Renewable Energy in the UK –
Building for the Future of the Environment

Executive Summary

- In March 2001, the Prime Minister announced that an additional £100 million would be made available to support those renewable technologies identified by the Performance and Innovation Unit (PIU) in its work on the future of UK renewable energy.

- The Prime Minister said that the extra money would *"help us to promote solar PV, give a boost to offshore wind, kick start energy crops, and bring on stream other new generation technologies*".

- In response to the Prime Minister's announcement, the PIU focused its work on the state of renewable energy in the UK today, and the barriers to its development over the next ten years, the next twenty years and over the long-term to 2050.

- Working closely with other Government Departments and devolved administrations, and in consultation with external experts, the PIU has produced a series of recommendations for the allocation of the additional £100m funding.

- The funding will help to develop renewable energy in the UK, building for the future of the environment.

- The list overleaf highlights the way in which the funding will be used. This will help in the delivery of our environmental commitments, and in the development of new technologies for the future.

- The Government has in place a target to increase the contribution of licensed electricity sales from eligible renewables to 10% by the end of 2010. A package of policies to help deliver these targets is already in place. But the extra funding announced here will provide even more of a boost to deliver our commitments, by:

    - Helping to get offshore wind off the ground;

    - Developing heat and electricity markets for energy crops, demonstrating new technologies, and building up the necessary infrastructure for energy crops;

    - Doubling the support available under the Government's intended major demonstration of innovative solar photovoltaics (PV);

    - Support for renewable heat technologies;

    - Encouraging and promoting renewable energy in households and local communities;

  - Facilitating the connection of renewable sources to the UK's electricity network;

  - Taking forward the development of wave and tidal stream technologies;

  - Almost doubling the budget for fundamental research that will develop the next generation of renewable technologies.

- It is also clear that the case for further funding will need to be reviewed in the light of progress.

Summary of Additional Funding (more detail is given in Annex 1)

- £25m for offshore wind
- £15.5 m to help farmers and foresters establish energy crops
- £10m dedicated to innovative PV schemes
- £10m for PV, solar hot water, biomass heat and other technologies that can be utilised directly in homes, communities and businesses
- £5 million for demonstration and testing of wave and tidal technologies
- £18 million for development and demonstration of advanced energy crop technologies
- £10 million for fundamental research on the next generation of renewable energy technologies.
- £4 million for advanced metering and control technologies
- £2.5 million to provide information and support for land use planning purposes.

Renewable Energy in the UK –
Building for the Future of the Environment

1. Introduction

1.1 What this report is about

Renewable sources of energy are important for the environment and for business

Renewable sources of energy, such as wind, biomass fuels or solar energy emit no greenhouse gases in generating electricity, or are carbon-neutral over their life cycle. Because of this, renewable energy will have a key role to play as part of our response to climate change, and the UK policy on renewables is one of a range of initiatives to support the development of a more sustainable approach to energy use.

There are, however, wider reasons for developing renewable sources of energy in the UK. Green technologies are on the verge of becoming one of the next waves in the knowledge economy revolution. The global market for environmental goods and services is projected to rise to £440 billion by 2010[1], and renewable sources of energy could take a large part of that market.

The £100 million is one element of the Government's policy to develop renewable sources of energy in the UK

The UK is well placed to exploit this opportunity by building on its strong science base, its liberalised energy markets and its excellent potential for renewable resources in areas such as wind energy, wave energy, tidal power and energy crops. The Government has already announced a series of measures to support the development of renewable energy in the UK. This report builds on that existing policy by making an assessment of the challenges we face, and identifying the most effective uses of the additional £100m funding.

1.2 Origin and remit of the report

The analysis underpinning this report stems from a PIU project on "Resource Productivity and Renewable Energy"

The Performance and Innovation Unit (PIU) was asked in January of this year to undertake a project entitled "Resource Productivity and Renewable Energy". This project had three separate workstreams:

- Development of a **resource productivity** framework as a means of joining-up the Government's existing productivity, sustainable development and environmental policies.

[1] Prime Minister's speech on the environment, March 6, 2001, full text available at http://www.number-10.gov.uk/news.asp?month=3&year=2001&SectionId=32.

- Application of the framework to **energy productivity**, resulting in policy recommendations in the context of 2010 greenhouse gas emission targets, and the likely levels of energy productivity improvement needed to 2050.

- Analysis of the current state of **renewable energy** in the UK, focusing on barriers to the delivery of 2010 targets and of the new technologies that will be needed over the longer term to 2050.

A report based on the first of these workstreams will be published later this year. The second and third workstreams have been incorporated into the review of energy policy also being carried out by the PIU, while the specific analysis of the £100m funding is detailed in this report[2].

The additional £100m for renewables was to be allocated on the basis of this analysis

In March of this year, the Prime Minister noted that he had asked the PIU to undertake a major study into the future of UK renewable energy, and announced the availability of a further £100 million to support those technologies identified by the report[3]. The Prime Minister said that the funding would *"help us to promote solar PV, give a boost to offshore wind, kick-start energy crops, and bring on stream other new generation technologies"*.

Following on from the announcement, the PIU instigated a work programme involving all relevant Government Departments and devolved administrations, and drawing on advice and input from external organisations, academics and industry representatives. The aim of this work programme was to make recommendations to Government on the most effective use of the additional £100m. It is these recommendations that underpin the results presented in this report. The work programme also raised a number of other issues relating to the wider energy system context within which renewable sources operate. These issues are being taken forward in the PIU review of energy policy.

1.3 How the study was carried out

The PIU's analysis took place over a three stage process

The PIU worked closely with other Government Departments and devolved administrations in taking forward the work programme described above. It also consulted very closely with external experts. The work programme followed three distinct stages:

1) **Information gathering**. PIU undertook a series of interviews, meetings and seminars with industry experts from inside and outside Government,

[2] Further details on these PIU projects are available from the PIU website, at http://www.cabinet-office.gov.uk/innovation
[3] Prime Minister's speech (March 2001), op cit.

gathering anecdotal information and hard facts about the current state and future prospects for renewable energy.

2) **Quantitative and qualitative analysis**. Using this information, PIU undertook quantitative and qualitative analysis of the prospects for renewable energy to 2010, 2020 and over the longer-term to 2050. This stage of the work programme drew heavily on modelling work undertaken by OXERA and on expert advice from Imperial College Centre for Energy Policy and Technology (ICCEPT).

3) **Inter-Departmental agreement.** During and after stages one and two of the work programme, PIU worked with other Government Departments to develop agreed Government views on the key issues.

