defined as the small-scale production of heat and/or electricity from a low carbon source.[90] Greenpeace UK and the Energy Saving Trust report that over 60 per cent of the 'primary' energy used in large-scale electricity generation is lost (either as waste heat or during electricity transmission).[91] By generating electricity locally, it is possible to avoid energy losses incurred as a result of long distance transportation. The use of a technology such as micro-Combined Heat and Power (CHP) could also allow end-users to exploit heat generated during electricity production.

Current deployment

80. In 2007, microgenerators supplied less than 1 per cent of UK electricity.[92] However, research commissioned by the Department for Trade and Industry (DTI) concluded that microgeneration could meet 30–40 per cent of the UK's electricity needs by 2050.[93] Allan Jones, London Climate Change Agency, felt this target is "potentially realistic"[94], a view shared by Professor Gordon MacKerron, Science and Technology Policy Research Unit, University of Sussex (SPRU): "it is certainly possible in such a long timescale […] it is certainly feasible, but far from certain that one could reach such a level".[95] The current deployment of different electricity microgeneration technologies is outlined in Table 4.

Table 4. Microgeneration technologies installed in the UK

	Number of installations March 2006	Number of installation grants since March 2006[96]	Total
Solar PV	1,301	548	1849
Small hydro	90	4	94
Micro-wind	650	1,488	2,138
Bio-energy	150	126	276
Renewable CHP	0	0	0
Fuel cells	5	0	5

Source: Ev 287

89 Q 374

90 Energy Act 2004, Section 82

91 Ev 183, 291

92 Sustainable Development Commission, *Lost in transmission: the role of Ofgem in a changing climate* (2007)

93 Energy Saving Trust, *Potential for microgeneration – study and analysis*, Energy Saving Trust, (2005)

94 Q 251

95 Q 253

96 Note that data on the deployment of microgenerators is estimated on the basis of applications to grant programmes, in this case the Government's Low Carbon Buildings Programme, which provide funds to support technology installation.

A microgeneration strategy

81. In 2006, the DTI published a microgeneration strategy, *Our energy challenge - power from the people*. The objective of the strategy was to:

> Create conditions under which microgeneration becomes a realistic alternative or supplementary energy generation source for the householder, for the community and for small businesses.[97]

82. Dave Sowden, Micropower Council, told us that the Government's microgeneration strategy had received strong support at the time of its publication, but that some "aspects of current policy […] have not worked particularly well, the Low Carbon Buildings Programme and particularly the Householder Grant Scheme has been plagued with implementation difficulties".[98] We consider the Low Carbon Buildings Programme later in this report, but note here that the Government will re-examine its microgeneration strategy as part of the renewable energy strategy review in Autumn 2008.

83. One issue that the revised microgeneration strategy will need to address is how best to support the transition of microgeneration technologies from the laboratory to the marketplace. The evidence we received highlighted two particular barriers to the widespread uptake of micropower devices. First, the cost of purchasing and installing microgeneration technologies is relatively high. To bring down future costs, and incentivise investment by the micropower industry, companies will need to invest in mass-market production capability. Second, funding for technology demonstration was considered to be inadequate.[99] This is of concern as demonstration projects are essential in finding out how a technology will perform in a 'real environment'.

84. Like the Micropower Council, we believe the microgeneration industry is unlikely to make a large investment in the production of microgeneration technologies unless there is a reasonable expectation of a market.[100] Yet, at the current time, the micropower industry does not have a quantified government expectation of where it is expected to fit into the sustainable energy mix.

85. **We recommend that in revising its microgeneration strategy, the Government review the provision of financial support for demonstration projects, and introduce a national target for the production of electricity from microgeneration technologies.**

97 DTI, *Our Energy Challenge – power from the people*, March 2006, p 4-5.

98 Q 261

99 Qq 273, 276, 282

100 Ev 296; Q 272

4 Research funding

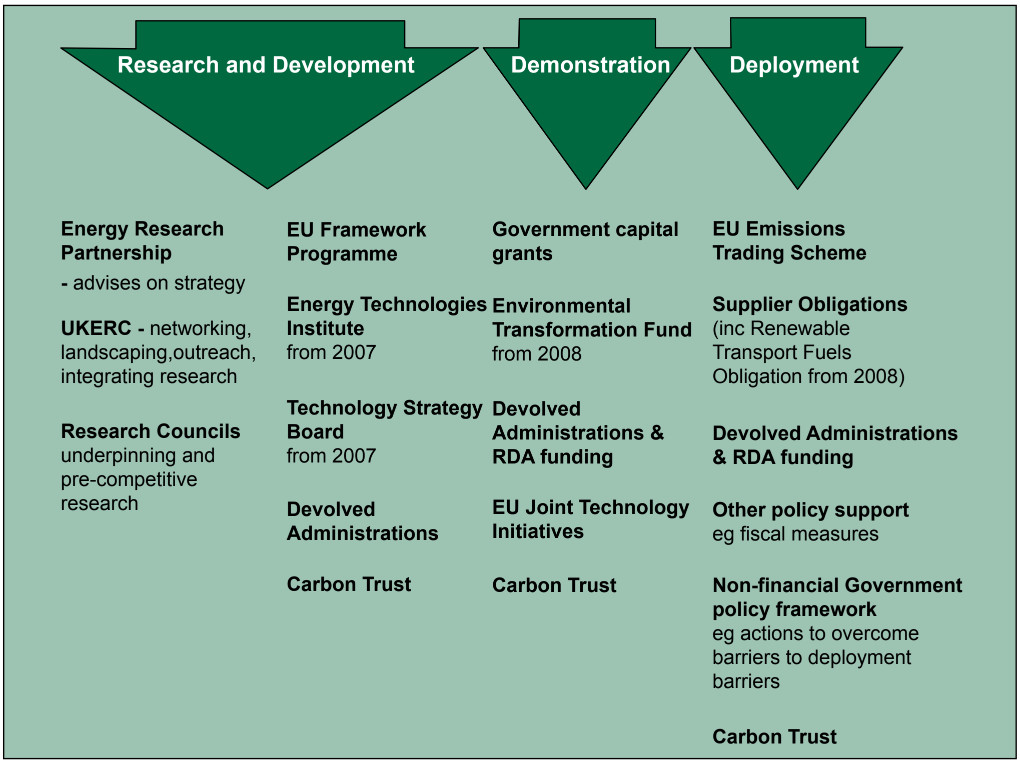
Background

86. The UK's public energy RD&D expenditure, including that on renewable energy, fell significantly after the collapse of oil prices in the mid-1980s and subsequent market liberalisation.[101] Excluding nuclear fission, the UK budget for energy R&D was €400 million in 1983, €80 million in 1995 and €50 million in 2004. Further, although UK expenditure on renewable energy RD&D is now increasing, it is still substantially lower than some other countries. The Institute of Physics report that, in 2005, investment in renewables RD&D totalled $68million in the UK, $123million in Germany, and $255million in the United States.[102]

The funders

87. UK energy-related RDD&D is currently funded by a number of national and international organisations. As shown in Figure 2, funding organisations can be broadly classified as supporting one of three stages in a technology's life cycle: research and development, demonstration or deployment. We describe the role of a number of funding organisations below.

Figure 2. Funders of energy-related RDD&D in the UK.



Source: Ev 282

101 Ev 134, Institute of Physics Energy Management Group, *Spring newsletter* (2006), p 7

102 Ev 72

The Research Councils

88. The Research Councils have a key role in supporting the fundamental science that underpins energy-related research. Expenditure on energy research by the Research Councils increased from £40million in 2004–05 to £77million in 2007–08. Over the same time period, spend on renewable energy increased from £8.3 million (a 21% share) to £18.8million (24%; Table 5).

Table 5. Research Council spend on renewable energy research

	2000–01	2001–02	2002–03	2003–4	2004–5	2005–6	2006–7
Wind	£260	£330	£490	£481	£242	£125	£1,140
Solar	£4,125	£4,666	£3,927	£3,834	£4,179	£4,065	£3,685
Fuel cells & Hydrogen	£981	£1,463	£1,984	£2,687	£2,393	£2,705	£3,074
Wave & tidal	£300	£605	£616	£830	£995	£1,026	£1,080
Bioenergy	£622	£752	£927	£1,177	£1,249	£2,023	£2,646
Geothermal	£40	£64	£63	£73	£79	£106	£124
Storage	£837	£888	£809	£730	£466	£789	£1,193
Networks	£919	£1,114	£1,388	£1,804	£2,390	£3,666	£4,037
Other renewable	£267	£432	£587	£453	£1,220	£1,315	£2,380
Total	**£8,356**	**£10,318**	**£10,795**	**£12,072**	**£13,218**	**£15,822**	**£19,359**

Source: Ev 217

89. In addition to supporting energy-related research under their own programmes, the Research Councils have established a cross-council multidisciplinary Energy Programme. Launched in 2005, the Programme is co-ordinated by the Engineering and Physical Sciences Research Council (EPSRC) and involves the and Biotechnology and Biological Sciences Research Council (BBSRC), Economic and Social Research Council (ESRC), NERC and the Science and Technology Facilities Council (STFC). The programme is expected to spend circa £300 million during the period 2008–11.[103] Funds are distributed via responsive mode grants for individual project proposals, training funds for research leaders, and multidisciplinary research consortia.

The Energy Technologies Institute

90. Budget 2006 announced the creation of an Institute to accelerate the development of low-carbon energy technologies towards commercial deployment. In September 2007 it was announced that this body, the Energy Technologies Institute (ETI), would be hosted by the Midlands Consortium[104], which comprises Loughborough, Birmingham and Nottingham Universities, with the ETI's headquarters to be located at Loughborough.

91. Dr David Clarke, Chief Executive of the ETI, told us that the Institute will fulfil a unique role in "de-risking" technologies.[105] That is, it will support technology demonstration rather than fundamental research or full-scale deployment. In doing so, it is

103 Ev 324

104 Ev 328

105 Q 165

hoped that the ETI will bridge what the Renewable Energy Association have termed the "valley of death" in the innovation chain (the pre-commercial stage between technology development and full market deployment).[106]

92. The costs involved in testing new devices are substantial, and the availability of dedicated facilities is key. The BWEA highlight the wave and tidal sector as an example of an industry where a number of demonstration facilities are coming online: the New and Renewable Energy Centre, Blyth, European Marine Energy Centre, Orkney, and WaveHUB, Cornwall.[107] We would like to see the same level of support given to other sectors in the renewable electricity industry and were pleased that Dr Clarke was of the opinion that:

> One of the roles of the ETI may well be to actually catalyse creation of […] a dedicated test area for new technologies bearing in mind that quite often, at the scales we are talking about, the best platform to use may well be a real machine in a real environment, so it may be operating a wind turbine in the Thames Estuary, for the sake of argument. We may say that there are a few machines there which we could use as a test platform for instance, but we will progress that.[108]

93. **We welcome the creation of the Energy Technologies Institute and view it as playing a key role in supporting pre-commercial technologies through the 'valley of death' and into the market place.**

94. **Further, we recommend that the ETI establish a test platform for offshore wind technologies.**

Funding structure

95. The ETI is a 50:50 public-private partnership. The Government has committed to providing the Institute with matched funding of up to £550 million over 10 years, creating a potential budget of £1.1 billion. The public sector contribution will be provided by the Technology Strategy Board (40 per cent) and by DIUS (60 per cent).

