

# Chapter 4 Low carbon generation

4.1 A new energy policy demands new thinking about energy supply. We need a shift towards energy sources and generation technologies that produce much less or no carbon. We can expect to see far more small-scale, distributed heat and electricity generation.

4.2 In particular:

■ renewable energy will play a vital part.

To date, renewable energy has expanded far less in the UK than in some other European countries. Yet the potential is huge. For example, the UK has over one third<sup>1</sup> of Europe's entire potential for offshore wind energy. And there is great scope for innovative, local developments, bringing together low carbon technologies such as renewable energy and energy efficient buildings<sup>2</sup>; and;

■ combined heat and power (CHP), which is an efficient form of providing heating and electricity at the same time, also fits into this wider picture. The UK already has around 5GW of CHP installed, mainly on an industrial scale. In the future, we can also expect to see far more 'micro-CHP' - efficient, small-scale heating and electricity generation systems in homes as well as businesses.

4.3 Although nuclear power produces no carbon dioxide, its current economics make new nuclear build an unattractive option and there are important issues of nuclear waste to be resolved. Against this background, we conclude it is right to concentrate our efforts on energy efficiency and renewables. We do not, therefore, propose to support new nuclear build now. But we will keep the option open.

4.4 This chapter looks at the role that we can expect renewables and CHP to play; examines the obstacles to their greater take-up; reviews the short and longer-term technological opportunities and the role we can play in promoting them; and sets out our conclusions on the role of nuclear power.

## The role of renewables...

### What is renewable energy?

Renewable electricity can be generated from wind power, wave, tidal, solar photovoltaics (PV), hydro generation, geothermal and biomass (energy from forestry or crops). These forms of generation offer an enormous potential resource, particularly in the UK where our coastline provides extensive opportunities to use wind, wave and tidal power. They all produce no carbon at all or, in the case of biomass, produce only the carbon they have already absorbed from the atmosphere when growing. Some forms of waste are also classed as renewable under the Renewables Obligation.

Solar energy can heat water directly, either for hot water or for space heating in buildings. And heat from the ground, river water, sewage and even the air can be put through a heat exchanger for both water and space heating.

4.5 If we are to achieve a 60% reduction in carbon emissions by 2050, we are likely to need renewables by then to be contributing at least 30% to 40% of our electricity generation<sup>3</sup> and possibly more. We therefore need to develop a framework which encourages the development of a wide range of renewable options and to make significant changes to our institutions and systems.

1 BWEA, 2002 [www.offshorewindfarms.co.uk/info.html](http://www.offshorewindfarms.co.uk/info.html)

2 Renewable fuels will also be important in transport. This is discussed in chapter 5.

3 *Options for a low carbon future* (Future Energy Solutions, 2003) [www.dti.gov.uk/energy/whitepaper](http://www.dti.gov.uk/energy/whitepaper)

## **We have made a start...**

4.6 In January 2000 we announced our aim for renewables to supply 10% of UK electricity in 2010, subject to the costs being acceptable to the consumer<sup>4</sup>. It is clear that achieving the 10% target over the next seven years will be very challenging.

4.7 We have recently put in place a range of new measures to deliver this. We have:

- introduced a Renewables Obligation for England and Wales in April 2002<sup>5</sup>. This will incentivise generators to supply progressively higher levels of renewable energy over time. The cost is met through higher prices to consumers. By 2010, it is estimated that this support and Climate Change Levy (CCL) exemption will be worth around £1 billion a year to the UK renewables industry;
- exempted renewable electricity from the CCL;
- created a renewables support programme worth £250m from 2002-2005;
- drawn up a strategic framework for a major expansion of offshore wind; and
- created a new organisation within Government - Renewables UK - to help our renewables industry grow and compete internationally.

In addition, from 2005 onwards, the EU emissions trading system will provide a further incentive for renewables.

4 *Conclusions in response to the public consultation - New and Renewable Energy: Prospects for the 21st century* (DTI, 2000) [www.dti.gov.uk/renew/condoc/policy.pdf](http://www.dti.gov.uk/renew/condoc/policy.pdf)

5 The Scottish Executive launched the Renewables Obligation Scotland on 1 April 2002. We make proposals in paragraph 4.64 on integrating the Renewables Obligation Certificate trading schemes for Great Britain and Northern Ireland.

4.8 We are pushing forward these programmes in consultation with industry. A new Renewables Advisory Board - comprising representatives of the relevant industries, the Government and the Devolved Administrations - has been set up with a remit to provide expert independent advice to DTI on renewables issues.

## **But we need to do still more...**

4.9 We produce less electricity from renewables than a number of our European partners. In 2000, renewables (excluding large hydro plant and mixed waste incineration) supplied only 1.3%<sup>6</sup> of our electricity, compared with 16.7% in Denmark, 4% in the Netherlands, 3.2% in Germany and 3.4% in Spain. To hit the 10% target we will need to install approximately 10,000MW of renewables capacity by 2010, an annual build rate of over 1250MW. Only 1200MW of renewables capacity has been installed in total so far (excluding large hydro). The measures we have already put in place will make a major difference to the rate at which capacity is installed. But they were only introduced last year and it will take a few years before these measures impact fully.

4.10 Our analysis and consultation has shown that we need to strengthen our policy if we are to ensure that the measures we have put in place have the maximum impact. We describe below a number of steps that we will take to accelerate the take-up of renewables.

4.11 As we have set out, our aim for renewables is that they should supply 10% of UK electricity in 2010, as long as the cost to customers is acceptable. We believe that renewable sources of energy will increasingly

6 *Renewables Information 2002* (IEA, 2002) [www.iea.org/stats/files/ren2002.pdf](http://www.iea.org/stats/files/ren2002.pdf)

demonstrate that they can meet our energy needs both economically and in a carbon free way. Technologies such as onshore and offshore wind and biomass are potentially - after energy efficiency and alongside CHP - the most cost-effective ways of limiting carbon emissions in the longer-term. We expect industry to respond to the framework established by the Government and demonstrate they can achieve our goals at an acceptable cost. **On that basis, our aspiration is by 2020 to double renewables' share of electricity from our 2010 target and we will pursue policies to achieve this.**

4.12 We remain firmly committed to the current Renewables Obligation and will maintain the level of support it provides as planned until 2027. **In 2005/06, we will review progress and will elaborate a strategy for the decade to 2020.** This will take account of the experience of carbon prices arising from the emissions trading scheme and of the costs of renewable technologies.