This report highlights some of the key issues and analyses that fed into the work programme, and enabled the Government to reach its conclusions on the best use of the £100m. Section 2 provides some background on the role of renewable energy, and the current policy context within which it operates. Section 3 outlines the analytical approach that was taken, looking at the conclusions reached about the future prospects for renewable energy. Section 4 explains how the analysis was used to arrive at conclusions for the best use of the funding. Section 5 explains what happens next, and sets out what needs to be done by those interested in applying for any of the funding.

2. Renewable Energy in the UK

2.1 The role of renewable energy

Renewable energy comes from sources that are not depleted by use

Renewable energy is that which can be harnessed in such a way that the source of the energy is not depleted. The energy derived from fossil fuels (gas, coal, oil) is not renewable, because once the fossil fuel is burned to provide energy, it is gone forever. In contrast, renewable energy is derived from the sun, the wind, the heat at the earth's core, crops that can be replanted or the flow of rivers or tides. When energy is harnessed from any of these sources, there is no reduction in the energy that can be taken from them in the future.

Renewable energy sources are often subject to some constraints …

In view of this characteristic, energy from renewable sources clearly has its attractions. But with supplies of fossil fuels seemingly abundant, the market has not attached very much value to renewable energy. In addition, many renewable sources of energy tend to be constrained by location (e.g. a windy site, a river, a tidal estuary) and because they are often linked to natural phenomena (sunshine, the strength of the wind, etc.), they cannot be turned on and off at will[4]. Both of these problems complicate the development of renewable energy.

… But they can make an important contribution to a number of policy goals

One of the key benefits of renewable energy is the fact that it does not add to emissions of greenhouse gases in its operation. This is in direct contrast to the combustion of fossil fuels, which is by far the largest source of these emissions. However, without Government intervention to internalise the costs of greenhouse gas emissions, renewable energy cannot extract a premium for this benefit. Renewable energy can also contribute to diversity and energy security, as well as creating new industries, job opportunities and export markets. The role of renewable energy in delivering the objectives of energy policy is being considered in the PIU review of energy policy.

2.2 Renewable energy in the UK

Support for renewable energy in the 1990's came mainly from the Non-Fossil Fuel Obligation and supporting programmes

The UK Government has been supporting the development of new and renewable sources of energy since the mid-1970's. Most notably, renewables were included in the Non-Fossil Fuel Obligation (NFFO) in 1990. Under NFFO, electricity from

[4] Exceptions are energy crops and energy-from-waste, which are no more constrained by location than other sources of energy, and which provide an energy source that can be turned on and off at will; and pumped hydro, which although location-specific, can be matched to demand.

renewables was provided with a guaranteed market for a set period at premium prices, subsidised by a levy on electricity consumers.

The contracts for renewable generation were awarded by technology type through competitive tender, the intention being to create an initial market while putting downward pressure on the costs of subsidy. There have been five rounds of bids in England and Wales, three in Scotland (under the Scottish Renewables Obligation, SRO) and two in Northern Ireland (under the Northern Ireland NFFO). NFFO supported a number of technologies including landfill gas (combustion of the methane naturally emitted by decomposition of waste at landfill sites), onshore wind, small-scale hydro, biomass (combustion of forestry products and crops where replanting occurs) and wave energy (under the SRO). Some of the output from energy-from-waste schemes supported by the NFFO would not now be classed as renewable, since the source was not always biodegradable.

A supporting programme ran alongside the NFFO, aimed at stimulating the development of a range of new and renewable technologies. Many of the projects in receipt of the grants from this programme were relatively small (< £100,000) and many of the grants were for monitoring and evaluation, with much of the capital raised separately.

Utilities Act 2000 ushered in a new legal framework for renewable energy in England, Wales and Scotland

The Government announced in February 2000 that there were to be no further NFFO Orders, although existing NFFO contracts would be honoured. The Utilities Act 2000 gave the Government powers to put in place a Renewables Obligation (RO) in England and Wales – the new centrepiece of the Government's support for renewable energy in those countries, discussed in more detail below. Executive devolution of parts of the Utilities Act also gave Scottish Ministers the power to establish a separate Renewables Obligation Scotland (ROS) and to exclude specific generation technologies. This reflects the fact that certain powers relating to renewable energy are executively devolved to the Scottish Executive.

Energy policy in Northern Ireland is governed by separate legislation

Energy policy is also largely devolved in Northern Ireland. Northern Ireland was not covered by the Utilities Act and as a result, there is currently no legislation to enable a Renewables Obligation to be placed on Northern Ireland suppliers. However, support for renewable energy in Northern Ireland is being reviewed, and work has started on preparing separate Northern Ireland Utilities legislation, which is likely to be broadly similar to the provisions in England and Wales. Until then, the electricity and gas industries will remain regulated under separate Northern Ireland legislation which largely mirrors the equivalent Great Britain Gas and Electricity Acts prior to the passing of the Utilities Act.

2.3 A new strategy for renewable energy

Government now has in place a range of measures to support renewable energy

The Government has set itself a target of securing 10% of electricity from eligible renewable sources by 2010. There are four elements to the new strategy in support of renewable energy:

- The Renewables Obligations
- Climate Change Levy (CCL) Exemption
- Capital Grants (& Planting Grants for Energy Crops)
- Research & Development Programme

Renewables Obligation

The Renewables Obligations require licensed suppliers to purchase at least a specified proportion of renewable electricity from eligible sources

The Renewables Obligations require electricity suppliers in Great Britain to purchase a certain proportion of renewable electricity from a range of eligible sources. The Government's preliminary proposals for the Renewables Obligations were published in October 2000[5]. Over 200 responses were received and these have been taken into account in preparing the detailed proposals published in August 2001[6]. State Aid clearance on these proposals is currently being sought from the European Commission. Following this statutory consultation, the Government intends to lay an Order before Parliament to implement its final proposals.

Compliance with the Renewables Obligations will be demonstrated using Renewables Obligation Certificates

Full details on the expected operation of the Obligations may be found in the consultation document published in August 2001. One of the key features is that compliance with the Obligations will be demonstrated by presenting Renewables Obligation Certificates (ROCs) to the Gas and Electricity Markets Authority, Ofgem, in respect of generally year-long periods. These certificates will usually be issued to accredited generators for eligible renewable electricity generated within the UK, its territorial waters and Continental Shelf, and supplied to customers in Great Britain.

If insufficient ROCs are presented to Ofgem by a specified date, a buy-out price must be paid

Under the Obligations, electricity suppliers can comply by:

- buying ROCs from an accredited renewable generator; and / or
- buying ROCs from other suppliers / traders who have bought more than they need (through the trading of ROCs);

[5] Department of Trade and Industry (2000). "New & Renewable Energy – Prospects for the 21st Century: The Renewables Obligation Preliminary Consultation". London: DTI.
[6] Department of Trade and Industry (2001). "New & Renewable Energy – Prospects for the 21st Century: The Renewables Obligation Statutory Consultation". London: DTI

and / or, as an alternative to supplying renewable energy, by:

- paying Ofgem the "buy-out price" of (currently) £30/MWh[7] for each unit the supplier is under obligation.