96. DIUS's contribution to the ETI is paid out of the Science Budget, and for the period 2008–11 will be met by EPSRC. EPSRC's 2008–11 delivery plan commits £60 million to ETI, and £21 million of spend has already been allocated.[109] Professor Bruce, Royal Society of Edinburgh, told us that EPSRC's responsibility to fund the ETI is a matter of "real concern to the research community"[110]:

> I really feel that there is a problem of perhaps robbing Peter to pay Paul here and if we starve funding for […] the longer-term renewable technologies that we are going to need in 20 to 40 years as opposed to 10 to 20, then we will not really make the right investment in developing scientific breakthroughs that are essential to deliver

106 Ev 154

107 Ev 283

108 Q 201

109 Ev 369

110 Q 162

> those technologies. It is a relatively small amount of money we fund on the science base: £60 million is in many ways a drop in the ocean in terms of commercialisation.[111]

97. We share the concern that EPSRC may be forced to reduce support for basic research in order to fulfil its commitment to ETI. EPSRC told us that "there would have been other priority areas to consider for further funding as well as energy if EPSRC had not been asked to fund ETI",[112] and Dr Paul Golby, ERP, was of the opinion that "the Government have come up with matched funding [for ETI] but it has probably got there through taking money from other areas in the pure research area", a sentiment with which Dr Alison Wall, EPSRC, agreed.[113]

98. **We believe that the Research Councils are unique in their support for basic and speculative research and that their research budget should not be compromised by the Government's commitment, however laudable, to provide increased support for technology demonstration. As such, funding for ETI must be over and above that allocated to the EPSRC Energy Programme.**

99. Public sector funding for the ETI is subject to EU State aid rules which limit the proportion of public funding for a particular project depending on the classification of the type of work being carried out. For any given project, the ETI hopes to match public monies with finance from its industrial partners. However, in order to fund projects at 100 per cent of cost, the ETI has applied for State aid approval. Lodged in October 2007, the application is currently being considered by the European Commission with a decision expected in Summer 2008.

Intellectual property rights

100. The Renewable Energy Association has expressed concern regarding the intellectual property rights (IPR) for projects undertaken in partnership with the ETI. In short, they are concerned that SMEs collaborating on ETI-funded projects will effectively have their IPR 'stolen' by the Institute's industrial partners.[114] When asked about the Renewable Energy Agency's concern, Dr Clarke responded:

> frankly there is no point in anybody having IP in the technology space and the energy space if it cannot find a route to exploiting it […] if that means that you need a big corporate […] to actually exploit the IP, then, frankly, we will try and engineer a deal that gets the IP into the big corporate and gives a fair return to the SME that provided it.[115]

101. The potential for SMEs to drive the creation of new ideas was recognised by the Government in the 2008 science and innovation White Paper, *Innovation Nation*[116], and it

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111 162

112 Ev 370

113 Q 168

114 Ev 289

115 Q 199

116 DIUS, *Innovation Nation*, Cm 7345, March 2008

is essential that concerns over IPR do not dissuade innovative SMEs from participating in ETI-funded projects. Further, as 50 per cent of funding for ETI comes from public money, IPR generated from ETI-funded projects should not necessarily be made the sole concern of the Institute's corporate partners.

102. It must be recognised, however, that there is a careful balance to be struck between meeting the wishes of SMEs, and rewarding the Institute's investors. The finance raised from the ETI's industrial partners is central to the Institute's ability to support technology RD&D, and it is likely that large corporate firms would be reluctant to invest in an institute from which they received little return in terms of IPR generated under projects they have part-funded.

103. **It is essential that the ETI addresses the concerns of SMEs with regard to the exploitation of intellectual property (IP) generated during ETI-funded projects. We believe that ETI's guidelines on the exploitation of IP should be formulated to encourage interaction between SMEs and the Institute's partner organisations.**

The Carbon Trust

104. The Carbon Trust was set up by Government in 2001 as an independent company. Its mission is "to accelerate the move to a low carbon economy by working with organisations to reduce carbon emissions and develop commercial low carbon technologies".[117] Since its creation, the Carbon Trust has supported projects spanning the innovation spectrum (from R&D through to early stage venture capital investments). In collaboration with the ETI, the Carbon Trust has launched a £40 million fund for projects aimed at cutting the costs of offshore wind power and accelerating its deployment around the UK.

The UK Energy Research Centre

105. The UK Energy Research Centre (UKERC) was established in 2004 following a recommendation from the 2002 review of energy initiated by the Government Chief Scientific Adviser. Funding for the Centre was allocated in the 2002 Spending Review.

106. Based at Imperial College London, UKERC is headed by Professor Jim Skea, Research Director, and John Loughhead, Executive Director. UKERC organises its networking and research activity under six related themes: demand reduction; future sources of energy; energy infrastructure and supply; energy systems and modelling; environmental sustainability; and materials for advanced energy systems. The Centre's work also encompasses four functions: technology and policy assessment; meeting place; research register; and energy data centre.

Government funding programmes

The Environmental Transformation Fund

107. On 1 April 2008, the Government launched the Environmental Transformation Fund (ETF) to invest in low carbon and energy efficiency technologies. Funds within the

117 http://www.carbontrust.co.uk/about

domestic element of the ETF, led by the Department of Food and Rural Affairs (Defra) and BERR, will total £370 million between 2008–09 and 2010–11.[118] The ETF also comprises an £800 million international fund, to focus on poverty reduction and environmental protection, and to help developing countries to tackle climate change.

108. The budget for the ETF's domestic fund is not wholly uncommitted. For example, the ETF incorporates the Sustainable Energy Capital Grants formerly administered by BERR. E.ON UK told us that, when existing commitments are taken into account, the overall funding uplift of approximately £170 million is likely to be insufficient to support large-scale demonstration and deployment of new low-carbon energy technologies.[119] This concern was echoed by Dr Golby (ERP):

> if you look at the Environmental Transformation Fund, I think that the CSR settlement for the next three years is £370 million which is quite small in terms of real scaling-up issues […] I have a real concern that actually we are still not putting sufficient money in this to make the progress that we need in the timescale we have available.[120]

Capital Grants

109. Concerns over the Government's funding programmes for energy-related RDD&D were not limited to the adequacy of the financial resource available. Speaking of the Government's Capital Grants programme, Dr Paul Golby, ERP, said "we have quite a number of let me call them pet schemes floating around which are subscale and not delivering a bang for the buck".[121] He went on to suggest that the Government's funding programmes should be subject to "a humane cull".[122]

> […] there is a need to stand back […] and to actually do what we would do in private industry and actually stop some activities in order to fund other activities to an extent that can really deliver.[123]

110. During our inquiry, we heard particular concern as to the ability of the Low Carbon Buildings Programme to deliver on its objectives.[124] We consider this programme, together with the Marine Renewable Deployment Fund, in more detail below.

111. **We recommend that BERR urgently review their funding programmes for energy-related research in order to ensure they are able to support the RDD&D necessary to meet the UK's 2020 renewable electricity targets.**

118 Ev 325

119 Ev 312

120 Q 168

121 Q 149

122 Q 151

123 Q 150

124 Qq 150, 262

Low Carbon Buildings Programme

112. The Government supports the deployment of microgenerators via the Low Carbon Buildings Programme (LCBP). The programme, managed by BERR, provides grants for the installation of microgeneration technologies. Householders, for example, can apply for grants up to £2,500 per property towards the cost of installing a certified product by a certified installer. Eligible technologies include PV, wind turbines and renewable CHP.

113. Launched in 2006, the LCBP was designed as a three-year grant programme to stimulate the microgeneration industry. While acknowledged to have been helpful initially, we found little support for the LCBP in its current form.[125] Concerns regarding the LCBP were two-fold. First, the grants administered were considered too small[126], and second, as summarised by Dave Sowden of the Micropower Council, the grant-based form in which support is delivered was deemed inappropriate:

> [...] with a grant scheme by definition you are hamstrung by the Treasury every three years and it introduces a great deal of uncertainty. It is not particularly helpful as the industry starts to scale up in the early stages of mass-market commercialisation. It is a blunt instrument. It is very good in the much earlier stages of market development but not suitable for mass-market deployment, which is what the Government was trying to use it for.[127]

114. We note that since completing our evidence sessions the Government has announced several changes to the LCBP. For example, since 1 April 2008 public sector organisations and charitable bodies can apply for 50 per cent of the cost of installing approved microgeneration technologies. However, these changes fail to recognise the industry's concerns that a grant-based system is neither effective nor sustainable.

115. **We recommend that the Government review the role of the Low Carbon Building Programme, and consider whether it is still a necessary and/or appropriate form of support. We suggest that the Government consider using this financial resource to reward installers for the amount of electricity they generate, rather than to support the installation of a microgeneration device. Further, we urge the Government to re-examine the role of renewable energy in the Low Carbon Building Programme.**

Marine Renewable Deployment Fund

116. The Marine Renewable Deployment Fund (MRDF) is a £50 million fund launched in 2005. To date, it has provided support to facilities such as the European Marine Energy Centre, Orkney. The core of the MRDF is its £42 million Wave and Tidal-stream Energy Demonstration Scheme. The Scheme was designed to take forward the demonstration of early stage pre-commercial wave and tidal stream technologies that have completed their R&D, but that are not yet commercially competitive. The Fund provides 25 per cent capital grant and a revenue support payment of £100 per MWh.

125 Qq 261- 263

126 Qq 261- 262

127 Q 261

117. We were surprised to find that since being launched there have only been two applications to the Demonstration Scheme. Neither of these applications proceeded, however, as they failed to meet the Scheme's eligibility criterion of 3 months continuous operation or 6 months operation with occasional breaks.[128] Mrs Sarah Rhodes, BERR, expressed the Government's concern at the lack of spend, but pointed out that the Scheme retains the support of the offshore renewables industry.[129]

118. In our opinion the Demonstration Scheme is a valuable resource. One of the primary reasons for the Scheme's lack of spend appears to be that it was positioned to fund technology deployment despite inadequate support for early-stage technology demonstration. We expect that ETI's wave and tidal programme will bridge this gap.

119. **The MRDF was designed to support the deployment of marine technologies. However, it was launched in a funding landscape that did not provide adequate support for technology demonstration projects. As a result, marine energy devices failed to develop to the extent required to qualify for support under the MRDF. We recommend that BERR consult the Energy Research Partnership, Energy Technologies Institute and Renewables Advisory Board when developing future funding programmes, to ensure they are targeted appropriately.**

European initiatives

In addition to national funding for research, there are a number of European programmes that provide support for energy-related RDD&D.

Framework Programme Seven

120. Funding for energy research is available under the EU's Framework Programme for Research and Development. The Seventh Framework Programme (FP7) took over from FP6 on 1 January 2007 and will run for seven years. FP7 has a budget of €2350 million for research under its energy theme.

121. Under FP7, projects need to have a minimum of three partners from three different nations. Two of these have to be Member States. The Institute of Engineering and Technology told us that "historically UK companies and research establishments have been under-represented EU energy research programme".[130] We note that the Government's white paper on science and innovation, *Innovation Nation*, reports that the Technology Strategy Board will develop a plan to help deliver a 'step-change' in the level of UK business participation in consortia competing successfully for grants in FP7.[131]

128 Ev 367

129 Q 132

130 Ev 241

131 DIUS, *Innovation Nation*, Cm 7345, March 2008, p 56

Intelligent Energy Europe

122. Intelligent Energy Europe is part of a broader EU programme on Competitiveness and Innovation Programme which supports promotional sustainable energy projects and 'integrated initiatives'. The aim of the programme is to improve market conditions so to encourage the use of renewable energy sources and save energy. The programme has a budget of €727 million, which will be used to co-finance international projects, events and the start-up of local or regional agencies.

