

SCOTTISH GOVERNMENT AND FORUM FOR RENEWABLE ENERGY DEVELOPMENT IN SCOTLAND (FREDS)

FRAMEWORK FOR THE DEVELOPMENT AND DEPLOYMENT OF RENEWABLES IN SCOTLAND

Contents

1. Introduction and Key Points

Where we are now

2. Why Renewable Energy?

- Climate Change
- European Union Framework
- UK Energy Markets
- Sustainable Economic Growth

3. Energy Efficiency

From now to 2020

4. Increasing the share of renewable energy to 20% of final energy consumption

5. Renewables in Electricity

- 5.1 Introduction
- 5.2 Generation structure
- 5.3 Financial support
- 5.4 The role of different technologies
- 5.5 Grid security
- 5.6 Grid development onshore and offshore
- 5.7 Transmission access and charging
- 5.8 Conclusions

6. Renewable Heat

- 6.1 Introduction
- 6.2 Scottish Action Plan on renewable heat
- 6.3 Conclusions

7. Distributed Energy and Community Based Schemes

- 7.1 Introduction
- 7.2 Distributed Energy
- 7.3 Community Renewables

8. **Bio Energy**

8.1 Introduction

8.2 Scottish Government Policy

9. **Sustainable Transport**

9.1 Introduction

9.2 Biofuels

9.3 Alternative Road Transport Technologies

9.4 Other forms of Transport

Supporting measures

10. **Consents and Planning**

11. **Research and Development**

12. **Supply Chain and Skills**

1. Introduction

1.1. The Scottish Government, in cooperation with the Forum for Renewable Energy Development in Scotland (FREDS), is consulting on a framework for the development and deployment of renewable energy in Scotland. This complements proposals in the parallel consultation document on a Renewables Energy Strategy issued in June by the UK Department for Business, Enterprise and Regulatory Reform (BERR). The Scottish Government intends that its proposed framework should contribute to the Scottish element of the UK National Action Plan for renewable energy if and when the proposed EU directive on renewable energy comes into force.¹ The Scottish Government and FREDS would welcome discussion of and comments on the proposals in this document by 1 December 2008 – subject to that feedback, we plan to prepare and publish a final Framework by early 2009.

1.2. Promoting the development and deployment of renewable energy is a key aspect of meeting the Scottish Government's purpose of promoting sustainable economic growth in Scotland. The Scottish Government's Economic Strategy identifies energy as a priority sector of the economy with renewable energy development contributing both to commitments to reduce carbon emissions and to promoting growth. Relevant indicators are included in the Government's performance framework and are being supported by local government too. These are: working towards an emissions reduction target of 80% by 2050; and a target that 50% of Scottish gross electricity consumption should come from renewable generation in Scotland by 2020, with 31% by 2011.

1.3. Renewable energy is not the only means by which to reduce carbon emissions from energy generation and use. For example, we will continue to need thermal generation and must reduce carbon emissions from coal and gas generation too. But these are not either/or choices – we are aiming both a reduction in carbon emissions and for the growth benefit to be gained from achieving a leading edge in new technologies. However, we will, in seeking to promote renewable energy, take into account the benefits and costs of different technologies both in relation to prospects for growth and for carbon reductions.

1.4. Scotland is on track to meet its target of meeting 50% of gross electricity consumption from renewable generation. The most recent electricity statistics (for 2006) indicate that renewable generation was equivalent to 16.3% of Scottish gross electricity consumption. The Scottish Government has recognised, however, that we need to make progress on renewable energy more generally, i.e. taking into account heat and transport as well as electricity. We believe that a challenging, necessary and achievable objective is 20% renewable energy by 2020. This aligns with the EU target but goes higher than the 15% likely to be required of the UK as a whole. It is also important to stress that this is in no sense a cap but rather an interim stage towards our more long term vision for renewable energy in Scotland, where we see Scotland playing a leading role in conjunction with European partners in developing and supplying renewable energy to a wider market.

1.5. The challenge of reducing carbon emissions will be made easier if we can reduce energy consumption. This document provides a summary of current actions for context but is not consulting on this issue. We propose to issue an Action Plan on Energy Efficiency and

¹ Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources {COM(2008) 30 final}
<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52008PC0019:EN:NOT>

Micro-generation in the near future.

1.6. This document seeks views on the Scottish Government's proposed 20% target. It sets out what we are doing and what more we need to do to achieve this target. Meeting it will require action by a range of partners – industry, government and its agencies, researchers and more. We also need to work effectively in a UK and EU context. The latter will be assisted by the Scottish European Green Energy Centre which will start work later this year.

1.7. These are challenging targets; we want to work in meaningful partnership with all stakeholders to achieve our objectives. Your responses will help the Scottish Government, working with FREDS, to draw up a Framework which can be the agenda for our combined efforts.

Comments should be sent by **1 December 2008** to

Robin Allison
Renewable Policy Team
Scottish Government
2nd Floor, Meridian Court
5 Cadogan Street
Glasgow, G2 6AT

Tel: 0141 242 5819

Email: robin.allison@scotland.gsi.gov.uk

2. Why renewable energy?

- Renewable energy is identified as a priority in the Strategy for Economic Development since it offers significant potential for helping deliver the Scottish Government's key purpose of sustainable economic growth.
- The Scottish Government's proposals for an ambitious Scottish Climate Change Bill include setting a challenging statutory target of reducing Scotland's emissions by 80% by 2050.
- The Scottish Government has identified support for the EU Energy Policy for Europe as one of its 5 main priority areas under its European Action Plan.
- The Scottish Government is committed to work towards the achievement of 20% of total Scottish energy use coming from renewable sources by 2020, in line with the overall EU approach.
- There is opportunity to harness considerable natural resources and leverage considerable comparative advantage from those resources and the strengths of our Academic and Engineering base.

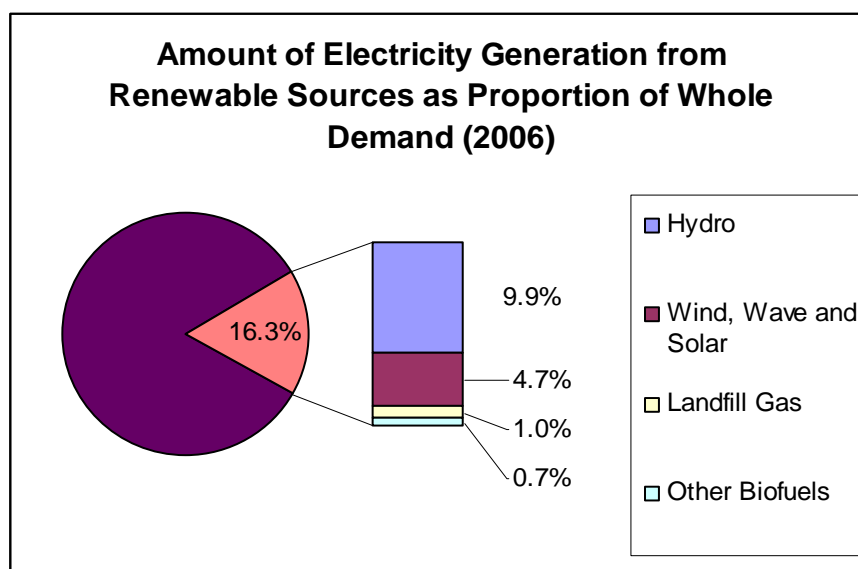
2.1. Economic development

2.1.1. The Scottish Government has set out in its Strategy for Economic Development (the Government Economic Strategy) its key purpose:

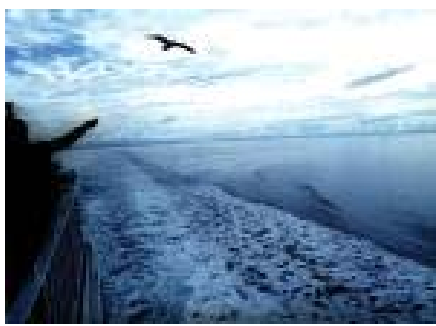
to focus the Government and public services on creating a more successful country, with opportunities for all of Scotland to flourish, through increasing sustainable economic growth.

2.1.2. Energy is identified in this strategy as a priority sector. Within this renewable energy offers opportunities for growth, while also contributing to carbon emissions. Our natural resources, research base and wider energy strengths which give opportunities for transfer of technology and expertise, together provide competitive advantage. We have the opportunity to:

- provide reliable, locally produced sustainable sources of energy;
- generate greater and more widely shared employment;
- create more highly skilled and better paid jobs;
- foster a self-sustaining and ambitious climate of entrepreneurial advance;
- encourage economic activity and investment across Scotland, thereby sharing the benefits of growth;
- bring a culture of confidence and personal empowerment to Scotland; and
- secure a high quality environment today and a sustainable legacy for future generations.



2.1.3. Scotland's oil and gas industry demonstrates how we can prosper, with a cluster of supply-chain companies developed at peak periods of production now evolving into a critical mass of high-value, internationally-orientated activities. Scotland has the opportunity, in marine and offshore energy in particular, to develop a similar economic strength. Scotland has an opportunity, in marine and offshore energy in particular, to develop clear economic benefits at home as well as pushing forward the boundaries of research with a world-wide impact and benefit. In addition to a range of support available for renewable energy development, the Scottish Government has announced the £10 million Saltire Prize, the largest single innovation prize in the world. The Saltire Prize will be open to entrants from across the world, will focus on marine renewable energy and will raise Scotland's profile as a leader in innovation and in renewable energy in particular. The Saltire Prize will make Scotland a world leader in the development of marine renewable technology. The challenge for the Saltire Prize will be announced in December 2008.



The Saltire Prize was announced by First Minister Alex Salmond in Washington DC in April 2008.

Simply put, innovation prizes are successful when people want to win them. We want the Saltire Prize to achieve the profile that will engender the kind of return on investment that makes innovation prizes successful .

The key elements of the Saltire Prize are:

- capturing imaginations: challenge that can inspire a revolution in green energy
- global challenge: high profile prize open to teams from across the world
- relevant to Scotland: relevant to area in which Scotland has strong natural resource and can be demonstrated in Scotland
- capitalises on Scotland's expertise: challenge will reflect area in which Scotland has strong technical expertise and people already working
- achievable in the short-medium term: challenge ideally achievable within a 2-5 year timeframe

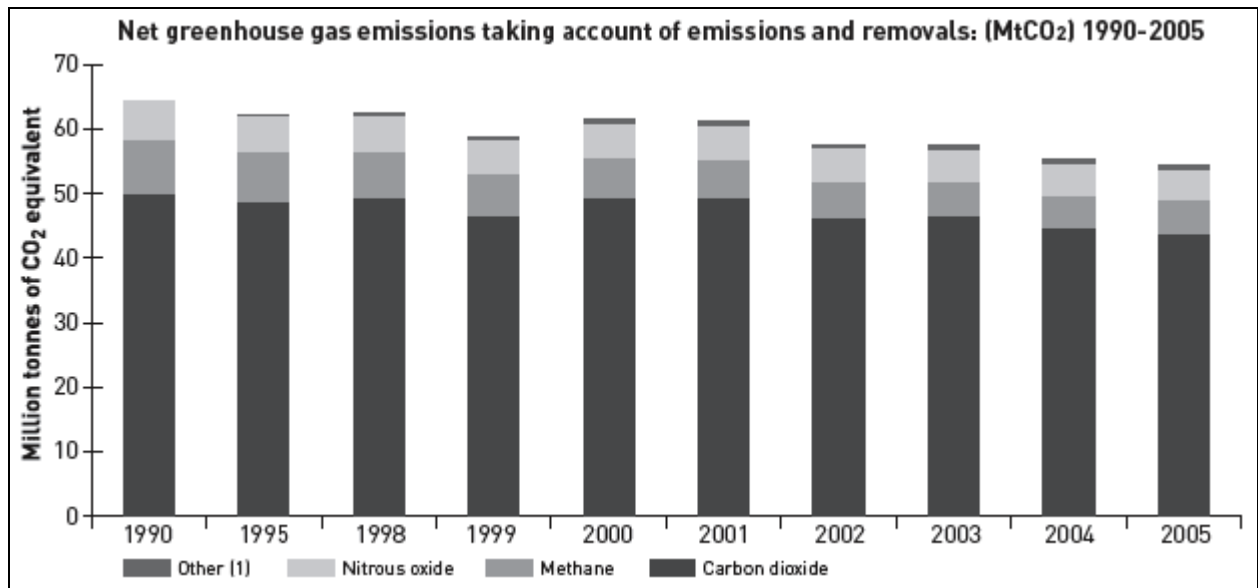
With over 16 per cent of electricity already generated by renewables, Scotland is a world-leader in alternative energy. The Saltire Prize capitalises on Scotland's strengths and carries the potential for Scotland to advance its own economy and energy independence while making a substantial contribution to the world's most pressing challenges www.scotland.gov.uk/saltireprize

2.2. Climate Change

2.2.1. Climate change is one of the most serious threats facing Scotland and the world. The most severe global consequences include famine, drought and the extinction of species. The scale of climate change occurring at present is unprecedented and evidence points to this being caused mainly by human activities. Scotland continues to emit greenhouse gases at a rate disproportionate to our size, and our consumption patterns are unsustainable. The chart below shows net emissions of both carbon dioxide and all greenhouse gas emissions between 1990 and 2005 in Scotland, as recorded in the Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland².

Figure 3

² www.naei.org.uk/reports.php. Data for 2006 is expected to be published in autumn 2008.



2.2.2. The Scottish Government was represented at official level, as part of the UK delegation, at the third meeting of the Parties to the Kyoto Protocol in Bali in December 2007. The conference achieved an historic breakthrough in agreeing a roadmap to achieve a global deal by the end of 2009. The roadmap recognises that deep cuts in global emissions are needed. The conference agreed to address the four 'building blocks' of mitigation, adaptation, technology and financing. Agreements were also reached on addressing deforestation, work to accelerate investment in technology, and a fund to support adaptation in developing countries.

2.2.3. Before the launch of the climate change and energy initiative in 2007, the EU had committed to reducing its collective greenhouse gas emissions by 8% compared to 1990 in order to contribute to the Kyoto Protocol target of 5.2% overall. The UK share of the EU collective target was 12.5%. The key plank for achieving the EU target is the EU Emissions Trading Scheme (EUETS) which began in January 2005 and is the largest greenhouse gas emissions trading scheme in the world. The scheme is mandatory for large emitters, covers around 50% of Scottish net CO₂ emissions and is designed to ensure that emissions reductions are made where they are most cost-effective.

2.2.4. Against this background and taking a strong lead, the Scottish Government has consulted on proposals for a Scottish Climate Change Bill, including a target to reduce emissions by 80% by 2050 – further details can be found at: <http://www.scotland.gov.uk/climatechangebill>. The Bill will set a clear, long-term legal framework thereby allowing businesses, organisations and individuals to invest in energy and carbon saving technologies with certainty. The consultation on the Bill closed on 23 April 2008. Over 21,000 responses were received and a report on the analysis of the consultation responses was published on 20 August 2008. The Scottish Government plan to introduce the Scottish Climate Change Bill into Parliament before the end of 2008.

2.3. Scotland in Europe and in the United Kingdom

2.3.1. Further developments have been taking place at a European level. At the Spring European Council on 8 and 9 March 2007, EU Heads of Government agreed an ambitious unilateral binding target to reduce Europe's greenhouse gas emissions by at least 20% by 2020 (compared to 1990 levels) and to increase this commitment to a 30% reduction if an international agreement is reached. In parallel with this decision a new Energy Policy for Europe was agreed, which set a number of objectives including the following key targets:

- an **improvement in energy efficiency** in order to save 20% of the EU's projected energy consumption in 2020;
- a binding target for **renewable energy** to make up 20% of overall EU final energy consumption (i.e. not just electricity) by 2020;
- a **binding target for renewables** to make up a minimum of 10% of transport petrol and diesel consumption by 2020.

2.3.2. The Commission published on 23 January 2008 a package of measures to help implement these targets, including a draft comprehensive framework directive for renewable energies³. It covers the three energy sectors: electricity, transport, and energy used for heating and cooling. It aims to provide a framework for increasing the share of renewable energy to 20% of final EU energy consumption, including sharing out this target amongst Member States, and (within this target) a 10% share of renewable energy in transport petrol and diesel consumption. It addresses standards and requires national action plans to be prepared for each Member State by 31 March 2010. The national action plans shall set out Member States' targets for the shares of energy from renewable sources in transport, electricity and heating and cooling in 2020, and adequate measures to be taken to achieve these targets, including national policies to develop existing biomass resources and mobilise new biomass resources for different uses, and the measures to be taken to ensure issues such as access to the grid and the environmental sustainability of biofuels. The Council and Parliament have begun consideration of the draft directive and expect consideration to be taken forward during the French Presidency of the Council in the second half of 2008.

2.3.3. The Scottish Government has identified support for the EUs' Energy Policy for Europe (EPE) as one of its 5 main priority areas under its European Action Plan. It aims to position Scotland as a leader in the development of green, sustainable energy and to influence the development of EU policy to support this aim. This will not only assist climate change objectives but help the growth of energy as a key economic sector in Scotland.

2.3.4. The Scottish Government is committed to work towards the achievement of 20% of total Scottish energy use coming from renewable sources by 2020, in line with the overall EU approach. In this context it is:

- working with the UK Government and European partners on the implications of the proposed renewables directive, including the ways in which Scotland can meet the 20% target and the implication of the directive for our long term plans to export some of our vast renewables potential to our European neighbours;
- intended that this proposed Renewables Framework should contribute to the

³ **Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources {COM(2008) 30 final} {SEC(2008) 57} {SEC(2008) 85}**

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52008PC0019:EN:NOT>

Scottish element of the UK National Action Plan for renewable energy, which will be required under the proposed EU directive;

- working with the UK Government and European partners on parallel proposed directives on Carbon Capture and Storage and Emissions Trading;
- taking forward, with support from the European Energy and Research Commissioners, the establishment of a Scottish European Green Energy Centre. This will develop networks and partnerships with research and deployment bodies for green energy in like minded countries designed to promote the deployment of green energy technologies and contribute towards the new targets of the EPE. It will disseminate throughout Europe the results of this work, and hold seminars and conferences for academics and practitioners.

2.3.5. Scottish Ministers have a range of powers which they may use to promote the development of renewable energy (while taking into account other considerations such as protecting the environment). But aspects of energy development – and in particular market issues relating to electricity generation and transmission - are regulated under policies set by the UK Government. The Scottish Government is committed to seeing the market develop in way which provides a robust and fair framework for renewable energy development and removes barriers in its way while providing a fair deal for consumers and energy users more widely. The Scottish Government therefore maintains a close dialogue not just with Departments of the UK Government but also with UK wide bodies working in the energy field such as Ofgem. Further details are given in relevant sections in this document.

2.4. Sustainable economic growth

2.4.1. We could become Europe's biggest exporter of renewable energy if we take robust advantage of our potential. Scotland's emissions, and the potential to reduce emissions in Scotland, are different from the rest of the UK. As well as our wind and marine potential we have in our forests both a contributor to biomass energy and the ability to absorb CO₂. The majority of the UK's forest area is in Scotland and the Scottish Government proposes expanding forest cover from 17% of the land area to 25%. In this context we will look carefully at how the public estate can contribute further to renewable targets.

2.4.2. The Strategy for Economic Development includes a national performance framework, covering all public sector bodies in Scotland including local authorities, against which progress towards the overall Government purpose should be judged. This includes an overall interim target of reducing emissions by 2011 and a longer term target to reduce overall emissions by 80% by 2050. It also includes a national indicator to achieve 50% of gross electricity consumption from renewable sources by 2020, with an interim target of 31% by 2011. Our objective is that actions to achieve these targets should, as far as possible, also contribute to achievement of targets for growth of the economy, **to raise Scotland's GDP growth rate to the UK level by 2011 and to match the GDP growth rate of the small independent EU countries by 2017.**

2.4.3. In seeking to achieve the objectives of energy policy we need good evidence. For the benefit of all policy areas we are currently developing tools and guidance that will help policy makers to assess the carbon impact of policies in a manner consistent with national and international obligations. This will enable the identification and quantification of specific carbon impacts and timescales during policy evaluation and will therefore ensure that climate change impacts are considered as part of the policy development process. This applies to

renewable energy in the same way any other development; for example the impact of wind farms on peatlands is one of the issues that are now taken into account in considering new applications for consent.⁴

2.4.4. Developing a comprehensive approach to renewable energy provides opportunities to meet climate change targets, demonstrate our commitment to shared European and international objectives and contribute to sustainable economic growth in Scotland. **It also provides a real platform to develop the industries of tomorrow in matters as diverse as electricity generation and heat and insulation technology which can place Scotland at the leading edge of countries which are making the most of the opportunity to deliver both sustainable economic growth and carbon targets at the same time.** This framework will provide the basis for investment in our country's future.