The August 2001 consultation document explains how the Obligations will be structured to encourage compliance through ROCs rather than through the buy-out.

The proportion of renewable electricity required under the Obligations will increase between now and 2010

The proportion of electricity that energy suppliers would be required to source from renewables is expected to increase over the period of the obligation. It is proposed that the obligation would account for around 3% in the first compliance period ending 31 March 2003, rising to about 10.4% in the year ending 31 March 2011. To provide long term security for investors, the Obligation will then continue to apply at a minimum of 10.4% of sales until 2027.

Climate Change Levy Exemption

Renewable generation is exempt from the Climate Change Levy

From 1st April 2001, a climate change levy has been payable on the use of energy by all non-domestic (industrial, commercial and public sector) customers throughout the UK. The rate for electricity is 0.43p/kWh[8]. Renewable generation (excluding hydro over 10MW) is exempt from the CCL. This means that suppliers who sell eligible renewable electricity to non-domestic customers are exempt from the Climate Change Levy for that supply. Some of the resultant savings will be shared with generators.

There are risks associated with how much value renewables generators will be able to appropriate

One of the key issues for potential renewable generators will be whether or not the value they can appropriate from the Renewables Obligation plus the CCL exemption is sufficient for renewables generation to be commercially viable. The buy-out price has been set at a level such that the Government's renewables target should be achievable. However, there is a *risk* that in the competitive market, renewables generators may not be able to appropriate all of the value of the buy-out price or the CCL exemption. In addition, there is a risk that wider cost reductions may drive down the market price for electricity below the expected level. These risks mean that the viability of marginal technologies (see Section 3) is highly questionable.

Capital Grants

Capital grants can help the economics of marginal technologies

[7] Until 1 April 2003, thereafter to be adjusted in line with the retail price index (RPI).
[8] The value of this exemption drops to 0.086 p/kWh for those energy intensive companies entering into Climate Change Agreements and only paying 20% of the full rate.

One means of providing additional support is through capital grants. In this situation, a generator is able to bid for a capital grant, which could bring down their costs of generation (p/kWh) to within the expected price cap.

Table 1 sets out the current sources of capital grants or planting funds available to renewable energy technologies on a UK basis. It can be seen that in addition to the availability of capital grants, energy crops also benefit from DEFRA's provision of £29m in planting grants in England; and in Wales, the National Assembly's Farm Woodlands and Biomass strategy group, is developing a similar support scheme for energy crops. This reflects the fact that, unlike other renewable energy technologies, the energy source for energy from crops is not immediately available, and needs to be grown. Given the currently high cost of establishment the planting grant is paid to growers for each hectare of crop established. Harvesting of short rotation coppice (SRC) commences 4 years after planting (2 years for miscanthus).

Table 1: UK Sources of Funding for Capital (and Planting) Grants

Budget	**Technology / Source**	**Level of Funding**	**Timescale**
DTI SR2000 Allocation	Offshore Wind	£39m	3 years from 2001-02 to 2003-04
DTI SR2000 Allocation	Photovoltaics (PV)	£10m	3 years from 2001-02 to 2003-04
New Opportunities Fund (NOF)	Total o/w • Energy crop technologies • Offshore wind • Small scale biomass heat / CHP	£50m o/w • > £33m • > £10m • > 3m	All to be committed by 2005
DEFRA Planting Fund (England only)	Energy Crops[9]	£29m	All to be committed by 2006

Capital grants will play a crucial role in kick starting the deployment of technologies that are not quite commercially viable. It is at the stage of moving from R&D to construction of fully operational demonstration plant that many renewable energy technologies have fallen in the past.

Research and Development

DTI provides funding on a UK basis for R&D into a range of new renewable technologies

[9] Short Rotation Coppice and Miscanthus crops qualify for planting grants under this scheme.

DTI's UK budget for R& D into renewable technologies is £18m per annum for the 3 years from 2001/2. This covers a wide range of renewable energy technologies – including wind energy, hydro, solar, biofuels and fuel cells. Further funding of £3.5m per annum to support R&D activities is also available from the Engineering and Physical Sciences Research Council (EPSRC), and other Research Councils are spending small amounts on renewables projects. Existing research projects totalling £11m are under way.

2.4 The institutional and regulatory context for renewable energy

Renewable energy operates within a wider context of energy policy and other influences

In understanding the current status and prospects for renewable energy in the UK, it is important to look at the wider context within which renewable energy has to operate. The Utilities Act 2000 has already been discussed in the context of its role in establishing the Renewables Obligations. But the Act also provided for the New Electricity Trading Arrangements (NETA), and established the regulatory regime for networks, infrastructure and connections – aspects of the energy system that have not yet been subject to liberalisation. Both of these are important in setting the wider framework within which renewable energy operates, as is the planning system through which renewable energy projects must seek planning permission.

The New Electricity Trading Arrangements

The New Electricity Trading Arrangements provide a new system for buying and selling electricity

The New Electricity Trading Arrangements (NETA) commenced in England and Wales in March 2001. They encompass the basic principle that those wishing to buy and sell electricity should be able to enter into freely negotiated contracts to do so. In practice, traders of electricity may buy more or less energy than they have sold; and the customers of suppliers may consume more or less energy that their supplier has purchased on their behalf. The central NETA balancing and settlement systems are designed to measure these surpluses and deficits (or imbalances) and to determine the prices (or imbalance charges) at which they are to be settled in order to send out invoices and payments for them. The payment for these imbalances is intended to reflect the costs that out-of-balance participants place on the system, so that the incentive within the system is to encourage all generators and users to be predictable in their supply and demand.

The PIU review of energy policy will assess the likely impact of NETA on renewable energy

In September, Ofgem published two reports on the early performance and effect of NETA. Ofgem concluded that thus far, on the basis of three months operation, NETA was bedding down well – but recognised that there had been significant falls in the output from and prices earned by certain small generators. Ofgem's reviews of early NETA operation and the impact of NETA on smaller generators, and possible

remedial measures will be the subject of a consultation by DTI. The PIU review of energy policy will also be considering the issue in some detail.