European Institute for Innovation and Technology (EIT)

123. The European Institute for Innovation and Technology (EIT) is a new initiative which aims to become a flagship for excellence in European innovation. Based on partnerships known as 'Knowledge and Innovation Communities' (KICs), the Institute aims to bring together Higher Education, Research and Business to "transform education and research results into tangible commercial innovation opportunities".[132] On 11 March 2008, the European Council announced that within 18-months of being established, two or three KICs would be established in the areas of renewables, climate change and ICT-technology. The location of the EIT headquarters will be determined by the European Council during 2008.

124. **European funding programmes provide valuable support for energy-related RDD&D in the UK. We welcome the announcement that the Technology Strategy Board will take steps to increase the involvement of UK business in Framework Programme 7. Further, we believe that the creation of a European Institute for Innovation and Technology is an exciting development, and one with which the UK research base should actively engage.**

The funding landscape

125. A common criticism made to us of the RDD&D funding landscape was that it was both overcrowded and lacking clarity.[133] This concern was summed up by the Renewable Energy Association:

> It is very difficult for all but the most informed observers to understand the remit of each [funding body], where they differ and where they overlap.[134]

126. There are benefits to be gained from having a range of funding agencies. For example, as Professor Peter Bruce commented, "with a single body, you can have a uniformity of view, whereas if you have a number of bodies, they tend to occupy different parts of the landscape".[135] However, critical for any funding landscape is that applicants can easily identify the organisation best placed to meet their needs. The evidence we received suggests this is not currently the case.

132 http://ec.europa.eu/eit/mission_en.htm

133 Ev 72, 256, 259, 282, 357; Q 149

134 Ev 289

135 Q 153

127. In reviewing the funding available for energy-related research, the Energy Research Partnership (ERP) recommended that the Government establish a "linear supply chain" of research funders.[136] Essentially a national programme for energy-related research, the chain would comprise 'the Research Councils at the front end, the Energy Technologies Institute in applied research and the Environmental Transformation Fund at the tail end in terms of deployment'.[137]

128. Although we agree that the funding landscape requires clarification, we do not believe the concept of a "linear supply chain' is appropriate. As pointed out by the Minister, "there is never a final chapter to a technology"[138], and technologies may require support from funders in different 'spaces' in the landscape at the same point in time. To take PV systems as an example, first generation products are commercially available at the same time that basic research is being conducted into third generation nanotechnologies.

129. **We find the funding landscape for energy-related RDD&D to be complex. We recommend that the Government review the role of each funding organisation, and that these roles be clarified and defined. Further, we recommend that the Government develop a strategy for communicating the remit of each funding body to the UK RDD&D community.**

136 Q 149; Ev 357

137 Q 149

138 Q 385

5 The Renewables Obligation

Background

The Renewables Obligation

130. The Renewables Obligation (RO) is the Government's key policy for encouraging new renewable electricity generation. Introduced in 2002, the RO requires licensed electricity suppliers to source a specific, and annually increasing, percentage of the electricity they supply from renewable sources. The current level is 9.1 per cent for 2008–09, rising to 15.4 per cent by 2015–16. The RO will remain flat between 2015–16 and the end of the Obligation in 2027.

Renewable Obligation Certificate

131. Electricity suppliers meet their Obligation by presenting Renewable Obligation Certificates (ROCs) as evidence of renewable generation or by paying the 'buyout' price, or a combination of the two. A ROC is a tradable certificate issued to an accredited generator for renewable electricity generated, and supplied to customers, within the UK. One ROC is issued for each megawatt hour (MWh) of eligible renewable output generated by a licensed supplier. If suppliers fail to accrue sufficient ROCs, they pay the buyout price, equivalent to £35.76 per MWh in 2008–09. The buy-out fund is redistributed to electricity suppliers as a proportion of ROCs presented at the end of the 12–month Obligation period.

Reform of the Renewables Obligation

132. The Government has conducted two recent consultations on potential reforms to the RO.[139] We consider here two of the proposed reforms. First, the Government recommends extending the obligation to a maximum level of 20 per cent on a headroom basis. This would result in the RO becoming a moving target. RO levels would be maintained above renewable generation, up to a level of 20 per cent of supply, in order to give investors long-term confidence in the support mechanism.

133. The second reform is to 'band' the RO. This will mean that a ROC will not necessarily be equivalent to one MWh of renewable electricity; it could be more, or less, depending on the technology. Banding the RO would permit differential levels of support to be provided to established and emerging technologies (Table 6). To protect current investors, the Government have guaranteed the continued receipt of ROCs at the current rate, even after the reform of the RO ('grandfathering').

139 DTI, *Reform of the Renewables Obligation and Statutory Consultation on the Renewables Obligation Order 2007*, October 2006; DTI, *Renewable Energy: Reform of the Renewables Obligation*, May 2007

Table 6. Proposed 'banding' of the Renewables Obligation		
Band	**Technologies**	**ROCs/MWh**
Established	Sewage gas; landfill gas; co-firing of non-energy crop biomass.	0.25
Reference	Onshore wind; hydro-electric; co-firing of energy crops.	1.0
Post-demonstration	Offshore wind; dedicated regular biomass.	1.5
Emerging technologies	Wave; tidal stream; advanced conversion technologies (anaerobic digestion, gasification, pyrolysis); dedicated biomass burning energy crops; dedicated regular biomass with CHP; photovoltaics; geothermal.	2.0

Source: Ev 282

134. Changes to the RO will require new primary legislation and so will not be introduced until April 2009 at the earliest. Once implemented, the RO bands would be reviewed in 2013.[140]

Banding the RO and picking winners

135. In line with the Government's policy of not 'picking winners' in the technology arena, the RO was intended to be technology-neutral. It is crucial that any public subsidy is carefully analysed to demonstrate the benefit to the taxpayer. There are concerns that the current structure may have distorted the market against certain renewable technologies.[141] The Government has admitted that the RO's neutrality meant that it has "proved less successful in bringing forward development of the more emerging renewable technologies".[142] Mr Wicks explained that, by reforming the RO, the Government hoped to reverse this trend:

> Through the reform of the Renewables Obligation we are, as it were, tilting the subsidies structure in favour of, say, wave and tidal and not so much in favour of onshore wind. That is not the same as picking winners; it is about having an understanding of the life cycle in terms of R&D and deployment, and a move towards hopefully successful commercial development.[143]

136. **We welcome the proposed reforms to the Renewables Obligation (RO) and the additional support it will provide to emerging technologies. We believe that the reformed RO will be a more flexible instrument.**

Supporting technology deployment

137. Introduced in 2002 as a 25–year instrument, the RO will end in 2027. One advantage of the fixed-term nature of the RO is that it provides investors with a stable policy arena

140 HM Treasury, *Meeting the Energy Challenge*, Cm 7124, May 2007, p 155

141 http://www.timesonline.co.uk/tol/news/environment/article3257728.ece, *The Sunday Times*, 27 January 2008

142 DTI, *Reform of the Renewables Obligation and Statutory Consultation on the Renewables Obligation Order* 2007, October 2006, p11

143 Q 375

within which to operate. However, although this mechanism will remain in place for the next 19 years, the BWEA told us that it will fail to incentivise the deployment of renewable technologies post–2012:

> The sudden end of the RO in 2027/28 will begin to deter investment in new generating capacity from about 2012 onwards, starting with more expensive technologies, particularly offshore wind. This is because the period under the RO that investors will be able to recoup their outlay will become progressively shorter: there will come a point where the income under the RO will not sustain investment, and new build will stop.[144]

138. We put the concerns of the BWEA to Mr Duggan, BERR. He accepted that "an instrument which ends in 2027 will start to run out of impact between the 2010 and 2015 period".[145] This is backed up by the Government's own models which show new capacity build peaking at about 15 per cent of total supply in 2012–13 and dropping away to zero by approximately 2020.[146] While this would meet the National Target for 15 per cent renewable electricity by 2015, it would, at best, provide only half of that required to meet the proposed EC Mandated Target of 15 per cent renewable energies by 2020.

139. When we pressed Mr Duggan, BERR, on the Government's progress in developing a framework for supporting the deployment of renewable technologies post–2027, he reported that:

> [as part of] the consultation that will take place on the 2020 [renewable energies] target, one of the things we will have to do is consider what it is that we do as the next step, either in extending the Renewables Obligation or in adding to the Renewables Obligation, to bring on increased investment over that kind of timescale from 2010 onwards.[147]

140. The potential for extending the RO beyond 2027 was also raised by Mr Wicks:

> That was the [end] date [2027] and we are now, as it were, revisiting our renewable strategy in the light of the very demanding European target […] so no, I would not say anything about the [end] date. I cannot predict what it will be but it is not set in stone.[148]

141. **We are pleased that the Government has recognised the need to develop a mechanism for supporting the deployment of renewables post–2027. However, we are concerned by the apparently narrow focus of the Government's considerations. In addition to the potential for modifying the RO, we believe that BERR should give serious consideration to the introduction of an alternative support mechanism, the 'feed-in' tariff.**[149]

144 Ev 259

145 Q 73

146 Reform of the Renewables Obligation: What is the likely impact of changes? Report by Oxera for DTI, May 2007. URN 07/949

147 Q 74

148 Q 403

149 Note that several European countries, such as Germany, the Netherlands and Spain currently operate feed-in tariffs.

Feed-in tariffs and the German experience

142. In 2006, Germany generated 11.8 per cent of its electricity from renewable sources.[150] In the same year, electricity sourced from renewables accounted for 4.55 per cent of all electricity generated in the UK.[151] Sigmar Gabriel, Federal Minister for the Environment, Nature Conservation and Nuclear Safety, has announced ambitions for 27 per cent of Germany's total electricity consumption to be produced from renewable energy sources by 2020, rising to 45 per cent of supply by 2030.[152]

143. Germany's success in deploying renewable technologies is often attributed to their use of feed-in tariffs.[153] In brief, the Renewable Energy Sources Act 2000 (Erneuerbare-Energien-Gesetz [EEG]; Box 1) obliges grid system operators to purchase all electricity generated by renewable installations, and to pay a fee per kWh to the electricity generator in accordance with fixed rates.

Box 1. The Renewable Energy Sources Act (EEG), Germany.

In Germany, renewable energy generation is supported by the Renewable Energy Sources Act of 2000 (Erneuerbare-Energien-Gesetz [EEG]). Amended in 2004, the EEG aims to increase the share of renewable energies in the total electricity supply to at least 12.5% by 2010 and to at least 20% by 2020. Details of the EEG are outlined below.

Obligation to purchase and transit.

- Grid operators must give priority to connecting installations for the generation of electricity from renewable energies or from mine gas to their grid. Grid operators are obliged to purchase and transmit all electricity available from these installations.
- Grid operators bear the costs of connections and upgrades. These costs may be incorporated into charges for the use of the grid. Grid upgrading costs must be declared.
- Incentives are available for operators of renewable energy installations to agree on the management of energy generation with grid operators.

Fees

- The EEG prescribes fixed tariffs which grid operators must pay for the feed-in of electricity generated from hydro, landfill gas, sewage treatment and mine gas, biomass, geothermal, wind and solar sources.
- Payments vary with energy source and by installation size.
- For 2005, fees under the EEG ranged from 5.39 euro cents/kWh for electricity from wind power, and 6.65 euro cents/kWh for electricity from hydropower, to 59.53 euro cents/kWh for solar electricity generated from small façade systems.

Digression

- To account for technological developments and the use of economic efficiency the feed-in tariffs are digressive. The digression annually lowers the payment rates for new installations. For installed plants, the fee applicable to the year of installation applies for the payment period (20 calendar years. 15–30 calendar years for hydropower).