⁴ <http://www.scotland.gov.uk/Publications/2008/06/25114657/1> Dali Rani Nayak ¹, David Miller ², Andrew Nolan ², Pete Smith ¹ & Jo Smith ¹ “Calculating carbon savings from wind farms on Scottish peat lands - A New Approach”

3. Energy Efficiency

- Improving energy efficiency is widely recognised as the easiest and most cost-effective means of reducing carbon dioxide emissions and needs to be pursued in parallel with measures to increase renewable energy use. This will have benefits in terms of job creation in products and services.
- We fund the work of the Energy Saving Trust and its network of centres and the Carbon Trust in Scotland to offer advice and support to the domestic, business and public sector on how to improve their energy efficiency.
- The Scottish Government is using building standards and the planning system to help achieve low carbon buildings.
- We are developing and implementing a CERT Strategy⁵ for Scotland in partnership with the energy supply companies, the Energy Saving Trust and Ofgem.
- We will continue to work with the UK Government to consider what additional energy efficiency measures could be adopted across the UK to cost effectively reduce carbon emissions.
- We are committed to continually reviewing, improving, simplifying and streamlining programme delivery to ensure that support is effectively targeted.
- We will set out in 2008 our Energy Efficiency and Micro-generation Action Plan, outlining the actions we are taking and plan to take across Government.
- We [are considering the recommendations of the Fuel Poverty Forum on redesigning our fuel poverty programmes, to ensure they provide maximum help to those struggling with high fuel bills

3.1. Developing renewables is only one part of our overall approach to developing sustainable energy production and use in Scotland. Demand for energy continues to grow. Under current patterns of production, this leads to increased carbon emissions and tends to drive higher energy prices. Improving energy efficiency is widely recognised as the easiest and most cost-effective means of reducing carbon dioxide emissions and needs to be pursued in parallel with measures to increase renewable energy use.

3.2. The financial benefits of investing in energy efficiency are clear: - industry and society can achieve more with less energy, public services are delivered at lower cost, and fuel poverty is reduced. Better insulated buildings and more energy efficient workplaces cut energy bills for householders and businesses. Energy efficiency can also be achieved through better practice in our use of energy (switching lights off, less use of standby). Reducing demand in these ways also puts less pressure on energy supplies.

3.3. The Stern Review states that:

Studies by the International Energy Agency show that, by 2050, energy efficiency has the potential to be the biggest single source of emissions savings in the energy sector. This would

⁵ CERT - Carbon Emissions Reduction Target - is the scheme which requires energy companies to support energy efficiency measures by householders.

*have both environmental and economic benefits: energy-efficiency measures cut waste and often save money.*⁶

Stern goes on to suggest that reductions in global CO₂ emissions due to greater energy efficiency could be between 31% and 53% of the total reductions achievable by 2050.

3.4. However it is not always clear that individuals and organisations fully realise the benefits that can be achieved through simple energy efficiency measures. There are still barriers to be overcome: making use of and acting on clear and trusted information, disruption if works are taking place, and the initial financial investment - although most energy efficiency measures save money in a relatively short time. A key element of our approach is to increase the quality of information available to people and businesses to allow them to reach better informed decisions about ways to manage more effectively their energy use.

3.5. The Scottish Government has devolved responsibilities for the *promotion* of energy efficiency and takes on the challenging role of changing behaviour through raising awareness and providing advice and financial incentives to improve energy efficiency across the public, business and domestic sectors. The Scottish Government funds:

- support provided by the Carbon Trust and the Energy Saving Trust;
- a new network of energy savings advice centres in Scotland
- an interest-free loan scheme for SMEs;
- an energy efficiency fund for the public sector;
- fuel poverty programmes.

The Scottish Government also supports Envirowise, which provides advice to business and the public sector on waste prevention, the efficient use of water and reducing unnecessary use of raw materials. Much of Envirowise's work (e.g. reducing the unnecessary use of raw materials) will also have energy efficiency benefits. The Scottish Government is considering whether changes could be made to the resource efficiency programmes it supports, to provide a more joined-up service to the consumer.

3.6. The Scottish Government is also using building standards and the planning system to help achieve low carbon buildings. The Sullivan report recommends staged increases in energy standards for new buildings to substantially reduce emissions, with a route-map to the goal of zero carbon buildings. The impact of the recommendations are currently being investigated and it is intended that proposals for changes to the energy standards will be issued to consultation early next year, with a view to changes being introduced in 2010. Work to prevent waste and increase recycling also has energy efficiency benefits. For example, it often takes less energy to make new products from recycled materials than from virgin materials. The Scottish Government also plans to consult on further measures to reduce energy use and emissions from existing housing to enable us to build on the impact of current energy efficiency and fuel poverty programmes and to contribute to our emission reduction objectives. Further improvements to housing energy efficiency are central to this and, going forward, the use of renewable energy sources alongside a more energy efficient housing stock, will become increasingly important.

⁶ Stern Review: Executive Summary p.13 [based on research in Energy Technology Perspectives, International Energy Agency, 2006.]

3.7. Some regulatory powers associated with energy efficiency are the responsibility of Westminster, for example, the obligation on energy suppliers to support energy efficiency measures by their customers through the Carbon Emissions Reduction Target (CERT). The Scottish Government is concerned that Scotland may not be benefitting fully from CERT and we want to ensure a more strategic and integrated approach to maximising the impact of CERT in Scotland. We are therefore developing and implementing a CERT Strategy for Scotland in partnership with the energy supply companies, the Energy Saving Trust and Ofgem. During 2008, regulation-making functions were transferred from the UK Government to Scottish Ministers which will enable Scotland to implement fully European Community obligations concerning energy efficiency at industrial plants.

3.8. We will continue to work with the UK Government in such areas and encourage them to consider what additional energy efficiency measures could be adopted across the UK to cost effectively reduce carbon emissions. For example, an accelerated roll out of advanced displays and metering technologies, and more accurate billing in homes, could help to raise public awareness of what activities use the most energy and what changes in behaviour produce the greatest reduction in energy consumption.

3.9 The Scottish Fuel Poverty Forum was reconvened in May to advise Ministers on the best way to take forward fuel poverty programmes in future. They will report to Ministers shortly, and ministers will consider and implement their recommendations as soon as possible. Energy companies have agreed to work with the Government on providing a package of insulation measures, funded under CERT, to fuel poor households, and we anticipate that this may form part of any future fuel poverty programme.

3.10 Going forward we want to ensure that we have the right incentives in place to encourage energy efficiency and micro-generation – we are committed to continually reviewing, improving, simplifying and streamlining programme delivery to ensure that support is effectively targeted.

3.11. We also want to ensure that we create the right conditions to support the developing low carbon technology industry so as to build consumer confidence and transform the market from early adopters into widespread take-up. The newly established Scottish Construction Industry Low Carbon Steering Group brings together a range of partners including the building trades, academic researchers, enterprise networks, skills and training organisations, architects and Government. Its main focus is to identify the action needed by Government and others to take advantage of our strengths and drive a flourishing low carbon buildings industry in Scotland.

3.12. The Scottish Government will set out how it is translating key objectives into action through an Energy Efficiency and Microgeneration Action Plan. This will take into account responses to the previous administrations' consultation on a draft Energy Efficiency and Microgeneration Strategy which ran during 2007. An analysis of the responses to this consultation, and a separate Scottish Government response to the issues raised during this consultation, were published in June 2008. Action will also reflect the results of the independent review of energy efficiency and micro-generation support in Scotland undertaken by Halcrow and published in June 2008, and the consultation on the Scottish Climate Change Bill which seeks views on further incentives to encourage energy efficiency.

3.13. We also need to change the way we treat waste heat, making sure it can be treated as a resource and used efficiently whenever possible. Whether it be from power stations or computer/office air conditioning or process plant we should always try to capture, store and reuse it where economic to do so. The Scottish Government is preparing guidance separately for thermal applications for s36 consents for electricity generation, and this will include guidance on heat matters.

Sustainable Transport

3.14. In the transport sector, we are encouraging energy efficiency by working with UK Government on economic measures, such as the introduction of new bandings of Vehicle Excise that will reward vehicles with low emissions and set new higher bands for the worst polluting cars. Regulatory measures include a mandatory European approach to new car CO₂ emission standards, where a target of 130gmCO₂/km is currently being negotiated for 2012. In developing a longer term target for emissions reduction, the UK have called for a longer-term target of 100g/km by 2020.

3.15. To encourage behavioural change in the transport sector, Scottish Government support for bus services is considerable, amounting to some £280 million per year. This substantial investment is intended to help the industry drive down fare costs, encourage more routes and enable more older and disabled people to use these important services. This complements communication programmes to promote more efficient and environmentally aware driving being developed by the Energy Saving Trust. The Safe and Fuel Efficient Driving campaign encourages efficient operating practices in the haulage industry, which helps reduce fuel consumption. The continued support and promotion of Traveline Scotland is further supported by development of new guidance and resources for Travel Planning via www.choosetheway.com, which provides advice to organisation to encourage staff and visitors to use more active and sustainable modes of travel on the commute to work as well as business travel.

3.16. The *Smarter Choices, Smarter Places* programme supports demonstration projects in towns and cities to illustrate what can be achieved through a concentrated programme of walking and cycling infrastructure improvement alongside measures such as travel plans for workplaces, schools and individuals, personal travel marketing and promotion of active travel and public transport.

3.17. A Cycling Action Plan for Scotland (CAPS) will be developed in 2008-09 through consultation event with the people of Scotland and stakeholders, with the goal of getting more people to cycle more often. This grass routes approach to cycling policy development will help to shape an action plan that will be meaningful to everyone. It will be helpful to local authorities in developing their single outcome agreements and local transport strategies, and also to central government in shaping policy around the Government's Economic Strategy and the National Performance Framework.

Conclusion

3.18. Our commitment to develop renewable energy is part of our overall commitment to a more sustainable use of energy, of which energy efficiency as well as sustainable transport form part. We are taking forward proposals in these areas through a number of different initiatives and will seek to ensure that our policies across these separate but

related areas work in the same direction towards shared goals. **We will consider the forthcoming report of the Fuel Poverty Forum on redesigning our fuel poverty programmes, to ensure they provide maximum help to those struggling with high fuel bills**

From now to 2020

4. Achieving 20% of energy consumption from renewable sources

4.1. The Scottish Government is keen to play an active and leading role in the overall European commitment to **increase the share of renewable energy to 20% of final EU energy consumption by 2020**.

4.2. The Commission has proposed a burden sharing arrangement across the EU, taking into account the current situation on renewable energy in each Member State and the relative GDP of each country. The UK's proposed share is 15%, up from the current figure of under 2%. Scotland will be expected to contribute to the UK's overall share and to play a part in the UK National Action Plan.

4.3. The Scottish Government believes that Scotland should aspire to a higher figure than the UK as a whole, and would like to aim for the figure of 20% of overall energy use. To reach this figure significant progress above current levels will be required in all sectors. This consultation document considers the range of measures that will be needed and how we propose, in conjunction with the UK as a whole, to get there. It is also important to stress that this is in no sense a cap but rather an interim stage towards our more long term vision for renewable energy in Scotland, where we see Scotland playing a leading role in conjunction with European partners in developing and supplying renewable energy to a wider market. We will look at going further than this if it is possible and practical to do so.

4.4. In considering the contribution that Scotland will make, the following issues should be taken into account (please note that these statistics are our current best estimate and will need refinement as better statistics become available).

- The current breakdown of total energy use by sector in Scotland is 45% heat; 29% transport; and 26% electricity.
- The current % of energy use from renewable sources in Scotland, broken down to electricity, heat and transport, is as follows:
Electricity⁷ – 2002 - 12% of gross electricity consumption; 2006 - 16%
Heat – 2002 1%; 2006 1%
Biofuels in petrol and diesel⁸ – 2002 0.01%; 2006 0.44%
Overall (Scottish final energy consumption) – 2002 3.4%; 2006 4.6%.
- On the basis of renewables providing 50% of gross electricity consumption (our current target), and 10% of transport use⁹, and renewables in heat staying at 1%, renewable sources would provide some 15-17% of total energy use in Scotland by 2020.

⁷ Normalised Hydro, using UK factor and includes non biodegradable wastes, although these need to be deleted

⁸ uses UK figures

⁹ This is premised upon the target of 10% for biofuel use being achieved; if it is amended as a result of current discussion, including the Gallagher report – see chapter 9, we may need to place more emphasis on other areas

- If renewable electricity reached 50% and transport 10%, renewable heat would need to increase to at least 11% of total heat use for renewables as a whole to account for 20%.
- If renewable heat remained at 1% and transport 10%, renewable electricity would need to rise to at least 62% of gross electricity consumption for renewables as a whole to account for 20%.
- If renewable heat remained at 1%, and transport also remained at 1%, renewable electricity would need to rise to at least 69% of gross electricity consumption for renewables as a whole to account for 20%.

4.5. The working assumption behind this consultation document is that we should make progress in all three areas in order to provide a flexible mix, thus bringing business benefit to a wide range of economic sectors. Our preferred option to meet the 20% target is to aim for at least 50% of gross electricity consumption from renewable sources, some 11% from heat and some 10% from transport.

Questions for debate

- **Do consultees agree that we should aim at 20% to meet the 2020 target and that progress should be made in all three sectors of electricity, heat and transport?**
- **If not – why not?**

The rest of the document looks at different forms of energy use, the opportunities each presents and the ways in which development may need to be facilitated. Readers may therefore want to reflect on those chapters before responding to this question.

5. Renewable Electricity

Objective: to facilitate the development of renewable electricity so as to reduce carbon emissions and promote economic growth as well as to enable greater exploitation of the renewable energy resource and drive down costs.

- In meeting our 2011 interim target of 31% of gross electricity consumption from renewable sources we expect the vast bulk of new capacity to be delivered by additional onshore wind power stations. Smaller scale developments – wind and hydro – are valued for their contribution to energy supply and community benefit and we wish to encourage the development of these.
- Onshore wind will continue to increase beyond 2011 playing a strong part in meeting our 2020 target, but we also expect offshore wind, marine and tidal and biomass to make significant contributions in the next decade. The Scottish Government wishes to support the development of emerging technologies so as to achieve a balanced mix of renewable generation.
- The Scottish Government supports powers in the UK Energy Bill which will allow the provision of varying levels of support for different technologies under the Renewable Obligation Scotland (ROS) mechanism, thus driving the development of less mature technologies.
- To achieve our objectives significant increases in grid capacity will be required, both onshore and offshore. The Scottish Government is in dialogue with BERR and Ofgem to ensure that regulatory mechanisms are aligned fully with the need to exploit renewable resources – which are found predominantly in Scotland.
- A major study on grid security concludes that the Scottish transmission network could cope with 8 GW of installed renewables capacity in 2020 without the need for significant investment, other than that which has already been approved by Ofgem, and without adversely impacting upon grid system stability or system security.
- We are looking forward to the growth of offshore wind and marine energy and considering potential for export. We are working with European partners to look at how current grid regimes might develop in the future and specifically the feasibility of offshore grids (“supergrids”), which will be essential as we move beyond 2020 towards large scale exports of renewable electricity.

5.1. Introduction

5.1.1. Development of new generating capacity is led by the private sector acting within a regulated market. In making investment decisions, developers will take into account any financial benefits which may result from renewable energy as compared with other options for investment and will take into account any real or perceived barriers to the realisation of their project proposals.

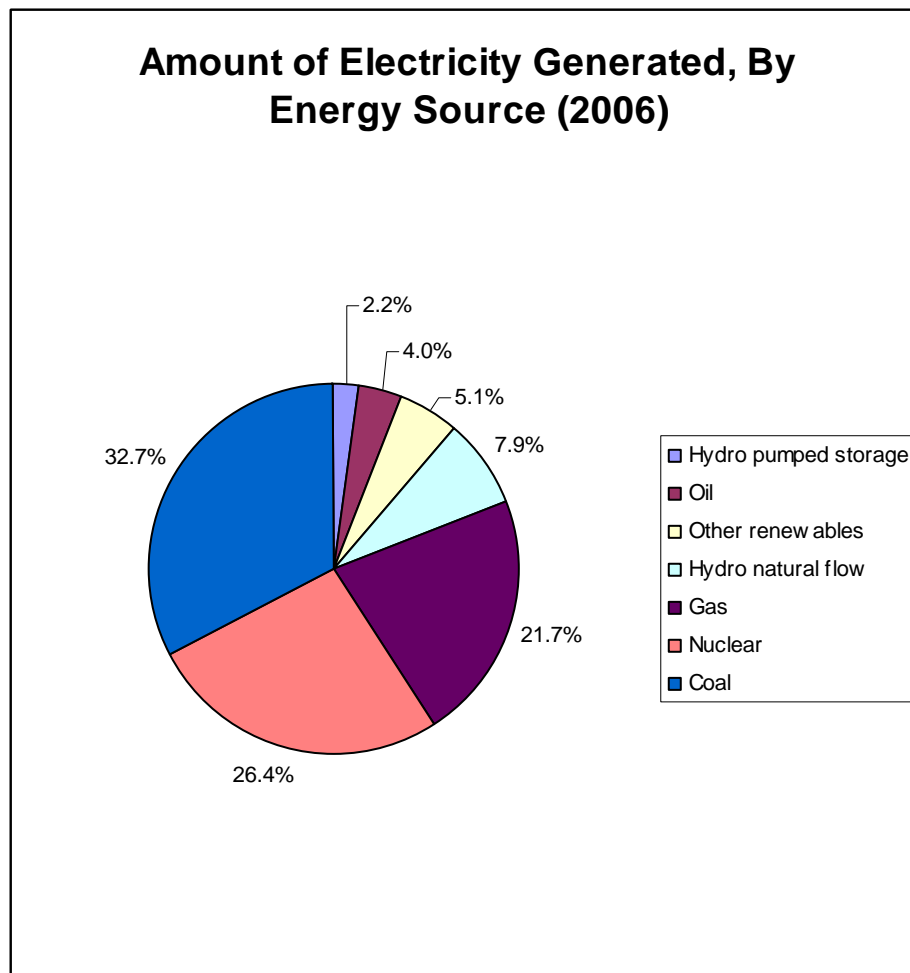
5.1.2. The Scottish Government therefore recognises the need to provide a policy context which will encourage investment, while at the same time balancing energy objectives with other objectives such as protection of the natural environment.

5.1.3. This chapter looks first at how our target of meeting 50% of gross electricity consumption from renewable generation in Scotland by 2020 might be achieved, and at what contribution we might reasonably expect from different technologies. The subsequent sections set out how the Scottish Government is taking action to facilitate investment and remove barriers, whether by:

- acting directly itself;
- seeking to influence UK and EU policy;
- supporting industry in its individual and collective actions.

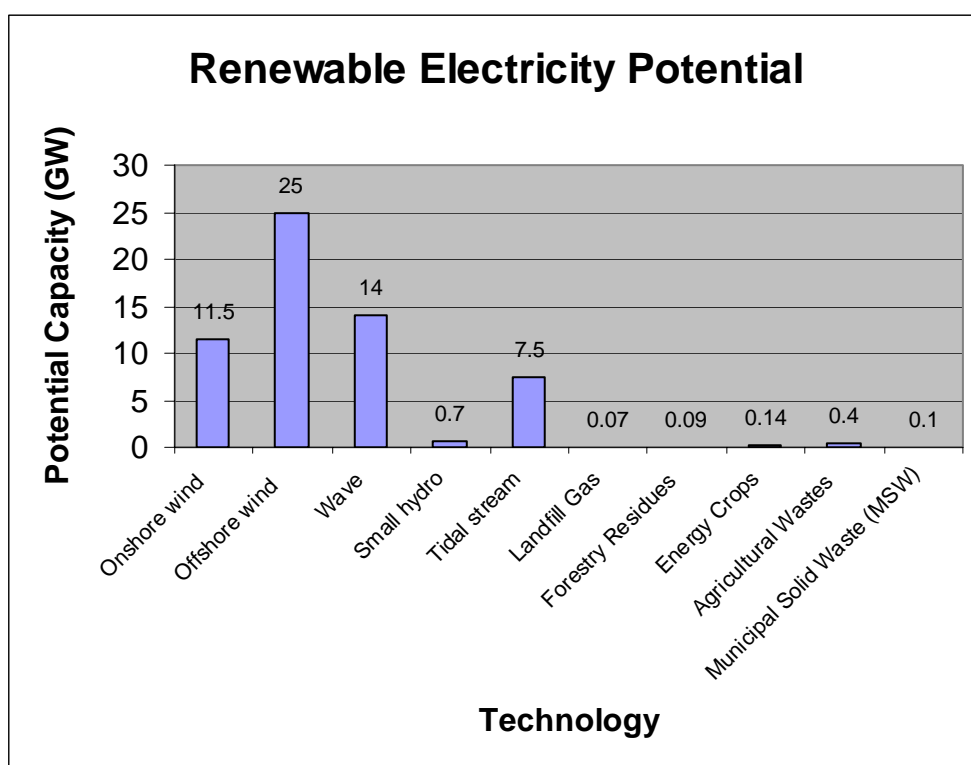
5.2. Generation Structure

5.2.1. Scotland's electricity is currently produced by a small number of large coal, gas and nuclear generating stations, together with a larger number of smaller renewable plant. (mainly established hydro and onshore wind). This is illustrated in the chart below.



