Economic Development Committee

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Renewable Energy – overview

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1. Introduction

This note provides an overview of renewable energy to help put renewables into the context of the wider consideration of energy issues in Wales. The note briefly

- provides some background on the benefits associated with renewable energy and the issues holding back deployment, considers the status of the various technologies and indicates the policies and targets for renewables being considered in Europe and worldwide.

- summarises the position as far as the UK is concerned, considering targets, policy measures and funding which is being put in place to encourage uptake of renewables.

- considers some of the issues pertinent to Wales.

2. Background

Renewable energy is the term used to describe a wide range of naturally occurring and sustainable energy sources – principally solar energy, wind energy, biological materials used as fuel (biomass), hydropower, tidal and wave energy (and in some regions geothermal energy). In principle these sources can provide energy as heat or electricity or can be used to produce fuels for transport. One major advantage of these energy sources is that they can supplant the use of fossil fuels without significantly adding to greenhouse gas emissions. The development of renewable energy is an important part of any strategy to minimise climate change impacts of energy use, along with the range of other measures, such as energy efficiency and fuel switching.

Benefits and Barriers

In addition to the global environmental benefits associated with these technologies, renewables can bring some other benefits including:

- Diversity and security of energy supply
- Industrial development and employment opportunities in a rapidly growing sector
- Reduction of local pollution from fossil fuel use
- Rural development and employment, since many of the technologies will be largely deployed in rural rather than urban areas

These benefits are offset by a number of characteristics either inherent in the technologies, or which arise because today's energy infrastructure (both physical and institutional) is designed around fossil fuel generation. For example:

- Renewable energy projects tend to be of relatively small scale and this makes it difficult to realise the benefits of scale enjoyed by some conventional energy systems. This is one factor which tends to make energy from renewables more expensive than that from fossil fuels. Current commercial and regulatory systems do not put a compensating value on the environmental benefits from renewables generation.

- Because renewable energy systems have to be designed to capture relatively low intensity flow of energy from the sun, wind and water, the equipment involved is often large and therefore obtrusive, which makes installation in some locations controversial.

- Existing infrastucture is designed around large centralised generating units, with power flowing outwards to meet dispersed demand. The small scale of most renewables projects, and the need for them to be located in particular locations, means that it can be difficult to integrate projects into existing networks. Individual and relatively small scale projects cannot cost effectively bear the costs of upgrading or changing the infrastructure to suit.

- As well as the physical infrastructure, many institutional, regulatory and commercial frameworks have been developed around energy supplied by fossil fuels, and in many cases these systems discriminate unnecessarily against renewables systems.

In order to encourage development of renewables in order to realise the environmental benefits, policies are needed to offset or compensate for these disadvantages.

Technologies

There are a large number of potential renewable energy technologies that have been proposed. Most

attention is now focussed on those which have prospects of being deployed in the short to medium term. These are:

- Solar energy – including passive solar building design, solar hot water systems and photovoltaic (PV) systems which allow electricity to produced directly from sunlight.
- Wind energy – on shore and offshore.
- Hydro Power
- Biomass – the use of either crop or timber residues or else crops specifically grown for energy purposes. These materials can be burned to generate heat or electricity, or used to produce intermediate gaseous or liquid fuels by thermal or biological processes.
- Wave and tidal power
- Energy from waste products
- Geothermal energy – the use of heat from underground sources, often hot water generated naturally in aquifers (unfortunately the UK has a poor geothermal resource and very limited opportunity to exploit this option.)

These renewable energy technologies are at different stages of technical and commercial development. Some technologies are well developed and technically reliable, and available under fully commercial terms. For example, hydropower is a fully developed technology deployed worldwide. The installed capacity of some other technologies such as wind power is rising across the world with, for example over 1 GW of new capacity installed in 2000 in Germany alone. Most of the other technologies are less well developed and some are still in the demonstration or R&D phases.

As described above, the dispersed nature and generally smaller scale of energy production that characterises renewable energy projects compared to those involving fossil fuels, mean that the costs of energy from these technologies are in general higher than those of fossil fuels. However as capacity increases and technology advances costs have been reducing rapidly. Such trends can be expected to continue as the markets develop, and the gap between the cost of energy from renewable and fossil fuel sources can be expected to narrow, even discounting the value of the environmental benefits associated with the technologies.

International Targets and Policies

Given the high priority being given to measures which can reduce climate change, the increasing maturity and reducing costs of renewable technologies, many countries are setting targets and implementing policies to encourage renewable energy, principally to assist with achievement of their

commitments under the Kyoto agreement. For example, the EU target is to double the contribution from renewable energy to primary energy consumption (from 6% to 12%) by 2010. Individual member states are setting targets and taking measures in line with this overall target. The same sorts of measures are being taken worldwide. For example, Japan is seeking to achieve 3.1% of its electricity supply by 2010 from renewables, principally from the installation of photovoltaic systems with a capacity of 5000 MW, and many other developed and developing nations, like India and China, are taking similar measures. Even in the US, which is not formally committed to any greenhouse gas reduction targets, R&D on renewables is receiving very substantial funding, and measures to ensure that a proportion of all electricity comes from renewable sources have been introduced in 11 states.

3. UK Situation

Although the UK is rich in renewable energy resources, for historical reasons the current contribution of renewables to energy supply is modest compared to other countries. In 2000 only 1.3% of our total energy supply currently came from renewable energy (compared with an EU figure of 6%). 2.8% of our electricity was from renewable energy sources, with around half of this coming from well established large hydropower schemes.

The Government has accepted that renewables should form an important part of the strategy to tackle climate change and has set a target of 5% of all electricity from renewables by 2003, and 10% by 2010. This forms an important part of the overall package of measures designed to ensure we meet our commitments under the Kyoto agreement. The increase in contribution from renewables over this timescale will mostly come from the best developed technologies such as on and offshore wind, wastes and biomass.