Regulation of Networks

Many renewable energy sources will link to regional or local distribution networks

Although it is not the case for all renewable sources of energy, many will be optimally linked to regional or local distribution networks rather than to the national transmission network. An Embedded Generation Working Group (EGWG) was established specifically to address these issues and reported in March 2001. A DTI / Ofgem Working Group (the Embedded Generation Co-ordinating Group) is being established to implement the recommendations of the EGWG across Great Britain. The PIU review of energy policy will be linking in with this ongoing process, and may make additional recommendations.

Planning Permission

Success in gaining planning permission varies greatly across different technologies

Over the last decade, around 89% of renewable energy projects have gained planning permission, which is in line with acceptance rates for other types of planning applications[10]. However, when examined across the range of renewable energy technologies, success in gaining planning permission varies greatly.

Landfill gas projects have fared particularly well, as the additional requirements of power generation on a landfill site are minimal. If these projects are removed from the headline statistic, then only around 71% of renewable energy projects (with NFFO contracts) that have applied for planning permission have been successful. The larger wind farms (above 1MW) awarded contracts under NFFO have encountered the most severe problems in gaining planning permission and only 41% of projects that have applied for planning permission under the later rounds of NFFO (orders 3 – 5) have been successful. Biomass projects have also encountered a number of difficulties gaining planning permission.

Attitudes towards local renewables schemes are likely to be just as important as the planning system itself

The Government is reviewing the operation of the planning systems (in England) and propose to issue a Green Paper by the end of the year. The National Assembly for Wales is also currently reviewing its planning policy guidance and the Scottish Executive has recently revised its national planning guidance for renewable energy developments. But just as important as the planning system itself is the attitude taken to renewable energy schemes by local communities. Public opinion surveys show that the majority of the UK's population support the development of renewable energy. Moreover, there is considerable evidence that local populations tend to become more favourably disposed towards local renewable energy power plants once they are built.

[10] Figures based on all renewable energy projects up to and including Dec 2000 – data collected by ETSU under the New and Renewable Energy programme.

This, however, does not translate into a “cultural” perception that Britain is supportive of renewables, as would be perceived in (for example) Denmark, Spain or Germany. And this support for renewables at a very generalised level has not prevented opposition to individual projects at the local level.

Planning systems and the issue of community involvement are both being addressed in the PIU review of energy policy.

3. Analysis of Prospects for Renewable Energy

3.1 Analytical Approach

Looking to 2010 and 2020, the analysis has been based largely on a model of renewables entry

The PIU commissioned OXERA to carry out an analysis of the likely entry of renewable generation between 2002 and 2020 in response to the Renewables Obligations. OXERA based their work on a model designed to show the potential market penetration of a number of technologies following the introduction of ROCs. By altering the underlying assumptions, the model is able to explore a range of potential scenarios.

The model explicitly analyses the prospects of a number of key renewable energy technologies, including:

- Onshore wind;
- Energy crops;
- Energy from waste (the bio-degradable fraction of advanced technologies);
- Landfill gas;
- Offshore wind.

In addition, the model also includes large and small hydro, existing biomass (e.g. from forestry woodfuel) and photovoltaics (PV). The contribution of these technologies is calculated deterministically. The entry of the key modelled technologies depends on a range of assumptions such as current costs, likely cost trends, build rates and electricity market values and prices.

The OXERA model enables the analysis of a number of possible scenarios

The analysis has enabled an assessment to be made of the likely entry of renewables in the context of the economics of electricity generation, and in the context of the barriers discussed above. The model does not enable us to deal explicitly with different policy options, such as a tax credit for basic R&D, or a change to planning regulations. However, it does allow us to draw some conclusions about the possible impact of these and other such measures, by changing the input assumptions in such a way as to proxy the effect of the measure. A range of scenarios has been used to assess the sensitivity of renewable generation to key assumptions.

Looking to the longer term, analysis has been based around the potential benefits of moving technologies along their "learning curves"

The whole context for this analysis is provided by the anticipated reductions in greenhouse gas emissions that will need to be made over the next 50 years. The contribution of renewable energy to 2010 greenhouse gas targets has already been determined by the adoption of the 10% target. Although the contribution of renewable energy in later periods – particularly to 2020 and to 2050 – is being addressed in the PIU review of energy policy, renewable energy sources could make a very large

contribution to UK energy supply in the long term. What is clear is that at this stage, the UK needs to maintain as many options as possible for delivering emissions reductions, and for maintaining security of supply.

The quantitative approach of the OXERA model is not feasible for the longer-term out to 2050. This is because data is unavailable, and uncertainty is too great. As a result, PIU worked with OXERA and with ICCEPT on an assessment of the benefits that can accrue from moving technologies along their learning curves. Learning curves relate the costs of a technology to the installed world-wide capacity. A learning index measures the rate at which costs fall as the technology is developed.

There are two types of learning benefit – relating to domestic deployment and to export

In bringing forward the development of technologies that will contribute to targets in the future – and in stimulating and supporting "blue skies" research to maximise the likelihood of further innovations – there are two types of learning benefits that can apply:

- If technologies are to be deployed ultimately in the UK, the benefits will be felt through cheaper achievement of greenhouse gas emission targets in the UK.

- If technologies are to be deployed elsewhere, the benefits will be felt through export and through application to mechanisms such as the Clean Development Mechanism (CDM) established under the Kyoto Protocol on Climate Change, which allows companies to earn tradable credits through emission reduction projects in the developing world.

3.2 Assessing the prospects to 2010

The OXERA work suggests that achieving the 10% 2010 target is in principle possible without any additional financial support. The key uncertainties are summarised below:

- The build rate for all renewable technologies – especially onshore and offshore wind, which are likely to be the main contributors to 2010 – will need to increase by about two orders of magnitude. Additional capital grants will help to deliver an improvement. But unless further action is taken to make renewable energy schemes more acceptable to local communities, and to facilitate the process of obtaining planning permission (in particular for onshore wind) and connection to distribution networks, the required build-rates are unlikely to be achieved.

- Assuming that costs come down over time as experience develops, both offshore wind and biomass projects are likely to be viable under the Renewables Obligation by 2010 – but only if generators can appropriate a large proportion of the ROC price. If generators are unable to negotiate a

reasonable proportion of this value with suppliers, the 2010 target will not be met.

- On similar lines, anything that undermines the fair market value of renewable electricity will make it less likely that commercial viability is achieved. It will be important that NETA does not load excessive costs onto intermittent generators, and does not provide barriers to appropriating the benefits of embedded generation.

- Another possibility is that the price of ROCs could be lower than otherwise expected. This would be the case if alternative and less expensive means of achieving the RO became available. This could be through eligibility of renewable electricity imported through the inter-connector, or through links being made to wider emissions trading schemes or to a European-wide ROC trading scheme.