144. Fluctuations in electricity prices expose electricity generators to a source of revenue risk. If prices are volatile, revenue risks may discourage investment in renewable electricity-generation technologies.[154] The fact that German consumers pay fixed prices for electricity

150 Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, *Development of renewable energies in 2006 in Germany*, February 2007

151 BERR, *Digest of UK energy statistics 2007 (DUKES)*, 2007

152 http://www.erneuerbare-energien.de/files/pdfs/allgemein/application/pdf/eeg_brochure_engl.pdf

153 Qq 8, 25

154 UKERC, *Investment in electricity generation: the role of costs, incentives and risks* (London 2007)

under the EEG, however, means that developers are guaranteed a set return for electricity generated, and that consumers bear the costs of changing electricity prices.[155] By contrast, under the RO, the revenue risk associated with electricity-generation is borne by developers.

145. Although the feed-in tariff is hailed as the impetus for the large-scale deployment of renewable electricity devices in countries such as Germany and Spain, we note that it is only one part of a much broader policy landscape. For example, the EEG obliges grid operators to purchase and transmit all electricity from renewable generators as a priority. Consequently, Germany's success in deploying renewable technologies should be attributed not only to the feed-in tariff but also to the coherence and consistency of their renewables policy.

A UK support mechanism

146. We heard repeated praise for the efficacy of the feed-in tariff from a number of organisations including the BWEA and UKERC.[156] When we asked BERR whether they would consider introducing a feed-in tariff as successor to the RO we received mixed messages. Sarah Rhodes, BERR, assured us that feed-in tariffs "are not off the agenda, they are firmly on the agenda"[157], whereas Malcolm Wicks was more guarded:

> […] we will look again at microgeneration and on the table will be one or two different mechanisms including feed-in tariffs, but that is not about large scale deployment or turning our back on the RO, which we think is the appropriate mechanism, and one does not want to keep chopping and changing because of investor confidence.[158]

147. Electricity generators such as RWE npower and EDF Energy also underlined the importance of long-term consistency of policy in maintaining regulatory and investor certainty.[159] We agree that maintaining investor confidence is key to the health of the renewable electricity industry. However, it should not be the only factor used to decide on the optimal mechanism for supporting the deployment of renewable technologies in the UK.

148. **We believe that, in consulting on policies to support the deployment of renewable technologies after the end of the Renewables Obligation in 2027, detailed consideration should be given to the full range of potential support mechanisms, including the introduction of a feed-in tariff.**

149. Several of the submissions we received expressed concern that the case for a feed-in tariff in the UK has not received appropriate consideration to date. Professor Keith Barnham, Imperial College London, told us that "the second [Energy White Paper] in May 2007 briefly mentions that other European countries have such schemes but dismisses

155 UKERC, *Investment in electricity generation: the role of costs, incentives and risks* (London 2007)

156 Ev 186, 297, 321; Qq 8, 25

157 Q 86

158 Q 404

159 Ev 108, 131

them in a few lines".[160] We note that the merits of the feed-in tariff were debated in April 2008, in the context of the Energy Bill. A motion to commit the Government to developing a framework for the introduction of a feed-in tariff for renewable electricity generators was voted down.[161]

150. **Irrespective of the policy mechanism, or mechanisms, selected to support the deployment of renewable electricity technologies post–2027, we recommend that the Government provide a full and transparent account of its decision process and the reason for rejecting or adopting possible options.**

Microgeneration and the Renewables Obligation

151. Specific arrangements exist under the RO for microgenerators (installations of 50kW or less) to be issued with ROCs. To be eligible, the installation must be accredited by Ofgem and the output meter, which records the electricity generated, needs to be on the Ofgem list of approved meters. Just like any large-scale electricity generator, one ROC is awarded for every MWh of electricity produced. Once issued with a ROC, the microgenerator can either sell it direct to an electricity supply company or to an agent. The threshold for claiming 1 ROC is the generation of 0.5MWh over a year.

152. Speaking to the Committee in March 2008, Dave Sowden, Micropower Council, stated that:

> The process which a customer needs to go through in order to register as eligible for ROCs and subsequently to claim them is quite a torturous process […] in their current form ROCs do not work for microgeneration customers.[162]

153. The Government has recognised that current arrangements under the RO are insufficient to support microgeneration and, in Budget 2008, committed to consulting on an appropriate form of support.[163] This commitment was reaffirmed by the Minister:

> […] we need to revisit whether we are providing enough incentives for microgeneration - something I am very interested in and the Government is very interested in […] There are some incentives for householders in terms of micro but are there enough? Maybe not, and I have said that as part of our renewable energy strategy review we will look again at microgeneration and on the table will be one or two different mechanisms including feed-in tariffs.[164]

The Government will consider future support mechanisms for microgenerators as part of consultations on the new microgeneration strategy, to be conducted in Autumn 2008.

160 Ev 298

161 HC Deb, 30 Apr 2008, col 394 [Westminster Hall]

162 Q 267

163 HM Treasury, *Budget 2008*, HC 388, March 2008

164 Q 484

154. **We welcome the Government's forthcoming consultation on mechanisms to incentivise the deployment of microgeneration technologies, and recommend that a feed-in tariff for microgenerators be introduced urgently.**

6 Electricity transmission and distribution

Background

155. Much of today's transmission system was constructed in the 1950's and 1960's to transport and distribute electricity generated from coal power stations. As a result, the UK 'Grid' is designed for the distribution of electricity from a small number of large power stations, rather than a large number of relatively small renewable installations. If the UK is to deploy sufficient resource to generate 35–40 per cent of electricity from renewables by 2020, it is essential the transmission system be reconfigured to support its supply and distribution.

Electricity transmission

156. The transmission system for England and Wales is owned and managed by National Grid Electricity Transmission plc (NGET), whilst the transmission system in Scotland is owned and managed by SP Transmission Ltd and Scottish Hydro Electricity Transmission Ltd (SHETL). Although the ownership of the Britain's transmission system is split between different companies, National Grid is responsible for overseeing and managing the flow of electricity across the whole of the GB transmission network. In this role, the National Grid is known as the GB System Operator (GBSO).

157. Most electricity generated by power stations is connected to and transmitted by the high voltage transmission network (400kV or 275kV). Electricity from the transmission network is then distributed to homes and businesses via 14 distribution networks, which are owned by seven different operators.[165] To transmit electricity along the distribution system, the voltage has to be reduced through various voltage levels: 132kV, 33kV, 11kV and finally 400/230V.

158. The Distribution Network Operators (DNOs) do not sell electricity to consumers; this is carried out by 'suppliers' who make use of the distribution networks. At present, the electricity supply market is dominated by the 'big six' supply companies (E.ON, Centrica, EDF Energy, Scottish and Southern Energy, RWE npower and Scottish Power).

Grid connection

159. The EU Directive on the promotion of electricity produced from renewable energy sources in the internal electricity market (2001/77/EC) states that:

> Without prejudice to the maintenance of the reliability and safety of the grid, Member States will take the necessary measures to ensure that the transmission system operators and distribution system operators in their territory guarantee the transmission and distribution of electricity produced from renewable sources.

165 Scottish and Southern Energy, Scottish Power Energy Networks, United Utilities, EDF Energy Networks, CE Electric UK, E.on Central Networks, and Western Power Distribution.

160. This Directive is not currently enforced in the UK. Currently, generators wishing to connect to the UK's high voltage transmission system enter into an agreement with National Grid (in its role as GBSO). National Grid, however, is under no legal obligation to connect renewable installations to the Grid network. When we asked the Minister whether the Government intended to implement the Directive, he told us that they were "discussing" the matter.[166]

161. In Germany, renewables legislation (EEG; Box 1) requires that grid operators guarantee the connection of renewable installations to the transmission system, and purchase and transmit all electricity generated as a priority. We asked Steve Smith, Ofgem, whether he thought this should also be the case in the UK. However, he was unable to comment on this matter as the issue is currently *sub judice*:

> We have a proposal from the [wind] industry on which we will have to take a decision as to whether we should prioritise renewables access. We are shortly to publish an impact assessment which will set out our assessment of that. That assessment basically will look at what the carbon benefits of doing that would be, how much renewables you could get and how much faster and weigh that against some of the risks associated with prioritising renewables over other low carbon forms of generation. We will need to do that within our existing statutory system.[167]

We put the same question to the Minister, who told us that the Government is:

> [...] reflecting on the issue about priority access; I do not think we are convinced by that. We need to look at that very carefully. It sounds attractive but [...] I do not think we are going to commit ourselves at this stage to saying that is the right approach.[168]

162. The Government is currently considering reforms to grid access arrangements as part of the Transmission Access Review being conducted by BERR and Ofgem. The findings of the review will be published in May 2008. Speaking on the issue of priority access, however, the Minister has advanced the view that "from the perspective of a reasonable developer, connection in a reasonable time consistent with the development programme for their project timetable is likely to be more important than whether they have been treated more favourable than other technologies".[169]

163. If the UK is to generate 35–40 per cent of its electricity from renewables by 2020, it is essential that steps are taken to facilitate the connection of renewable generators to the transmission system. **We believe that, in line with the EU Directive, renewable electricity generators should be guaranteed connection to the UK transmission system. In addition, we believe that electricity generated from renewables should be transmitted as a priority.**

166 Q 421

167 Q 298

168 Q 420

169 HC Deb, 30 Apr 2008, col 386 [Westminster Hall]

The GB queue

164. The GB Queue describes the queue of projects, largely in Scotland, that are waiting to be connected to the transmission system. The queue arose from an unprecedented number of applications for connection to, or use of, the transmission system submitted before the introduction of the British Electricity Trading and Transmission Arrangements (BETTA) in 2005. Projects in the GB queue are offered connection to the grid by date of application rather than project status. Consequently, some projects in Scotland now have connection offers despite not having applied for planning consent, whereas other projects have consent but do not have a connection offer. There are now some 9.3 GW of wind energy applications awaiting connection.[170]

165. We find it frustrating that, on the one hand, the Government is encouraging the deployment of renewable technologies, but that, on the other, these technologies are unable to commence electricity generation due to a poorly conceived transmission access regime. This frustration is compounded by the knowledge that Ofgem attempted to pilot transmission access reform in 1999 and 2000 but, under threats of legal action, was unable to proceed.[171]

166. Ofgem, together with BERR, are now conducting a Transmission Access Review. In an Interim Report published in January 2008, they concluded:

> National Grid […] should make sure that available capacity is allocated to projects in the connection queue that are able to use it. In practice, this means prioritising projects with consents and financing in place. This should be supported by appropriate information on generation projects wishing to connect so that decisions on where to connect can be taken in full knowledge of what the relevant issues are.[172]

167. Since the publication of the Transmission Access Review's report, National Grid has published new guidelines for managing project connections. The guidelines state that "where National Grid is aware of a "queue" for connection then advancement within that queue will be done in a manner that facilitates projects that are ready, able and willing to connect first".[173] However, Ofgem have questioned whether National Grid is able to do this in practice:

> […] it is very difficult for National Grid to determine whether one particular development is more likely to be able to connect faster than another development. National Grid themselves have acknowledged this […] So although some improvements have been made, in Ofgem's view the current arrangements are in practice still largely on the basis of "first come, first served".[174]

168. **We agree with the interim conclusion of the Transmission Access Review that those projects in the GB queue that are able to use grid capacity be connected as a**

170 Sustainable Development Commission, *Lost in transmission: the role of Ofgem in a changing climate* (2007)

171 Q 306

172 Ofgem & BERR, *Transmission Access Review: Interim Report*, January 2008, p 5

173 National Grid, *GB Queue Management Methodology*, February 2008

174 Ev 286

priority. If the electricity industry does not set up formal arrangements to resolve this problem, we recommend that the Government bring forward legislation to make it do so.