Meeting more stringent CO_2 reduction targets, such as those that would be necessary to achieve the Royal Commission for Environment's suggested 40% reduction in CO_2 emissions by 2050, would require major contributions from a wider range of technologies including those currently under development such as wave and tidal power, and a significant growth in energy from solar PV.

Non Fossil Fuel Obligation

The contribution from the newer renewable energy sources has been growing steadily as Figure 1 shows. The main reason for this growth has been Government policy encouraging renewables for power generation through the Non Fossil Fuel Obligation (NFFO) which between 1998 and 2000 allowed Government to require electricity companies to secure specified amounts of renewable energy from renewable energy sources. This policy operated by competitively awarding electricity contracts to renewable energy project developers, who were then guaranteed long term premium prices for the electricity produced. The contracts were awarded in 5 tranches and were financed via a levy on customers' electricity bills.

The policy was successful in creating a commercial activity in renewables in the UK, and in stimulating

capacity. Because of the competitive nature of the bidding process, NFFO led to very significant reductions in the price of renewable energy from the different technologies. Fig 2 shows how prices reduced with the different tranches. However many of the projects awarded NFFO contracts have not yet been constructed, principally because of difficulties and delays in receiving planning permission for the projects. In order to increases implementation rates it is intended amend legislation to allow some projects to become portable – that is be built in locations other than those originally intended, and where planning consideration might be more favourable.

Figure 1 : Growth in New Renewables Capacity in UK

Figure 2 : Reduction in Electricity Prices in Successive NFFO Rounds

Figure 2 : Reduction in Electricity Prices in Successive NFFO Rounds

Current Policies

The NFFO has now been replaced by the Renewables Obligation. This measure requires all licensed electricity suppliers to obtain an increasing proportion of the electricity they supply from renewables sources. The proposed level of the obligation will rise from 3% in 2002-03 to 10.4% by 2010. OFGEM will administer the scheme and will issue "Renewable Energy Certificates" (ROC's) to accredited renewable energy generators for each MWh of electricity they produce. Suppliers need to demonstrate their compliance with the order by redeeming a sufficient number of ROC's obtained from generators directly or through trading.

If suppliers can't provide enough ROC's then they will have to pay an amount of money in proportion to their shortfall. This "buyout" fee will initially be set at £30/MWh. This value of the buyout sets a cap on the value of ROC's and therefore on the costs of renewable energy which will be passed onto consumers. Proceeds from the buyout payments will be recycled by OFGEM back to suppliers in proportion to the number of ROC's they have redeemed. This will provide an additional incentive to purchase renewable energy, and so stimulate investment in new capacity.

The introduction of the Obligation is complemented by a range of other policy measures aimed to encourage renewables. These include the exemption of renewable electricity and heat from the Climate Change Levy. There is also provision for an expanded programme of grants for projects including:

- £50M from the National lottery New Opportunities fund, £33M of which will be committed to energy crops, £10M to offshore wind and £3M to smaller scale biomass heat and CHP projects;
- £39M for offshore wind and £12M for energy crops from Climate Change Levy receipts;
- an increase in DTI funding for R&D from £36M to £55M;

- an additional £100M to be allocated on the basis of the energy review currently being carried out by the Cabinet Office's Performance and Innovation Unit.

Taken together this will mean that in total around £85Mwill be available over each of the next three years.

It is recognised that in order for renewables contribution to grow, then projects must be developed in harmony with the planning systems, and at present many projects do not go ahead because of a failure at the planning stage. At present this is perhaps the most immediate constraint on the rate of development of renewables. As one way to address this issue, each Region is developing strategic plans and targets for renewables, by examining the available resources and trying to reach consensus with stakeholders on how and when renewables can be best integrated into the strategic planning framework.

4. Renewable Energy in Wales

Wales is rich in renewable energy sources – windy upland and coastal regions, significant forestry and woodland residues, scope for development of energy crops, and coastal areas with favourable wave and tidal regimes. Wales also has some well-developed expertise in the form of a strong academic base and some experienced developers and equipment manufacturers. There is scope therefore for Wales to benefit from the environmental and economic advantages that renewable energy can offer, and development of this sector could be a major component of Wales' focus on sustainable development.

However the development of renewables in Wales also poses some significant challenges. Foremost of these is the development of a degree of consensus on the planning issues surrounding renewables, with a need to reach a balance between the global environmental and economic benefits of projects and their local impact, particularly in upland areas. This could be addressed by a targeted awareness and information dissemination programme which aims to inform the Assembly, professionals and the general public about the issues surrounding renewable energy. This should be centred around, and facilitated by, well-publicised demonstrations of the technologies in practice. A more detailed and rational approach to the evaluation of particular developments entering the planning system, covering each of the elements of the sustainable development agenda could be developed to encourage a balanced debate about the positive and negative aspects of specific projects.

The other major challenge is to ensure that Wales captures the economic benefits associated with the development of these technologies, rather than just being an importer of systems and equipment made elsewhere, with the income from operation also departing. A number of measures could be taken to encourage the development of a significant commercial and industrial capability within Wales. These would include ensuring that the relevant players in Wales were well aware of UK wide policy developments and the opportunities that these create, including the available funding from UK and EC sources. It would also be beneficial to facilitate the development of links between some of the well-developed academic centres of excellence and industry, so as to foster the development of significant clusters of expertise, with resources focussed on areas where Wales could develop a distinctive

capability. Based on current perceptions this could involve areas such as tidal energy, community based systems, renewables in the built environment, and hydrogen from bioprocesses.