We wish to move to a much greater proportion of renewable energy, together with cleaner generation from coal and gas. Scotland's potential renewable electricity capacity, as illustrated in the chart below, has been estimated by previous studies to be around 60 GW – sufficient to meet peak demand for power around ten times over. The scale of the resource dictates that there is potential for substantial exports to the rest of the United Kingdom and neighbouring countries in Northern Europe. In developing the resource(s), both regulators

and developers need to take into account environmental and other constraints and ensure that carbon benefits are considered as well as financial costs. With this in mind, however, renewable electricity represents a major economic opportunity for Scotland which needs to be pursued over time, including the necessary investment in marine and tidal technology in particular and in the subsea grids which will be needed to transport the electricity to market. As such, progress towards 2020 needs to be seen as a stepping stone towards more substantial exports in the next decade and beyond, rather than an end in itself.



5.2.2. The Scottish Government is on track to meet its renewable electricity targets of 31% of gross electricity consumption by 2011 and 50% by 2020. This is not a cap, but a step on the way to our longer term vision, and we will look at going further than this if it is possible and practical to do so. We believe that precise targets for the contribution of different technologies are not appropriate. This will be a matter determined largely by the market and by consenting decisions, albeit influenced to a significant extent by policy mechanisms such as the Renewables Obligation. However, we have examined different scenarios in order to be satisfied that targets can be met and to identify actions necessary to achieve these.

5.2.3. Our targets relate to meeting gross electricity consumption - which is measured and expressed in GigaWatt hours (GWh), i.e. in terms of actual output rather than installed capacity. Installed capacity will not run at full potential all of the time, and will be influenced by such factors as weather conditions, down time for repairs etc. Wind, for example, is categorised as “variable” or “intermittent” energy with onshore wind delivering from 25-45% of theoretical potential, depending on the site in question. Hydro can operate at levels of 40-% plus, while thermal plants (gas, coal and biomass) operate at 85% of capacity. This variability has to be taken into account when estimating the amount of installed capacity that might be required to meet our targets.

5.2.4. On the assumption that renewable sources will operate at 30% of theoretical potential, we estimate that we will require 5 GW to achieve the 2011 target and 8.3-8.4 GW to achieve 50% by 2020. Current installed renewables capacity is around 2.8 GW. There is a further 1.7 GW of capacity approved under the Electricity Act (i.e. above 50 MW) under construction, and approximately 2.5 GW of capacity of Section 36 applications in the system, with more (smaller projects) being approved and considered by councils. We have offered pre-application opinions on a further 2 GW of potential developments. We expect many further applications which will feed into 2020 capacity. However, allowing time for the application process and construction, projects which will contribute in 2020 will probably have to be in the planning system by 2017. Prior to that data gathering is required and, in the case of emerging technologies, testing and refining of devices. It will also be important to extend the lifetime of the Renewable Obligation beyond 2017.

5.2.5. Some 1.6 GW of current capacity is in the form of hydro electricity, with the remainder coming from onshore wind and a small amount of biomass and offshore wind. For 2011 we expect the vast bulk of new capacity to be delivered by additional onshore wind power stations. Onshore wind will continue to increase beyond 2011, but we also expect offshore wind, wave and tidal and biomass to make a significant contribution in the next decade, as set out in the next chapter. It is too early to make detailed predictions of the balance in technology while details of the way the Renewables Obligation will work are being finalised, but by way of illustration, the breakdown might be on the following lines:

Technology	Estimate (GW)	Current (GW)
Hydro	2.1-2.4	1.4
Onshore Wind	5-7	1.3 ¹⁰
Offshore Wind (mainly deep water)	1-4	0.00
Wave and Tidal	0.5-1.0	0.00
Biomass	0.2-0.4	0.04

5.2.6. These estimates assume that appropriate financial incentives are in place, that technology research and development is successful, that grid access and availability improves and that projects move with reasonable speed through the planning system to determination. These issues are discussed further below. Further details are also given of how we are working to develop individual renewable technologies.

5.3. Financial support

5.3.1. Renewable electricity is currently more expensive to generate than from fossil fuel but that has the disadvantage of high carbon emissions associated with generation, which in turn has significant wider costs to the economy and environment. Carbon capture and storage is expected to make a significant reduction in time but this will have its own costs. In addition fossil fuels are finite while renewable energy has advantages for security of supply. Governments across Europe and wider have therefore taken steps to support generation from renewable sources.

5.3.2. While some countries in Europe have adopted a feed in tariff to support renewable electricity, in the UK market it is supported by the Renewable Obligation (RO). The RO legislation obliges licensed electricity suppliers to secure increasing amounts of their supply

¹⁰ As at September 2008

to customers from eligible renewable sources. The wider powers enabling the creation of an obligation on suppliers are reserved to the UK Government, but the Scottish Government has devolved powers which enable it to deliver the RO in Scotland. Compliance is demonstrated by the provision to Ofgem of Renewables Obligation Certificates (ROCs), which suppliers can buy from renewable generators. A supplier has the option of paying a buy-out payment rather than producing ROCs if it wishes (or using some combination of the two methods). Buy-out monies are paid by suppliers into a fund, and are redistributed by Ofgem to ROC holders in the form of recycling payments in proportion to each supplier's share of the total number of ROCs redeemed in an obligation year. The obligation levels are currently well ahead of demand, i.e. there are not enough ROCs for all suppliers to meet their obligations in full. This means that there is more money in the buy-out fund being recycled to suppliers who redeem ROCs, and thus making the ROCs themselves more valuable. This ensures that the prices being paid to renewable generators are sufficiently high. The cost to consumers of the Renewable Obligation is capped by the buyout price, set at £30 per unit of electricity in 2002 and linked to inflation, and the level of the Obligation in a given period.

5.3.3. The Scottish Government wishes to see a balanced mix of renewable technologies and therefore supports UK plans to amend the RO to allow varying levels of support to different technologies and thus drive the development of less mature technologies. This is fully consistent with changes already made to the RO in Scotland to deliver additional support for wave and tidal generation (the Marine Supply Obligation). The precise nature of any further changes to the RO in Scotland will depend on full consultation, which is currently underway,¹¹ and the subsequent agreement of the Scottish Parliament.

5.3.4. Emerging technologies are currently being supported with Scottish Government grants for capital expenditure, e.g. the development of wave and tidal capacity, where we have a technological lead and a huge potential resource, the development of hydrogen fuel cell technology and the deployment of biomass energy which is underdeveloped in Scotland and the UK more generally. The need for further capital grants will be considered in the light of other support available, including banded ROCs, generic support for innovation and investment and UK wide schemes for specific technologies.

5.4. The role of different technologies

5.4.1. This section looks in more detail at the potential of different sources of renewable electricity, what does or will influence their exploitation and the role of the public sector in facilitating private sector investment. It focuses on larger scale generation. Micro-generation is considered in a later section.

Mature technologies

Hydro

5.4.2. Scotland is already home to a significant amount of **hydro** power (almost 1.4 GW, some half of current installed renewable capacity). Several large scale run of river and storage schemes were built during the course of the twentieth century, most of which are located in the Highlands, and more recently the Glendoe scheme has been built. Hydro power is proven and reliable, although the output from such stations is dependent on the

¹¹ <http://www.scotland.gov.uk/Topics/Business-Industry/Energy/19185/ROSCons08BS>

amount of rainfall during a given year. Storage and pumped storage schemes can also be used to help manage the grid system and meet peaks in demand. The potential impact of large scale hydro power on the environment means that there is limited scope for any further large projects. However, there continues to be interest in small scale run of river schemes. Three applications have been determined by Ministers over the last 15 months and new applications continue to be received.

Glendoe Hydro Scheme

The Glendoe hydro scheme, near Loch Ness, is the first large-scale hydropower station to be built in Scotland for almost 50 years. The project is being developed by Scottish and Southern Energy and is the largest civil engineering project currently underway in Scotland, bringing with it employment and economic benefits. The 100 MW plant will be largely complete by winter 2008 and, from its quiet and inconspicuous location in the mountainside, will ultimately be capable of generating enough electricity to power every home in a city the size of Glasgow. Hydro currently provides most of Scotland's renewable energy generation and the construction of the Glendoe plant illustrates how this success story will continue.

5.4.3. The Forum for Renewable Energy Development in Scotland (FREDS) has recently examined the potential for small scale schemes with research funded by the Scottish Government. This illustrates that significant potential remains for hydro development and provides the sector with an indication of where the resource may lie. The Scottish Hydropower Resource Study is available from <http://www.scotland.gov.uk/Topics/Business-Industry/Energy/19185/FREDShydroResStudy>

SCOTTISH HYDROPOWER RESOURCE STUDY

The study was commissioned by the Scottish Government on behalf of the FREDS Hydro Sub-group which was set up in early 2007 to look at opportunities and barriers to the further development of hydropower in Scotland. The Sub-group decided that its main task was to identify the potential for further viable hydro power, based on topography and other environmental factors, and taking into account constraints such as land designations. The study, undertaken by a consortium of partners from the Scottish Institute of Sustainable Technology (SISTech), Nick Forrest Associates, and Black & Veatch Ltd, was published in September 2008. It shows that there is 657 MW of economically viable hydropower potential as yet untapped in Scotland. This would represent roughly a 50% increase in installed hydro capacity from current levels. Most of the potential 1000+ new schemes posited are between 100 kW and 1 MW in size, with a considerable quantity also in the 1-5 MW scale. The study will be used by the FREDS Hydro Sub-group to inform its wider strategic thinking on the future of the sector in Scotland. The sub-group will develop its own report to FREDS over the remainder of 2008.

<http://www.scotland.gov.uk/Topics/Business-Industry/Energy/19185/FREDShydroResStudy>

5.4.4. The FREDS planning and hydro sub groups have also considered whether it would be helpful to lift the MW level at which applications come to Ministers for determination rather than local authorities. Local authorities, like Ministers, would need to consider the views of relevant statutory bodies and of the public. With improvements to the Electricity Act application process now in place, it is not clear that this would speed up processing more than by a marginal degree. However, this could still be valuable and views are welcome on this

issue. But it should be noted that, as the Act is drafted at present, a single MW limit for determination by Ministers applies for marine (wave and tidal) as well as hydro developments. The Scottish Government considers that, given the early stage of development of wave and tidal energy, the current 1 MW limit should remain for wave and tidal projects in order to ensure that impacts are fully considered and expertise is built up in a central location.

Onshore Wind

5.4.5. Development of **onshore wind** farms commenced in Scotland during the 1990s, supported under the old Scottish Renewables Obligation scheme. The technology has progressed and improved since then, with turbine sizes increasing significantly. Installed onshore wind capacity in Scotland is now 1240 MW with further projects consented and under construction and more various stages of the planning process. Developments range considerably in size. Those under 50 MW capacity require planning permission from planning authorities while larger developments require consent from Ministers under section 36 of the Electricity Act. Given its proven status, as well as known and anticipated levels of applications for consent to develop onshore wind, this technology is expected to play a major role in meeting our interim and 2020 renewable electricity targets.

5.4.6. As for all technologies, the planning and consenting systems seek, against the context of the Scottish Government's policy support for renewable electricity, to consider whether onshore developments are acceptable against a range of considerations including visual impact and impact on communities, impact on habitats and impact on aviation radar. Onshore wind developments have sometimes given rise to a considerable volume of public objections, largely relating to visual impact. These will continue to be properly taken into account but it is interesting to note that recent research has found that wind developments do not have a detrimental impact on tourism while developers find considerable public interest in wind farms once they have been constructed. The effectiveness of the planning and consents system, particularly in relation to speed of processing, is considered further in section 10 below.

5.4.7. The Scottish Government is aware that further investment in onshore wind will depend crucially not just on developers identifying appropriate sites and an efficient planning and consents regime but also on suitable transmission access and charging regimes (see section 5.7 below) and on a stable financial incentive mechanism. Another established technology is landfill gas. Under EU obligations, gas from landfill sites must be collected and either used for energy or flared. The increased capture of landfill gas has helped to decrease greenhouse gas emissions from waste management. Renewable Obligation support is available for landfill gas. In the longer term landfill is not a sustainable option for waste management (although it may still be used for a limited amount of waste) and so landfill gas is likely to decrease in significance.

Developing technologies (to 2050)

Biomass

5.4.8. Forestry material, or material from other biological sources (such as animal waste and by-products, or other biodegradable wastes, such as post consumer woody material from both indigenous and imported sources) can power boilers and provide useful quantities of predictable, baseload electricity and/or heat generation. This sets biomass electricity apart

from variable forms of renewable generation, such as wind, and increases its value and attractiveness. At present, much of this fuel is combusted in electricity generation rather than intrinsic energy being captured. It is renewable in the sense that it can either be replaced on a relatively short lifecycle (of trees as opposed to, for example, coal production), is part of a repeating cycle (animal waste) or would otherwise bio-degrade on a longer timescale.

5.4.9. Use of biomass in Scotland is far less developed than in many European countries where it is used in rural areas particularly for combined heat and power plants, often in district heating schemes. This is therefore a proven technology but one which is not yet extensively used in Scotland or the UK more generally. In order to encourage deployment, Scottish renewables legislation already supports biomass electricity generation (the most visible example of which is a 45 MW wood fuelled plant in Dumfries and Galloway). The Scottish Government has also funded a large number of projects under its Scottish Biomass Support Scheme and several with regional selective assistance support. The aim was to stimulate the wood and pellet supply chain, the installation of boilers and development of relevant skills.

5.4.10. The RO will continue to provide support for biomass electricity but, in order to achieve the maximum impact from use of biomass, increased focus will in future be placed on combined heat and power, and outwith the electricity obligation, on biomass for heat. (As discussed in section 6/8 below, biomass has a particularly important role in reducing dependence on oil for heating.) The recent consultation on the RO in Scotland therefore proposed increasing that support above its current level (particularly for projects which include Combined Heat and Power, or CHP). Action to develop the supply chain and skills is discussed further in section 12 below. The Government's overall policy in relation to energy from waste is outlined at 6.2.iv below. The Government is also supporting the development of Anaerobic Digestion, which can generate energy as well as produce material which can be used to improve Scotland's soils. For example, the Waste and Resources Action Programme is making up to £6 million available over three years to support infrastructure which can treat organic waste, particularly food waste. Similarly there are opportunities to develop schemes using agricultural waste.

Offshore Wind

5.4.11. **Offshore wind** is establishing itself gradually around the shores of the UK. Most initial developments are in shallower waters which are to be found to a greater extent off the coast of England and Wales. However, there is a project under construction in the Solway Firth and the Scottish Government has provided grant funding towards a demonstrator project in deep waters in the Moray Firth. The latter draws on technology and skills from the oil and gas industry: this wider infrastructure which gives Scotland a competitive advantage in driving forward projects. As discussed in section 12 below, Scottish Development International is actively seeking to attract developers and manufacturers to Scotland who can benefit from facilities such as those of, for example, Fife and Nigg, in taking forward their projects.

5.4.12. Initial thinking was that, taking into account technology and environmental constraints, the opportunities for offshore wind development within Scottish territorial waters (i.e. within 12 miles of the coast) might be limited. The Crown Estate recently sought expressions of interest from developers in Scottish territorial waters, in relation to its role of providing leases for use of the seabed. The extent of current and practical interest in this area

will be more apparent in the autumn, once more detailed information from potential applicants is submitted. The Scottish Government stands ready to deal speedily with applications for consent to generate electricity although applicants are encouraged to seek a scoping opinion before proceeding to a full application. It will be important for the Scottish Government, Fisheries Research Services, industry and other bodies to work closely with the Crown Estate to ensure that all aspects of the process work hand in hand. The proposed introduction of banding under the Renewables Obligation will provide an additional financial incentive (in the form of higher ROC multiples) for offshore wind generation.

5.4.13. We believe that there may be considerable and greater potential for offshore wind development in deeper waters off Scotland, although this will not be developed extensively until into the next decade. The Scottish Government is sponsoring a Strategic Environmental Assessment (SEA) of Scottish renewable energy zone waters (beyond 12 miles) and this will help guide developers to areas more suitable for exploitation. The Crown Estate has recently sought expressions of interest but follow through to this will be informed by the results of the SEA.

5.4.14. As discussed in sections 5.5-7 below, development of the offshore resource will also require grid access and the Scottish Government is taking steps to ensure that this is put in place. Work will also be put in place to minimise waste from offshore installations.

Emerging technologies

Wave and Tidal Energy

5.4.15. Scotland's long and exposed coastlines, and the tidal channels between the islands and mainland, combine to create a potentially huge renewable power resource from **waves and tides**. The Scottish Government believes that our resource, coupled with Scots based innovators and our academic expertise, can make Scotland a world leader in developing and installing marine technologies. This ambition is supported by legislation which, even before the introduction of banding, offers greater support for wave and tidal power in Scottish waters than anywhere else in the UK. It is also supported by the existence of the unique wave and tidal test facilities at the £16 million European Marine Energy Centre (EMEC) in Orkney.

EMEC Tidal Test Facility



The European Marine Energy Centre has been the heart beat of Scotland's fledgling wave and tidal sector since 2003 when it established the wave power testing facility. Since then the Orkney facility has seen some of the best European devices being put through its paces and is now establishing international standards for the marine industry. It recently added tidal power test births on Eday in Orkney and this development earned it the Best Renewable Innovation Award at last year's Scottish Renewables Green Energy Awards.

5.4.16. EMEC recently played host to the UK's first grid connected tidal turbine (supported by a Scottish Government grant), mirroring its earlier achievement with the Pelamis wave energy converter. Having seen intensive research and early stage testing, the sector needs to

prove that its technologies will work efficiently and effectively at scale for prolonged periods and in real sea conditions. The Scottish Government is providing grants to support the capital investment associated with such deployment.

5.4.17. While test at sea is a necessary requirement before commercial operation, there are a number of steps which the public sector is taking to help speed up development. While the objective is that EMEC becomes self-financing, the public sector continues to support EMEC in its early years. It will however be important that EMEC operates to a clear and commercially oriented business plan and can negotiate quickly and effectively with developers the legal and commercial underpinnings of a lease.

5.4.18. As developers look to deploy devices outside EMEC it will be important that they select locations which not only offer significant tidal or wave resource but which also will not suffer undue environmental impact from operation of devices. The Scottish Government has already carried out a Strategic Environmental Assessment which has identified what further work is needed in order to assess environmental issues. In order to assist the development of the industry, and in partnership with industry, the Scottish Government, working through its Marine Energy Spatial Planning Group¹² and with stakeholders, will support this further work, such as sea bed mapping, with the end objective of providing high level strategic locational guidance for developers. Of course, operation of a device will require consent from Ministers (unless under 1 MW) and applicants will therefore require to complete an environmental assessment. But information to be collected on behalf of the Government will be of a public nature and should help avoid developments being proposed in sensitive areas with the time and investment that this can entail. Scottish Ministers are currently consulting on a Scottish Marine Bill that contains provisions for the creation of a marine planning system and streamlined marine consents. It is anticipated that Marine Scotland will oversee the planning system and as a minimum will operate as a front door for all marine consents.

5.4.19. In deploying devices the marine energy industry is engaging in an area of vast future potential but also of shorter term financial cost and risk. Following the innovative Marine Supply Obligation, the Scottish Government intends now to implement banding of its Renewables Obligation, and has proposed that marine energy, given its state of development, should benefit from a suitably high number of ROCs, broadly equivalent to the impact of the MSO.

5.4.20. In helping enable developers prove these devices, the Scottish Government is providing the foundations for a sector which could supply large quantities of predictable power and create significant economic benefits. The successful deployment of capacity from these emerging technologies could also prove vitally important in terms of progress towards meeting our domestic electricity and EU renewable energy targets. A longer term ambition

¹² The Group's remit is to develop locational and environmental guidance to deliver sustainable marine renewable energy development. Currently the Group is promoting initiatives such as sea bed mapping and the production of marine GIS in areas with significant marine renewable energy resources. Other initiatives being considered within an integrated approach include:

- the provision of spatial planning policies (strategic and regional),
- creation of a one stop shop approach,
- development of EIA guidance to provide a single seamless consenting process,
- the design of a science strategy to cover technology/environment interfaces and
- facilitating regional approaches, such as the Pentland Firth Tidal Energy Project.

for this sector is to develop significant levels of exports of renewable energy from Scotland, which will require investment in maritime transmission infrastructure as discussed in the previous section.

5.4.21. Given the importance of this sector, we will work through FREDS to develop a **route map** to present current and required actions, including work already underway on areas such as infrastructure, finance (grants, RO, Saltire) and the environment. It will also cover the role of the Marine Energy Spatial Planning Group (MESPG) (see paragraph 5.4.18 above) and connections with related activity such as the development of offshore wind.