4.13 We have already put in place a substantial renewables support programme worth in total £250m between 2002/03 to 2005/06. But we recognise that further funding is needed to give us the best chance of reaching the 2010 target. **We will therefore increase funding for renewables capital grants by a further £60m within this period. This is additional to the extra funding announced in the 2002 Spending Review, which allocated an additional £38m for energy policy objectives in 2005/06<sup>7</sup>.** This funding will enable us to increase momentum and to take forward a broad strategy for renewables including ramping-up medium-term funding for offshore wind.

4.14 As well as making progress towards our 2010 target, and paving the way for our 2020 strategy, we need to make sure that we are planning for the longer-term up to 2050. We are already reviewing innovation spending, including that for renewable energy, across government. With respect to renewable energy, we will review the barriers to successful innovation across the range of renewables technologies and will set out a programme for developing, with industry, strategies for the successful application of those technologies in the liberalised energy market. We expect this work to cover advanced conversion technologies for biomass, wave and tidal, building-integrated renewables, and hydrogen and fuel cells.

## **Innovation, research and development are crucial...**

4.15 Key to realising the full potential of renewables over time is the generation of innovative ideas which will bring on new technologies as well as improving existing ones. The Chief Scientific Adviser's Energy Research Review Group<sup>8</sup> recommended that more needed to be spent on energy research and development and singled out two renewables technologies (solar PV and wave/tidal power) as areas in which increased investment was particularly likely to lead to step-change breakthroughs. **We accept these recommendations and have already increased funding for basic research into renewables (see paragraphs 4.60 and 4.61).**

<sup>7</sup> Compared with 2002/03

<sup>8</sup> *Report of the Chief Scientific Adviser's Energy Research Review Group*, Office of Science and Technology, 2001. [www.ost.gov.uk/policy/issues/csa\\_errg/main\\_rep.pdf](http://www.ost.gov.uk/policy/issues/csa_errg/main_rep.pdf)

## Combined heat and power also has significant potential...

- 4.16 CHP is an efficient form of providing heating and electricity at the same time. CHP's overall fuel efficiency is around 70-90% of the input fuel - much better than most power stations which are only up to around 40-50% efficient. It enables a very wide range of energy users, from heavy industry down to individual homes, to save money and help the environment by reducing overall carbon emissions. It is also the cornerstone of many community energy schemes, providing heating, electricity and in some cases cooling to a wide range of users. But the low prices in the wholesale electricity market and the increases in wholesale gas prices over recent years are adversely affecting new CHP developments. A number of proposed new power stations, which already have planning approval, are awaiting electricity price rises and/or gas price reductions before they go ahead.
- 4.17 We have set a target of achieving 10GWe of Good Quality CHP<sup>9</sup> by 2010. Good progress has been made over the last decade and 4.8GWe is currently installed. Achieving the Government's target could save a further 1.25MtC per year. **We remain committed to a target of 10GWe of Good Quality CHP capacity being installed by 2010.**
- 4.18 **In addition to the measures we have already put in place to support CHP, we will introduce a number of further measures to help address the current market difficulties and support the achievement of our target:**

- **we will undertake a review of the existing guidance on information required to accompany power station consent applications.** Applicants will need to provide significant evidence clearly demonstrating they have considered all economically viable options for CHP and community heating;
- **we will continue to emphasise the benefits of CHP and community heating whenever Planning Policy Guidance, Regional Planning Guidance or Sustainable Development Guidance is introduced or reviewed;**
- it is vital that NETA does not discriminate against smaller generators, including CHP. Some changes have already been made. We expect OFGEM to continue to work with smaller generators and ELEXON to ensure that the administrative procedures for the Balancing and Settlement Code under NETA are fully accessible to smaller generators. **We will work with OFGEM to keep these developments under review since the existence of a level playing-field for smaller generators, including CHP and renewables, is essential if our ambitious targets are to be met;**
- in the draft CHP Strategy we announced that we would consider setting targets for Government Departments to use CHP generated electricity. **We will now proceed with this. Over the coming months we will consider the nature and extent of such a target or targets and announce our conclusions in the energy section of the Framework for Sustainable Development on the Government Estate that we hope to publish later this year. We will also encourage other parts of the public sector to consider whether setting CHP targets would be appropriate;**

<sup>9</sup> Good Quality CHP is CHP generation that meets efficiency standards prescribed in the Government's CHP Quality Assurance programme.

- **as we consider and consult on the expansion of the energy efficiency commitment (EEC) for households from 2005 onwards and on whether to extend the EEC beyond the household sector (see chapter 3), we will explore the opportunities for incentivising CHP technologies;**
- **we will support field trials designed to evaluate the benefits of micro-CHP;**
- we recognise that the CHP target will require sustained effort from both the private and public sectors, and can therefore only be achieved with the active collaboration of all the partner organisations which have a contribution to make. **We have invited the Energy Saving Trust and the Carbon Trust to review their current and future programmes to ensure that they reinforce the delivery of the Government's CHP target; and**
- over time the measures outlined in this white paper - in particular emissions trading - will encourage lower-carbon forms of generation and more efficient use of fuels. **Under the UK Emissions Trading Scheme, carbon savings from CHP can already be traded, and we will work on a framework for pilot projects within the Scheme for which CHP projects may be eligible.** This work would take into account the forthcoming EU Directive on emission reduction projects. Furthermore, the EU emissions trading scheme will encourage low-carbon technologies, including CHP. And we expect to see a new approach to electricity generation developing that recognises and encourages local generation opportunities.

- 4.19 These measures will be elaborated in the final version of our CHP Strategy to be published in the course of this year, on which we look forward to a continuing and constructive dialogue with industry.
- 4.20 **We will also monitor and report on developments on CHP as part of the arrangements described in chapter 9.**

### **Structural barriers to renewables and CHP...**

- 4.21 Many renewable and CHP generators, because of their small size and/or location, need to be connected to local distribution networks rather than the national transmission network. To achieve our targets for higher levels of renewable generation and CHP plant, distribution networks will have to be capable of accommodating many more directly connected generators. Very substantial changes will be needed in the way in which our distribution networks are designed, organised and financed - greater than anything we have seen in the last 50 years. Distribution Network Operators (DNOs) will also need to take a more proactive approach to distributed generation.
- 4.22 During the white paper consultation, distributed generators expressed concern that their projects were being unduly delayed because they could not obtain quick and easy connections to the distribution network. Under the present price control rules there is no financial incentive for the DNOs to connect distributed generation to their networks. We therefore believe that the regulatory framework needs to be amended so that the DNOs connect and use higher levels of distributed generation.