Grid capacity

169. Built to support conventional electricity-generators, the transmission system is heavily reinforced in former coal-mining regions but has limited capacity in many areas suitable for renewable electricity generation. For example, there are no high voltage transmission lines in locations in North West Scotland where wind speeds are high.[175] As current Security and Quality Supply Standards (SQSS) require that the capacity of all generating stations cannot exceed the capacity of the grid infrastructure, the limited capacity of the Scottish transmission system has resulted in the GB queue.

170. In order to increase transmission capacity there are two large infrastructure projects in the pipeline. First, in Scotland, there are plans to construct a high voltage transmission line between Beauly, west of Inverness, and Denny, west of Falkirk. A public inquiry into the construction of the Beauly-Denny line was launched in 2007, and it is hoped that the outcome of the inquiry will be submitted to Ministers for consideration during 2008. The second project is the upgrade of the North-South transmission system. This system supports the movement of large power flows between Scotland and the North of England (net flow is from north to south). Currently, flow from Scotland to England is limited to 2.2 GW.

171. Although the Beauly-Denny line is already in public inquiry, the project is unlikely to be completed for some years. The last major transmission upgrade, the 96km North Yorkshire transmission line, applied for planning permission in 1991 but was not completed until 2003. When we asked Mr Whittaker, National Grid, whether we should expect a similar timescale for the construction of the Beauly-Denny line he replied "we must fear that it is that sort of delay".[176]

172. Given that additional transmission capacity is unlikely to be available in the short term, it is our opinion that alternative means of connecting renewable electricity generators to the Grid be explored as a priority. Steve Smith, Ofgem, explained that it is currently possible to accommodate the GB queue within the current transmission network:

> If they [conventional generators] share that capacity, there is already enough capacity in Scotland to accommodate that level of renewables [the 9.3GW GB queue]. What you need to do for that is to unlock the existing rights and say to the existing gas, coal and other stations up there that these renewables are going to have to come on and share those rights.[177]

173. The ability for existing generators to share grid capacity with renewables is reflected by the Transmission Access Review's conclusion that "the growth in intermittent

175 Ev 303

176 Q 313

177 Q 306

generation should enable the SO [National Grid] to connect more generating capacity for a given amount of transmission capacity”.[178]

174. **We agree that, at least until new transmission capacity is constructed, it will be increasingly necessary for generators to share grid capacity. We believe that the Government should act immediately to ensure that current capacity is shared with renewable generation.**

Renewable electricity generation

175. The energy produced by renewables is often intermittent in nature; solar power is dependent on cloud cover and wave energy on distance of wave travel. Intermittent generation has the potential to affect the operation of the grid network, for example, by affecting the reliability of electricity supply or increasing the work needed to balance supply with demand. It is not the case, however, that intermittency is synonymous with unpredictability. Tidal power can be accurately estimated and, although not particularly predictable day-to-day, wind is predictable hour-to-hour.[179]

176. One way to mitigate the impact of intermittent electricity generation is to exploit the full range of renewable electricity-generation technologies available. By combining sources of renewable electricity, troughs in wind power, for example, can be smoothed out using tidal, wave or bioenergy.[180] Further, by encouraging widespread geographical deployment of individual technologies it is possible to reduce adverse effects on the Grid - it is highly unlikely the wind will not be blowing anywhere in the UK during any one time-period.[181]

177. In reviewing over 200 international studies on the costs and impacts of intermittent electricity generation, the UK Energy Research Centre (UKERC) found that intermittency need not compromise the reliability of the UK electricity system, a view shared by, amongst others, BWEA.[182] However, UKERC's review considered increased electricity-generation from renewables up to 20 per cent of supply, and we now know that we will need to generate approximately double that amount if the UK is to meet the proposed EC Mandated Target for renewable energy.

178. Asked whether generating 30–40 per cent of electricity from renewables would raise management problems for the electricity network, Philip Wolfe, Renewable Energy Association, told us that the impact of wind power on the Grid's stability is “an issue that needs serious consideration and […] we should not underestimate the need to prepare for

178 Ofgem & BERR, *Transmission Access Review: Interim Report*, January 2008, p 41

179 Q 325

180 The costs and impacts of intermittency: an assessment of the evidence on the costs and impacts of intermittent generation on the British electricity network, UKERC, 2006; Variability of wind power and other renewables: management options and strategies. International Energy Agency, June 2005.

181 The costs and impacts of intermittency: an assessment of the evidence on the costs and impacts of intermittent generation on the British electricity network, UKERC, 2006; Variability of wind power and other renewables: management options and strategies. International Energy Agency, June 2005.

182 Q 51; and *The costs and impacts of intermittency: an assessment of the evidence on the costs and impacts of intermittent generation on the British electricity network*, UKERC, 2006

it appropriately"[183], and John Loughhead, UKERC, was of the opinion that the issue "deserves further consideration".[184]

179. We asked Ofgem and National Grid whether there was a threshold for intermittent generation which, if breached, would put the surety of electricity supply at risk. Steve Smith, Ofgem, told us that "anything is feasible and do-able and there is not a percentage",[185] and National Grid were of the opinion that the challenge of managing increased renewable electricity generation could be met.[186] These opinions did not appear to be evidence-based, however, as National Grid told us that they were currently in the process of undertaking research to ascertain "what the impacts of coping with that [30–40 per cent renewable electricity] is".[187]

180. **We were dismayed by the complacent attitudes of Ofgem and National Grid with regard to the potential demands that generating 30–40 per cent of electricity from renewables might place on the evolution and management of the transmission system. We recommend that detailed research into the implications of sourcing 30–40 per cent of electricity from renewables be supported as a priority. Further, we believe it is essential this work be completed by early 2009, such that it can inform the Government's revised Renewable Energy Strategy.**

Offshore transmission

181. The Energy Act 2004 provides for the Secretary of State to put in place new arrangements for the offshore transmission system. When the offshore transmission regime is introduced, there will be new offshore transmission operators (OFTOs) with specific responsibility for constructing, owning and maintaining individual offshore transmission networks. Ofgem will grant OFTO licences after a process of competitive tender.

182. The process of competitive tender for individual OFTO licences will result in the creation of a number of 'point-to-point' transmission systems, rather than a network of connected installations or national offshore grid. While the construction of point-to-point networks may have been appropriate when the UK was to deploy 8 GW of offshore wind, there have been large policy shifts since the decision was originally taken. For example, the Government has proposed the development of an additional 25 GW of offshore wind by 2020. We are therefore concerned that a point-to-point transmission system may no longer be optimal.

183. Doubts over the suitability of the point-to-point networks were raised by RWE Innogy and the Renewable Energy Association, the latter highlighting two additional benefits of an offshore grid.[188] First, a wider offshore network would provide a flexible means to connect

183 Q 52

184 Q 53

185 Q 327

186 Q 325

187 Q325

188 Ev 384, 387

future, perhaps as yet unplanned, projects to the UK transmission system. Second, it would enable the UK to connect to the Grids of other countries thereby improving security of electricity supply.[189]

184. To counter criticism of the proposed point-to-point transmission networks, we received evidence in support of the arrangements. E.ON UK stated that "the case for the development of a wider offshore transmission network has not been made"[190], and Ofgem held the view that the point-to-point system is the best way to meet the needs of both generators and developers.[191]

185. There are also concerns regarding the regulatory approach of the OFTO system. National Grid, offshore GBSO designate, told us that:

> We do not believe the proposed regulatory regime for offshore transmission can deliver the Government's aspiration for around 30 GW of offshore renewables by 2020. The proposed regime is overly complex with many areas of the regulatory regime still uncertain and undecided. Further, we do not share the Ofgem/BERR view on the consumer benefits in terms of cost this regime will produce.[192]

National Grid went on to advocate the extension of the regulated onshore transmission franchises to cover offshore transmission for renewables.[193]

186. Given that targets for the deployment of offshore wind have almost tripled since the Government consulted on the form of the offshore transmission system, and as the renewables industry has mixed views on the technical and regulatory suitability of the proposed offshore transmission arrangements, we believe it is essential that further consideration be given to this matter.

187. **We are concerned that the proposed offshore transmission arrangements are not appropriate for the UK's target of 33GW of offshore wind by 2020. We urge the Government to reconsider the development of an offshore grid.**

A grid for the future

Infrastructure

188. The challenges associated with connecting renewable electricity-generators to the transmission system require investment in the system's infrastructure. In addition to the construction of additional transmission capacity—such as the Beauly-Denny and North-South transmission lines—much of the current infrastructure is reaching the end of its 50 year lifetime and will need to be replaced or upgraded.[194]

189 Ev 184

190 Ev 380

191 *Ibid.*

192 Ev 381

193 *Ibid.*

194 Ev 179, 300, 312, 345

189. In their 2007–2012 transmission price control review, Ofgem commit nearly £5 billion to renewing Britain's electricity and gas infrastructure to meet new demands from gas imports and renewables connections. National Grid will spend upwards of £4 billion on electricity transmission investment over the next five years.[195] Both organisations expressed confidence that this investment would be sufficient to provide a Grid with the ability to support 40 per cent renewable electricity by 2020.[196]

Intelligent grid management

190. Intelligent grid management is "a generic term applied to innovations that coordinate and manage generation and network resources".[197] The UK has a strong research base in this area, with a number of SMEs and academic institutions involved, such as Ecconect, Universities of Manchester, Strathclyde, and Imperial College London. First generation products are already commercially available and are expected to have reached a stage of partial maturity by 2020.[198]

191. Intelligent management of the Grid will become increasingly important with further deployment of microgeneration technologies. In the current system, Distribution Network Operators (DNOs) are passive players as the flow of power is unidirectional. The connection of microgenerators to the distribution network will fundamentally change the nature of the relationship between the consumers and the DNOs, however, as these devices draw power from, and contribute power to, the grid network raising both integration and grid management issues.

Research and development

192. In developing the grid, it will be necessary to invest in R&D for transmission and grid management technologies. In setting the electricity distribution price control for 2005–2010, Ofgem initiated three new incentives (Distributed Generation Incentive, Registered Power Zones and the Innovation Funding Incentive) to reward generation connections, principally renewables, and to encourage innovation in network development.

193. Paul Whittaker, National Grid, told us that National Grid currently spends 0.5 per cent of turnover, or £5 million per year, on R&D in this sector.[199] Given that the Government has an ambition to increase UK R&D investment to 2.5 per cent of national income by 2014 (up from 1.9 per cent in 2004),[200] and that the UK engineering sector spends an average of 4.5 per cent of revenue on R&D[201], National Grid's expenditure in this area appears to be particularly low.

195 Q 292

196 Qq 341-342

197 Ev 274

198 *Ibid.*

199 Q 336

200 HM Treasury, DTI, DfES, *Science and innovation investment framework 2004-2014*, July 2004, p 1

201 Lord Sainsbury of Turville, *The Race to the Top: A Review of Government's Science and Innovation Policies*, October 2007, p 27

194. **We are concerned that the level of investment in R&D by National Grid is insufficient to identify and respond effectively to the challenges that face transmission and grid management technologies.**

Demand-side management

195. The pattern of electricity use in UK households leads to peaks and troughs in overall electricity demand. It may be possible to use demand-side management tools to achieve a better balance between consumer demand and the electricity generated by renewable technologies, for example by smoothing local or national demand profiles. The use of demand flexibility does not have to be centrally managed, and could evolve through the autonomous actions of individual consumers.

196. One way in which this may be possible is through the use of 'smart' meters which facilitate two-way communication between the consumer's meter and the distribution network. Capable of recognising energy demand at different times of the day, smart meters can display real time price and electricity consumption information. By developing a tariff that was sensitive to demand, and by rewarding consumers for using electricity 'off-peak', the use of smart meters could act to reduce peak electricity need.