5.4.22. The Scottish Government is also supporting research and development in the area of **hydrogen fuel cells**. Hydrogen is an ‘energy carrier’ rather than a fuel source because it can only be produced using energy. It can be produced from fossil fuels such as natural gas or coal by the application of heat, but it can also be produced using renewable energy. Our £1.5 million Renewable Hydrogen & Fuel Cell Support Scheme has provided grants to seven projects seeking to deploy and demonstrate renewable hydrogen and fuel cell technology. The development of these technologies could play an important role over time in enhancing grid stability by accommodating off grid generation from intermittent renewable sources.

5.5. Grid Security

5.5.1 The operators of the electricity grid ensure supply on a day to day basis. Scotland is currently a net exporter of electricity to England and Northern Ireland, although the interconnector with England can import electricity to Scotland if needed. The Scottish Government has been considering how the current transmission grid would cope with increasing levels of variable generation from renewable sources, particularly wind, in Scotland.

5.5.2 One of the keys to longer term system security, and efficiency is to develop more effective ways of storing electricity. Achieving this will include avoiding developing even more capacity just to meet peak demand. We need to look at more innovative ways as well as economic ways to store production; here the development and deployment of electric cars will make a big difference to storage potential. A further priority is to use grid capacity in a more innovative way, with the model of regional grid management being implemented in Orkney and providing a more efficient way to matching capacity to demand being capable of implementation in other areas. Indeed, the expected investment over the next 20 years in re-equipping the transmission and distribution grid systems offers a real opportunity to develop the “smart grids” which will allow us to be much more energy efficient in the use of electricity and to maximise the potential of the renewable resource. This is one of the areas where research cooperation with UK and European partners will provide real benefit (see section 10 below).

5.6. Grid development: onshore and offshore

5.6.1. If Scotland’s 60 GW potential renewable electricity resource is to be exploited as fully as possible, significant increases in grid capacity will be required, both onshore and offshore. Reinforcements to grid infrastructure are recognised as strategic national development in the National Planning Framework 2 (NPF2-see section 10 below). Investment in some of these reinforcements has already been authorised by Ofgem. Other reinforcements are proposed in NPF2 in order to continue to exploit renewable resources. If

Parliament confirms the proposed strategic developments this will establish need and leave applications for consent to be assessed on the basis of local impact. Scotland is in the forefront in the UK in this approach to strategic developments. As future needs become clearer these can be included in future versions of the NPF which will be periodically updated. Future needs are likely to include sub sea connections both to other parts of the UK mainland and to other countries. The establishment of an offshore grid to collect electricity generated by offshore marine devices and wind turbines would enable this power to be connected to a robust point on the grid, either in Scotland or preferably in England or Europe, lessening the need for upgrades to the land based transmission network in Scotland. The costs of this would be very substantial, but technologies such as HVDC are maturing and becoming more cost effective.

5.6.2. Sub sea connections offer the potential for export of renewable electricity. The Scottish Government is planning now for this given the time needed for investigation, investment approval and construction. In order to make the case for commercial investment, work to assess the feasibility of developing offshore grids is currently being developed in partnership with the Irish Republic, Northern Ireland, the UK, the Netherlands and Germany. Following a pre-scoping study, the European Union has awarded funding for a full feasibility study of an offshore grid between Scotland, Northern Ireland and Ireland. An application for funding for a similar North Sea study will be made once the current pre-scoping study is finalised.

5.6.3. In relation to investment in grid infrastructure, the Scottish Government welcomes the approach proposed in the UK Renewable Energy Strategy that the transmission operators should be able to invest in an anticipatory manner and not have to await firm development proposals before seeking such agreement from Ofgem. Furthermore, while understanding that the new regime for investment in offshore connections follows a substantial period of consultation, the Scottish Government considers that, in the future, we need to move away from approval of point to point connections to a more anticipatory approach and one which envisages a network grid of connected installations. This is in keeping with the feasibility studies mentioned above.

5.7. Transmission Access and Charging

5.7.1. The Scottish Government meets with industry partners to explore grid transmission issues. Membership includes Scottish Power, Scottish & Southern Energy and the Scottish Renewables Forum. We are liaising closely with the UK Government (BERR), Ofgem, National Grid, and other EU member states and regions to secure reforms to the regulatory framework which will facilitate the development of renewable energy (and investment in clean thermal based generation.).

5.7.2. The Scottish Government believes that the current ‘first-come-first-served’ access arrangements operated by National Grid and Ofgem for prioritising the connection of new renewable generation are not defensible. The queue for connection includes a large number of speculative projects. We concur with the interim report of the Transmission Access review (led by BERR and Ofgem) which repeats a previous requirement on National Grid to ‘make sure that available capacity is allocated to projects currently in the connection queue that are able to use it. In practice, this means prioritising projects with consents and financing in place’. The Scottish Government also supports calls for a “connect and manage” approach to grid connections. At the moment, connection offers are only given where the grid can accommodate full generating capacity. However many projects do not run at full capacity and thus more projects could be accommodated. The final report of the Access report was published in the summer of 2008 and while we agree with many of the proposals contained within it, such as the principle to shorten queues and improve grid management along with further work on increasing incentives for infrastructure development, we are aware that concerns remain about the detail and deliverability of some of these proposals in practice. We will look forward to further development on these as the consultation proceeds.

5.7.3. The Scottish Government is also keen that small generators should not face unnecessarily high costs or administrative burdens in applying for or obtaining connection to distribution networks. Thresholds determining whether or not applicants in particular areas should face higher costs or delays should be set sensibly by the grid operators and regulator, and with this policy of support for small generators firmly in mind. SPP6 states that planning authorities may consider steering developments to areas where existing and approved grid capacity can be maximised and wind farm developments are likely to be able to be accommodated. This is intended to facilitate early achievement of the Government’s 2020 target. However, planning authorities should also recognise that upgrade of the grid is essential if Scotland is to realise fully its renewable energy ambitions. Grid constraints should not, therefore, be used to exclude the identification or safeguarding of appropriate broad areas of search where renewable energy potential exists and there is likely to be developer interest in bringing forward proposals.

5.7.4. The current transmission charging regime substantially limits Scotland’s capacity to exploit its renewable energy potential. The regime fails to take adequate account of the need to tackle climate change, or of government targets to promote renewable energy. The charging system encourages generation near large centres of population. It does not aim to promote sustainable development. The existing system for charging for access to the grid contains a strong geographic element with producers further from the main source of demand in the South East of England being charged more for access than those who are geographically closer. This is a particular problem for renewable generation given that much of the potential resource is far from the “centre of gravity” of the UK charging system.

5.7.5. The Scottish Government has submitted a detailed paper to Ofgem setting out why it believes that the current charging arrangements adversely impact on the exploitation of Scotland's renewable resources and further retrospectively penalise investment decisions taken in the past on power station location with consequences for their current competitiveness. For example a 2000MW coal or gas station operating in Northern Scotland will pay in 2008/09 transmission charges of £44.5 million pounds – if based in London, the same sized station will receive £11.3 million. For a 100MW wind farm in Northern Scotland the charge will be £2.2 million; in London they would receive £0.6m. We will continue to work to ensure that the impacts of UK wide decisions on transmission charges do not adversely effect Scotland and the UK's ambitions for renewable energy, and that those decisions are fair to consumers and producers where ever they live or operate. Changes are urgently required on the method used by National Grid for calculating charges by geographical area and in relation to the current volatility of charges.

5.7.6. The First Minister, accompanied by Scottish Power, Scottish & Southern Energy and the Scottish Renewables Forum, met Ofgem on 9 April to press the “unanswerable case” that the Electricity Transmission Charging Regime as it stands works against the development of renewable and clean energy in Scotland. Ofgem gave a positive response to many of our detailed points. A separate meeting was also held with National Grid to discuss this issue. We will continue, in conjunction with generators, to work to develop an alternative charging methodology to present to Ofgem and National Grid to encourage a reformed approach to transmission charging which acts to support progress towards these strengthened renewable targets.

5.8. Conclusion

5.8.1. The Scottish Government is supporting an increase in generation of electricity from renewable sources by:

- proposing banding of the Renewables Obligation in a manner which will promote mature and emerging technologies;
- making the case for investment in grid infrastructure on and offshore;
- pressing for change to transmission access and charging regimes;
- streamlining the process for applications for consent to generate electricity and supporting local authorities in work to implement SPP6 (see section 10)

5.8.2. The Scottish Government sees an important role for a range of different technologies of renewable electricity. These are at varying stages of maturity, but the successful development of emerging technologies will allow us to export power and to use electricity for heat and transport. Moreover, a spread of technologies will assist in taking forward developments in keeping with other environmental objectives such as protecting habitats and landscape. Of course, financial support, whether from the taxpayer or the consumer must take into account both the need for support in order to be commercially viable and the relative benefits in respect of the objective of reducing carbon emissions – we will continue to focus on these issues.

Questions for debate

- **Are the expectations for each technology reasonable?**
- **Have the main constraints to development been identified?**
- **Bearing in mind the need for costs to be taken into account, are there further actions which need to be taken by relevant parties in order to release renewables potential?**

6. Renewable Heat

Objective: To build a commercially viable, diverse renewable heat industry in Scotland in support of our 2020 renewable energy target.

- **Making progress on renewable heat is a major new challenge if we are to meet the EU 2020 target of 20% of final consumption of energy from renewable sources.**
- **The Scottish Government has prepared an Action Plan for the development of renewable heat in Scotland in response to the report from FREDs.**
- **The Scottish Action Plan on renewable heat includes an indicative target of 11% heat demand to be sourced from renewable heat by 2020.**
- **We will work closely with the UK Government to ensure that plans for regulatory financial incentives for renewable heat can support our Action Plan.**
- **We will run another round of the Scottish Biomass Support Scheme specifically to encourage renewable heat use by businesses and in district heating demonstrators.**

6.1. Introduction

6.1.1. The Scottish Government recognises the significance of renewable heat in achieving our renewable energy targets. Heat demand accounts for some 45% of all energy use, with electricity accounting for 26%. The Scottish Government recognises the importance of developing renewable heat if we are to progress towards the 20% target for final consumption of energy from renewable sources by 2020.

6.1.2. It could be argued that the focus hitherto in the UK on support for renewable electricity without similar mechanisms or measures for renewable heat has failed to acknowledge the challenge that will have to be addressed by the heat sector if wider climate change targets are to be met. The EU target for 20% of all energy (electricity, heat and transport) to be sourced from renewables has introduced a new and welcome focus on the need to support renewable heat. Deployment is at a very early stage, however, and the sector poses particular challenges for Government policy. Unlike electricity, heat cannot travel for long distances without significant losses and expense so most deployment is de-centralised and local. It does however proffer significant benefits in terms of local employment and carbon efficiency. Because heat is typically generated on-site, the market consists of fuel, equipment and services – there is at present no heat unit price or traded sector as there is for electricity. Currently, fuel for heating is supplied in a range of forms (e.g. gas, oil, coal) by a wide range of suppliers, including many small operators particularly in areas off mains gas. For these reasons, Government policies on renewable heat are not as well defined as those for renewable electricity.

6.1.3. It is also important to recognise that while renewable heat is an important option for future moves towards a low carbon economy, it is not the only option for heating – and in many circumstances may not be the most efficient. For example, in the case of the significant proportion of our urban housing stock which was built before modern space heating standards became standard practice, it will be more often be more efficient in both economic and carbon saving terms to invest in energy efficiency measures than in new renewable heat sources. In terms of overall carbon savings, there may also be opportunities to exploit non-

renewable “waste heat” from industrial processes. **The wider issue of waste heat is being considered by the Scottish Government separately and does not form part of this consultation.** However it is worth mentioning here that the Scottish Government is at an early stage of developing its approach to heat, and will undertake work on how to promote the use of waste heat from industrial processes, on promoting combined heat and power plants (with renewable and fossil fuel energy), and on promoting the infrastructure required to carry such heat to consumers. We will learn from others addressing the same issues, including the UK Government. This issue will be addressed in the new draft guidance for thermal applications for electricity power generation under s36 of the Electricity Act.

6.1.4. Nonetheless, the Scottish Government believes that renewable heat should be given priority where it makes sense to do so. There is a particular opportunity to develop renewable heat in large scale public buildings such as hospitals, and in suitable district heating (including off the gas grid) where heat needs are constant over long periods. **It will also be important to ensure that renewable heat is developed in a manner which delivers where possible, energy saving opportunities.**

6.1.5. Microgeneration technologies such as solar water heating and ground-source heat and air pumps will also play an important role in increasing renewable heat in Scotland. We already support the installation of these technologies through the Scottish Community and Householder Renewables Initiative, including the largest heat pump district heating scheme in Scotland in Tranent. We can learn from best practice elsewhere in Europe where heat pumps are being installed in volume. We will need to consider the skills implications for the installation market if the market expands (see recommendation ix) particularly in remoter areas.

6.1.6 However, in terms of scale, **the main technologies to increase renewable heat in the UK are likely to be biomass-based**, such as renewable energy from waste and biomass-fuelled Combined Heat and Power plants, which would also deliver a proportion of renewable electricity. It is also important to consider the role of biogas, which, following adaptation, could use the existing infrastructure and perhaps be more efficient to use than biomass. The Scottish Government has recently undertaken a study to evaluate the cumulative impacts of biomass boilers on air quality, in particular in urban areas with pre-existing air quality management issues. While the report confirms that the overall impact of biomass generation on air quality is minor, the study recognises the need to minimise any impact in particularly sensitive urban areas, and will provide guidance on appropriate abatement measures.

In a terraced housing development constructed in 1999 in Glenalmond Street, Glasgow, **Shettleston Housing Association** has successfully integrated geothermal energy and solar panel heating. The site is close to public transport and shops and is located in the middle of a traditional housing area in the east end of the city.. Heating for hot water is provided by pre-warmed water (12°C) piped up from an old coalmine which is 100 metres below the site. The water temperature is boosted by a heat pump and stored in a large insulated storage tank (10,000 litres). The temperature is additionally topped up by 36 m² of solar panels. The water is used to supply low temperature radiators (45°C) and warm water via storage cylinders. Tenants can also raise the temperature of the hot water using electric immersion heaters which avoids the need for expensive metering controls. The charge for communal heating is

included as a basic service charge within the rent. Monitoring of the heat store has shown that it is performing better than expected. There are many sites in Scotland which are over old mine workings so that harnessing the potential of geothermal energy becomes a viable option.

6.2. Scottish Action Plan on renewable heat

6.2.1. In Scotland, the Forum for Renewable Energy Development in Scotland (FREDS) sub-group on renewable heat looked carefully at this issue over the course of 2007, and in March 2008 produced a report: “Scotland’s Renewable Heat Strategy: Recommendations to Scottish Ministers”. FREDS identified key goals of any Scottish renewable heat strategy which highlighted the importance both of a supportive policy, planning and regulatory framework and of the setting of a target as a benchmark against which progress can be measured. The FREDS report acknowledged that the renewable heat market in Scotland is in its infancy, and that the very nature of the wider heat market - including the entrenched position of the dominant fossil fuel technologies, and the lack of a single market – will act as obstacles to sectoral growth. But the report also pointed out the particular market opportunity in Scotland where a significant of households, especially in remote areas, do not have access to the gas grid.

6.2.2. An initial assessment of policies to reduce emissions, prepared by AEA Technology, is due for publication in the autumn. This was a scoping exercise, looking forward to 2050, largely based on a review of existing literature and interviews with experts to deliver an initial assessment of the impacts of policy options in terms of their cost, reduction potential, feasibility and public acceptability. The report makes 23 recommendations to the Scottish Government for action to promote renewable heat, ranging from capacity building in local communities to a review of financial incentives. The Scottish Government is responding with the **Action Plan for Renewable Heat** set out below which considers the FREDS recommendations in the context of wider policy development at a Scottish as well as at a UK level, and related research such as the Scottish Government study “Mitigating Against Climate Change in Scotland: Identification and Initial Assessment of Policy Options” (produced in relation to the 2050 emissions reduction target).

The Scottish Action Plan for Renewable Heat: Scottish Government actions

i. Legal Powers

The FREDs report seeks clarification as to whether responsibility for the promotion of renewable heat in Scotland is a reserved or devolved matter.

In general terms “heat” is not a reserved matter. However, heat is not of itself (usually) a transferable nor saleable commodity. Heat relies on generation at a local point and this involves fuel. Scottish Ministers could legislate in relation to the generation of heat from renewable sources. However, any proposal which relates to the generation of heat from fossil fuels could be covered by reservations in Schedule 5 of the Scotland Act relating to oil, gas and coal. The generation of heat from electricity (itself generated from the use of another fuel) also falls with the reservations. Thus we first need to consider proposed actions and then determine whether they would fall under reserved or devolved powers. This is considered further below in relation to **a Renewable Heat Obligation**.

ii. Information provision

One of the major findings of the FREDs report is the lack of information available on renewable heat – not only to consumers but to potential developers and local authorities wishing to make the best use of local resources and to match supply with demand. The Scottish Government agrees that better information needs to be provided, and that heat mapping of resources may be of benefit to local authorities and developers in planning heat use. To address these issues, the Scottish Government is:

- supporting Scottish Renewables to produce a consumer information pack outlining what the key renewable heat technologies are as well as explaining the important factors to bear in mind when considering which may be appropriate for specific applications;
- developing case studies showing best practice on the exploitation of renewable heat both in Scotland and further afield;
- making available an indicative heat map of Scotland online at:
<http://www.scotland.gov.uk/About/FOI/Disclosures/2007/10/AEAHeatMap2007>

In addition, the Scottish Government is engaging with COSLA (under the Woodfuel Taskforce recommendations – see Section 9 below) on mapping biomass resources.

iii. Target

The FREDs report recommends that the Scottish Government conducts further analysis of the potential heat markets in Scotland and the respective barriers and costs in order to inform the identification of an appropriate target for renewable heat, taking into consideration the impact of energy efficiency and heat loss reduction on the overall market size. Such analysis has been carried out in the context of Scotland’s existing 2020 target of 50% of gross electricity consumption to be sourced from renewables, and an assumed 10% UK biofuels aspiration. Taking these electricity and transport renewables targets, and using UK growth

rates and projections, Scotland will need to produce **11% of heat from renewable sources**, in order to meet an overall target of 20% energy demand from renewable sources. Views are being sought in this consultation on whether this is the right target and how it should be achieved.

iv. Links with waste treatment policy

The FREDs report recommends the prohibition of waste biomass from industrial and commercial processes to landfill in order to promote its use for energy production; the encouragement of heat recovery in energy from waste; and the establishment of a fuel standard(s) for materials from waste derived sources to enable appropriate materials to be treated as non waste fuel.

On 24 January 2008, the Cabinet Secretary for Rural Affairs and the Environment made a statement to Parliament on the future direction of waste policy in Scotland. This statement made it clear that waste management priorities should be preventing waste in the first place and high levels of recycling and composting. The statement also said that there was a limited role for energy from waste, so long as the plants had high levels of efficiency (the heat is captured as well as the energy). The Scottish Environment Protection Agency (SEPA) are currently preparing revised guidelines on the thermal treatment of waste, which will give detailed information on the type of efficiency levels that are expected.

Mr Lochhead also announced on 24 January that the Scottish Government would prepare a new National Waste Management Plan for Scotland. There will be full consultation on this Plan which, amongst other issues, will consider the scope for banning more materials from being sent to landfill.

In Scotland decisions on the applicability of waste legislation are for SEPA. Waste is highly heterogeneous and of variable composition. A standard for fuels derived from mixed waste sources in general would therefore be almost impossible to arrive at. It may be easier to consider a standard which relates to a narrow selection of waste inputs, for example non-contaminated wood from construction and demolition. It is also important to note that technology developments such as sewage works which co-digest organic fractions of commercial waste can create supplies of biogas.

SEPA has recently published a review of waste biomass arisings in Scotland. This study indicates potential arisings of around 10 million tonnes of waste biomass as process residues in the agricultural and forestry sectors as well as materials currently going to landfill from commercial, industrial and municipal wastes. The study modelled a range of potential energy recovery scenarios. The scenarios looked at a combination of anaerobic digestion and standard thermal combustion technologies at varying efficiency levels calculating the useable electrical and heat energy outputs and carbon reduction benefits of each scenario. The study highlights the potential energy and carbon reduction benefits from the proper management of waste biomass in Scotland.