4.23 OFGEM has started working with the DNOs to address these issues<sup>10</sup>. **OFGEM is committed to publishing the detail of an incentive framework for connecting and utilising distributed generation later this year, for implementation in April 2005.**

This will help distributed generators to obtain quicker and easier connections to the distribution network in the interim period to the next price control and beyond. DNOs need to work closely with the industry to exploit the existing infrastructure by using innovative engineering solutions when connecting higher levels of distributed generation.

4.24 **We are also working with OFGEM to address the administrative burdens placed on smaller generators and to ensure that they are not unfairly disadvantaged in their relations with local suppliers<sup>11</sup>. Through the Distributed Generation Co-ordinating Group<sup>12</sup>, we are also following up a range of wider changes designed to facilitate distributed generation. We will report progress on this in the follow-up to the white paper (see chapter 9).**

4.25 We need to develop the existing transmission network to exploit our massive onshore and offshore wind resources. Transmission companies must start preparing now to

strengthen the network to enable the UK to increase substantially its deployment of renewables. **The regulatory arrangements are crucial to our ability to deliver infrastructure which will, in turn, permit the development of renewable generation throughout the country - not least in those peripheral areas where natural resources are often greatest. Discussions are currently taking place between OFGEM and the transmission operators on plans to upgrade the transmission network across the whole country. We are also consulting on network issues across Great Britain (GB) in the context of the forthcoming British Electricity Trading and Transmission Arrangements (BETTA) legislation (as discussed in paragraphs 4.28 and 4.29). It is essential to create a network infrastructure capable of supporting our environmental objectives.**

4.26 **We are establishing with OFGEM a joint working group on environmental issues<sup>13</sup> modelled on the successful joint working group on security.** One of the key priorities for the group will be to monitor network operators' progress in modernising the transmission and distribution networks to meet our carbon aims.

### **The New Electricity Trading Arrangements (NETA) are evolving to respond to industry concerns...**

4.27 During the first few months of NETA some generators, in particular renewables and CHP, were exposed to very high costs as a result of the mechanism used to balance the

10 In January 2003 OFGEM published its initial thoughts on both the principles for developing the regulatory framework for the next distribution price control and on interim arrangements for the period to April 2005 when the next price control is implemented. [www.ofgem.gov.uk/docs2003/dnoletter\\_jan.pdf](http://www.ofgem.gov.uk/docs2003/dnoletter_jan.pdf)

11 OFGEM has recently launched a help facility for smaller generators under NETA [www.ofgem.gov.uk](http://www.ofgem.gov.uk)

12 The DTI and OFGEM created and jointly chair the Distributed Generation Co-ordinating Group. The Group is concerned with a wide range of issues related to the connection and operation of distributed electricity generation in Great Britain. The Group is also considering recommendations made by an earlier group (Embedded Generation Working Group) on how to encourage DNOs to connect higher levels of distributed generation [www.distributed-generation.org.uk](http://www.distributed-generation.org.uk)

13 As discussed in chapter 9.

electricity system. NETA is evolving to deal with these problems. It is important that the balancing mechanism reflects costs and that the system as a whole provides a realistic route to market for all generators. We have worked with OFGEM to make the balancing mechanism more genuinely reflect costs. A number of amendments have been made since NETA was introduced<sup>14</sup>. This has helped all players but especially smaller generators such as renewables and CHP to operate more effectively in the market. OFGEM has also approved a proposal to introduce in February 2003 a further amendment that should more accurately reflect the costs of being out of balance<sup>15</sup>. OFGEM is also committed to continuing to work with smaller generators to ensure that the Balancing and Settlement Code is fully accessible to smaller generators<sup>16</sup>.

**We will continue to keep the operation of these aspects of NETA under close review.**

We discuss the impact of NETA on the electricity industry as a whole in chapter 7.



### What is NETA?

The New Electricity Trading Arrangements (NETA) were introduced in England and Wales on 27 March 2001. NETA replaced the Electricity Pool whose centralised, inflexible arrangements for setting wholesale electricity prices meant that prices failed to reflect falling costs and increased competition.

NETA put in place market-based trading arrangements, more like those in other commodity markets. The majority of electricity is traded through bilateral contracts where prices are agreed between parties and on power exchanges, the remainder, around 2%, is traded through the NETA balancing mechanism.

The Balancing Mechanism has two functions. As electricity cannot be stored, the transmission system has to be balanced on a second by second basis to ensure system security. The National Grid Company (NGC) operates a balancing mechanism to do this. The 2% of electricity traded through the balancing mechanism is due to generators and suppliers being out of balance with their contracted position; either a generator not producing enough or too much electricity or suppliers not consuming enough or too much electricity. NGC then has to accept offers for more electricity, or bids to produce less. These additional costs to NGC are passed on through imbalance charges.

14 Modification P12 to the Balancing and Settlement Code (BSC) was implemented on 2 July 2002. This has the effect of reducing gate closure to one hour and has helped all participants (and especially less predictable generators) better manage the risk of being out of balance.

15 Modification P78 to the Balancing and Settlement Code (BSC).

16 The Balancing and Settlement Code covers the trading, balancing and subsequent settlement of electricity.

## **BETTA...**

- 4.28 We have announced that we intend to bring forward legislation to create a wholesale electricity market for GB as soon as Parliamentary time allows. The development of these new arrangements, is being undertaken with OFGEM and with the involvement of industry. For planning purposes, we are working towards the implementation of BETTA in October 2004. We intend to implement BETTA by April 2005 at the very latest.
- 4.29 BETTA will mean that Scottish domestic and business customers will benefit from the same levels of competition that are now established in England and Wales. The single set of trading rules, connection policies and transmission charging arrangements under BETTA will reduce barriers for independent generators across GB to getting their power to market. BETTA will help to create a diverse generating base in GB and encourage new transmission capacity, helping to support renewables development.