3.3 Assessing the prospects to 2020

Further uncertainties surround what renewables can deliver in the period to 2020

Looking ahead to 2020, many of the key uncertainties described above will still apply. But there will also be two additional factors that are key in the ongoing development of renewable generation in the UK:

- Even though the Renewables Obligation is proposed to last until 2027, the potential value of ROCs is expected to decrease unless the level of the RO is increased beyond its 10.4% level. For example, if the level of the RO is increased to deliver a target of 20% by 2020, the potential value of ROCs is expected to hold steady at around 3p/kWh in real terms throughout the period. But if the RO is frozen at the level needed for a target of 10.4%, the value falls considerably below 3p/kWh. ROCs could also lose value if high electricity prices or successful energy efficiency programmes reduce energy demand, hence reducing the amount of renewable energy required to meet the Obligation.

- Energy crops could make a contribution over the short to medium term (up to 2600MW by 2020, in one scenario). However, for this to occur, considerable cost reductions will need to have been achieved and the necessary planting schemes put in place over the period to 2010. If these requirements are to be delivered, Government subsidy and facilitation of contracts between growers and energy companies is likely to be required. This is why energy crops have support for planting and capital grants, but there appears to be a gap in support with respect to the interim infrastructure of harvesting, drying, transportation and storage. The harvesting infrastructure overlaps to some extent with the type of machinery required for harvesting forestry wood-fuel, although some is entirely specific. Nevertheless, it is clear that the infrastructure question has to be addressed if energy crops and forestry wood-fuel are to be successfully developed.

A target of 20% appears achievable by 2020

If all of the above factors come together, then the modelling work suggests that a target as high as 20% for renewable energy in the UK could be achieved by 2020. This is perfectly feasible, and well below the PIU's estimates of the technical potentials of the technologies concerned. It will however be necessary to look at the cost to consumers of such a target.

However there is some evidence that penetration levels of much above 20% from intermittent generation sources (i.e. wind and solar) and to a lesser degree hydro (which has a higher level of prediction capability) could start to create additional issues for management of the overall electricity system – initially additional costs. Though of limited concern at present, this suggests that in the longer term, effort should be devoted to technologies that maximise the value of intermittent sources – in particular advanced network (and demand) management systems, and energy storage. These issues will be addressed in more detail in the PIU review of energy policy.

3.4 Assessing the prospects over the longer-term to 2050

An assessment has been made of learning benefits that can accrue through cheaper future deployment of renewables in the UK

OXERA have carried out an analysis of the benefits that could accrue to the UK through cheaper future deployment of renewable technologies in the UK only. OXERA's analysis has used learning curves and engineering assessments developed by the PIU and by Imperial College. The projected benefits are subject to varying degrees of uncertainty, and can only give an indication of where the greatest economic benefits from intervention are likely to be found. Within this context, the hierarchy of technologies is wave and tidal stream, followed by offshore wind, then energy crops and PV. This hierarchy is determined by three key factors.

One of the key determinants is the opportunity for further learning still available

The first of these is opportunities for further learning, which relate in turn to the extent to which technologies have already been developed. The following qualitative assessment of learning opportunities was estimated:

Table 2: Opportunities for Learning

	Onshore wind	**Offshore wind**	**Wave and tide**	**Energy crops**	**PV**
Scale in manufacture	Low	Med	High	Low	High
Standard design	Low	Med	High	Med	Low
Standard contracts	Low	Low	Low	High	Med
Performance and risks	Med	High	High	High	Med
Design innovation	Low	Med	High	Low	High

It can be seen that the areas for which learning benefits can occur vary across technology types, but that overall, wave / tidal and PV offer the greatest opportunities.

As a relatively mature technology, onshore wind offers the lowest opportunities for further learning.

Another key determinant is the potential for the technology to be used in the UK

The second determinant is the potential for use in the UK. Because OXERA's analysis focuses on lower cost delivery of future UK installation, the extent of the possible uptake in the UK is a crucial determinant of the scale of the benefit. This tends to work against PV, and in favour of wave / tidal and offshore wind, where the UK's potential resource is huge.

And a third key determinant is the likelihood of eventual commercial viability

The third key determinant is the likelihood of eventual commercial viability. The major risk with investments to deliver learning benefits is simply that those benefits turn out to be smaller than expected, such that commercial viability is never achieved. This risk is greatest for wave / tidal, which is the least developed of the technologies. However, the strong possibilities for learning and for use in the UK mean that wave and tidal remains at the top of the OXERA hierarchy.

The prospects for renewables that will be deployed elsewhere are less clear

Moving on to consider the benefits of learning if renewable technologies are deployed elsewhere, it is important to remember that the renewable energy market is international. Not only will other countries benefit from cheaper technology if developments occur in the UK, but the UK will have the potential to develop a valuable export market in the technologies and in the expertise associated with them. This would fit well alongside the UK's active role in establishing and supporting the G8 Task Force that has been looking at the diffusion of renewable technologies to developing countries, and which reported on 17th July 2001[11]. And through the CDM and similar mechanisms, the UK can also appropriate the environmental benefits associated with the technology.

This benefit is not captured by the work carried out by OXERA, and is even more difficult to quantify. But what it does suggest is that even if the total UK market for a particular renewable energy source appears to be limited, there may be merit in developing a UK-based industry if world markets are likely to be large. The technology for which this argument is most relevant would appear to be PV.

[11] Details available at http://www.renewabletaskforce.org/report.asp

4. Conclusions for Financial Support

4.1 Delivering on our Commitments

Deploying renewables on the ground will help to kick-start the wider use of these technologies throughout the UK

On the basis of the analysis carried out, it is evident that one use of the £100m funding will be to encourage the deployment of proven renewable technologies that are approaching, but not yet at, commercial viability under the RO. This can help to kick-start the use of these technologies, particularly where risks or other barriers are threatening to hold back deployment. The benefits of early deployment are to be felt through the contribution to environmental objectives and other goals of energy policy (especially security of supply).

Offshore wind and energy crops are the key technologies to promote

The analysis carried out by OXERA illustrates the fact that the greatest gains (in terms of kWh deployed per £ spent) are to be enjoyed with those technologies closest to commercial viability. In the UK, offshore wind falls most neatly into this category, with energy crops somewhat further away from viability.

With both offshore wind and energy crops, and especially the former, the risk to Government is that there will be a significant "deadweight" element in the support[12], given how near the technologies are to being deployed on a commercial basis (given support through ROCs and CCL exemption).

Quantifying this risk is likely to be almost impossible, as commercial viability in the early stages will depend heavily upon the attitude of the financial community to the perceived risk of investments and on how rapidly cost reductions are secured. However, the risk is mitigated by the fact that even if there is a deadweight element, other benefits such as learning benefits and political / commercial benefits will remain. It should also be possible to design allocation methods such that deadweight is minimised.