Further work to improve the volume estimates of the potential resource from biomass waste streams is ongoing under the Scottish Government's woodfuel taskforce.

v. Fuel Poverty

The Scottish Government has provided funding to pilot the installation of renewables-based central heating properties that are off the gas grid across Scotland. The pilot aims to assess the impact of renewable technologies on fuel poverty; assess people's reaction to using these technologies; and to evaluate the potential costs and benefits of including them in the fuel poverty programmes. The interim findings show that renewable technologies can be a cheaper alternative to oil and electric heating but that the installation costs are prohibitive. The link to the interim findings, published November 2007, can be found at: <http://www.scotland.gov.uk/Publications/2007/11/21152714/2>

The final report is due to be issued shortly and the Scottish Fuel Poverty Forum will consider its findings. The Forum has been asked to present options for the future direction of fuel poverty policy/programmes to Ministers by the autumn. Part of that will be to consider what role renewables should play, taking account of the findings of the pilot.

vi. Building standards

The Scottish Government is also using building standards and the planning system to help achieve low carbon buildings. The Sullivan report¹³ recommends staged increases in energy standards for new buildings to substantially reduce emissions, with a route-map to the goal of zero carbon buildings. The impact of the recommendations are currently being investigated and it is intended that proposals for changes to the energy standards will be issued to consultation early next year, with a view to changes being introduced in 2010.

vii. Air Quality

The Scottish Government recognises that renewable heat technologies can benefit air quality in situations where they replace oil and coal heating. When assessing planning applications for such technologies, local authorities are expected to take into account air quality considerations, particularly if the development is to be located in or adjacent to a current or potential Air Quality Management Area. However the Scottish Government recognises that there is presently insufficient information on the relationship between biomass boilers and particulate emissions to allow local authorities to effectively assess potential air quality implications of such developments. In this context, the Scottish Government has recently carried out research on the impact of biomass emissions on air quality, particularly in sensitive urban areas, which includes best practice guidance to local authorities and developers on abatement measures.

¹³ A Low Carbon Building Standards Strategy for Scotland (The Sullivan Report)
<http://www.sbsa.gov.uk/sullivanreport.htm>

viii Planning

SPP6

Scottish Planning Policy (SPP6) sets out how the planning system through the preparation of development plans and determination of planning applications should promote renewable energy and assess individual proposals. More detailed information on planning can be found at section 10.

Scottish Sustainable Communities Initiative

The Scottish Government launched the **Scottish Sustainable Communities Initiative** in June 2008 to seek to achieve a step change in design, quality and environmental standards of new housing-led developments, and to lead to the creation of exemplar projects which provide a basis for demonstration and learning.

The Initiative invites the submission of proposals and provides guidance on the issues to be addressed by new sustainable communities including meeting identified housing requirements, locational considerations, relationship to a sustainable transport network, principles of design and construction, environmental considerations and delivery.

The primary focus of Scottish Government support will be to minimise the regulatory burden. There is no budget for direct Scottish Government financial support. The SSCI document proposes that sustainable communities should provide for an efficient energy supply, such as low carbon district heating, combined heat and power or other forms of renewable heat and micro-generation technologies providing communal energy generation.

ix. Renewables Obligation (Scotland)

The Renewables Obligation is designed to incentivise renewable electricity generation, not renewable heat. However, changes being proposed at a UK as well as at a Scottish level to be introduced in April 2009 provide an opportunity to encourage renewable heat through greater reward to combined heat and power plants, as well as to the biomass sector. The Scottish Government is consulting at the moment on amendments to the Renewables Obligation (Scotland), and encourages as many stakeholders as possible to respond.

The details of the banding measures related to biomass which should help grow the sector are set out in Section 9 (?).

x. Regulatory and financial incentives

The Scottish Government believes that there is a clear role for an incentive mechanism to promote renewable heat. As highlighted above, the UK Government is currently consulting on forms of incentive as part of its Renewable Energy Strategy. The Scottish Government is not repeating this information here but will be informed by that consultation in considering next steps. The use of a scheme to promote the uptake of renewable heat is a new step for the UK and involves certain challenges given the nature of the UK heat market. The key characteristics of potential models for a renewable heat obligation (RHO) and renewable heat incentive (RHI) can be summarised as follows:

Renewable Heat Obligation

Scheme design

- Suppliers of non-renewable heating fuels are obliged to present a quantity of Renewable Heat Certificates (RHCs) demonstrating the production of heat from renewable sources, as determined in proportion to the total quantity of fossil fuel for heating that they supply. These RHCs will be obtained from producers of renewable heat.
- For small installations, eligibility for RHCs is likely to be deemed; for larger installations it could be calculated accurately using a heat meter.
- Compliance with the obligation would be monitored by a regulator, with penalties for energy suppliers not meeting the obligation.
- Could apply to all suppliers of non-renewable heating fuels, including suppliers of non net-bound fuels such as heating oil, or limited to suppliers over a certain size.
- RHCs could be purchased by energy suppliers within a market for certificates or secure through direct involvement in renewable heat projects.
- A buy-out price could be used as a 'safety value', limiting the costs of compliance.
- Cost of scheme passed through by suppliers to all buyers of non renewable heating fuels via fuel bills.
- Government will determine the amount of renewable heat delivered by the scheme.
- Buy-out monies channelled into renewable heat investments.

Renewable Heat Incentive

Scheme design

- Any heat user who can prove they have generated heat from a renewable source is entitled to claim a set payment per MWh from a central fund or from the obligated fossil fuel energy supplier.
- Could apply to all suppliers of non-renewable heating fuels, including suppliers of non net-bound fuels such as heating oil, or alternatively only to suppliers of a certain size.
- Output likely to be deemed for small installations
- If suppliers make payments to claimants directly, a methodology for balancing of payments across fossil fuel suppliers ensure all suppliers of fossil fuel for heating bear a proportionate share of the total costs of the RHI support.
- Alternatively the policy could be operated by a central body which makes all payments to renewable heat users and collects its revenues from suppliers according to their share of costs.
- Cost of scheme passed on by suppliers to all buyers of non-renewable heating fuels.
- Financial support paid to installer of renewable heat would be known in advance but total amount of renewable heat coming forward would depend upon uptake of the offer.

More details on the above models can be found at [Chapter 4: Heat of the UK Renewable Energy Consultation Document](#)¹⁴

The Scottish Government expressed its early view in March in relation to the UK Government's earlier Call for Evidence on Heat. We suggested that a RHO seemed preferable to a RHI, on the basis that it is consistent with the Renewables Obligation approach for electricity; that it allows comparisons with the Renewables Obligation on the cost of carbon saved; that it gives us the ability (potentially) to tailor support to Scottish needs; and finally that it allows the market to seek out the most efficient approach and should encourage innovation. We argued that the main attraction of a RHI was that it might offer a degree of certainty to investors which could encourage them to bring forward applications. However, we felt that if the price was set too low, then no projects would emerge, whilst if set too high then firms would make excessive profits. If the price were guaranteed, then excessive profits could be locked into the system.

Our response above highlights our concerns around the detail of implementation. The Scottish Government will pay close attention to views expressed in the UK consultation in developing its own policy and in dialogue with the UK Government. The views of consultees on any issues of special relevance to Scotland would be helpful.

Any regulatory support mechanism is however likely to take time to phase in. In the meantime, the **Scottish Government considers that, the market for renewable heat needs to be kick-started with support for biomass heat use by businesses and demonstrator district heating projects.** Support is available to encourage micro-generation and community projects. The case for support for businesses to encourage use of renewable heat has been highlighted by the Woodfuel Taskforce (in relation to biomass), and in the report "Mitigating Against Climate Change in Scotland: Identification and Initial Assessment of Policy Options". The need for support for renewable heat in district heating projects was highlighted in the FREDS report. We recommend a further round of the successful Scottish Biomass Support Scheme in order to promote these two important areas with the business focus on smaller businesses who may find it harder to meet up front capital costs.

xi. Skills and Training - jobs

The Scottish Government's Skills Strategy has set clear expectations for Sector Skill Councils (SSC) in Scotland to identify and articulate employers' skills needs; to work with employers and stakeholders to develop skills solutions; to produce robust labour market intelligence for their sector; and to contribute to the development of vocational qualifications. A Sector Skills Agreement (SSA) is developed by SSCs in consultation with employers and other key stakeholders. It is the vehicle used to outline the skills needs in the sector, and the steps to address these. SSC lead on the delivery of the actions identified in the SSAs, working in partnership with all major stakeholder organisations such as Skills Development Scotland as well as further and higher education institutions.

The Scottish Government is supporting the Sector Skills Councils to undertake major new research on the future skills needs of the renewables sector, including renewable heat, in order to inform policy.

¹⁴ http://renewableconsultation.berr.gov.uk/consultation/consultation_summary

Skills Development Scotland is raising awareness of career opportunities in renewable energy through its “The Path is Green” initiative for schools. This highlights the drive towards the increasing use of renewable energy, supporting the global commitment to tackle climate change and the economic advantages that Scotland is well placed to exploit thanks to its natural resources and its people. The Path is Green encourages secondary school pupils to look at the wide range of jobs that are now associated with sustainable energy and the environment. It provides case studies of real jobs and guidance on the qualifications that might be necessary to pursue those careers, in order to build the workforce capacity to meet the challenges and fill the opportunities posed by the government’s aspirations for transformation of the heat, electricity and transport energy sectors.

The Action Plan for Renewable Heat takes into account related policy development on community renewables (see Section 7) and on the biomass sector (see Section 8).

Summary of Actions

i) Legal Powers

- We will continue to work with the UK Government as they refine the potential for regulatory support for renewable heat, and this work will clarify whether such support falls under reserved or devolved powers.

ii) Information Provision

- By the end of March 2009, we shall support Scottish Renewables to produce a consumer information pack on renewable heat, and we shall produce case studies on best practice.
- We have made available on line an indicative heat map of Scotland.

iii) Targets

- By April 2009, we propose to introduce a target of 11% of heat demand to be sourced from renewables by 2020.

iv) Links with waste treatment policy

- We are preparing a National Waste Management Plan for Scotland which will consider the scope for banning more materials from being sent to landfill, including waste biomass.
- We are undertaking further work to improve the volume estimates of the potential resource from biomass waste streams as part of the follow up to our Woodfuel Taskforce, which is due to report to Ministers in early October.
- By the end of the year, SEPA will publish Thermal Treatment guidelines which will include details of efficiency levels expected at energy from waste plants.

v) Fuel Poverty

- We have funded a pilot project installing renewables under the Central Heating Programme in off gas grid areas, and the Scottish Fuel Poverty Forum will consider the findings and make recommendations to Ministers by the end of the year.

vi) Building Standards

- Following the Sullivan report, proposals for changes to energy standards will be issued for consultation in early 2009, with a view to changes being introduced in 2010.

vii) Air Quality

- We are carrying out research on the impact of biomass emissions on air quality in urban areas and will develop best practice guidance to local authorities and developers on abatement measures and expect to publish a report shortly.
- Forestry Commission Scotland will develop an Air Quality Decision toolkit as part of the work being undertaken in the Regional Biomass Advice Network project

viii) Planning

- We are supporting the implementation of measures within SPP6 on the installation of microrenewables.
- We have launched the Sustainable Communities Initiative to lead to the creation of exemplar projects.

ix) Renewables Obligation

- We are currently consulting on measures to amend the Renewables Obligation Scotland, including the banding of biomass in line with UK proposals, and cross-referring to the new SEPA Thermal Treatment guidelines where appropriate.

x) Regulatory and Financial incentives

- As at i) above, we will continue to work with the UK Government as they refine the potential for regulatory support for renewable heat, in order to ensure that Scottish needs are taken into account.
- We already provide support to the renewable heat market in Scotland through schemes such as the Scottish Community and Householder Renewables Initiative (SCHRI), and the Scottish Rural Development Programme.
- In addition, over the next two years, we propose to run a second round of the Scottish Biomass Support Scheme (SBSS) focussing on heat-only projects by businesses and on demonstrator district heating schemes.

xi) Skills and Training

- By the end of March 2009, we will support the Sector Skills Councils to undertake major new research on the future skills needs of the renewables sector, including renewable heat, in order to help inform policy.

Conclusion

6.3.1. The Scottish Government's **Action Plan for Renewable Heat** highlights activity across a wide range of areas which will contribute to the promotion of this sector in Scotland, including at a UK level, and new grant support. However, the Scottish Government is under no illusion as to the enormous scale of the challenge which must be faced. Heat may have been the poor relation to electricity in the renewables policy arena thus far, but it will need to be pushed to the head of the family if we are to aspire to the huge increase necessary to meet our proposed 2020 energy target.

Questions for debate

- **Do consultees agree that we should work towards a target of 11% for renewable heat?**
- **What more could we or other parties do to encourage renewable heat deployment specifically with regard to: air quality, awareness raising, planning, other areas?**
- **Do consultees agree that renewable heat should be promoted through a regulatory incentive mechanism? Do consultees consider that there are Scotland specific issues in the choice between a RHI and RHO?**

7. Distributed Energy and Community Based Schemes

Objective: To promote distributed energy systems to promote renewables as well as wider energy targets, and to maximise the benefits for communities from renewables.

- We are keen to promote the development of distributed energy systems to deliver renewable as well as wider energy targets;
- The Scottish Government wishes to maximise the benefits for communities from renewable energy;
- The Scottish Government is developing guidance, including good practice information, for communities and developers on models for community renewables;
- The Scottish Government is refocusing the community stream of the Scottish Community and Householder Renewables Initiative (SCHRI) in the short-term towards projects with direct community engagement and benefit;
- For 2009/10 we intend to develop a community support scheme to be tendered across Scotland, focussed on direct community engagement and encouraging renewable heat;
- The Scottish Government is supporting a study of how to develop renewable energy on the Western Isles in a manner compatible with environmental objectives.



The community of Fintry, off the gas grid and north of Glasgow, is beginning to see tangible benefits from its involvement in the local Earlsburn wind farm development which went operational in the summer. Having invested in an additional turbine for this commercial scheme, the community is now starting to earn revenue, and is already able to offer all villagers the opportunity to insulate their attics and cavity walls free of charge. Other plans in the early stages of

development include domestic ground source heat pump installations for local householders, a biomass boiler for the well-used community and sports facility which currently relies on heating oil, and the formation of a suitable service (ESCo) model to deliver these new technologies sustainably. The community will be showcasing its achievements in the Fintry Renewable Energy Show (FRESH), in May 2009.

Introduction

7.1.1. It is important to consider the development of renewable energy in the context of the significant changes to the way in which energy is produced and consumed within our communities. It is particularly important to recognise that the industrial model of centralised production, distribution and supply of electricity which dominated our perception of energy systems in the twentieth century is being replaced by a more decentralised system which is more attuned to local and individual needs. This offers significant opportunities for efficiency

gains through the development of a range of approaches such as distributed energy, smart grids and community-based production and supply. This section describes a number of initiatives in this area and seeks views on how these approaches can reinforce our goals in respect of sustainable energy.

7.2 Distributed Energy

7.2.1. Distributed Energy (DE) is the local supply of electricity and heat which is generated on or near the site where it is used. In practice it is delivered as a package of energy efficiency and energy supply measures and covers a range of technologies at varying scales from the household to the community, which can generate electricity and heat from renewable or fossil fuel energy sources. Distributed Energy in its widest sense currently accounts for just under 10% of electricity supply. This figure includes all generation that is linked to the electricity distribution networks, regardless of fuel or size.¹⁵ The contribution of renewable community DE is thought to be very low at present¹⁶; indeed the lack of precise figures illustrates the immaturity of the sector. However, the number and variety of sites that could be utilised for generation make clear that community DE has potential to make significant contribution to renewable energy and carbon reduction targets.

7.2.2. Distributed Energy has a number of important attractions:

- By opting to use a distributed, local solution to their own energy needs householders, communities, businesses and schools can move from being passive users of energy and become producers making an active contribution to energy and climate goals. For many this is an attractive proposition; the step beyond energy efficiency towards truly more sustainable living.
- Alongside energy efficiency measures, DE has a crucial part to play in reducing the carbon impact of the built environment. Energy generation technologies can be integrated into the fabric of buildings as they are built; retrofitted to existing buildings particularly those where energy efficiency measures such as double glazing or cavity wall insulation are not suitable; or installed near the point of use on waste land, nearby roofs or outdoor spaces such as car parks.
- Microgeneration technologies can be installed and connected relatively quickly, particularly where recent changes to rules on household permitted development apply. When considering the need to meet renewables targets this takes on added importance as larger renewable developments can face greater challenges in terms of planning, infrastructure investment.
- DE can help in tackling fuel poverty, particularly as the fuel-poor tend to be heat-poor. Household heat technologies such as solar water heating cut the amount of energy the consumer needs to buy, so also cutting their bills. Once installation costs are covered, there are good examples of positive benefits for the fuel-poor.¹⁷

¹⁶ 'The growth Potential of Microgeneration in England, Wales and Scotland' – Element Energy, June 2008, estimates only 16 MW of electricity from microgeneration technologies.

¹⁷ Reference to field trials for Fuel Poverty in the North East of England

- DE can increase the efficiency of fuel use, as the losses that occur in transportation are reduced,¹⁸ leading to lower generation requirements and consequently lower carbon emissions.
- DE brings valuable diversity to the energy mix, encompassing a range of technologies taking their energy from the sun, the wind or the earth; to meet the energy needs of homes, schools, supermarkets or hospitals; that can be owned and operated by householders, small businesses or local authorities.

While these are strong arguments, there is still much more information required on the carbon and cost benefits of distributed energy. The UK Government is carrying out further research on this issue and the Scottish Government will consider this in developing future policy.

7.3. Community Renewables

7.3.1. The Scottish Government wishes to maximise the benefits for communities from renewable energy. Benefits which could accrue are socio-economic and could include local regeneration and the development of skills capacity, as well as enhancement of social confidence, energy awareness, community cohesion and partnership working, and the mitigation of fuel poverty.

Proven Energy – small wind systems



Gordon Proven deservedly won the Scottish Renewables Green Energy Awards Outstanding Contribution to the Industry last December. Proven Energy, based in Ayrshire, has been designing, developing and installing durable small wind systems since the 1980s and has been a real success story not just in Scotland but also in some of the most remote places in the world. You can find out more at www.provenenergy.com. The picture used is from Cumbernauld primary School, North Lanarkshire.



Four 6kW Proven wind turbines helping to provide 24 hour power on the Island of Eigg

¹⁸Heat by its nature cannot be transported over long distances, and local electricity generation can reduce transmission losses by 1% and distribution losses by 6.5%. Sustainable Development Report, Ofgem, 2007

7.3.2. The level of benefits, and indeed the level of risk incurred, depends largely on the models of ownership deployed, and to date these have ranged widely. Models for community renewables include:

- 100% ownership by a non-profit distributing community body, as in the Isle of Gigha Heritage Trust, or nearly 30 projects being developed across the north of Scotland by Community Energy Scotland, formerly the Highlands and Islands Community Energy Company (HICEC);
- the voluntary community benefit “windfall” payment offered by commercial developers, as in the Hadyard Hill Wind farm owned by Scottish and Southern Energy. This model does not necessarily entail any local ownership;
- mixed ownership – via a community body and co-ops (as in Findhorn – which has a private wires network);
- mixed ownership between public and private developers (as promoted by Energy 4 All and Fintry Frostfree);
- the joint venture model proposed by Viking Energy in Shetland.

7.3.4. Community Energy Scotland (CES) has quantified the potential benefits to be gained from the encouragement of small-scale community renewables in Scotland over the next 10 years as potentially comprising 10,000 community buildings (including schools), up to 100 small-scale wind farms, 40 hydro schemes and 50 district heating schemes. Such development could cost about £200M over the next 10 years but would result in annual energy cost savings of nearly £50M and an annual income to communities of over £30M, to the benefit of up to 2 million people. It is clear from CES’s estimates that the main benefits are socio-economic, and could help regenerate local communities; with a lesser impact in terms of generation capacity and contribution to the national renewables target.

7.3.5. Clearly there are a number of different models for community engagement in renewables which entail varying degrees of impact and risk: commercial windfall payments attract the lowest risk to communities, although the rate of financial benefit offered under this model (usually £2,000 per MW) would put a 50 MW “commercial” development on the same rate of return to a community as a 1MW development under a fully community-owned model. Developers may engage with communities, or communities may take forward their own projects without developers.

7.3.6. The Scottish Government recognises that there is a need to differentiate in policy terms between community benefits and community ownership – related to the different models above. We also believe that, with some notable exceptions, very large scale commercial developments, while bringing community benefits, should be seen primarily for their contribution to the climate change agenda. These are commercial-scale power stations contributing to achieving Scottish renewable generation targets. By comparison, small scale developments will not impact significantly on renewables targets, but can allow more direct engagement with the local community. As such, they should be viewed within the rural development context: community-scale wind farms provide an opportunity to mobilise Scotland’s social economy to local socio-economic benefit.

7.3.7. The Scottish Government has more than doubled its budget for community renewables over the next 3 years and will be focussing on signposting for communities on how to make these developments happen and who can help them, as well as developing clear and stable funding mechanisms. We intend to:

- Develop guidance, including good practice information, for communities and developers on models for community renewables;
- Refocus the community stream of our Scottish Community and Householder Renewables Initiative (SCHRI) in the short-term towards projects with direct community engagement and benefit;
- Develop (for 2009/10) a community support scheme to be tendered across Scotland, focussed on direct community engagement and on renewable heat.
- Fund two Schools Renewables Development Officers to work with local authorities increased uptake of micro-renewables in schools to reduce carbon emissions and energy costs and raise awareness of sustainable energy issues through educational opportunities



Windygoul Primary School, Tranent, East Lothian. Winner of the 2008 Carbon Trust Low Carbon Building Award.