## **Planning needs to be streamlined and simplified ...**

- 4.30 Many of those who responded to the white paper consultation saw planning as one of the big obstacles to new renewables. We recognise that this is a serious problem for renewables. **The Office of the Deputy Prime Minister (ODPM) will shortly publish new planning guidance on renewables (PPS22)**

**for England<sup>17</sup>. A separate guide containing advice on best practice will also be published.** These documents will provide guidance to local planning authorities and developers about the best way to promote renewables through the planning system as well as encouraging a strategic approach to the deployment of renewable projects through regional planning guidance and development plans. We will also be consulting on a new regional-level strategic approach to energy issues, including renewables, which we expect will incorporate regional targets, as discussed further in chapter 9. This approach will help to encourage regional bodies as well as local authorities to examine strategically the resources and opportunities for renewable projects within their areas and what they can do to develop them in their region.

- 4.31 **ODPM, in partnership with other government departments, will be examining how to bring consideration of the use of renewables and energy efficiency in developments more within the scope of the planning system, in the context of the review of PPG22 and the Government's wider planning reforms, and in a way that does not impose undue burdens on developers.**

- 4.32 We need better information on what is happening on the ground. **We will therefore work with local planning authorities and others to obtain better statistics on the number of renewable projects that are achieving planning approval and why others are being rejected.**

<sup>17</sup> The Welsh Assembly Government is currently revising its national planning guidance on renewables (TAN8) and has commenced the process of developing a Wales spatial plan. The Scottish Executive updated its national planning guidance (NPPG6) in 2000.

4.33 We have published legislative proposals<sup>18</sup> to streamline the public inquiry process for Major Infrastructure Projects in the planning process in England by allowing lead inspectors to appoint further inspectors to share the work and allowing issues to be considered concurrently in inquiries rather than sequentially. **We will also apply these principles to decision-making for major energy projects in England and Wales, where consents are awarded by the Secretary of State for Trade and Industry.**<sup>19</sup> This should help streamline planning processes for large renewable energy developments and other large generation plant and help major upgrades of the transmission network.

4.34 There is currently no guidance on the implications for land use planning at local level for projects related to energy reliability. **We will prepare a separate guidance note focusing on this for local planning authorities.**

## People make the difference ...

4.35 Increasing the deployment of renewables will depend on people supporting local projects<sup>20</sup>. The public consultation suggests people are keen on renewables, particularly for their contribution to tackling climate change. But they feel that they do not know enough about the impact of renewables in practice.

4.36 The white paper consultation has shown the value of community engagement. This will be crucial for the development of new forms of

distributed generation, in gaining acceptance of new infrastructure and in developing opportunities for local energy delivery. Developers need to continue to engage local planning authorities and work directly with communities. We have recently launched Clear Skies, a three-year capital grant programme worth £10m, for schemes such as solar water heating and biomass heat which have a strong community or household focus. The Scottish Executive has also a similar community and household capital grants scheme in Scotland worth £3.7m over 3 years. Defra's Community Energy scheme, which has a two-year budget of £50m, helps install and refurbish community heating systems. The Countryside Agency launched the Community Renewables Initiative in 2002 to help people to influence and benefit from renewable energy. All of these schemes have a key role to play in helping to breakdown the barriers to public acceptability of renewables by providing local residents with a direct benefit from the renewables development.

### Community action in practice

National Wind Power's practice is to establish community funds at each operating wind farm in consultation with local communities and councillors. These funds benefit the community and typically include student sponsorships, equipment for schools and village halls repairs.

One such example is the provision of IT and other equipment worth up to £60,000 to support 19 schools near the Bears Down Wind Farm in Cornwall. Local schools also received two days energy efficiency training as part of a £30,000 energy efficiency scheme funded by the wind farm and carried out by the Cornwall Energy Advice Centre.

18 *Planning and Compulsory Purchase Bill*  
[www.publications.parliament.uk/pa/cm200203/cmbills/012/2003012.htm](http://www.publications.parliament.uk/pa/cm200203/cmbills/012/2003012.htm)

19 These powers are devolved in Scotland.

20 *Renewable Energy in the UK* (PIU, 2001)  
[www.piu.gov.uk/2001/energy/Renewener.shtml](http://www.piu.gov.uk/2001/energy/Renewener.shtml)

4.37 We see a clear benefit in local communities becoming producers, as well as consumers, of energy, establishing and benefiting from the local ownership of some forms of generation. To help promote ideas and good practice **we will collate and publish examples of projects in which developers have gained added value by taking innovative approaches to engaging and working with communities, in partnership with local government and the renewables industry.**

### **We will simplify the procedures for accommodating our national security needs...**

4.38 The Ministry of Defence (MoD) needs to make sure that windfarm developments do not impair operational needs including training and radar monitoring. MoD has objected to a third of all recent on and offshore wind energy proposals<sup>21</sup>. We need to work with the industry to reduce this.

4.39 To address these issues, MoD:

- has contributed to the issue recently of new guidelines for windfarm developers through the Wind Energy, Defence and Civil Aviation Working Group<sup>22</sup>, designed to increase the transparency of the process for assessing wind proposals;
- will provide more central guidance to those reviewing applications, develop a help line for the industry and shorten proposal turn-around times from the current 6-8 weeks;

- will provide advice to developers on any adjustments that could be made to the location of a wind farm in order to make it acceptable to MoD. If this is not possible, MoD will explain to developers the problem of siting a wind farm in the locality; and
- is supporting research to model the effect of turbines on radar and to identify ways in which adverse impacts could be reduced, including technical adaptations to turbine design.

4.40 MoD is also ready to engage with local authorities and regional bodies as they move towards considering the best sites for wind farms in the longer-term when they begin to develop their regional strategies for energy, as discussed in chapter 9.

### **Learning to handle intermittency...**

4.41 Renewables contribute to certain aspects of security of supply. Supplies will not be disrupted by international crises. But some will create additional system complications, depending on the extent to which they are intermittent (wind energy, wave energy, tidal and solar) and on the types of generation they displace. Intermittency causes additional system costs. And as the proportion of intermittent generation increases, the cost of maintaining stable supplies also increases<sup>23</sup>.

21 Ministry of Defence (2002).

22 Comprising DTI, MoD, the Civil Aviation Authority, the British Wind Energy Association, the Devolved Administrations and others with an interest.