Offshore Wind

Offshore wind is a key technology, but the economics of offshore wind are subject to many uncertainties

Offshore wind has the potential to play a major role in delivering future renewable energy targets in the UK and across the world. In addition, although Denmark and others currently dominate the market for wind turbines, there are specific aspects to offshore wind in which the UK could become a world leader, particularly given the size of our own offshore wind resource.

[12] As both energy crops and offshore wind are technologies that can be classed as 'near commercial' there are some concerns that levels of support granted could be above those required in order to ensure early developments are commercial.

The economics of offshore wind in the UK appear to be very uncertain. Although it could become commercially viable by 2010 under the RO, this will be dependent on projects getting off the ground early in the decade. Attracting investor confidence will be difficult due to the range of uncertainties:

- Cost of capital;
- Extent of NETA imbalance charges;
- Value of ROCs;
- Proportion of ROC value accruing to the generator;
- Infrastructure requirements;
- Infrastructure development;
- The planning process and public perceptions.

This means there is a strong case for additional capital grant support

Because of these uncertainties, new offshore wind power plants attract a large risk penalty, and it is in overcoming these risk penalties that capital grants are important. If one assumes that the 18 developments (of a maximum 30 turbines) which pre-qualified in the Crown Estates licensing round use the currently available 2MW turbines, this would represent 1080MW of capacity. Existing funding should be able to support at least 300MW (at the maximum rate of approximately 0.6p/kW). **Up to an additional £25m is made available to fund offshore wind installations**. This should cover at least another 150MW, meaning that approaching half of the licensed capacity (or about 0.5% of electricity (or 5% of the Governments target) could be guaranteed early progress.

In the context of the earlier assessment of the analysis, it is anticipated that support for a minimum of 450MW will be enough to reduce the risk element of developing offshore wind, and to generate sufficient early momentum for offshore wind to play its full part in meeting the 2010 target. This is why we have limited our support to £25m. However, this situation should be kept under review. The analysis has shown how it is vital that deployment rates of renewable energy increase rapidly. Offshore wind is the technology most likely to deliver commissioned capacity. It may be necessary to consider increasing the capital grants available to offshore wind if there is evidence that further development of offshore wind farms is beginning to dry up once capital grants have been allocated.

In view of the potential for delays in the process of taking forward new and challenging offshore installations, the funding should be available for spending over a 6 year period, though committed over three years. The funding should be administered by DTI as part of its existing capital grants programme for offshore wind. The allocation of capital grants to offshore wind projects should be on a competitive basis to ensure both value for money and that individual projects are not over compensated.

Energy Crops

Energy crops have an important role to play in the short to medium-term and beyond

Energy crops could also become a significant renewable resource over the next few years. But there are major barriers related to the establishment of infrastructure and to the contractual relationships linking the growers to the energy providers. Some existing funding is available for electricity generation from energy crops through the New Opportunities Fund. The additional funding allocations listed below from the £100M are designed to complement this funding.

One area for funding will be near-commercial electricity schemes, particularly those classified as CHP

Up to approximately £10m will be allocated to support near commercial energy crop and forestry woodfuel schemes. A further criterion is that preference should be given to schemes which can be classified as good-quality Combined Heat and Power (CHP). This should allow the development of around 10 MW of steam combustion plant or (0.2% of the 10% target). It is expected that these schemes will be a range of sizes, and no prescription should be given for this aspect. This support for the nearer term technologies will help to establish the growing of energy crops in the UK. It should act as a complement to existing NOF funding The purpose of the preference for good-quality CHP is to ensure that these power plants should be as efficient as possible. Good quality CHP has the benefit of much greater efficiency (70% or more) than electricity generators using energy crops (30-35%). However, it is recognised that there may be times when CHP is inappropriate (e.g. when no use for a heat-load can be found), and projects in these circumstances should not be ineligible. Further funding is also allocated below to demonstration of new energy crop related technologies.

This funding will be administered by DTI, with input from DEFRA and the devolved administrations, given the potentially close links to the advanced energy crops power generation projects, DEFRA's CHP strategy, which is currently being prepared and the energy crop scheme that is currently being developed in Wales. One possibility for maximising the value of the funding would be to make the establishment of contractual relationships with growers a pre-requisite for receiving support.

Another area requiring funding is the infrastructure that links growers and energy providers

Energy crops are subject to their own unique barriers, particularly relating to the more complex supply chain associated with getting the energy source to the energy provider. DEFRA has already taken this into account by making available funding for planting grants, to sit alongside other funding for energy crop generators. But a potential gap relates to the infrastructure required to harvest, store and supply the energy crops once they have been grown.

In order to meet this gap, **up to £3.5m will be made available specifically to help fund market or physical (harvesting, storage and supply) infrastructure**. This fund may be available for producer groups, in particular those non-SRC schemes not covered by the existing DEFRA Energy Crops Scheme. The funding should be administered by DEFRA directly alongside this scheme, in order to ensure effective allocation. However, the amount available for infrastructure should be ring-fenced. DEFRA will be considering whether there is a need for further support to promote

energy crops infrastructure development, through other mechanisms, for example industry proposals for a "certificate" to offset the operational costs of harvesting, storage and transport. It will also be important to ensure that any schemes are complementary and co-ordinated with devolved schemes such as the energy crop scheme being developed in Wales.

And a third category of funding is industrial heat

Another aspect to energy crops not currently funded is the use of energy crops for industrial heat applications. In the same way as early introduction of energy crop CHP could help establish the energy crops industry in the UK, industrial heat from energy crops would seem to provide the potential for an easy win. This is already supported in part through £3m from the NOF but receives no other direct support, and is not covered by the Renewables Obligation. On this basis, and in view of the wider benefits, **up to £2m will be made available for industrial heat from energy crops**, to be administered directly alongside the existing NOF money. This complements the community and household fund below, and could support a further 10 MW of heat-equivalent at a maximum 50% subsidy, in units of 500kW or more. This is only equivalent to less than 1% of the 10% target but is intended to pave the way for a much more substantial contribution between 2010 and 2020.

Overcoming Barriers

Overcoming any barriers imposed by local attitudes, planning processes and network connection will be crucial to getting renewables on the ground

This report has highlighted (section 2) some potential barriers that are being addressed in the PIU review of energy policy. Notwithstanding the fact that the review is ongoing, there is sufficient evidence already to suggest that a proportion of the funding should be directly targeted at easing the entry of renewable technologies – especially given the sensitivity of their prospects to build rates over the next few years.