The single storey new school, opened in August 2007, was specified to ensure pupils benefit from a healthy learning environment which makes use of natural ventilation and minimises energy usage. Environmentally friendly features include a green 'living roof' of sedum which provides superb insulation, keeping the building warm in the winter and cool in the summer. Photovoltaic glazing has been incorporated into the glass

conservatory style roof in the dining hall, providing a 17kWp array to help heat water and provide electricity. Special control panels allow pupils to monitor the amount of electricity being used. Windygoul shows that high quality low carbon buildings can provide light and airy learning environments that give youngsters the best start in life.

7.3.8. Smaller, community based housing associations can play an important role in delivering local renewable energy schemes with community development benefits. Both local authorities and housing associations may also be well placed to facilitate the setting up of small and medium-sized renewables projects linked to housing that offer benefits in terms on emission reduction, and contributing to our renewables targets. They own and/or manage groups of properties, are used to working with local communities and many of their residents are on low incomes and thus may be in fuel poverty and in need of the benefits renewables can bring. Some have already developed renewables pilot projects or are keen to do so.

Easthall Park Housing Co-operative – Wind Turbines

Easthall Park is a small fully mutual housing co-operative based in Easterhouse in Glasgow. Earlier this year the co-op put together a funding package from range of sources to purchase two wind turbines. The turbines are sited in Glenburn Park (owned by the co-op) and are now used to provide 40% of the energy requirements needed by the Glenburn Centre (a local community facility owned the co-op and managed by a committee of local residents. Each turbine cost approx. £58,000 and a contribution of £6,858 was made towards the cost of the turbines by the Wider Role fund. However funding was secured by the co-op from a number of sources including the Energy Saving Trust.

7.3.9 It will be up to local authorities and communities across Scotland to take forward their own approaches to this area in line with this general framework. But the Scottish Government, in recognition of the special environmental and economic circumstances which apply in the Western Isles, is supporting (as at October 2008) a study to assist in the economic and community development of the Outer Hebrides in a manner consistent with conservation obligations.

7.3.10. The key objectives of the study are to examine a range of scenarios for development in the Outer Hebrides and thence:

- to identify renewable energy potential, including the role of different scales of energy generation. It will seek to outline the extent, in scale and timescale, to which this potential can deliver economic and community development compatible with environmental obligations. In doing so it will consider ownership models, their different impact on benefit to be realised and how these might be realised;
- to identify the other opportunities for sustainable development initiatives at different scales which might contribute to delivering economic and community benefit compatible with environmental obligations including opportunities which may arise from the management of habitat; and
- to produce a report and recommendations for action at a community rather than individual site level. The report will identify likely costs and benefits flowing from the recommendations.

7.3.11. The results of this study will be available in late 2008 and will be used to help frame future policies for the development of renewable energy in that area.

Questions for debate

- **How can distributed energy systems be promoted in Scotland?**
- **Do you agree with the Scottish Government's proposed measures for maximising community benefit from renewables, including the production of guidance and the development of an improved grants scheme?**
- **What role can social landlords play in developing local renewable energy schemes and what is the best way of supporting and enabling this ?**

8. Bio-energy

Objective: To maximise the sustainable contribution of biomass to meeting renewable heat and electricity targets.

- **Scotland is well placed to develop the use of bio-energy, which if properly planned can be carbon neutral and sustainable;**
- **Biomass energy from waste has a role to play, particularly via plants that deliver a high level of efficiency through combined heat and power and/or district heating;**
- **Biomass is recognised as a potential growth area in the plans to vary the levels of support to the different technologies, under the RO(S);**
- **The Scottish Government Scottish Biomass Support Scheme (SBSS) is expected to deliver up to 20 MWth of renewable energy capacity;**
- **The new Scottish Rural Development Programme (SRDP) includes measures to support the generation of renewable energy including from biomass projects;**
- **There is a case for further support under the SBSS;**
- **The Woodfuel Taskforce recommendations on making significant volumes of additional biomass material available to the growing biomass energy sector are now being implemented.**

8.1. Introduction

8.1.1. For the purposes of this section, bioenergy is defined as the production of energy for electricity and/or heat using renewable biomass. Section 9 deals with transport. On efficiency grounds, the Scottish Government would particularly like to see biomass utilised for heat-only or in combined heat and power plant, while accepting that there will also be a continuing role for stand-alone electricity applications in certain circumstances. Note that the potential sustainable contribution of biomass to meeting our renewable electricity and heat targets is dealt with under Sections 5 and 6 respectively.

8.1.2. As a country with a significant forest resource Scotland is well placed to develop the use of bioenergy. There is rapidly growing demand from the bioenergy sector for forestry material and the Wood Fuel Task Force has identified opportunities for increasing the volumes available to the sector, as well as additional sources of biomass such as commercial and industrial wood waste. Second generation biofuels projects are likely to be very large-scale and developments in Scotland would result in a highly competitive market for the available resource. Using biomass for energy offers a number of benefits as if properly planned it can be carbon neutral and sustainable. We need to recognise, however, that there are competitor industries for biomass supply and that it needs to be able to demonstrate its economic as well as its environmental benefits. A focus on local supply initiatives will therefore be important.

Stevens Croft – E.ON UK's wood fired power station near Lockerbie

Steven's Croft is a 44MW biomass power plant, burning a mixture of forestry residue and specially grown willow. It is expected to sustain around 300 jobs in the forestry and agriculture sector and to save up to 140,000 tonnes of greenhouse gas emissions a year. The majority of fuel is sourced within a 60 mile radius. The plant will require over 480,000 tonnes of fuel every year. The fuel is a blend of: 60% sawmill co-products and small round wood, 20% short rotation coppice (willow) and 20%

recycled fibre (from wood product manufacture). Steven's Croft was voted Best Renewable Project at the 2007 Scottish Green Energy Awards.

8.1.3. Scotland may also be well placed to develop so-called 3rd generation bioenergy systems via marine biomass (micro and macro-algae). Indeed the Scottish Association for Marine Science (SAMS) is leading a major research and commercialisation project “Biomara” in this area with partner organisations from Ireland under the EU INTERREG programme Cross Border programme.

8.1.4. This consultation focuses mainly on woody biomass and biomass from waste streams, which are currently most commercial. It is worth highlighting that the Scottish Government considers that biomass energy from waste, including agricultural waste, has a role to play, and can be a sustainable alternative to landfill. However, Ministers are opposed to large and inefficient energy from waste plants, and have a strong preference for plants that deliver a high level of efficiency through combined heat and power or district heating. The consultation on banding of the Renewables Obligation (Scotland) reflects this position. Biomass can also be co-fired in large coal burning boilers, up to a certain percentage - Scottish Power do this already. This is arguably the most cost efficient way of using biomass for electricity production.

8.1.5. Additional and important benefits from bio-energy lie in the potential to help rural communities, especially in relation to local economic development and the alleviation of fuel poverty in areas not served by the gas grid. Bio-energy for electricity and heat also has wider roles of enhancing energy security of supply and contributing to renewable electricity targets.

8.2. Scottish Government Policy

8.2.1. The Scottish Government is keen to develop the significant potential for bioenergy, and has in place a number of strategic policies to develop that potential:

- **Legislation**

Electricity generation on a large scale is discussed at section 5 above. It states that the production of renewable electricity is driven mainly by the Renewables Obligation (RO) legislation. The Scottish Government’s current consultation on changes to the RO in Scotland includes proposals for increased levels of support for biomass generation, with higher levels available for plant fitted with good quality combined heat and power (CHP)¹⁹.

- **Financial support**

The focus of public sector support for bioenergy (heat) to date has drawn on Scotland’s forestry strengths by promoting woody biomass. The Scottish Government’s Scottish Biomass Support Scheme (SBSS), (a 1 year grant scheme covering 2007-08, now closed), is funding around 65 projects from a wide range of organisations who are investing in the sector from the supply side

¹⁹ <http://www.scotland.gov.uk/Topics/Business-Industry/Energy/19185/ROSCons08BPR>

through to boiler and plant installation. The scheme is expected to deliver up to 20 MW of renewable energy capacity. (See Section 6 above on renewable heat)

The Scottish Government has also provided funding under the community element of the Scottish Community and Householder Renewables Initiative for a programme of biomass demonstrators in the Highlands and Islands, and one-off demonstrator funding to the boiler installation at the new campus of Queen Margaret University College. Through regional aid, the Scottish Government has also assisted larger biomass schemes – Balcas in Invergordon and UPM Caledonian in Irvine.

The new Scottish Rural Development Programme (SRDP) also includes measures to support the generation of renewable energy including from biomass projects.

Despite the above, there may still be, in the wider context of the commitment to renewable heat (see Section 6 above), a case both for additional support for businesses to install biomass heating systems, and to promote demonstrator district heating schemes using biomass. Hence we are planning to run a further round of the Scottish Biomass Support Scheme (SBSS) specifically to address these areas.

Several biomass district heating schemes are now in operation in Scotland, mainly in social housing schemes. Extending the use of district heating presents a number of challenges in terms of additional costs, planning and infrastructure. An important factor in promoting district heating is for local authorities and developers to adopt this approach as part of the way they approach housing scheme development.

Supply

8.2.2. The Scottish Government wants to see a viable biomass bioenergy sector. Demand for woody biomass from bioenergy is increasing rapidly and a number of large scale projects are seeking to secure substantial volumes. The number of suppliers from large-scale projects, local woodfuel markets, has increased rapidly over the last 5 years resulting in a number of new businesses using local resources, particularly in rural areas. In response to the growing demand, the Scottish Government set-up the **Woodfuel Taskforce**. The Taskforce published its findings in January, concluding that there are significant volumes of additional biomass material which can be made available to the growing biomass energy sector. The Scottish Government has responded by identifying 25 actions to be implemented to ensure the biomass resource will be available to the renewable energy sector now and in the future²⁰.

8.2.3. In taking this forward it will be important to tackle the challenges in relation to the growth of the biomass sector – e.g., competition for wood fibre, weak supply chains, and quality standards as well as other barriers to growth.

8.2.4. The Task Force recommendations covered a range of areas which need to be addressed to increase availability of material:

²⁰ [http://www.forestry.gov.uk/pdf/sgwoodfuel.pdf/\\$FILE/sgwoodfuel.pdf](http://www.forestry.gov.uk/pdf/sgwoodfuel.pdf/$FILE/sgwoodfuel.pdf)

- Improving knowledge both of the volume and location of the raw material and of the means of producing it and making it available to the market;
- Efficient markets with clearer price transparency and standards for biomass material;
- An effective supply chain to create an integrated an effective supply of biomass material, from the forest sector to the industrial waste sector;
- Support and incentives to stimulate and encourage the development of new markets, new biomass resources and development of the supply chain.

8.2.5. Initiatives which are delivering some of the key recommendations include demonstration sites being set up by Forestry Commission Scotland to promote bioenergy best practice and gain new knowledge; the development of a branch wood and brash recovery grant to encourage growers to bring this material to market, and increase thinning of their forests and woodlands; improving knowledge about, and handling of, biomass in the waste streams to ensure that as much as possible is used for bioenergy; development of a life cycle assessment model to enable the calculation of carbon benefits and disadvantages from the various biomass growing or utilisation options; and development of the appropriate infrastructure to utilise arboriculture arisings as a wood fuel and avoid the material entering the waste stream

8.2.6. The Government has set up a working group to oversee the implementation and monitoring of the accepted recommendations. The working group and the full task force will meet for a plenary session later in the year to review progress towards delivering the recommendations.

Sustainability

It is important that all renewable energy production is sustainable. If biomass sourcing were to take place without sufficient regard to environmental, social and economic impacts, its continued production and expansion would not be possible in the longer term.

The EU recently consulted on the development of sustainability criteria for biomass for heat and energy. We are working with UK government to produce a detailed response to the consultation.

Environment

8.2.7. Maintaining the high quality of our environment is an important element in the development of a sustainable biomass industry. There are a number of potential environmental impacts associated with the development of the raw materials and use of biomass for energy. How significant these impacts are will depend on a number of factors, which can be mitigated in many cases through the use of best practice in land management and adherence to air quality standards and planning regulations.

8.2.8. On air quality, the Scottish Government has carried out research into the emissions from biomass boilers, with a focus on urban areas currently deemed to be at high risk of being declared an Air Quality Management Area. See section 6.

Questions for debate

- **Do consultees agree that there is significant potential for developing bioenergy through wood and recyclable waste**
- **Is there anything more that can be done to encourage next generation bioenergy, including marine biomass?**

9. Sustainable Transport

Summary of actions

- We will develop an understanding of the contribution of alternative technologies such as electric or hydrogen vehicles in meeting our renewable targets, taking account of the potential impact on electricity demand, and the potential for vehicle-to-grid technologies to help smooth electricity demand.
- We will continue to monitor the emerging evidence on biofuels - it is essential that our biofuel use is sustainable.

Introduction

9.1.1. The Scottish Government is developing and delivering more sustainable transport through activity across a number of areas to improve efficiency and reduce transport emissions in the longer term. This is in the context of the Government's Economic Strategy and the National Transport Strategy. In addition, transport is heavily dependent on petroleum fuels. Reliance on these fuels has potential consequences for the security of our energy supply.

9.1.2. Achieving more sustainable transport relies on a range of activities - not just the use of renewable fuels. In parallel with the UK Government's role, the Scottish Government is supporting a range of measures to promote more sustainable transport measures, including significant investment in public transport: travel, car purchase and eco-driving information; behavioural change programmes; active travel measures; supporting investment in automotive technologies that increase efficiency; and taking action to reduce emissions in the public sector fleet. To maximise effectiveness, these measures are normally packaged together in themes to address particular issues.

9.1.3. The proposed Renewable Energy Directive²¹ sets a 10% target for renewables from transport (restricted to those modes that currently use either petrol or diesel) by 2020 as part of the 20% renewables target. This effectively excludes aviation and shipping, although renewable energy used in these sectors would count towards the target, as would electrified railways. The proposed Directive also provides for sustainability criteria for biofuels. The two main transport issues to consider in terms of **renewables** here, therefore, are biofuels and alternative technologies such as electric or hydrogen cars. The Scottish Government, working with the UK Government, needs to consider how best to work towards the transport target in a cost effective and sustainable way. The current expectation is that the Directive could be agreed in the Spring of 2009 although it could be sooner.

9.1.4. Reaching the transport target will be challenging, particularly given the findings of the Gallagher Review²² (see below). However there may be more sustainable opportunities through the development of second and third generation biofuels. Biofuels are the only

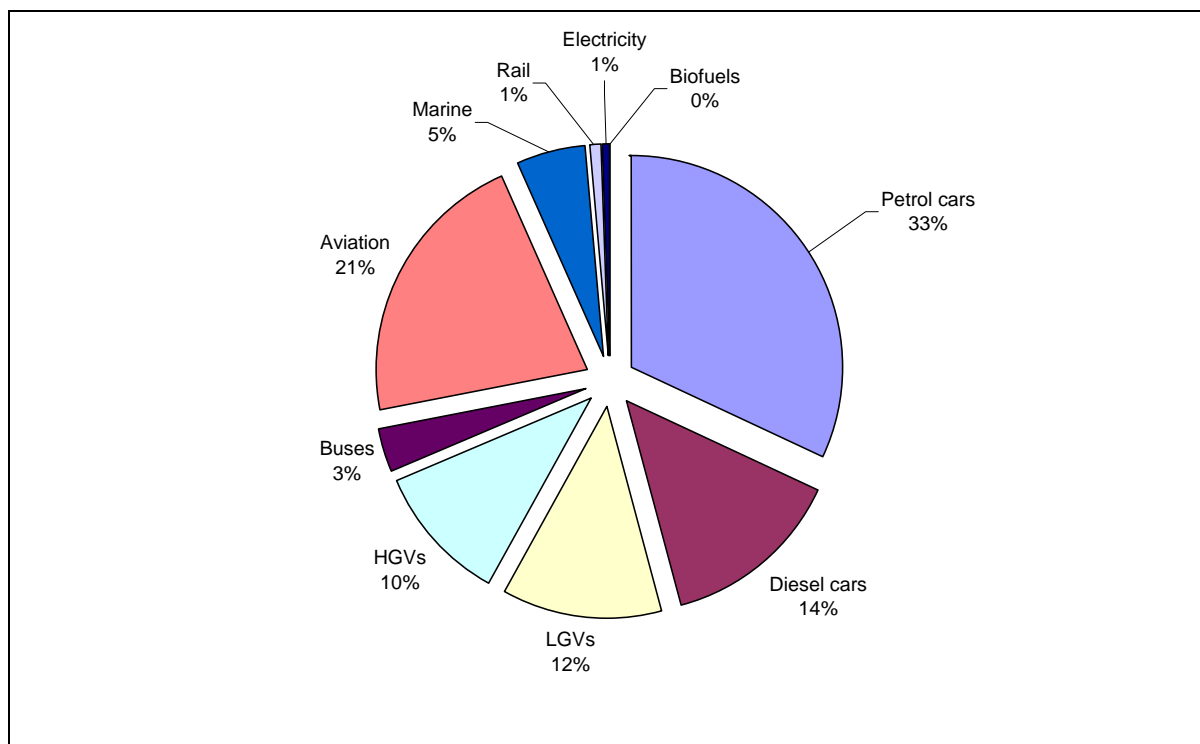
²¹ Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources {COM(2008) 30 final} {SEC(2008) 57} {SEC(2008) 85}

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52008PC0019:EN:NOT>

²² <http://www.dft.gov.uk/rfa/reportsandpublications/reviewoftheindirecteffectsofbiofuels.cfm>

renewable transport fuel commercially available on a significant scale at present. However, in the longer term, alternatives such as electric and hydrogen powered vehicles are likely to be of greater significance.

Figure 9.1: Estimated Energy Consumption by Transport Mode – 2005 (including international aviation and shipping)



Source: Scottish Government (2006) Scottish Energy Study – Volume 1

What are biofuels?

Biofuels are fossil fuel substitutes that can be made from a range of organic materials including oilseeds, wheat and sugar, and are typically blended with conventional petrol and diesel. Biofuels offer the potential to reduce GHG emissions from road transport. Such a technology is important for global efforts to tackle climate change as car and vehicle use grows rapidly across the globe in the next few decades. At present the two main types of biofuel are biodiesel and bioethanol. Biodiesel, a diesel substitute, is generally produced from oily crops (or feedstocks) such as rapeseed, sunflower or palm oil, or recovered cooking oil. Bioethanol, a petrol substitute, is generally produced from starchy feedstocks, such as wheat, sugar beet or sugar cane, - although it can be produced from any organic substance (such as municipal solid waste). Other forms of biofuels include biomethane, which is a gas produced by the biological breakdown of organic matter and can be used as a renewable alternative to natural gas, either as a transport fuel or for electricity generation and heating.

Biofuels are **less energy efficient than fossil fuels**. For a given volume, bioethanol has around two-thirds the energy content of petrol and current forms of biodiesel have about nine-tenths of the energy content of fossil diesel. To achieve a 10% biofuels share by energy would therefore require a target of 11-15% by volume, depending on the relative market shares for petrol and diesel.

Biofuels and sustainability

The Scottish Government is committed to sustainability requirements for biofuels. Sustainability means that the biofuels are produced in ways which do not damage the environment or create social conflict. For example, it would be unacceptable to clear rainforest to grow feedstock for biofuels, as apart from the loss of biodiversity, there would be a net increase in carbon emissions. Conversion of other biodiverse ecosystems would be equally unacceptable. Other concerns include the indirect effects of biofuels, such as where biofuel feedstocks displace other crops which are then grown on previously forested land that is cleared for this purpose. Such effects can mean that some biofuels would produce an overall increase in greenhouse gas emissions. There is also evidence (see Gallagher Review²³ below), that some biofuels are contributing to rising food prices and therefore food insecurity. It will be important to look at more sustainable alternatives such as tallow.

Biofuels have different impacts on CO₂ savings. Biofuels release CO₂ when burnt in a vehicle engine but the plants from which they are grown absorb an equivalent amount of CO₂ from the atmosphere. Potentially they are carbon neutral over their lifecycle, although this is normally not the practice because energy from fossil fuels may be required to process and transport them, and the cultivation of crops results in nitrous oxide emissions from the soil. If produced appropriately the GHG savings can be significant compared with fossil fuels.