23 The additional system costs - attached to transmission, the distribution network and balancing generation and demand - of 20% and 30% of electricity supplied by intermittent generation is equivalent to a maximum of £0.9/MWh and £2.20/MWh respectively. It is quite possible that technical developments in storage, fuel cells and load management may by 2020 reduce such costs. *Quantifying the system costs of additional renewables in 2020 (Ilex, 2002)*. [www.dti.gov.uk/energy/developpep/080scar\\_report\\_v2\\_0.pdf](http://www.dti.gov.uk/energy/developpep/080scar_report_v2_0.pdf)

4.42 These costs need to be managed and new ways found to minimise them. We are already funding research into this through the DTI's Renewable Energy and the Engineering and Physical Sciences Research Council's (EPSRC)<sup>24</sup> SUPERGEN<sup>25</sup> programmes. As part of our current capital grant programme we allocated in 2002 an additional £4m to facilitate the demonstration of new control, storage and metering technologies.

### **Renewable technologies are at different stages of development...**

4.43 We need to scale up substantially our deployment of renewables in order to secure economies of scale and reduce costs significantly. Some renewable technologies are close to commercial deployment and should be pulled through to market by the range of measures that we have in place. With support from the Renewables Obligation and the Renewables Obligation Scotland, onshore wind is already economic. But we are also strongly committed to supporting the innovation that will be fundamental to bringing forward new and emerging technologies. The remainder of this chapter looks at what more needs to be done for us to fully establish a wide range of renewable options to deliver our carbon aims.

### **Offshore wind - about to take off...**

- 4.44 We have more wind off our coasts than anywhere else in Europe<sup>26</sup>. Given our experience in offshore engineering, we should be able to expect offshore windfarms to make a strong contribution to our carbon aims.
- 4.45 Developers have entered into agreements for leases for windfarm sites around the UK coast with a total capacity of at least 1400MW of renewable energy, sufficient to power a city the size of Greater Manchester. The offshore wind industry considers a further 3000-4000MW can be built by 2010.<sup>27</sup>
- 4.46 Only 250MW<sup>28</sup> of offshore wind capacity has so far been installed world-wide. 4MW of this is in UK waters. Although the long-term potential looks promising, the economics of offshore wind are very uncertain. In the short-term significant fixed costs have to be borne before installation can begin. Our programme of capital grants has started to address this.
- 4.47 Delivering our carbon aims will require the rapid expansion of offshore wind not only within territorial waters but beyond. We published in November 2002 a consultation document<sup>29</sup>, *Future Offshore*, which proposes a strategic planning framework to harness the significant potential of offshore wind. The *Future Offshore* consultation document includes proposals for the provision and regulation of offshore infrastructure for transmitting electricity.
- We will work with OFGEM, developers and the transmission companies, over the**

24 Government's leading funding agency for research and training in engineering and the physical sciences [www.epsrc.ac.uk](http://www.epsrc.ac.uk)

25 Sustainable Power Generation and Supply initiative [www.epsrc.ac.uk](http://www.epsrc.ac.uk)

26 BWEA, 2002 [www.offshorewindfarms.co.uk/info.html](http://www.offshorewindfarms.co.uk/info.html)

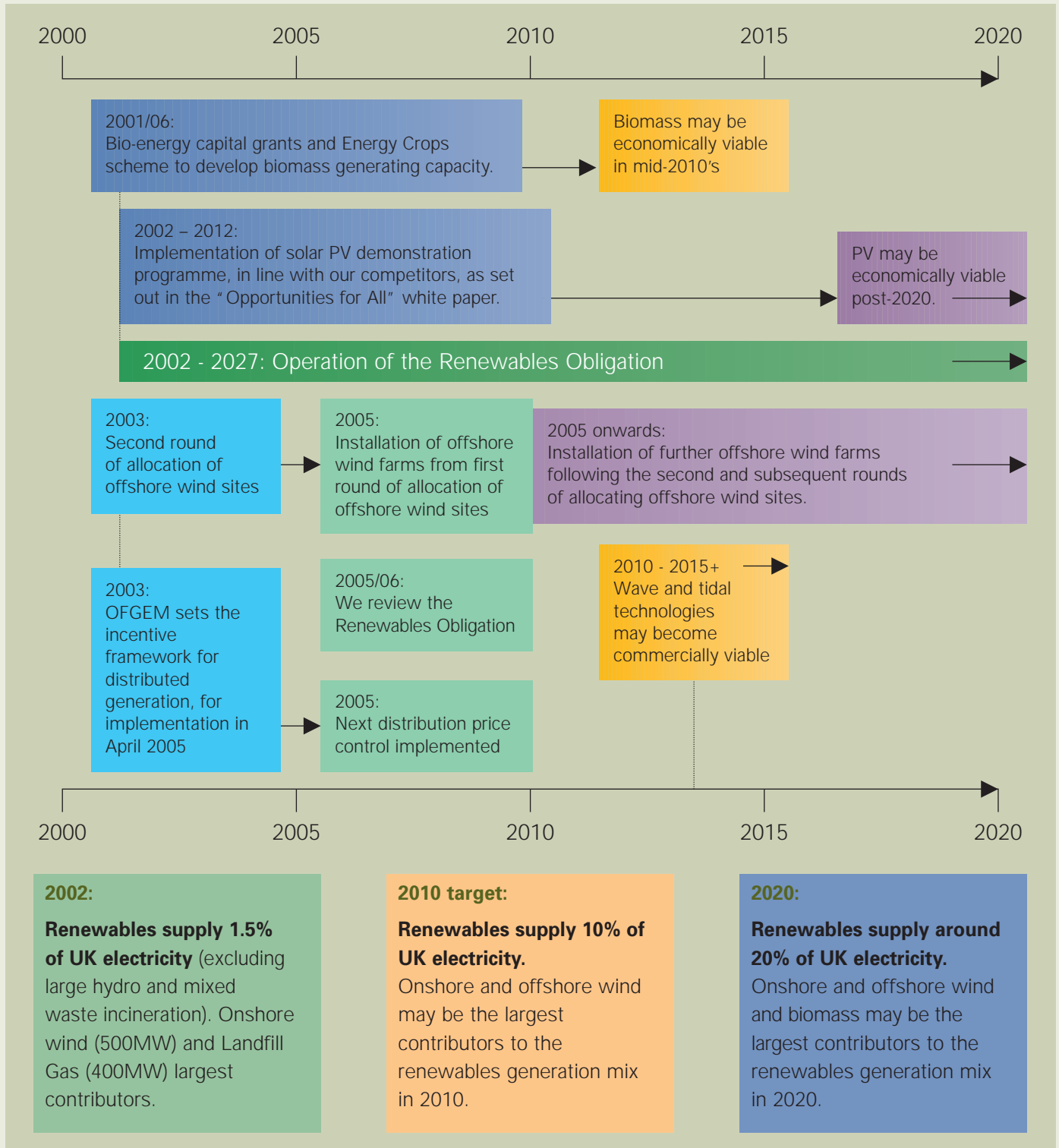
27 BWEA, 2002

28 BWEA, 2002

29 *Future Offshore: A consultation of the future framework for developing offshore wind farms* (DTI, 2002) [www.dti.gov.uk/energy/leg\\_and\\_reg/consents/future\\_offshore/index.shtml](http://www.dti.gov.uk/energy/leg_and_reg/consents/future_offshore/index.shtml)