One way of engaging the public will be through local community schemes

So for example, initiatives on the planning front will not help get renewable energy off the ground unless the public extends its general support for renewable energy to support for renewable energy in local situations. This makes community engagement crucial, so that more people are either individually involved in renewable energy schemes or able to see them. At the same time, there is some concern that the majority of renewable energy projects are seen as relatively large-scale and/or promoted by remote large companies and somewhat inaccessible to households and individuals.

One means of overcoming these concerns will be to make funding available specifically for renewable energy schemes that engage local communities or individual households. We have made good progress in developing community schemes in the UK and currently there is a small amount of funding available through both the Countryside Agency's Community Renewables Scheme and the New

Opportunities Fund Green Spaces and Sustainable Communities Scheme[13]. However, more funding will have a beneficial impact in this area. **Up to £10m will therefore be allocated to a programme spread over three years**, for which bids are invited on behalf of schemes with a strong local community or household interest. The scheme will be administered by DTI, working closely with the devolved administrations. Community schemes have proved very successful in allowing local residents to directly gain from local developments and feel they have some ownership of them. They have an important role in familiarising individuals with renewable energy technologies and it is expected that these schemes will then allow a number of larger schemes an easier path to gaining planning permission.

No restrictions will be placed on the types of technology employed, but eligibility would be restricted to renewables deployed at the level of households, or buildings / land owned by non-profit making organisations. Care would need to be taken to ensure that this scheme does not duplicate existing programmes. Examples would include:

- A "solar street", involving the fitting of solar panels to the roof of every house in a street;
- Incorporating solar water heating into the design of new civic buildings;
- Installing a wind turbine to provide electricity to a school or hospital;
- Biomass heat projects for schools or farms.

And making people more aware of the implications of renewable energy will help to smooth the planning process

All renewable energy schemes need to progress through local planning approval. To this end, **it is recommended that up to £2.5m be allocated to the administration of a series of regional road-shows, to which regional and local authorities would be invited, alongside those expecting to make planning applications**. Other facilitation-type-schemes could also seek funding through this fund. The purpose of these seminars would be to share information and best practice with respect to the treatment of renewable energy schemes. DTI will administer this scheme, with input from the Government Offices and devolved administrations.

On network connection, a useful approach will be to demonstrate the new technologies that can help make renewables more attractive

There is limited understanding of new ways of managing and controlling renewable technologies and demand management within the liberalised energy market. This will prevent generators of renewable energy from receiving the full benefit of their installation, and will hence continue to hold back the introduction of the technologies.

[13] Funding in the region of £0.5m is available through the Countryside Agency's Community Renewables Initiative, which is operated in England only. In addition, community renewable energy schemes are eligible to qualify for funding under the New Opportunities Fund Green Spaces and Sustainable Communities scheme, also operated in England only. £125 million is available through this scheme, but it does have a very wide remit. Only a small number of renewable energy projects are likely to be successful in gaining funding through the scheme.

Up to £4m will therefore be placed into a fund, for which bids will be invited from suppliers, brokers and Distribution Network Operators (DNOs). The purpose of this fund will be to facilitate the demonstration of new control, storage and metering technologies, with a view towards active management of distribution networks. The scheme will be administered by DTI, and links with the community / household fund described above will be encouraged. It is difficult to quantify the impact of this in terms of capacity. Nevertheless, it is a key area that will add additional value to renewable heat and power.

4.2 Developing new technologies and expanding our knowledge base

It is important that we take action now to prepare for the long-term

Even as we take action to deploy renewable technologies and deliver on our commitments, it is essential that we prepare for the longer-term by bringing on technologies currently some way from commercial viability, and by undertaking research into new technologies.

Many of these issues will be picked up in other work currently under way, such as the PIU review of energy policy and the DTI-led review of energy R&D. However, it is possible to identify now some areas where support will be important in developing renewable energy sources for the longer-term.

There would seem to be three key technologies that are currently some way from commercial viability, even under the RO, yet have the potential to play a very significant role in the long-term in the UK or elsewhere. These are new **energy crop technologies such as gasification and pyrolysis; photovoltaics (PV); and wave or tidal power**.

New energy crop technologies need to be developed

The energy crop technologies are probably nearest to commercial viability in the UK, inasmuch as they are expected to approach viability by around 2010. However, there is very limited experience of these technologies in practical application in the UK or elsewhere. Without this practical application, it is difficult to see how costs will fall over time. With other mechanisms in place to set up the supporting infrastructure and contractual relationships for the energy crops industry, **up to £18m will be made available to prepare the UK for the next stage of energy crop technologies**. This fund will be administered by DTI, working closely with DEFRA and the devolved administrations and taking account of the administration of the NOF money already available for energy crop technologies. It will also be applied in close conjunction with any EU-wide funding programmes, in order to extract maximum benefit.

Wave and tidal power offer perhaps the greatest long-term scope for the UK

The UK has a large potential wave and tidal resource and a long history of pioneering R&D in these areas. The technology is still in its infancy, with many competing designs, and considerable uncertainty about whether and when commercially viable technologies will be delivered. This presents both a threat and an opportunity.

Without support, the technologies may not develop at all, and their long-term potential may not be realised. But because they are little developed, the UK has an opportunity to exploit a world-leading expertise at relatively low cost.

The UK is still one of the world leaders in marine technology. Several new companies have spun out of UK universities and some have been successful in attracting commercial backing. However many analysts suggest that, with more generous support available in other countries, the UK may already be losing place in the marine technology industry. With more proactive political support and considerably more resources (at present) going into wave technology in Denmark, the parallel with the early development of wind power is not difficult to draw.

Some of the more promising technologies are now moving beyond the laboratory and very early prototype phases, and an increasing number of demonstration devices are going into the sea in several countries. A few of these have secured power purchase agreements, including support through the SRO in the UK, and are effectively in pre-commercial demonstration. However there is a clear need for further substantive field trials. The DTI "Technology Route-maps" for both wave and tidal technologies focus on support for long term trials of prototypes, alongside ongoing R&D into less advanced devices.

The DTI provide for up to 10 years of prototype field-testing. However should any of the technologies prove reliable and viable they would be able to move into what might be termed the 'early pre-commercial phase' – fully operational grid connected projects – much sooner. It is not reasonable to expect such schemes to be commercially viable under the RO, and additional support is necessary to enable such schemes to be deployed on a modest scale. **Up to £5 million will be made available for grid-connected early pre-commercial wave and tidal stream projects.** The intention is to create a small niche market that would bridge a potential "valley of death" for marine renewables.

This money will be administered alongside the existing DTI programme. A competition for funds, timed to provide a clear next step for those technologies emerging from the DTI field trials (or elsewhere), will be the best way to facilitate steady progression in wave technology. The competition will run in 2 to 3 years time, but should be announced as soon as it is practicable, to provide guidance and a competitive incentive for the emerging industry.