197. Professor MacKerron informed us that research undertaken by Science and Technology Policy Research Unit, University of Sussex (SPRU) concluded that smart metering should not be "a matter of individual consumer choice, but as a matter of infrastructure development that should be treated at a national and policy level generically".[202] However, smart meters are currently designed for the commercial sector, rather than the domestic one.[203]

198. **We believe that demand-side management will be increasingly important as the deployment of microgeneration technologies gathers pace. We recommend that the Government support the development, and roll-out to domestic consumers, of smart meters which are compatible with electricity microgeneration devices.**

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202 Q 285

203 Q 265

7 Planning and the environment

Background

199. The UK's ability to meet its 2020 renewable energy target depends not only on technological development, but also on the timely deployment of market-ready technologies. We were therefore disappointed to find that current planning regulations are at best acting to delay the commercial deployment of renewable electricity installations[204], and at worst may function to discourage industry from investing in the UK.[205]

200. The onshore wind industry was consistently cited as a sector badly hit by delays in the planning and consenting regime. According to BWEA, only 5 per cent of applications for onshore wind projects are decided within the statutory 16 weeks, with several applications having been held up in the system for four to five years.[206] A common reason for the eventual refusal of consent for onshore wind is negative public opinion based on a lack of visual acceptability. This finding highlights an area in which research in the social sciences has the potential to impact on the deployment of renewable technologies, and is an issue we discuss later.

Planning policy

201. The Energy White Paper recognised that "although securing planning permission can be difficult for all types of electricity generation […] low carbon technologies face particular difficulties".[207] The Government's Planning Bill aims to address these challenges by (a) streamlining the consenting process for energy developments, (b) publishing a National Policy Statement on Energy, and (c) improving community engagement in the planning process. As planning is a devolved matter, these proposals will not impact upon the devolved administration.

202. The principal means of streamlining the consenting regime will be the creation of an independent Infrastructure Planning Commission (IPC). The IPC will comprise a panel of experts who will decide on planning applications for national infrastructure projects. In the energy sector, the IPC will decide on onshore projects of 50 MW plus and offshore projects of 100 MW plus. There will be a time limit of nine months on the consenting process.

203. Once the IPC is established, developers will no longer need to apply for consent under different pieces of legislation for parts of the same project. Currently, for example, an onshore power station requires consent under the Electricity Act 1989 as well as planning permission for overhead electric lines. To align the consenting process for onshore and

204 Ev 71, 105, 121, 129, 133, 139, 157, 168, 175, 180, 242, 244, 257, 279, 300, 322; Qq 11, 80, 88, 209, 210, 212

205 Q 248, Sustainable Development Commission, *Lost in transmission: the role of Ofgem in a changing climate* (2007), p66

206 Ev 257

207 HM Treasury, *Meeting the Energy Challenge*, Cm 7214, May 2007, p 256

offshore developments, the draft Marine Bill makes provision for offshore generators to be considered through the Electricity Act 1989 procedure, and therefore by the IPC.[208]

204. The IPC will use National Policy Statements (NPSs) as their primary consideration. These statements will set out the national need for infrastructure and explain how this need fits with other policies such as those relating to economic development, international competitiveness, climate change, energy conservation/efficiency and protection of the historic and natural environment. The Government has announced its intention to publish an overarching NPS for energy developments. As outlined by the Minister, the Energy NPS will provide guidance on the deployment of renewable technologies:

> We will certainly have an over-arching national policy statement on energy […] We are expecting that that will be published sometime […] in 2009, but also under that we see the need for a number of other statements on renewables, obviously, and on nuclear.[209]

The Government will consult on the renewables element of the Energy NPS during Autumn 2008.

205. **We note the proposal contained in the Planning Bill that consenting decisions on major infrastructure projects are to be decided by an Infrastructure Planning Committee (IPC). We look forward to further clarification of how the IPC will interact with, and address the concerns of, local authorities and other stakeholders.**

Planning applications

206. Throughout our inquiry, the renewables industry expressed its support for the Planning Bill.[210] A common concern, however, was that the IPC would only decide on onshore developments with a capacity of 50 MW or greater and offshore projects with a capacity of 100 MW or more.[211]

207. In the onshore sector, 30–40 per cent of renewable projects currently submitted for planning determination are thought to fall below the 50 MW threshold required for IPC consideration.[212] Further, sites with the potential to support a 50 MW wind farm are relatively rare in England and Wales, and many of these will have been developed before the IPC comes into operation. It is therefore likely that a significant proportion of future renewable proposals, in particular onshore wind developments, will not be eligible for consent under the IPC.

208. The 100 MW threshold for IPC consideration of renewable installations in the offshore sector is also a point of concern. Wave and tidal devices are very much in the early development and demonstration phase of their life-cycle, and device developers are

208 Defra, *Draft Marine Bill*, Cm 7351, April 2008, p 38

209 Uncorrected transcript of oral evidence taken before the Business Enterprise and Regulatory Reform Committee on 31 January 2008, HC (2007-08) 293-i,Q 129

210 Ev 108, 175, 257; Q 211-213

211 Ev 257; Q 214

212 Ev 335, 373; Q 211

looking to deploy small-scale pilot projects.[213] These projects will not only fall below the 100 MW threshold, but are likely to be less than 50 MW in capacity. Given these circumstances, the Renewable Energy Association has called for the offshore limit to be brought in line with that for the onshore sector (50 MW), and for consideration to be given to a further lowering of this limit.[214]

209. **We are concerned that measures introduced in the Planning Bill will not materially affect the speed at which consenting decisions for smaller projects are reached. We urge the Department for Communities and Local Government to reconsider whether the thresholds for IPC consideration of onshore and offshore developments are appropriate.**

Planning Policy Statement 22 (PPS22)

210. In considering energy infrastructure projects under 50MW, local authorities are required to consult guidance laid out in Planning Policy Statement 22 (PPS22). An underlying principle of PPS22 is that:

> Regional spatial strategies and local development documents should contain policies designed to promote and encourage, rather than restrict, the development of renewable energy resources. Regional planning bodies and local planning authorities should recognise the full range of renewable energy sources, their differing characteristics, locational requirements and the potential for exploiting them subject to appropriate environmental safeguards.[215]

211. In their submission, the BWEA stated that 'renewable projects are often rejected for reasons that contravene PPS22'.[216] When we asked Kevin McCullough, RWE Innogy, to give us an industry perspective on the utility of PPS22 and its application by local authorities, he replied:

> PPS22 as an instrument and a policy guidance document is very sound […] but the weak point in the system is, in my view, in the education and understanding and the […] equality of application across the many, many authorities that have these planning applications to deal with, because at the moment there is a very definite emerging inequality in how one scheme is treated in one authority to the other.[217]

Mr McCullough went on express the view that, if inconsistencies in the application of PPS22 were not rectified, developers would begin to selectively develop sites in areas where "they think their chance with planning is greater".[218]

212. The equitable application of PPS22 by local authorities is crucial to maintaining investor confidence. We asked Simon Virley, BERR, what guidance the Government will

213 Q 210

214 Ev 384

215 Office of Deputy Prime Minister, *Planning Policy Statement 22: renewable energy*, 2004, p 7

216 Ev 258

217 Q 216

218 Q 211

give local authorities on the implementation of new renewables planning policy. He responded:

> I think the National Policy Statements […] will be very important here in terms of setting the framework for local authorities, and then they will be translated into local and regional strategies, so that clear guidance will be coming in the form of the National Policy Statements.[219]

This response fails to recognise that it is not the efficacy of current planning guidance on renewable installations that is in question, but the equity of its application.

213. **We are concerned that a local authority's reputation in the application of PPS22 may become the deciding factor in an investor's choice of site location, rather than the specifics of the site itself. We recommend that 'best practice' in the application of PPS22 be developed and disseminated as a priority.**

Environmental considerations

214. During the planning process, consideration must be given to the environmental impact of the development in question. No energy source is completely harmless to the environment and for each technology, there is a trade-off between the wider benefits (e.g. energy security and lower carbon emissions), and their social and local environmental impacts (potential impacts on populations of seabirds and aquatic mammals, for example).[220]

Environmental Impact Assessments

215. Environmental Impact Assessment (EIA) is a procedure that must be followed for certain types of development, such as the deployment of renewable electricity-generation devices, before they are granted development consent. Mandated by a European Directive (85/33/EEC as amended by 97/11/EC), EIA requires developers to compile an Environmental Statement describing the likely significant effects of the development on the environment and proposed mitigation measures. The Statement is circulated to statutory consultation bodies and made available to the public for comment. Its contents, together with any comments, must be taken into account by the competent authority (e.g. local planning authority) before it may grant consent.

216. The costs associated with the EIA can represent a significant financial burden to companies attempting to develop pioneering marine renewables projects. The BWEA told us that:

> These are small developments, using technologies that are new. The latter feature leads to demands for comprehensive surveying and monitoring to assess what is and is not an issue, which makes them particularly burdensome on pilot projects of one or a handful of devices. A proportional approach by statutory conservation consultees would be welcome to reduce this burden to the absolute minimum

219 Q 452

220 Ev 120, 187, & Boyle, G. (Ed), *Renewable energy*, (Oxford University Press, 2004)

> required, and extra help from Government in carrying out such surveys and monitoring required would also be very helpful.[221]

The high cost of the EIA for offshore developments is highlighted by the budget allocation of Marine Current Turbine's Seagen project. The total budget for this tidal turbine development was £8million of which £2million was for the EIA.[222]

217. We note that the forthcoming NPS on energy is expected to contain a list of criteria for offshore wind sites, and a list of sites that meet those criteria. The Minister assured us that the EIAs for these sites would be conducted by BERR rather than being left to developers.[223] In order to further support the offshore marine industry, and to prevent the cost of the EIA from deterring developers from investing in marine renewables projects, the Renewable Energy Association suggested that the Government also provide developers with baseline EIAs for potential locations of high wave and tidal stream energy.[224]

218. **We recommend that the Government provide baseline Environmental Impact Assessments for areas suitable for all offshore renewables projects, and that it liaise with industry to ensure these assessments are appropriate to their needs.**

221 Ev 369

222 Ev 151

223 Qq 425-426

224 Ev 288

8 Social science research

The challenges

219. Professor Gordon MacKerron, SPRU, identified three challenges as key to social science research in the renewable electricity sector:

> The first, 'bottom up' challenge is better understanding of consumer and citizen behaviours in the face of potentially radical technological change.
>
> The second challenge, both 'top down' and 'bottom up', […] is then to develop better understanding of the ways in which Government may act with greater urgency in the promotion of renewable and other sustainable energy developments, while acquiring and retaining sufficient political legitimacy for the urgency to be translated into long-term and effective action.
>
> The third challenge is to achieve better analysis and evaluation of Government policy impacts, both before and after implementation.[225]

220. Research conducted on government renewables policy ranges from analysing the effectiveness of the Renewables Obligation, and alternative mechanisms, to the deployment of microgeneration technologies. Professor MacKerron pointed out that the social science community makes efforts to engage with many of the institutions that undertake policy research and development, such as the Sustainable Development Commission, as well as "the traditional activity" of conducting research projects.[226]

221. Social science researchers are contributing to examining the interaction between public perception and the planning regime in at least two ways. First, political scientists and sociologists are analysing how the planning process, now being revised, could achieve both legitimacy and speed. Second, through programmes of research such *Beyond Nimbyism*, funded by ESRC, researchers are examining public views and how they might impact on the way in which the deployment of renewable technologies evolves.