## A Renewables Timeline

The timeline below shows the key dates on the critical path to help us to achieve our 2010 10% target and to double the renewable's share of electricity generation in the decade after.



### **coming months, to take this issue forward.**

A second round of windfarm site allocations is planned for spring 2003, focusing on three strategic areas of the sea within territorial waters, informed by a strategic environmental assessment.

- 4.48 To enable further rounds to extend the opportunity for developers to exploit areas beyond the UK 12-mile zone **we will also bring forward legislation as soon as possible to enable the granting of licences for offshore windfarm developments beyond territorial waters. We will identify and assess the difficulties that might be posed for aviation and other military and civil interests before we offer areas of the sea to the wind industry for development.**

### **Biomass and waste technologies need to gain momentum...**

- 4.49 Biomass<sup>30</sup> and waste can be used for electricity, heat and liquid fuels. Unlike wind, biomass and waste generation is flexible - it can be generated at any time. A strong biomass supply chain can also revitalise rural communities, offering diversification opportunities for farmers and foresters as well as job opportunities in growing, supply and electricity plant building. We are supporting biomass projects through our 3-year £66m Bioenergy Capital Grants Scheme and through our £29m Energy Crops Scheme, to help farmers and foresters establish energy crops.

30 Biomass is anything derived from plant or animal matter and includes agricultural, forestry or wood wastes/residues and energy crops. Energy crops are crops grown for the purpose of energy generation, such as short rotation coppice willow and miscanthus.

- 4.50 To develop a stronger stimulus to provide a biomass supply chain, **we will undertake a statutory consultation in 2003 of the current requirement under the Renewables Obligation that by 1 April 2006 75% of the biomass in co-fired stations should be energy crops<sup>31</sup>.**

#### **Elean Power Station - the UK's first straw-fired power plant**

Elean Power Station at Sutton near Ely, Cambridgeshire, is the UK's first straw-fired power plant. With an electricity output of 36MW, it is the world's largest such facility. The power station will generate enough power to heat and light 80,000 homes.

The 200,000 tonnes/per year of straw needed to fuel the facility is being procured through long-term contracts with farmers and contractors located within a 50-mile radius. Running currently on 100% straw, Elean Power Station also has the capability of using a range of biofuels and up to 10% natural gas. Whatever the exact make-up of its fuel in the course of its life, the plant represents an important first in the development of renewables in the UK and a significant step forward towards the Government's objectives for renewables deployment over the coming years.

31 Stations that are powered by co-firing may have an important role to help deliver biomass and energy crops and in delivering renewable energy capacity quickly at relatively low cost. Under the current Renewables Obligation arrangements, electricity generated from biomass by co-firing in existing generating stations are eligible for Renewable Obligation Certificates (ROCs) subject to two restrictions. Only electricity generated before 1 April 2011 will be eligible and from 1 April 2006 at least 75% of the biomass must consist of energy crops.

- 4.51 The Government's Strategy Unit published a report in November 2002<sup>32</sup> on its review into the delivery of our Waste Strategy 2000<sup>33</sup>. The report includes the recommendation that we should ensure that there are financial incentives to develop new waste technologies, such as pyrolysis, gasification and anaerobic digestion. **We are now considering the recommendations of the report.**

### **Wave and tidal are further off but potentially very important ...**

- 4.52 Wave and tidal technologies are rather further from commercialisation, with a number of competing designs. The UK is at the forefront of these technologies. On the island of Islay, we have the only commercially operational wave-power station in the world. Yet progress from research and development to more general commercial application has been slow. But, as recognised in the Chief Scientific Adviser's review, the UK has an opportunity here to develop world-leading expertise.
- 4.53 **Recognising this, we are supporting industry to develop prototype wave and tidal technologies in projects off the Western Isles and Devon coasts. We are also supporting, along with the Scottish Executive and others<sup>34</sup>, the establishment of a marine test centre off the coast of the Orkney Islands. This centre, a first in Europe, is expected to open later this year.** We are determined that wave and tidal technologies should be given the opportunity to play the fullest part they can in the

expansion of generation from renewables. This in turn can create another significant opportunity, with world-wide application, for our manufacturing sector.

### **Energy from the Oceans - The Stingray Project**

Funded under the DTI's Renewable Energy Programme, a Northumberland-based company The Engineering Business has successfully developed its ideas for a tidal stream generator system '*Stingray*' from concept through to demonstration stage. In September 2002, following early design work carried out under Phase 1 of its project, a 150kW full-scale prototype weighing 180 tonnes was built, installed and successfully operated on the seabed in Yell Sound, Shetland.

With early results encouraging, the technology will continue to be developed with further offshore testing planned this year. The company has plans to commence installation of a 5MW '*Stingray*' power station with connection to the local distribution network in summer 2004.

- 4.54 Large-scale tidal barrages have the potential to make a significant contribution to carbon reductions in 2020 or beyond. But such schemes have a very substantial impact on the local and regional environment and are very expensive, though some of the costs could be offset by other benefits. It is clear that plans for a Severn Barrage would raise strong environmental concerns and we doubt if it would be fruitful to pursue it at this stage. Tidal barrages may be capable of offering major renewable projects which will help us reach our goals and we will continue to explore opportunities.