Table 6.1: Types of biofuels and greenhouse gas savings²⁴

Biofuel type	Greenhouse gas saving
Bioethanol	
Wheat ethanol	0-69%
Sugar beet ethanol	35-48%
Corn ethanol	49-56%
Sugar cane ethanol	74%
Biodiesel	
Palm oil biodiesel	16-57%
Hydrogenated vegetable oil	24-83%
Rape seed biodiesel	36-44%
Sunflower biodiesel	51-58%
Pure vegetable oil from rape seed	55-57%
Waste animal or vegetable oil biodiesel	77-83%
Biomethane	75-88%

²³ <http://www.dft.gov.uk/rfa/reportsandpublications/reviewoftheindirecteffectsofbiofuels.cfm>

²⁴ Reproduced from page 162 of the June 2008 consultation draft of the UK's Renewable Energy Strategy http://renewableconsultation.berr.gov.uk/consultation/consultation_summary

Currently, only **a limited amount of biofuels** can be used in most engines, but more is possible. Most biofuels on the market at present can be used in unmodified vehicles and are sold in blends of up to 5% biofuel and the remainder consisting of fossil fuels. Some petrol vehicles, known as 'flex-fuel' vehicles, can operate on a range of mixtures of fossil fuel petrol and bioethanol (usually up to 85% ethanol by volume), commonly referred as E85 fuel), with the engine being adjusted automatically according to the fuel mix. Higher biofuel blends would be possible either by adapting vehicle engines or by using biofuels such as biobutanol that are more compatible with existing engines

To use **more biofuels in Scotland and the UK** - more **investment** would be required in **infrastructure**. There is only limited infrastructure for production, refining and supply of biodiesel, and an even more limited infrastructure for bioethanol. In the next decade, a greater number and volume of biofuels are likely to be available in the UK, with some of the more common biofuels coming from Brazilian sugarcane, European sunflower oil and wheat and palm oil. Aside from **sustainability and infrastructure** constraints, there are also further **regulatory constraints** to increasing the use of biofuels (i.e. Fuel Quality Directive), and **vehicle and fuel distribution technical constraints**. For example, by 2020 the majority of diesel vehicles should be able to run on a 10% biodiesel blend and petrol vehicles on a 10% bioethanol blend, but even if all road vehicles used a 10% blend, this would only achieve 8% of renewable energy because of the lower energy content of biofuels. A solution to this issue would involve mandatory compatibility standards for new vehicles at the European level at least

Biofuels

9.2.1. **UK Biofuel targets** are currently set out in the Renewable Transport Fuel Obligation (RTFO), made under the Energy Act 2004, which transposed the Biofuels directive (2003/30/EC). The RTFO is therefore reserved to the UK Government. The target for 2008/9 is 2.5% by volume. Under the RTFO, fuel suppliers are awarded certificates for each litre of biofuel, and these can be traded. Suppliers can also buy themselves out of the obligation, at a price set by the UK Government at a level intended to be higher than the additional cost of supplying biofuel (over and above the fossil based alternative). The UK Government originally encouraged the use of biofuels through a duty differential for biodiesel and bioethanol of 20 pence per litre below regular fuel. The combination of duty incentive and the buy out price paid by fuel suppliers who fail to meet their RTFO obligation is guaranteed at 35 pence per litre until 2010-11, when the duty differential will cease and the RTFO buy-out price will change to 30 pence per litre.

9.2.2. The **RTFO** lays down a set of sustainability (environmental and social) principles:

- Biomass production will not destroy or damage large above or below ground carbon stocks
- Biomass production will not lead to the destruction or damage to high biodiversity areas
- Biomass production does not lead to soil degradation
- Biomass production does not lead to the contamination or depletion of water sources
- Biomass production does not lead to air pollution
- Biomass production does not adversely affect workers' rights and working relationships

9.2.3. In February 2008, the UK Department for Transport asked Professor Ed Gallagher, **Chair of the Renewable Fuels Agency**, to consider the indirect effects of biofuel production (globally) - namely the extent to which production of biofuel feedstocks leads to land use change; and GHG emissions arising from changes in land use change and cultivation practices. The Gallagher Review²⁵ concluded that:

- there is a future for a sustainable biofuels industry;
- biofuels can contribute to GHG savings from transport - but only where significant emissions from land use change are avoided and appropriate production technologies are employed;
- demand for food, animal feed and bioenergy is rising and creating additional pressure on land. Current policies do not ensure that additional production moves to suitable areas;
- there is significant risk that current biofuel policies will lead to a net increase in GHG emissions as a result of the displacement of existing agricultural production;
- the introduction of biofuels should be significantly slowed until adequate controls to address displacement effects are implemented and demonstrated to be effective;

²⁵ <http://www.dft.gov.uk/rfa/reportsandpublications/reviewoftheindirecteffectsofbiofuels.cfm>

- in the UK, the rate of increase in the UK's RTFO (Renewable Transport Fuel Obligation) should be slowed to 0.5% per annum so that the RTFO reaches 5% in 2013/14 rather than 2010/11 as currently planned;
- at an EU level it is not appropriate at this stage to set a binding 10% by 2020 target for biofuels;
- in the meantime a more appropriate range for the 2020 biofuel target would be around 4.5 - 8% energy;
- this target should include a separate obligation to force the development of advance biofuel technologies, commencing in 2015;
- if sufficient controls are enforced globally and new evidence provides further confidence, a higher aspirational trajectory starting in 2016 and rising to 10% by energy in 2020 could be possible.

9.2.4. The UK Government has welcomed the Gallagher review and **accepted its main findings**. The UK Government agrees that biofuels have the potential to deliver GHG benefits but that a more cautious approach is required. It will consult later in 2008 on slowing down the rate of increase in the UK's RTFO taking the level to 5%, as Gallagher recommends, by 2013/14 but with a review in 2011/12. At EU level, it will argue that the proposed 10% by 2020 renewable transport fuel target can remain as an overall objective, subject to clear conditions: firstly that the sustainability criteria must address indirect as well as direct effects on land use and secondly, that the target must be subject to rigorous review in the light of emerging evidence, so that an informed decision can be made at EU level in 2013-14 about whether the target should be mandatory.

9.2.5. The Scottish Government agrees with the UK Government response to the Gallagher Review which takes full account of the available evidence, and is precautionary, while still encouraging the further research and development required for a sustainable biofuels industry. Given the reserved nature of the RTFO, it is not appropriate for the Scottish Government to consult on this issue at this time. However, the Scottish Government is committed to ensuring the sustainability of biofuels – and is working with the UK Government on this issue.

Case Studies - Biofuels

9.2.6. There are incidences of a range of small scale innovative developments in the use of biofuels in Scotland. These include the Forestry Commission which has a fleet of biofuel vehicles, the increasing interest of some bus operators who make use of used vegetable oil for transport fuel and small projects such as that on Westray in Orkney, where biogas is produced from animal slurry and can be (and is) used to power a vehicle.

9.2.7. Stagecoach West has converted eight vehicles to run on biofuel. As part of this initiative Stagecoach is encouraging its customers to recycle their cooking oil to help fuel the bus. All households on the Service 1 route from Stewarton to the centre of Kilmarnock were given a container to collect their used oil and are being asked to take it to the recycling plant at Western Road. Anyone who recycles their oil will be given a voucher for money off their bus travel.

9.2.8. On a larger scale, Regional Selective Assistance has been granted to two biodiesel facilities here in Scotland, one of which, Argent Energy, produces biodiesel from animal

tallow, used vegetable oil and rapeseed oil. The INEOS biodiesel plant in Grangemouth is due to open later this year.

9.2.9. Scottish Development International is involved in two key areas for transport. One is biofuels, and particularly the future development of “second generation” biofuels, and the other is in relation to developing a Scottish market and manufacturing base for sustainable transport technologies e.g. electric vehicles, the batteries they use, and hydrogen fuel cells.

Alternative road transport technologies

9.3.1. Increased use of non fossil fuel based technologies can help efforts to meet the EU 2020 renewable energy target. Aside from biofuels, there is a range of potential technological options for road transport which offers alternatives to the combustion of fossil fuels. These include ‘plug – in’ hybrids (which use batteries charged from the electricity grid, as well as a standard combustion engine); and fully electric vehicles. Future technologies could also include hydrogen-fuelled vehicles, powered either by an internal combustion engine or a fuel cell. Electric and hydrogen vehicles have potential for the energy they consume to be sourced from renewable energy, particularly as the proportion of renewable energy in the electricity grid increases. Recent research for the UK Government (E4Tech 2007 – <http://www.dft.gov.uk/pgr/scienceresearch/technology/lctis/e4techlcpdf>) concluded that as the transport sector is the most CO2 intensive sector per KWh of energy delivered, using renewable energy in battery electric vehicles could save more CO2 than using it in the electricity generation or heat sectors.

9.3.2. Part 2 of the **King Review of Low Carbon Cars** (http://www.hm-treasury.gov.uk/independent_reviews/king_review/king_review_index.cfm), concluded that almost complete de-carbonisation of road transport could be possible by 2050. This would, however, require major technological improvements as well as substantial de-carbonisation of the power system. The **King Review** makes a series of recommendations aimed at bringing existing low carbon transport technologies forward as soon as possible: ensuring a market for these vehicles; moving the focus from biofuels to automotive technology; ensuring effective sustainability criteria for biofuels; and sending the right signals to the automotive industry. The Review concludes that substantial progress on battery and/or fuel cell issues and cleaner electricity will be needed in order to deliver decarbonised transport by 2050. Advanced second generation biofuels will also have a part to play.

Potential impact of vehicles powered through the electricity grid

9.3.3. Widespread emergence of electric vehicle options could potentially contribute to long term carbon reduction and renewable energy targets in a number of ways:

- Even with today’s electricity mix, a switch to vehicles powered through the electricity grid would be likely to offer a carbon reduction benefit relative to typical conventional petrol or diesel cars. For example, all-electric vehicle CO2 emissions have been estimated at around 77gCO2/km based on recharging from today’s grid mix (compared to a 2007 new car CO2 average of 167g/CO2/km). Local air quality would also benefit as there are no tailpipe emissions when vehicles operate in electric mode;
- Electric vehicles are generally considered to be more energy efficient over the full life cycle compared to conventional petrol or diesel vehicles so that could

potentially reduce the overall amount of energy used by transport, despite the increase in electricity demand – making renewable energy and carbon reduction targets easier to achieve;

- Greater use of vehicles powered through the electricity grid could potentially improve the efficiency of the operation of the electricity grid by smoothing power demand between day and night (assuming vehicles were principally charged at night);
- Grid powered vehicles could provide distributed energy storage capacity via on-board batteries, potentially helping mitigate some of the issues of intermittency of renewable electricity and allowing a greater proportion of intermittent renewables to be accommodated within the overall grid mix. Using vehicle to grid V2G technology, electric vehicles could be charged and discharged at times of low or peak demand;
- Vehicles powered through the electricity grid could potentially contribute to the 10% renewable transport target if the proportion of renewable electricity used to provide energy to the vehicles could be counted towards the transport target (rather than towards the renewable electricity target). This would be subject to negotiations by the UK with the EU. Making any significant contribution would require a steep growth in a short space of time from a low base. There could also be significant attribution problems.

9.3.4. Realising the potential benefits of electric vehicles for long-term carbon reduction, renewable energy and efficient grid operation is dependent on significant market penetration of vehicles powered through the electricity grid. Currently these kinds of vehicles are not widely available mass market options for the majority of consumers, although extensive development work by major automotive companies is ongoing. Many companies have plans to introduce all-electric or plug-in hybrid or hydrogen vehicles for potential mass market commercialisation in the next decade and beyond. Sustained higher oil prices, improvements in battery technology cost and performance, and the emergence of new technologies and or business models which allow hydrogen refuelling or rapid battery re-charging or replacement are some of the key factors which could address existing barriers to market penetration of vehicles powered through the electricity grid. The Scottish Government will be considering the role the public sector might take in the procurement of these kinds of vehicles and whether and how that might stimulate the market.

9.3.5. A further key consideration will be the response of the market and consumer demand. Existing vehicles delivery very high standards of quality, performance and utility. Consumers will demand and expect better or equivalent performance at an affordable price.

9.3.6. Even if viable vehicle options emerge in the next decade, there is uncertainty about the potential for large scale impacts on renewable energy or carbon targets, power demand or grid operation from electric vehicles prior to 2020. A **major constraint** would be the time taken for new vehicle technologies and supporting infrastructure to penetrate the total Scottish and the rest of the UK's fleets.

9.3.7. In the longer term, widespread adoption of electric vehicles could significantly increase demand for electricity. To **illustrate** the implications, we can consider a scenario where biofuels contribute to half of the 10% transport target (i.e. a 5% saving, in line with the latest RTFO recommendation for 2013/14), and the remaining 5% is met with electric vehicles. It is estimated that this would require either 27% of total car travel to be electric-

powered, or just over half to be by electric-hybrids (or some combination of both). An estimated 1.5TWh of additional electricity demand would be required to achieve this, which is equivalent to approximately a 4% increase across Scotland.

9.3.8. Were biofuels to contribute 8% to the 10% transport target, then approximately 12% of car travel would need to be electric-powered, requiring 0.6TWh of additional electricity. However, a number of caveats should be placed on these figures (based on BERR's UK Renewable Energy Strategy – Consultation Document). They are based only on one type of technology, whereas a mix of technologies might be deployed and new solutions could emerge. The figures assume that distance travelled remains static at 2004 levels. There are other assumptions around technical performance, vehicle efficiency etc. There are thus considerable uncertainties around the potential impact of transport on electricity demand.

9.3.9. It is however clear that electricity demand for transport could have a significant impact on overall Scottish and UK energy demand. Whilst it would reduce overall energy demand due to the greater energy efficiency of electric cars, electricity demand would inevitably increase. However, this may not require a proportional increase in electricity generating capacity, as recharging of electric vehicles or plug-in hybrids, or production of hydrogen by electrolysis, might take principally at night when demand is lowest. The benefits in terms of renewable energy and carbon targets will therefore depend on the extent to which the electricity demanded is produced from renewable and other low carbon sources, and the amount of energy (including renewable energy) used by electric vehicles compared to the vehicles they would displace.

9.3.10. The UK Government is exploring the scale and viability of potential future market penetration of vehicles powered through the electricity grid. This work will examine the factors affecting the current and likely future economics of these options; the wider environmental impact; the potential impacts on and benefits to UK grid operation; and the case for further government measures to help accelerate the development and introduction of vehicles powered through the electricity grid and associated supporting re-charging infrastructure. It will also examine how the UK and automotive and other industries could benefit from expansion into these new markets. The Scottish Government will assess this work in terms of its full implications for Scotland: in terms of reducing Transport GHG emissions and contributing to our renewables targets; and where our industries might benefit.

Other forms of Transport

Aviation

9.4.1. This document does not suggest any proposals for the aviation sector as there are not expected to be safe, commercially viable options for renewable energy in aviation by 2020.

Rail

9.4.2. The carbon dioxide emission of a typical passenger rail journey is about half that of an equivalent car journey and about one-quarter of an equivalent journey by air. Rail freight emissions per tonne km are about one fifth of the carbon dioxide emissions of equivalent road freight. Emissions are even lower for those rail journeys undertaken with electric powered engines. The high cost and long life of railway assets means that future technological

changes need to be made some decades in advance of any long term carbon reduction goals, for example, any significant investment made now will take us to 2050.

9.4.3. Transport Scotland is working to implement the Scottish Government's rolling programme of electrification of the Scottish rail network. This will provide quicker, more reliable rail services with reduced emissions. The electrification programme will also allow the Government to benefit from any long-term improvements in the Scottish energy mix. New electrification work has already started in Edinburgh, and the new railway from Edinburgh to Glasgow linking Airdrie and Bathgate will be electrified from its opening. Other busy routes will follow. This will build on the 23 per cent of the network that is already electrified and will allow for a reduced reliance on diesel engines. All of this will ensure that rail remains an attractive and sustainable alternative means of transport.

Buses

9.4.4. The Scottish Government is reviewing the Scottish Bus Service Operators Grant with a view of making it more environmentally focussed. We estimate that average emissions could be reduced by more than a third by 2015 if funding was focussed on Euro III vehicles or better.

Ferries

9.4.5. The Scottish Government provides subsidies to NorthLink Ferries Ltd and CalMac Ferries Ltd to operate essential passenger and freight services to Orkney and Shetland and throughout the Clyde and Hebrides. A number of local authorities also support internal lifeline ferry services. Under the terms of the contracts with NorthLink and CalMac, the Scottish Government works closely with both operators to identify and implement fuel efficiency measures (especially relevant, given the high costs of fuel at this time) and to ensure that the companies are developing positive environmental practices and meeting emissions targets. While we would support further measures to reduce any harmful affects ferry services have on the environment, any measures, such as requiring modifications to vessels and/or engines, or the introduction of a carbon trading scheme, must be proportionate, incremental and affordable.

Questions for debate

- **How can we best incentivise renewable and low carbon transport in a sustainable and cost effective way in Scotland?**
- **What potential is there for the introduction of vehicles powered through the electricity grid in Scotland? What impact would the widespread introduction of these kinds of vehicles have on:**
 - **Energy demand and carbon emissions**
 - **Providing distributed storage capacity**
 - **Smoothing levels of electricity demand on the grid?**
- **What factors might affect the scale and timing of these impacts?**

- **Over what timescales do you think electric vehicles could contribute to our renewable energy and carbon reduction targets and what could the Scottish Government do to accelerate the introduction of these vehicles in Scotland in a cost effective way?**

10. Consents and Planning

Objective: an approach to planning and consenting which ensures that acceptable renewable energy developments can proceed expeditiously and discourages proposals which do not accord with wider energy, environmental and planning objectives.

Summary of actions²⁶

- **The Scottish Government is working with the industry to make decisions more quickly by improving the quality of applications, introducing more certainty about turnaround times and ensuring that more robust procedures are implemented.**
- **A number of other improvements are under way, including focusing upcoming Public Local inquiries where appropriate on key outstanding issues, reviewing the fee structure and distribution, and taking initiatives to promote solutions to conflicts with aviation and radar.**
- **Both renewable energy power generation and grid reinforcements are given priority in the National Planning Framework 2: Discussion Draft and planning authorities have been invited to prepare supplementary planning guidance for wind farms**
- **Scottish Ministers are currently consulting on a Scottish Marine Bill that contains provisions for the creation of a marine planning system and streamlined marine consents.**

10.1. The importance of planning for renewables development and deployment is set out in Scottish Planning Policy (SPP) 6 - Renewable Energy, published in 2007. It looks to planning authorities to prepare up-to-date policies, including spatial frameworks for wind farms over 20 MW, through the development planning process or as supplementary planning guidance. Some 2.8 GW of installed renewable electricity capacity are currently in place in Scotland, a further 1 GW are under construction, with applications for a further 2.4 GW currently being considered. The Scottish Government is working with stakeholders to make decisions more quickly by improving the quality of applications, introducing more certainty about turnaround times and ensuring that more robust procedures are implemented.

10.2. The Scottish Government welcomes the report by the sub group of the Forum on Renewable Developments in Scotland (FREDS) on the Planning and Consenting of Renewables in Scotland. The Government agrees with the sub group that urgent steps need to be taken to streamline the consenting process to ensure that appropriate developments can proceed in a reasonable timeframe, while discouraging inappropriate applications which do not meet wider energy and environmental objectives. Ministers are already dealing with applications without unnecessary delay, but are continually looking for improvements in the process which will allow applications to proceed more quickly to determination. The message is that we need more renewables, but not at any price – the best applications are those that recognise planning policies and take care to resolve environmental and other concerns in advance.

10.3. To this end we have already announced a series of measures to improve consents procedures under s 36 and s 37 of the Electricity Act. Working with the industry, our aim is

²⁶ A table showing actions under way is attached at the end of this section

to make decisions more quickly by improving the quality of applications, introducing more certainty about turnaround times and ensuring that more robust procedures are implemented. We have announced that we shall henceforth work to an objective of having new applications being determined within nine months where there is no public inquiry. In December 2007, inspired by the work of the FREDS subgroup, and with the aim of improving the consents process, the Scottish Government has released revised scoping guidance for developers²⁷.

10.4. The introduction of the revised scoping guidance for Electricity Act Consent proposals has reinforced the strong steer the Scottish Government gives to potential developers around the need to carry out as much pre application consultation and preparation as possible. This may mean that difficult issues which currently arise during consideration of the application itself, such as compliance with the Habitats and Wild Birds Directives and aviation and radar interests, can be minimised, thus saving considerable time and effort in the formal process. At present the use of scoping and compliance with its recommendations is voluntary, although highly recommended if the applicant wishes to reach determination in the target timescale.

10.5. We also want to join up earlier with our stakeholders and developers to discuss future projects. We have agreed with SEPA to, where practical, hold joint pre-application meetings with developers so that advice on hydro applications in particular is given in the round. In addition, SNH encourages pre-application dialogue and advises developers to seek advice on potential natural heritage impacts at this early stage, to help ensure that sufficient data is gathered in line with standard methodology and an adequate assessment of environmental impact prepared. The SNH Renewable Energy Service Level Statement can be found at www.snh.org.uk/pdfs/strategy/renewable/RE-SLS.pdf

10.6. In addition an application checklist has also been introduced by the Scottish Government and is compulsory for all new applications along with a timetable for Section 36 consents process. All these new documents will aid in the Scottish Government's aim to make decisions more quickly by improving quality of applications, providing more certainty about turnaround times and more robust procedures. A number of other improvements are under way, including focusing upcoming Public Local Inquiries where appropriate on key outstanding issues, reviewing the fee structure and distribution and taking similar steps to front load the consultation process for Electricity Consents as are currently being developed for the Planning system.