222. **We recognise the importance of the social sciences in supporting the deployment of renewable electricity-generation technologies. We welcome ESRC's continued involvement in the Research Council Energy Programme.**

223. A key strand of social science research is developing real and practical policy questions. This research is often designed to have impact either in the short term or to influence the climate of opinion. When asked whether, when examining a particular policy issue, social scientists develop potential policy solutions, Professor MacKerron replied:

> The answer is: yes, on the whole. One feels slight diffidence about allowing experts to be too much in control of policy. One can make a contribution; there are others, such as yourselves, who have contributions to make as well. Yes, if I was not clear, I am

225 Ev 379-380

226 Q 281

> sure it is the case that all that research is designed to think about practical policy solutions as well as simply to raise the questions.[227]

224. **Social scientists make a valuable contribution to developing and reviewing government renewables policy. We would advocate that social scientists undertaking policy-related research consistently develop practical policy solutions, and that the Government draw upon their expertise whenever it is engaged in the development of renewables policy of social or economic importance.**

227 Q 284

9 Skills

Background

225. The deployment of renewable electricity-generation technologies relies on a supply-chain of suitably qualified personnel. However, a survey conducted by the Energy Research Partnership in 2007 identified a long-term decline in the numbers of "next generation" scientists and engineers available to support UK industry and academia.[228] Although this report focuses on the need to provide skilled personnel in the renewable electricity sector, we are keenly aware of the growing skills crisis across a broad spectrum of engineering disciplines.

The shortages

226. Concerns over current skills shortages were highlighted in numerous submissions.[229] Rolls Royce Fuel Cell Systems (RRFCS) reported difficulties in recruiting suitably trained engineers within the UK, a problem shared by the marine industry[230], and the Institute of Physics described how developers are both recruiting personnel from overseas and investing in employer-led training in order to mitigate the impact of skills shortages.[231] The Institute of Engineering and Technology suggest that the shortage of 'home-grown' engineers is set to worsen:

> There is currently significant concern on the part of employers that the supply of skills will not be adequate or suitable in coming years to meet their demand for technical personnel. This concern extends to all levels of education and qualification, from technicians to experienced professional engineers and advanced researchers.[232]

227. There appear to be at least three underlying reasons for the current skills shortages. First, the engineering workforce has a rising age profile.[233] Second, and related to the first reason, the sector is seen to have a relatively unattractive image amongst young people and the pool of graduates is shrinking, and finally, although energy sector pay compares favourably in engineering, it is recognised that it does not have a competitive advantage over sectors recruiting from the same student supply chain, such as financial services.[234] Ravi Baga, EDF Energy, drew a parallel between the history of UK energy research and development and skills development:

> Post-privatisation in the early 1980s there was a significant downsizing within the industry and in that process a considerable amount of skills were lost. We are certainly facing an issue now in terms of the age profile of our workforce and we are

228 Ev 383

229 Ev 72, 111, 112, 121, 133, 176, 179, 241, 313, 348, 346, 350, 355

230 Ev 112, Renewables Advisory Board, *Current status and implications for R&D funding and the Marine Renewables Deployment Fund*, RAB (2007) 0182, January 2008

231 Ev 72

232 Ev 241

233 Ev 111

234 Ev 358

> putting a lot of investment into trying to bring new graduates and new apprenticeships through to try and have a transfer of skills.[235]

228. The publication of the Leitch Review of skills in 2006 heralded the Government's drive to increase the skills base in the UK population, a commitment welcomed by organisations such as the Energy Networks Association and RWE npower.[236] **Given the current commitment to the skills agenda, we deem it is essential that Government engage with the renewables industry to ensure that the skills needs of developers are addressed. This is an area in which the Energy Research Partnership could play a central role.**

Increasing the skills base

229. The skills base of graduates depends primarily on the content of university courses. Nick Harrington, WaveHub, explained how the marine sector is encouraging greater business-university interaction in the South West:

> What we are doing is [...] integrating the universities into relationships with device developers and as such the universities are becoming very aware of the particular issues facing the industry. That will in turn inform their research which will in turn inform their under-graduate teaching, so we are hoping in, say, five years time that the region will be producing a flow of graduates exactly suited to offshore renewables.[237]

230. We were pleased to hear that university and business are collaborating on a number of initiatives throughout the UK to mitigate the shortage of engineering skills. For example, David Smith, Energy Networks Association, described how industry and leading universities in the power-engineering field have invested in the Power Academy, a venture that offers scholarships to UK and EU engineering students.[238]

National Skills Academy

231. The National Skills Academy is a network of employer-led centres of excellence. Each centre aims to deliver the skills required by the corresponding sector of the community. There are currently centres for six sectors of the economy (construction, nuclear, fashion retail, financial services, food and drink manufacturing and manufacturing), with three further centres are about to launch (process industries, creative and cultural and hospitality).

232. We received a cross-section of views as to the potential value of a National Academy for the renewable energy industry. For example, the South East of England Development Agency advocated that consideration be given to a National Academy for Environmental Technology Skills[239], whereas the BWEA suggested that greater links be forged between

235 Q 232

236 Ev 133, 179

237 Q 230

238 Q 340

239 Ev 350

industry, the National Skills Academy and Sector Skills Councils (SSCs) such as the Energy and Utility Skills Council and the SSC for construction (ConstructionSkills). We note that ConstructionSkills currently part-funds a training course for the installation of solar devices together with the National Federation of Roofing Contractors (NFRC).[240]

233. BERR informed us that plans for a National Skills Academy for the environment are being developed, as are plans for a National Skills Academy for the electricity sector. Due to the "complex footprint" of the renewable energy sector, however, the Government believes that, rather than developing a National Skills Academy in this area, the skills needs of the renewables industry are best addressed by the collaborative working of existing SSCs.[241]

234. **We do not advocate the creation of a National Academy or Sector Skills Council in the Renewable Electricity Sector. Instead, we recommend that Sector Skills Councils, including the Energy and Utility Skills Council, ConstructionSkills and the Sector Skills Council for Science, Engineering and Manufacturing Technologies, establish a cross council steering body to address skills deficits within the industry.**

Knowledge Transfer Partnerships

235. Knowledge Transfer Partnerships (KTPs) is a programme that helps businesses improve their competitiveness through better use of the knowledge, technology and skills that reside within the UK. The programme enables a company to choose a partner from the UK knowledge base (a university or college, for example) in order to prepare a joint proposal for a project, or projects, to enhance their business. The partners submit an application for funding to the Technology Strategy Board, which approves proposals as appropriate.

236. Successful KTPs have been operating for many years and the 2008 Budget announced the Government's commitment to doubling the number of KTPs available. The potential for the KTP programme to contribute to the skills base of the renewable electricity sector was raised by the Royal Society of Edinburgh:

> The government's Knowledge Transfer Partnership programme is a most effective enabler for knowledge transfer and a flagship programme could usefully be established in the area of new and renewable energy systems. Such an initiative would both bridge the industry/academia gap and help with the training of new graduates.[242]

We recommend that a flagship Knowledge Transfer Partnership programme be established in the area of new and renewable energy systems

240 Ev 278

241 Ev 386

242 Ev 121

10 Conclusions

237. Once finalised by the EU Commission, the UK's 2020 renewable energy target will be mandatory. The agreed target is likely to require around 15 per cent of energy to be supplied from renewables, which in turn will require upwards of 35 per cent of electricity to be generated by renewable technologies (up from 4.6 per cent in 2006[243]).

238. Critical to meeting the 2020 target will be the widespread deployment of renewable electricity-generation devices, both at the level of macro and microgeneration. At the current time, rather than acting within a framework that functions to support the delivery of renewable electricity-generation installations, project developers face a lengthy wait for planning consent, limited access to the electricity transmission system, and a shortage of the necessary skills and equipment to allow for efficient project delivery.

239. To meet National Targets it is now essential that immediate steps are taken to support the RDD&D needs of the renewable electricity industry. We welcome the Government's commitment to consult on a new Renewable Energy Strategy. However, without increased public acceptance of renewable technologies, a clearer funding landscape, and action to upgrade and expand the UK electricity transmission system, no amount of Government intervention will be sufficient to meet the challenge that lies ahead.

240. Given the scale of the renewable energy targets and the need for action by stakeholders at every level, from the consumer to the Government, we were surprised and concerned by the lack of urgency with which organisations such as National Grid spoke of the need for change. Further, although Mr Malcolm Wicks, Minister for Energy, offered warm words to the renewables industry ("their task is urgent and the challenges are great, but we shall overcome. That is my message to them" [244]), we sensed little engagement on the part of the Government with the issue at hand. We think it reasonable to expect the Government to lead on this matter and hope that a greater sense of dynamism, together with a clear strategy for progress, will be forthcoming.

241. On a more positive note, we believe that with decisive and co-ordinated action it is feasible to meet the 2020 renewable energy targets. To do so, however, it is essential that any action is both considered and swift; without this we may find that the increasingly short amount of time we have to make the necessary change has run out.

243 http://restat.org.uk/electricity.htm

244 Q 401

Conclusions and recommendations

Targets

1. We are disappointed that the Government is seeking to lower the target of 15 per cent renewable energies by 2020, as proposed in the EU Draft Directive on the promotion of energy from renewable sources. (Paragraph 21)

National targets for renewable electricity generation

2. We do not consider current UK targets for renewable electricity generation to be of sufficient scale or ambition. The Government's commitment to triple renewable electricity production by 2015 will equate to the production of approximately 15 per cent of total electricity supply. If the UK is to meet the proposed EC Mandated Target of 15 per cent renewable energy by 2020, it would then become necessary to more than double renewable electricity-generation capacity between 2015 and 2020. (Paragraph 29)

3. We find it highly unlikely that, given current progress, the UK will meet the Government's ambition for 10 per cent of electricity to be generated from renewables by 2010, let alone the EC Mandated Target for 15 per cent renewable energies by 2020. (Paragraph 30)

Rationalising the targets

4. We recommend that, as soon as the UK's EU Mandated Target is known, the Government outline the UK's renewable energy targets in a single statement. This statement should set the context for the Government's new Renewable Energy Strategy, stipulating the country's 2020 target for renewable energy generation, and signposting the contribution required from the electricity, heating and cooling and transport sectors required to meet the headline target. In addition to setting targets for each renewable energy sector, it is vital that the Government's Renewable Energy Strategy provides a clear policy framework for achieving them. (Paragraph 33)

The technologies

5. We believe that it will be essential to deploy a portfolio of technologies to meet our renewable electricity targets. (Paragraph 37)

Offshore wind

6. Given the relative maturity of the wind sector, and the continuing construction of new wind capacity, we believe that wind energy will make the greatest contribution to meeting our 2020 renewable energy targets. In order for the full potential of wind power to be realised, it is essential that the Government takes urgent steps to address operational barriers to its deployment. (Paragraph 46)

Wave and tidal – common issues

7. We recommend that the Government review the barriers to the deployment of marine technologies as a priority, and that it engages with device developers in order to identify the most appropriate means of supporting technology development and deployment. (Paragraph 56)

Emerging technologies

8. We urge the Government to ensure that, in acting to meet the UK's 2020 renewable energy targets, support for near-to-market technologies does not come at the expense of support for basic long-term research into emerging technologies. (Paragraph 72)

Nuclear power

9. We agree that nuclear energy is not a form of renewable energy, whatever its advantages in carbon-saving, as it relies on uranium as a fuel source. (Paragraph 75)

10. We believe it essential that the deployment of nuclear energy does not compromise the ability for the UK transmission system to accommodate all electricity generated by renewable technologies, and that the Government should guarantee there will be no nuclear blight on the renewables industry. (Paragraph 78)

Microgeneration – a microgeneration strategy

11. We recommend that in revising its microgeneration strategy, the Government review the provision of financial support for demonstration projects, and introduce a national target for the production of electricity from microgeneration technologies. (Paragraph 85)

Research funding – The Energy Technologies Institute

12. We welcome the creation of the Energy Technologies Institute and view it as playing a key role in supporting pre-commercial technologies through the 'valley of death' and into the market place. (Paragraph 93)