32 *Waste Not, Want Not* (Strategy Unit, November 2002) [www.piu.gov.uk/2002/waste/report/index.html](http://www.piu.gov.uk/2002/waste/report/index.html)

33 *Waste Strategy 2000 for England and Wales* (Defra, 2000). [www.defra.gov.uk/environment/waste/strategy/cm4693/pdf/wastvol1.pdf](http://www.defra.gov.uk/environment/waste/strategy/cm4693/pdf/wastvol1.pdf)

34 The Carbon Trust, Scottish Enterprise, Highlands and Islands Enterprise, Orkney Islands Council.

## Solar PV is a potentially very large market...

- 4.55 The costs of solar PV technology have fallen substantially over the last 25 years and are widely expected to fall further as global markets expand. We committed in the *Opportunities for All* white paper<sup>35</sup> to embarking on a major initiative with industry and others to achieve a UK solar PV demonstration programme in line with those of our main competitors. The current programme, worth £20m over 3 years, is the first stage of this process.
- 4.56 At present solar PV qualifies for the Renewables Obligation. In practice almost all schemes are too small to generate the minimum 0.5MWh a month to qualify for a ROC<sup>36</sup>. **We will explore whether there is scope through the European renewables Directive to help bring smaller sources of generation within the Renewables Obligation. Through the Distributed Generation Co-ordinating Group, we are also exploring the scope for developing simpler metering arrangements to help micro generators (including solar PV) obtain a fair value for the surplus electricity they export to the grid.**
- 4.57 The Chief Scientific Adviser's Energy Research Review Group also identified solar PV as a key research area and specifically recommended that work on novel emerging systems, such as organics and polymers, could offer major decreases in the costs of production.

35 *Opportunities for all in a World of Change* (DTI, 2001) [www.dti.gov.uk/opportunityforall/pages/contents.html](http://www.dti.gov.uk/opportunityforall/pages/contents.html)

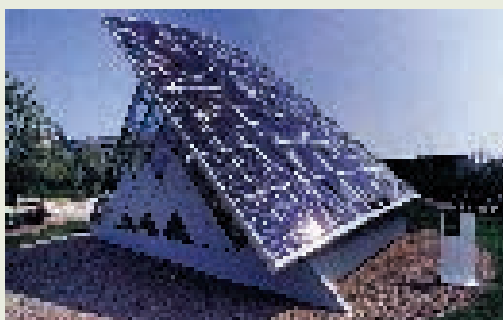
36 Eligible renewable generators receive ROCs for each MWh of electricity generated. These certificates can then be sold to suppliers. In order to fulfil their obligation, suppliers can either present enough certificates to cover the required percentage of their output, or they can pay a "buyout" price of £30/MWh for any shortfall. All proceeds from buyout payments are recycled to suppliers in proportion to the number of ROCs they present.

## Fuel cells offer a longer-term advantage...

- 4.58 Fuel cells produce electricity from hydrogen and air, with water as the only emission. Potential applications include stationary power generation, transport (replacing the internal combustion engine - as described more fully in chapter 5) and portable power (replacing batteries in mobile phones, laptop computers etc). Fuel cells also have the potential to help renewables produce more stable supplies. Hydrogen can be generated when electricity demand is less than that being generated by the renewable energy source. This can then be converted to electricity via the fuel cell when electricity demand exceeds that being generated by the renewable energy source.
- 4.59 To ensure that the UK is at the cutting-edge of fuel cells technology, **we will:**
- **following the Fuel Cells Market Study<sup>37</sup> funded jointly by DTI and the Carbon Trust, work with industry to produce a Fuel Cells Vision for the UK;**
  - **launch a new industry network, Fuel Cells UK, in May through which the industry can collaborate and work with us in implementing the vision (see Fuel Cells UK box);**
  - **develop a web-based fuel cells exchange so that global information can be accessed quickly and easily by UK industry;**

37 *Review of Fuel Cells Commercial Potential for DTI and the Carbon Trust* (E4Tech, 2003) [www.dti.gov.uk/energy](http://www.dti.gov.uk/energy)

- **develop a research programme dedicated to fuel cells to be funded jointly by EPSRC, DTI and the Carbon Trust;**
- **review the objectives of the DTI research and development programme;**
- **encourage UK organisations to work with the DTI's International Technology Service to identify potential partners and to participate in European collaborative research and development (R&D) projects including the EUREKA programme and to complement work by National Contact Points<sup>38</sup> to support participation in the EU's 6th Framework Programme;**
- **in collaboration with the EPSRC, review the supply of doctorates and MScs with the requisite skills; and**
- **working with the Carbon Trust, DTI's Small Business Service and Regional Development Agencies, support new start-ups in this sector.**



## Fuel Cells UK

Interest in fuel cells across the world has never been higher as commercialisation draws closer. The UK has a significant number of fuel cell players but there is no established forum to enable the industry to come together and to raise its profile. Fuel Cells UK is being established to foster the development of a UK industry, to raise the profile of fuel cell activity in the UK, and to act as central liaison point for national and international activity.

Fuel Cells UK will become the first point of contact for information on UK fuel cell activities. It will develop and distribute relevant promotional material (including a UK capabilities guide) and will foster partnering by linking potential partners together. Its activities will be guided by a high-level steering group which will ensure that its activities have maximum relevance for industry.

Fuel Cells UK will work closely with existing and new initiatives across the UK to build synergies and optimise the outcomes for both the industry and other stakeholders (including Government). One such DTI initiative will be Fuel Cells Forum, a network for industry, academia, venture capitalists and Government stakeholders in fuel cells to exchange and disseminate information.

Fuel Cells Forum will enable organisations to highlight their activities, and for industry to pose challenges to the research community. The DTI's International Technology Service offers the possibility for stakeholders to identify and engage overseas partners and keep abreast of developments overseas.

<sup>38</sup> National Contact Points provide an information and assistance service for UK organisations seeking R&D support from the EU's Framework Programme for Research and Development.

## Research is needed to give us new options for the longer term...

- 4.60 Technology will almost certainly surprise us in the field of renewables as elsewhere. **To expand the knowledge base we have already provided an extra £8 million to the Research Councils specifically for renewables research over the next three years. This is part of a new £28m investment in support of sustainable energy research.** The money will be spent on fundamental research into a range of technologies, consistent with the recommendations of the Chief Scientific Adviser's Energy Research Review Group.
- 4.61 We also need to support industry in taking the new ideas generated in the laboratory to the point where they can enter the market. We have increased the amount available to support industrially-led research and development through the DTI (£19m per year) and the Carbon Trust (£5m per year).