There may also be a case for using some of the budget to provide for accompanying measures – such as contributing to the marine test station mooted by the industry.

It is important that this support is viewed only as a step on the road to commercialisation. The success of wave and tidal technologies should be reviewed again towards the end of this funding programme, with a view to additional support in future.

PV has considerable scope – in the UK and abroad – so additional support is justified

Solar PV technology in buildings is a long way from commercial viability in the UK. However, the costs of PV have fallen substantially over the last 25 years, and are widely expected to continue to do so as global markets expand. PIU analysis using 'learning curves' and market growth data reinforces the view that PV could become an important and cost effective UK option for decentralised power generation in the long term, probably around 2020. Some niche markets could emerge much sooner, such as the use of PV as a prestigious and "green" building cladding material for companies wishing to demonstrate their environmental credentials. PV is already competitive in niche markets in sunnier latitudes, in particular off-grid applications, and large important global markets will emerge in the near future.

In the "Opportunity for All" White Paper published in February 2001, the Government announced its intention to embark on a major solar PV demonstration programme with industry and others, in line with those in Japan and Germany (70,000 and 100,000 roofs respectively). However even a 100,000 roofs programme would not make a significant contribution to the 10% renewables target by 2010 or to the CO_2 reduction targets. The rationale for such a support programme would be to encourage a strong industry to develop in the UK over the medium-term, which would be competitive in the potentially large export markets. The medium-long-term role of PV alongside other renewable technologies will be considered fully in the review of energy policy. The appropriate role of any long-term target in encouraging the promotion of PV will also be considered. Other issues for consideration include the role of PV as a niche urban technology alongside micro-CHP and micro wind turbines, and its role alongside these technologies in breaking down barriers to domestic generation.

A key UK strength is in architecture and building design. Innovative PV applications in buildings have been pioneered by UK architects and building engineering companies. We therefore propose that the UK PV programme should focus on these strengths. The UK also has strengths in the development of new PV materials and concepts, and these will be eligible for additional support for 'blue skies' research, discussed below.

Up to £10m will be made available to add to the DTI's existing £10m PV demonstration programme. The detailed criteria for DTI's existing scheme are currently being finalised and a key criteria for this scheme is likely to be that the scheme will run as a competition into which bids would be invited for innovative applications of PV technologies. This would be open to households, companies, builders and architects, and would focus on new and exciting applications of existing PV technologies.

"Blue skies" research will prepare us for the longer-term, opening up new options for renewable energy

In addition to these technologies, and over a 50 year time period, it is highly likely that new technologies not currently anticipated could come to play a significant role. New renewable energy devices may emerge, but in addition, facilitating technologies, such as inter-seasonal storage or compact energy storage for vehicles, could enhance the prospects for renewable energy, especially intermittent renewables. As an important step in expanding the knowledge base on which we depend to realise the

potential of renewable energy, **up to an extra £10 million will be given to the Research Councils over the next three years.** This will almost double current levels of spending. The money will be spent on fundamental research into a range of technologies which could include innovative approaches to solar PV, wave and tidal power, storage and the capture, storage and transmission of hydrogen.' Criteria for allocation of this funding will be drawn up by DTI in collaboration with the EPSRC and other Research Councils, but will recognise the uncertainties associated with "blue skies" research, and not be overly prescriptive. At the same time, research programmes will be co-ordinated as closely as possible to maximise potential synergies and to avoid duplication of effort.

5. What Happens Next?

Over the coming months DTI will lead on developing the detail of the proposed schemes. Where appropriate this will be in consultation with other Government departments, devolved administrations, the New Opportunities Fund, the renewables industry and other interested stakeholders.

DEFRA will however lead on the development of energy crop and forestry woodfuel market infrastructure programme.

Once the detail of the schemes has been agreed, the Government will seek State Aid clearance, where appropriate, from the European Commission.

It is expected that where additional funding has been allocated to existing schemes e.g. offshore wind capital grants, this will be available for bids before funding which has been allocated to schemes which do not yet exist.

DTI will maintain overall responsibility for co-ordination of the renewables policy. This will include management of the £100 million allocation.

Annex 1: Detailed break down of Recommendations for Spend of the 100M

The Table below gives a detailed break down of the recommendations for the spend of the 100M. Much of the funding will be allocated to existing programmes, however, where a new programme is required state aid approval will have to be sought. Each area has been recommended a level of spend 'up to' a certain amount. Where demand for a programme is sufficient all of the money allocated to a category should be spent in the area recommended, but there will also be some flexibility between the funds if demand for support is not as high as expected in any given area.

Summary of Additional Funding		
Area of support	**Level of support**[14]	**Comments**
Capital grants for **offshore wind**	Up to £25m	Should support an additional 150MW of capacity, taking total supported capacity to half the volume currently licensed.
Capital grants for **energy crops** and forestry wood-fuel	Up to £10m	Preference to be given to development of good-quality CHP. Should deliver an additional 10MW on the ground.
Grants for **energy crops** and forestry wood-fuel physical and market **infrastructure**	Up to £3.5m	Will facilitate the development of the enabling infrastructure for energy crops and forestry wood-fuel. For example, could support the development of miscanthus producer groups or purchase up to 15 one-off custom-built front-loader trucks for collecting and shredding forestry wood-fuel.
Capital grants for small-scale **industrial heat** from **energy crops** and forestry wood-fuel	Up to £2m	Should support the development of 10MW-equivalent of heat-load.
Capital grants for **community and household schemes**	Up to £10m	Key criterion will be that schemes must be able to demonstrate a strong local community or household interest. Could support PV, solar water heating, onshore wind, biomass, etc.
Planning facilitation	Up to £2.5m	Will fund a series of regional and local roadshows aimed at sharing information and best practice with respect to

[14] Administration costs for projects will be funded from the individual allocations, up to 1.5% of the total.

		renewable energy schemes.
Metering, storage and control technology demonstrations	Up to £4m	Will facilitate uptake of new renewable capacity by demonstrating and developing technologies that enable more effective connection to networks.
Demonstration of **new energy crop** technologies	Up to £18m	Should support demonstration projects totalling 20MW, bringing on the next generation of energy crop technologies.
Demonstration of **wave and tidal** technologies	Up to £5m	Will enable early demonstration of fully operational grid-connected demonstration projects.
Capital grants for innovative installation of **PV**	Up to £10m	Will be added to existing funding to encourage innovative application of PV technologies.
Support for **"blue skies" research**	Up to £10m	Will fund the early stages of research into future generations of renewables technologies.