13. Further, we recommend that the ETI establish a test platform for offshore wind technologies. (Paragraph 94)

14. We believe that the Research Councils are unique in their support for basic and speculative research and that their research budget should not be compromised by the Government's commitment, however laudable, to provide increased support for technology demonstration. As such, funding for ETI must be over and above that allocated to the EPSRC Energy Programme. (Paragraph 98)

Intellectual property rights

15. It is essential that the ETI addresses the concerns of SMEs with regard to the exploitation of intellectual property (IP) generated during ETI-funded projects. We

believe that ETI's guidelines on the exploitation of IP should be formulated to encourage interaction between SMEs and the Institute's partner organisations. (Paragraph 103)

Government funding programmes – capital grants

16. We recommend that BERR urgently review their funding programmes for energy-related research in order to ensure they are able to support the RDD&D necessary to meet the UK's 2020 renewable electricity targets. (Paragraph 111)

Low carbon buildings programme

17. We recommend that the Government review the role of the Low Carbon Building Programme, and consider whether it is still a necessary and/or appropriate form of support. We suggest that the Government consider using this financial resource to reward installers for the amount of electricity they generate, rather than to support the installation of a microgeneration device. Further, we urge the Government to re-examine the role of renewable energy in the Low Carbon Building Programme. (Paragraph 115)

Marine Renewable Development Fund

18. The MRDF was designed to support the deployment of marine technologies. However, it was launched in a funding landscape that did not provide adequate support for technology demonstration projects. As a result, marine energy devices failed to develop to the extent required to qualify for support under the MRDF. We recommend that BERR consult the Energy Research Partnership, Energy Technologies Institute and Renewables Advisory Board when developing future funding programmes, to ensure they are targeted appropriately. (Paragraph 119)

19. European funding programmes provide valuable support for energy-related RDD&D in the UK. We welcome the announcement that the Technology Strategy Board will take steps to increase the involvement of UK business in Framework Programme 7. Further, we believe that the creation of a European Institute for Innovation and Technology is an exciting development, and one with which the UK research base should actively engage. (Paragraph 124)

The funding landscape

20. We find the funding landscape for energy-related RDD&D to be complex. We recommend that the Government review the role of each funding organisation, and that these roles be clarified and defined. Further, we recommend that the Government develop a strategy for communicating the remit of each funding body to the UK RDD&D community. (Paragraph 129)

Banding the RO and picking winners

21. We welcome the proposed reforms to the Renewables Obligation (RO) and the additional support it will provide to emerging technologies. We believe that the reformed RO will be a more flexible instrument. (Paragraph 136)

A UK support mechanism

22. We believe that, in consulting on policies to support the deployment of renewable technologies after the end of the Renewables Obligation in 2027, detailed consideration should be given to the full range of potential support mechanisms, including the introduction of a feed-in tariff. (Paragraph 148)

23. Irrespective of the policy mechanism, or mechanisms, selected to support the deployment of renewable electricity technologies post–2027, we recommend that the Government provide a full and transparent account of its decision process and the reason for rejecting or adopting possible options. (Paragraph 150)

Microgeneration and the Renewables Obligation

24. We welcome the Government's forthcoming consultation on mechanisms to incentivise the deployment of microgeneration technologies, and recommend that a feed-in tariff for microgenerators be introduced urgently. (Paragraph 154)

Grid connection

25. We believe that, in line with the EU Directive, renewable electricity generators should be guaranteed connection to the UK transmission system. In addition, we believe that electricity generated from renewables should be transmitted as a priority. (Paragraph 163)

The GB Queue

26. We agree with the interim conclusion of the Transmission Access Review that those projects in the GB queue that are able to use grid capacity be connected as a priority. If the electricity industry does not set up formal arrangements to resolve this problem, we recommend that the Government bring forward legislation to make it do so. (Paragraph 168)

Grid capacity

27. We agree that, at least until new transmission capacity is constructed, it will be increasingly necessary for generators to share grid capacity. We believe that the Government should act immediately to ensure that current capacity is shared with renewable generation. (Paragraph 174)

Renewable electricity generation

28. We were dismayed by the complacent attitudes of Ofgem and National Grid with regard to the potential demands that generating 30–40 per cent of electricity from renewables might place on the evolution and management of the transmission system. **We recommend that detailed research into the implications of sourcing 30–40 per cent of electricity from renewables be supported as a priority. Further, we believe it is essential this work be completed by early 2009, such that it can inform the Government's revised Renewable Energy Strategy.** (Paragraph 180)

Offshore transmission

29. We are concerned that the proposed offshore transmission arrangements are not appropriate for the UK's target of 33GW of offshore wind by 2020. We urge the Government to reconsider the development of an offshore grid. (Paragraph 187)

Intelligent grid management

30. We are concerned that the level of investment in R&D by National Grid is insufficient to identify and respond effectively to the challenges that face transmission and grid management technologies. (Paragraph 194)

Demand-side management

31. We believe that demand-side management will be increasingly important as the deployment of microgeneration technologies gathers pace. We recommend that the Government support the development, and roll-out to domestic consumers, of smart meters which are compatible with electricity microgeneration devices. (Paragraph 198)

Planning and the environment – planning policy

32. We note the proposal contained in the Planning Bill that consenting decisions on major infrastructure projects are to be decided by an Infrastructure Planning Committee (IPC). We look forward to further clarification of how the IPC will interact with, and address the concerns of, local authorities and other stakeholders. (Paragraph 205)

Planning applications

33. We are concerned that measures introduced in the Planning Bill will not materially affect the speed at which consenting decisions for smaller projects are reached. We urge the Department for Communities and Local Government to reconsider whether the thresholds for IPC consideration of onshore and offshore developments are appropriate. (Paragraph 209)

Planning Policy Statement 22

34. We are concerned that a local authority's reputation in the application of PPS22 may become the deciding factor in an investor's choice of site location, rather than the specifics of the site itself. We recommend that 'best practice' in the application of PPS22 be developed and disseminated as a priority. (Paragraph 213)

Environmental Impact Assessment

35. We recommend that the Government provide baseline Environmental Impact Assessments for areas suitable for all offshore renewables projects, and that it liaise with industry to ensure these assessments are appropriate to their needs. (Paragraph 218)

Social science research

36. We recognise the importance of the social sciences in supporting the deployment of renewable electricity-generation technologies. We welcome ESRC's continued involvement in the Research Council Energy Programme. (Paragraph 222)

37. Social scientists make a valuable contribution to developing and reviewing government renewables policy. We would advocate that social scientists undertaking policy-related research consistently develop practical policy solutions, and that the Government draw upon their expertise whenever it is engaged in the development of renewables policy of social or economic importance. (Paragraph 224)

Skills

38. Given the current commitment to the skills agenda, we deem it is essential that Government engage with the renewables industry to ensure that the skills needs of developers are addressed. This is an area in which the Energy Research Partnership could play a central role. (Paragraph 228)

National Skills Academy

39. We do not advocate the creation of a National Academy or Sector Skills Council in the Renewable Electricity Sector. Instead, we recommend that Sector Skills Councils, including the Energy and Utility Skills Council, ConstructionSkills and the Sector Skills Council for Science, Engineering and Manufacturing Technologies, establish a cross council steering body to address skills deficits within the industry. (Paragraph 234)

Knowledge Transfer Partnerships

40. We recommend that a flagship Knowledge Transfer Partnership programme be established in the area of new and renewable energy systems (Paragraph 236)

Annex: Abbreviations

BERR – Department for Business, Enterprise and Regulatory Reform

BETTA – British Electricity Transmission Trading Arrangements

BWEA – British Wind Energy Association

CHP – Combined Heat and Power

CCGT – Combined Cycle Gas Turbine

CCHP – Combined Cooling, Heat and Power

Defra – Department for the Environment, Food and Rural Affairs

DIUS – Department for Innovation, Universities and Skills

DNO – Distribution Network Operator

DTI – Department for Trade and Industry

EEDA – East of England Development Agency

EEG – German Renewable Energy Act (Erneuerbare-Energien-Gesetz)

EIT – European Institute of Innovation and Technology

EMDA – East Midlands Development Agency

EMEC – European Marine Energy Centre

ENA – Energy Networks Association

EPSRC – Engineering and Physical Sciences Research Council

ERP – Energy Research Partnership

ETF – Environmental Transformation Fund

ETI – Energy Technologies Institute

FP7 – Framework Programme Seven

IET – Institute of Engineering and Technology

IOP – Institute of Physics

IMechE – Institute of Mechanical Engineers

IP – Intellectual Property

IPC – Infrastructure Planning Commission

KIC – Knowledge and Innovation Centre

KTP – Knowledge Transfer Partnership

kV - Kilovolt

kW - Kilowatt

kWh – Kilowatt hour

LCBP - Low Carbon Building Programme

LCCA – London Climate Change Agency

LDA – London Development Agency

MRDF – Marine Renewables Deployment Fund

MW - Megawatt

MWh – Megawatt hour

NFRC – National Federation Roofing Contractors

NPS – National Policy Statement

OFTO – Offshore Transmission Network Operator

PPS22 – Planning Policy Statement 22

PV – Photovoltaic

R&D – Research and Development

RDD&D – Research, Development, Demonstration and Deployment

RAB – Renewables Advisory Board

RAE – Royal Academy of Engineering

RCUK – Research Councils UK

REA – Renewable Energy Association

RO – Renewables Obligation

ROC – Renewables Obligation Certificate

RSC – Royal Society of Chemistry

RRFCS – Rolls Royce Fuel Cell Systems

SSC – Sector Skills Council

SDC – Sustainable Development Commission

SPRU – Science and Technology Policy Research Unit, University of Sussex

SQSS – Security and Quality Supply Standards

TW – Terawatt

TWh – Terrawatt hour

UKERC – UK Energy Research Centre

Formal Minutes

Wednesday 11 June 2008

Members present:

Mr Phil Willis, in the Chair

Mr Tim Boswell
Mr Ian Cawsey
Dr Ian Gibson
Dr Evan Harris
Dr Brian Iddon
Mr Gordon Marsden
Ian Stewart
Graham Stringer
Dr Desmond Turner

The Committee deliberated.

Draft Report (*Renewable electricity-generation technologies*), proposed by the Chairman, brought up and read.

Ordered, That the draft Report be read a second time, paragraph by paragraph.

Paragraphs 1 to 241 read and agreed to.

Summary agreed to.

Resolved, That the Report be the Fifth Report of the Committee to the House.

Ordered, That the Chairman make the Report to the House.

Ordered, That embargoed copies of the Report be made available, in accordance with the provisions of Standing Order No. 134.

[Adjourned till Monday 16 June at 4.00pm.

Witnesses

List of written evidence

List of Reports from the Committee during the current Parliament

The reference number of the Government's response to each Report is printed in brackets after the HC printing number.

Session 2007–08

First Report	UK Centre for Medical Research and Innovation	HC 185 (HC 459)
Second Report	The work and operation of the Copyright Tribunal	HC 245 (HC 637)
Third Report	Withdrawal of Funding for Equivalent or Lower Qualifications (ELQs)	HC 187- I (HC 638)
Fourth Report	Science Budget Allocations	HC 215-I (HC 639)
First Special Report	The Funding of Science and Discovery Centres: Government Response to the Eleventh Report from the Science and Technology Committee, Session 2006–07	HC 214
Second Special Report	The Last Report: Government Response to the Thirteenth Report from the Science and Technology Committee, Session 2006–07	HC 244
Fourth Special Report	Investigating the Oceans: Government Response to the Science and Technology Committee's Tenth Report of Session 2006-07	HC 506