## Renewables offer big opportunities for UK business...

- 4.62 The growth in the global renewables market offers considerable opportunities for UK companies to create jobs in manufacturing, services and supplies and to improve their export capabilities. The development of windfarms is already producing new jobs in manufacturing<sup>39</sup>. Renewables UK will help to secure benefit for UK industry in the renewables market.

<sup>39</sup> The world's leading wind turbine manufacturer, Vestas, established a turbine manufacturing base at Campbeltown in the Kintyre peninsular creating 130 jobs. Cambrian Engineering is establishing a wind turbine tower and offshore pile manufacturing and assembly operation at Arnish in the Isle of Lewis, expected to create 65 jobs.

- 4.63 If the UK is to compete globally, projects need to move out of the R&D stage into commercialisation. We have a role to play in facilitating this. **Through Renewables UK we will develop by April 2004 programmes and tools to assist the UK renewables supply chain.**

## Widening the renewables obligation certificate market...

- 4.64 The Northern Ireland Executive has recently brought forward an Energy Bill containing provisions to introduce a Northern Ireland Renewables Obligation. **We are considering with the Scottish Executive how we might devise a system allowing mutual recognition of Renewable Energy Certificates under the Renewables Obligation and those in Northern Ireland under their future Obligation.**

## The international community has a role to play...

- 4.65 The World Summit on Sustainable Development (WSSD) took place in Johannesburg in August/September 2002. The Summit brought together 180 countries who reaffirmed the international community's commitment to sustainable development through action to provide access to clean water, sanitation and sustainable energy, and to protect biodiversity, the oceans, fish stocks and natural resources. The Summit agreed joint actions urgently and substantially to increase the global share of renewable energy sources.<sup>40</sup> At the Summit the Prime Minister announced that the UK's Export

<sup>40</sup> [www.johannesburgsummit.org/](http://www.johannesburgsummit.org/)

Credit Guarantee Department will make available £50m per year to renewable energy exports to developing countries. The Sustainable Energy Exports Committee will work to deliver this commitment. At WSSD, the UK also launched and is taking forward an international partnership to promote the growth of renewable energy and energy efficiency systems (REEEP).

### **A Renewable Energy and Energy Efficiency Partnership (REEEP)**

REEEP aims to deliver our WSSD commitments on energy and take forward the recommendations of the G8 Renewable Energy Task Force for removing the policy, technical, market and regulatory barriers to renewable energy and energy efficiency.

Interested partners include governments from OECD and non-OECD countries, businesses, non-Governmental organisations and international agencies committed to accelerating the market development of renewable energy and energy efficiency technologies.

The partnership will focus on:

- state-of-the-art policies for power sector reform and building on best regulatory practice to promote distributed energy systems;
- innovative financing and tradable certificates for renewable energy and energy efficiency projects; and
- evaluation and awareness raising of the non-carbon reduction benefits of renewable energy such as energy security, rural development and export opportunities

4.66 **We will integrate the WSSD agreements and relevant follow-up into UK policy and action with a clear focus on the use of technological innovation to deliver sustainable development. We will work with like-minded states to promote the deployment of renewable sources of energy in developing countries, building on the initiatives launched at WSSD as well as encouraging investment in appropriate energy infrastructure.**

### **We do not propose new nuclear build...**

- 4.67 As chapter 1 makes clear, our priority is to strengthen the contribution that energy efficiency and renewable energy sources make to meeting our carbon commitment. We believe that such ambitious progress is achievable, but uncertainties remain.
- 4.68 While nuclear power is currently an important source of carbon free electricity, the current economics of nuclear power make it an unattractive option for new generating capacity and there are also important issues for nuclear waste to be resolved. This white paper does not contain proposals for building new nuclear power stations. However, we do not rule out the possibility that at some point in the future new nuclear build might be necessary if we are to meet our carbon targets. **Before any decision to proceed with the building of new nuclear power stations, there would need to be the fullest public consultation and the publication of a white paper setting out the Government's proposals.**

## But we are not seeking to shut existing stations prematurely...

- 4.69 The financial problems of the private sector nuclear electricity generator, British Energy, are well known. These problems are about a company, not about the future of nuclear power. Our main objectives with regard to British Energy continue to be the safety of its nuclear power stations and the security of electricity supplies to the grid and consumers. British Energy's nuclear power stations will continue to generate electricity. And since the revenue from continuing to run those stations more than covers the avoidable costs of their operations, this revenue can be put towards paying for the nuclear liabilities that are already incurred and cannot now be avoided.
- 4.70 Under the company's restructuring proposal, announced on 28 November 2002, which is subject to the approval of the European Commission, we are taking on financial responsibility for the company's historic spent nuclear fuel liabilities. We are also, to ensure safety and environmental protection, underwriting new and enhanced arrangements by the company to meet decommissioning and other liabilities. On 14 February 2003, British Energy secured the agreement in principle of its financial creditors to its restructuring proposal.

### Managing the Nuclear Legacy

Irrespective of decisions on future nuclear build, the legacy of nuclear waste has to be dealt with safely, securely and cost effectively in ways that protect the environment for current and future generations. We have announced our intention to make radical changes to arrangements for nuclear clean-up funded by the taxpayer. The white paper *Managing the Nuclear Legacy*<sup>41</sup> set out proposals for a new authority, the Nuclear Decommissioning Authority (NDA), to deal initially with the historic liabilities already funded by the taxpayer, which represent 85% of total UK nuclear liabilities. The NDA will set a framework for a clean up programme over the long-term, securing best value for money consistent with high safety, security and environmental standards, and using the best available skills through competitive markets for clean-up contracts. Preparation for the necessary legislation is underway.

#### **For nuclear sites outside the NDA remit, we will seek to ensure there are adequate resources set aside to provide for clean-up.**

In 2001, the Government and the Devolved Administrations for Scotland, Wales and Northern Ireland published *Managing Radioactive Waste Safely*,<sup>42</sup> a proposed programme of action for deciding how best to manage the UK's solid radioactive waste in the long-term. Having considered responses to the proposals, we announced in July 2002 that we would set up a new independent body to oversee a review of different ways of managing the waste, and to recommend a national strategy to Ministers. We hope to receive recommendations and announce the strategy by 2006.

41 July 2002, CM5552

42 *Managing Radioactive Waste Safely, 2001*  
[www.defra.gov.uk/environment/consult/radwaste/pdf/radwaste.pdf](http://www.defra.gov.uk/environment/consult/radwaste/pdf/radwaste.pdf)