Planning Framework

10.7. The Scottish Government has also taken a number of steps to streamline and modernise the planning system so that it helps deliver increased sustainable economic growth. Planning will deliver sustainable development by ensuring development in the right place and of the right quality. A key initiative, building on the Planning Act (Scotland) 2006 is the preparation of the second National Planning Framework (NPF setting out a strategy for Scotland's long-term spatial development. The draft National Planning Framework 2 provides a view of Scotland as a place and identifies likely change to ensure each part of the country can develop to its full potential. It also identifies key strategic infrastructure needs so that we can plan for the right investment in the right places. A statement on the criteria for identifying national developments in Scotland's second National Planning Framework was

²⁷ www.scotland.gov.uk/Topics/Business-Industry/Energy/Energy-Consents/Guidance

made in Parliament on 13 September 2007 by John Swinney MSP, Cabinet Secretary for Finance and Sustainable Growth. Projects which may be identified as national developments are those which:

- make a significant contribution to Scotland's sustainable economic development;
- strengthen Scotland's links with the rest of the world;
- deliver strategic improvements in internal connectivity;
- make a significant contribution to the achievement of climate change, renewable energy or waste management targets;
- are essential elements of a programme of investment in national infrastructure; or
- raise strategic issues of more than regional importance (projects with impacts on more than one city region, for example).

10.8. The Proposed Framework recognises that the capacity of parts of the energy transmission system need to be increased to facilitate the generation of electricity from renewable sources. The draft National Planning Framework 2 sets out what the Scottish Government views as national developments including upgrades to the onshore transmission grid (including connections to the Islands). As already noted, designation as a national development in the final version of the NPF2 will establish the principle of such developments and any subsequent inquiry would focus on issues such as design and the mitigation of environmental impacts, and would not re-address the matter of principle. (This does not impact on applications already under consideration such as Beaully-Denny.) This has a similar impact to the proposed National Policy Statements in England, although the process is very different. The draft National Planning Framework 2 also acknowledges the potential for the development of a sub-sea transmission grid, allowing Scotland to develop its offshore generation potential, and to connect across the North Sea and Irish Sea into other EU markets for export.

10.9. In respect of renewable energy, Scottish Planning Policy number 6, issued in 2007, sets out how the planning system should manage the process of encouraging, approving and implementing renewable energy proposals when preparing development plans and determining planning applications. This policy document also applies to applications considered under s36 and s37 of the Electricity Act. Planning authorities have been invited to prepare locational guidance, in the form of supplementary planning guidance and a second Annex to Planning Advice Note 45 will be published advising authorities on the preparation of that guidance. The Scottish Government has appointed consultants to advise planning authorities on this task, who are organising a series of seminars for local authority planners and have prepared a website designed to help answer questions that arise.

10.10. The FREDS group has highlighted the need to work closely with local authorities to develop good practice and consistency in the way decision making on planning applications for renewable energy. The work which is already under way to prepare locational guidance at local authority level will help this process. In addition, given the importance of working closely together to meet the agreed national outcome on renewable energy, the Scottish Energy Minister will hold a seminar during the year with local authority councillors and other stakeholders to raise awareness of the importance of the target and the locational guidance, to highlight good practice already under way and to discuss relevant issues. The aim of these seminars will be to seek to develop a consensus on the way the locational guidance will be

implemented at Scottish and local level and the way in which local communities can make an effective input to the process.

10.11. Scottish Ministers are currently consulting on a Scottish Marine Bill that contains provisions for the creation of a marine planning system and streamlined marine consents. Both a marine planning system and streamlined marine consenting will simplify the delivery of wet projects and are in line with proposals for terrestrial renewable energy development. The marine planning system will operate at a national and regional level, the national marine plan for Scotland will link to the national planning framework and will set out the high level objectives eg targets growth sector such as wet renewables. Ministers intend the system have a GIS component to assist site selection. A regional plan will set out the vision for the marine region agreed by stakeholders and within the broad parameters created by the national plan. Plans are based on the notion that there is a presumption of use, ie an area of sea can be used for a purpose unless that purpose it is specifically excluded from that area. It is anticipated that Marine Scotland will oversee the planning system and as a minimum will operate as a front door for all marine consents.

Aviation and Radar Issues

10.12. Wind farm proposals can impact significantly on primary, secondary or weather radar stations and thus affect public safety as well as national defence. Where actual or potential conflicts exist, it is important that a solution is identified as wind farm applications are being developed and considered. We are working with UK Government Departments and bodies such as Civil Aviation Authority (CAA), National Air Traffic Services En Route Ltd (NERL) and Scottish airports to seek to promote solutions to potential conflicts. The issue is highlighted in scoping guidance for s36 applications and planning policy guidance and new guidance on consultation with aviation and radar stakeholders is being prepared.

10.13. Recognising that growing aviation and radar issues could hamper plans for growth in renewables, the UK Prime Minister announced on 17 November (in his speech on climate change) that he had asked the Secretaries of State for Defence, Business and Transport to step up their efforts, in cooperation with industry and the regulators, to identify and test technical solutions to the potential difficulties wind farms pose to air traffic and defence radar. This issue is being taken forward by the UK Government's Aviation Board, in which the Scottish Government is participating with the aim of ensuring that Scotland can be given equal priority in the implementation of the initiative. There is no universal solution mitigating the effects of wind turbines on radar; therefore work is continuing on a series of workable mitigation solutions endorsed by aviation stakeholders which offer the opportunity for constructive dialogue between wind farm developers and aviation stakeholders to identify, explore and implement mitigation measures to reduce the impacts of wind turbines on radar to acceptable levels. The Board is hoping for some quick solutions to current problems, but in practice most of the solutions will be implemented in the next decade.

10.14. In the Scottish context it is important that work is taken forward in parallel with the UK activity to promote solutions to regional specific problems, for example in respect of issues affecting both airport radar and in en route radar in the Scottish Terminal Manoeuvring Area. This issue is being looked at in the context of the development of locational guidance in this area, where it will be important to ensure that aviation constraints are properly recognised while also recognising that mitigation solutions can be found more effectively by developers working together with the aviation authorities.

10.15. It is also important to recognise that ideally clarity is required about both the content and timing of solutions to aviation and radar issues before developers pursue an application as far as a decision. Not doing so would run the risk of freezing development in a number of areas given the need to count existing approvals as cumulative impact is considered. Failure to address aviation issues before lodging planning applications may result in applications being found to be insufficient.

Legislative Change

10.16. As well as the plans in respect of marine planning and consents (paragraph 10.11 above), some of the proposals to change the consenting process in respect of s36 and s37 applications will also require changes to the primary legislation. Since these sections are “executively devolved” it is necessary to seek the approval of Westminster if the Scottish Parliament is to be given the power to make such changes. For the most part the changes can be given effect without such legislative change, but some changes (e.g. in respect of the trigger for inquiries and the relationship between the two consenting regimes in respect of the threshold for consents) will require such primary legislative change. The Scottish Government has written to the UK Government to propose that such a change be agreed by Westminster and will be following this up in contacts with the UK Government and in the National Conversation.

Questions for debate

- **How can developers be encouraged to work closely with planning authorities and local communities to improve the quality of applications?**
- **Can more be done to develop joint working between central Government, planning authorities and statutory and non statutory consultees in pursuit of the Government’s ambitions on renewable energy?**
- **Given the growing number of issues connected with aviation and radar and wind farm development, especially in Southern Scotland, is there scope for cooperation between developers and aviation interests to promote a regional solution to complement the overall UK approach?**

STREAMLINING ENERGY CONSENTS: TABLE OF CURRENT AND PROPOSED ACTIONS

Message: we need more renewables but not at any price – the best applications are those that take care to resolve environmental and planning concerns in advance

Our aim is to make decisions more quickly by improving the quality of applications, introducing more certainty about turnaround times and ensuring that more robust procedures are implemented

Action	Who is involved	Current Status	Proposed next step
General			
National Planning Framework grid reinforcements 'national developments'.	SG	Revisions being made to Discussion Draft in light of consultation responses and Proposed Framework being prepared.	Proposed Framework to be laid before Parliament after the October recess for 60 days scrutiny. Final NPF2 to be published early 2009
SPP6 planning authorities prepare locational guidance	SG Planning authorities SNH	Consultants appointed and holding seminars Second Annex to Planning Advice Note 45	Locational guidance to be in place in 2009
Aviation and radar	SG, UK Government, airport authorities, NATS	SG supporting UK initiative to bring on new solutions, also case by case approach	Include spatial dimension in locational guidance. Regional initiatives in Southern Scotland
Legislative change to s 36 and s 37 (e.g. on trigger for public inquiries and to bring Electricity Act and Planning Acts closer together)	UK Govt, UK Parliament, SG, Scottish Parliament	UK Ministers considering introducing at Westminster	Considering detailed changes required: legislative devolution would be easier
Electricity Act			
Encouraging developers to use SG scoping services	SG, Developers, Stakeholders	Scoping guidance being revised	Reissue with strong recommendation, including for pre application consultation
Application	SG, Developers	Applications	

checklist compulsory		reviewed against checklist before formal acceptance	
Determine new applications within nine months where there is no public inquiry	SG, stakeholders, developers	8 applications currently in system, Energy Consents Unit has reviewed processes, timing will depend on comments from consultees	Review progress on first 6 applications in late 2008. Encourage local authorities to share in 50% national outcome
Focus PLIs on key issues	SG, DPEA	Already used at Ben Mhor (Lewis)	Guidance being prepared. Consider legislative change (see below)
Review current fee sharing regime to resource key stakeholders	SG, planning authorities, SNH, SEPA, Renewables Industry	Questionnaire issued	stakeholder workshops planned
Improve public and community consultation	Developers, SG, planning authorities	Pre application consultation recommended. Public Participation Directive transposed by new regulation - The Electricity Works (Environmental Impact Assessment) (Scotland) Amendment Regulations 2008 came into force in Sept 2008	Prepare good practice guidance for developers detailing pre-application case studies. Guidance to support new regulations published
Improved guidance and active case management	SG with stakeholders	SG Website updated	Develop a Scotland-wide database on renewable developments in Scotland
Simplified approach to consent offshore developments.	SG	Guidance issued for current applications Marine Bill consultation	

		document proposal promotes the development of marine planning and simplified regulation	
Planning Act			
Concordat with Local Authorities offers new opportunity to refresh and reinvigorate the co-working of the two bodies in considering renewable energy developments.	SG, Planning Authorities	Scottish Ministers are keen to ensure that both regimes are supportive of each other and will be offering planning authorities greater guidance on effective delivery, consideration of applications, and community engagement.	Minister to offer to hold seminar on joint working
Processing agreements for major developments	Planning authorities, developers	Being developed	

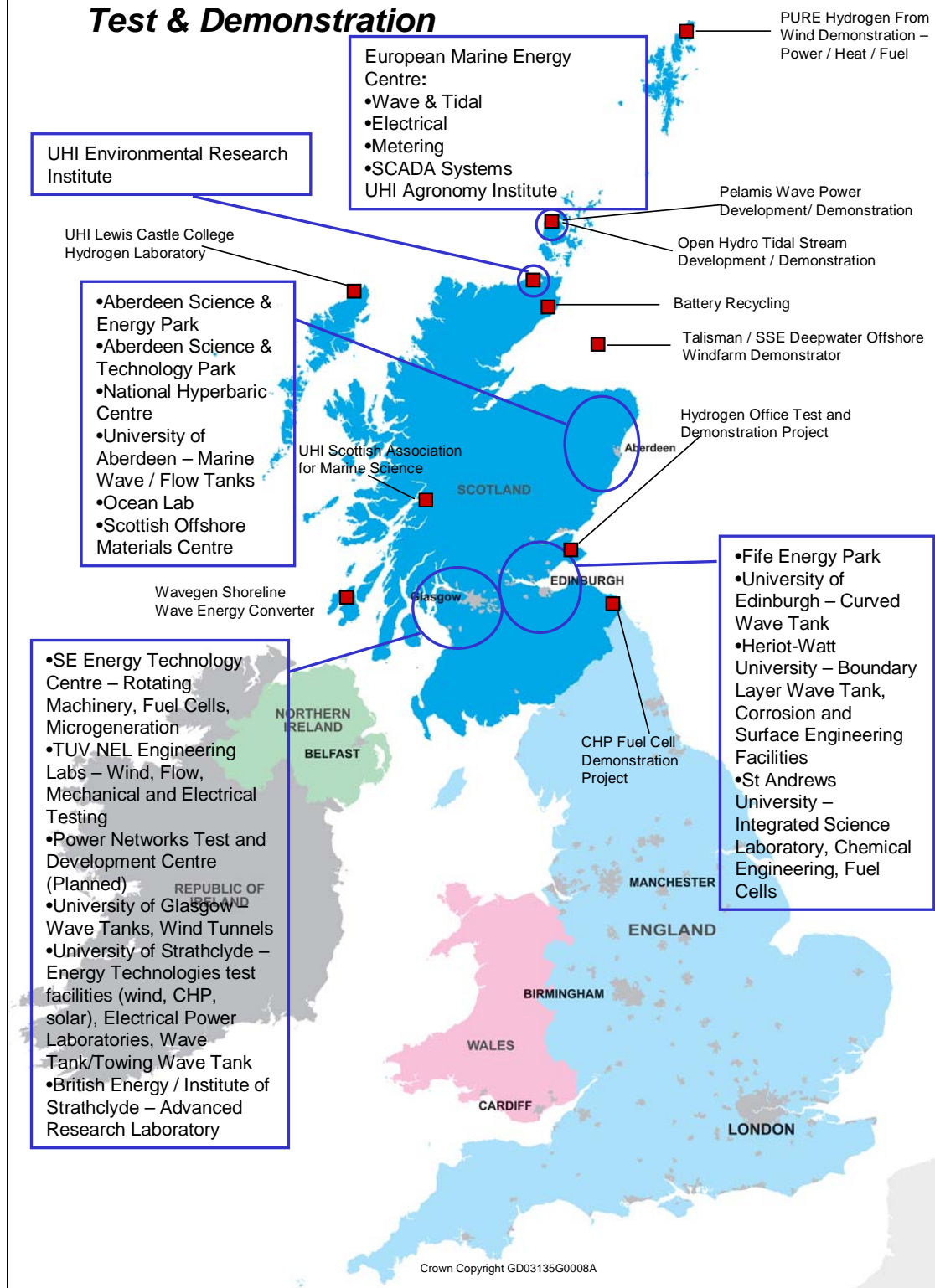
11. Research, development and demonstration

Objective: to promote a strategic approach to research and development of renewable energy so that Scotland capitalises on its current strengths and becomes a European and world leader?

Summary of actions

- The recently formalised Energy Technology Partnership (ETP) draws together all the key Scottish university based research and development teams involved in energy technologies.
- The ETP is well engaged with other major Research Pooling entities to bring major Scottish multidisciplinary research capability to bear on energy R&D e.g. advanced materials, bio-energy, energy economics.
- The ETP has strong engagement with industry (large and SME scaled oil/gas, network, renewable and other energy relevant sectors) at a leadership level thus connecting ETP activities to sustainable economic development and corporate competitiveness.
- Scottish Enterprise and Scottish Development International are making increasing use of the ETP to support dialogue with existing and prospective inwardly investing energy related companies. This has become part of the ETP mission.
- The Scottish Government is taking steps to establish a Scottish European Green Energy Centre (SEGEC).
- The ETP and SEGEC are developing a strategy for deeper engagement with the energy elements of the EU's seventh framework programme on research and development, including new funding applications in 2008.
- SEGEC and Scottish Enterprise are promoting a project to develop links with energy clusters in Stavanger and Groningen as well as Denmark and Germany designed to promote diversification from oil and gas into green energy.
- The Scottish Government has proposed to lead a project under the Intelligent Energy Programme to develop a good practice manual on onshore and offshore wind and the environment.
- The Scottish Government is leading cooperation on subsea grid issues with Irish Sea and North Sea partners, and linking to the emerging concept of a North Sea Initiative: Centres of Excellence in Renewables (NICER).

Scotland's Renewable Energy Test & Demonstration



11.1. Scottish energy research is world class and world-recognised. Our acknowledged research strength in energy includes electrical power networks and petroleum engineering but also now embraces cutting-edge research and demonstration in renewable wind, wave and

tidal power, low carbon energy solutions such as carbon capture and storage, and demand-side technologies.

11.2. The ETP academic partners collectively lead the largest portfolio of EPSRC Supergen Programmes including: Future Networks, Marine Energy; Wind Technology; Hydrogen; Highly Distributed Power Systems; Flexible Networks; Energy Storage; Energy Infrastructure. Strathclyde, Edinburgh and Heriot-Watt have successfully attracted two EPSRC Science and Innovation Awards in an Integrated Energy Initiative (networks and demand reduction) and Carbon Capture and Storage.

11.3. The work of our leading universities in energy research is informed by the Scottish Government's policy objectives in pursuit of sustainable economic growth and the development of the knowledge economy, taking advantage of new economic opportunities and access to overseas markets. A number of research exploitation activities are underway through Scottish Enterprise interventions such as Proof of Concept and RSE/SE Fellowships, with several KTP programmes also in place on energy technologies.

11.4. Collaboration is at the heart of Scotland's research success. The recently formalised Energy Technology Partnership (ETP) <http://www.etp-scotland.ac.uk/> focuses on universities in the cities of Glasgow (Strathclyde), Aberdeen (Aberdeen and RGU) and Edinburgh (Edinburgh and Heriot-Watt) but also draws together all the key Scottish university based research and development teams involved in energy technologies (e.g. fuel cell research in St Andrews) and is linked to key universities in England and abroad. The Partnership is founded on the principle of research pooling, and acts as a common platform for seeking funding from UK and international funding bodies and industry.

11.5. The Partnership is supported by an advisory committee on which industry bodies are represented. A supervisory body involving Government, other parts of the public sector and key industry figures is also being established.

11.6. The work of the universities and ETP is also complemented by the Intermediate Technology Institute for Energy – ITI Energy – which identifies technologies required to address future global market opportunities then funds and manages research and development programmes and the subsequent commercial exploitation of new intellectual property.

Scottish European Green Energy Centre (SEGEC)

11.6. The Scottish Government is taking steps to establish a Scottish European Green Energy Centre (SEGEC). This Centre will work with European partners to promote the deployment of renewable and low carbon technology in support of the new Energy Policy for Europe (EPE), which seeks to move Europe to a common energy policy focusing on renewable and low carbon energy systems within an interconnected single market.

11.7. The aim of the Scottish European Green Energy Centre is to develop networks and partnerships with research and deployment bodies for green energy in like minded countries designed to promote the deployment of green energy technologies. It is building on the many existing European wide projects under way in which Scottish partners are playing a full part and developing them into new and strengthened joint projects which contribute towards the new targets of the EPE. It will also disseminate throughout Europe the results of this work, and hold seminars and conferences for academics and practitioners.

11.8. Its tasks are:

- Development of joint projects in green energy research and deployment;
- EU-wide dissemination of results of existing and new projects, through web, conferences and seminars;
- Engaging industry in participation in such cross border activity;
- Obtaining funding for these activities through EU programmes.

11.9. Its key objectives are:

Aims

- To promote the internationalisation of sustainable energy research;
- To foster good practice in the development and deployment of green energy;
- To support sustainable economic growth and the EU's sustainable energy targets;

Specific Objectives

- Forming an alliance of Atlantic partners to raise the importance of marine and tidal energy research and development;
- Promoting offshore wind development and deployment;
- Promoting long distance supergrid development and smart distribution grids;
- Developing partnerships on key policy priorities such as carbon capture and storage, and renewable heat;
- Leading work on tackling policy and administrative barriers to deployment of renewable energies.



11.10. The SEGEC will be a self standing body led by a practitioner with experience in green energy development in Europe and contain a number of development and promotion staff. It will be managed by a board representing the various stakeholders. It is working in partnership with the newly established Energy Technology Partnership, which draws together the extensive experience and strengths in Scottish Universities with hubs in Glasgow, Edinburgh and Aberdeen. It is also working closely with the Scottish Government, Scotland Europa and the Scottish Enterprise Energy Team/ HIE as well as with Scottish industry. The Centre will be based in Aberdeen.

11.11. The key activities we are developing this year are:

- working with the Energy Technology Partnership to develop a strategy for deeper engagement with the energy elements of the EU's seventh framework programme on research and development. The key elements of this strategy will include developing a leading role in respect of marine and tidal research with Atlantic partners, building on existing activity in respect of offshore wind, developing work on smart grids and long distance sub sea transmission and developing active partnerships on carbon capture and storage;
- promoting a project to develop links with energy clusters in Stavanger and Groningen as well as Denmark and Germany designed to promote diversification from oil and gas into green energy;
- offering to lead a project under the Intelligent Energy Programme to develop a good practice manual on onshore and offshore wind and the environment;
- developing ways in which the Centre can support the current projects to cooperate on subsea grid issues with Irish Sea and North Sea partners, and the linked concept of a North Sea Initiative: Centres of Excellence in Renewables (NICER).
- promoting wider contact between Scottish business and researchers and European counterparts, including study visits on Carbon Capture and Storage and bringing into Scotland European expertise on renewable heat.

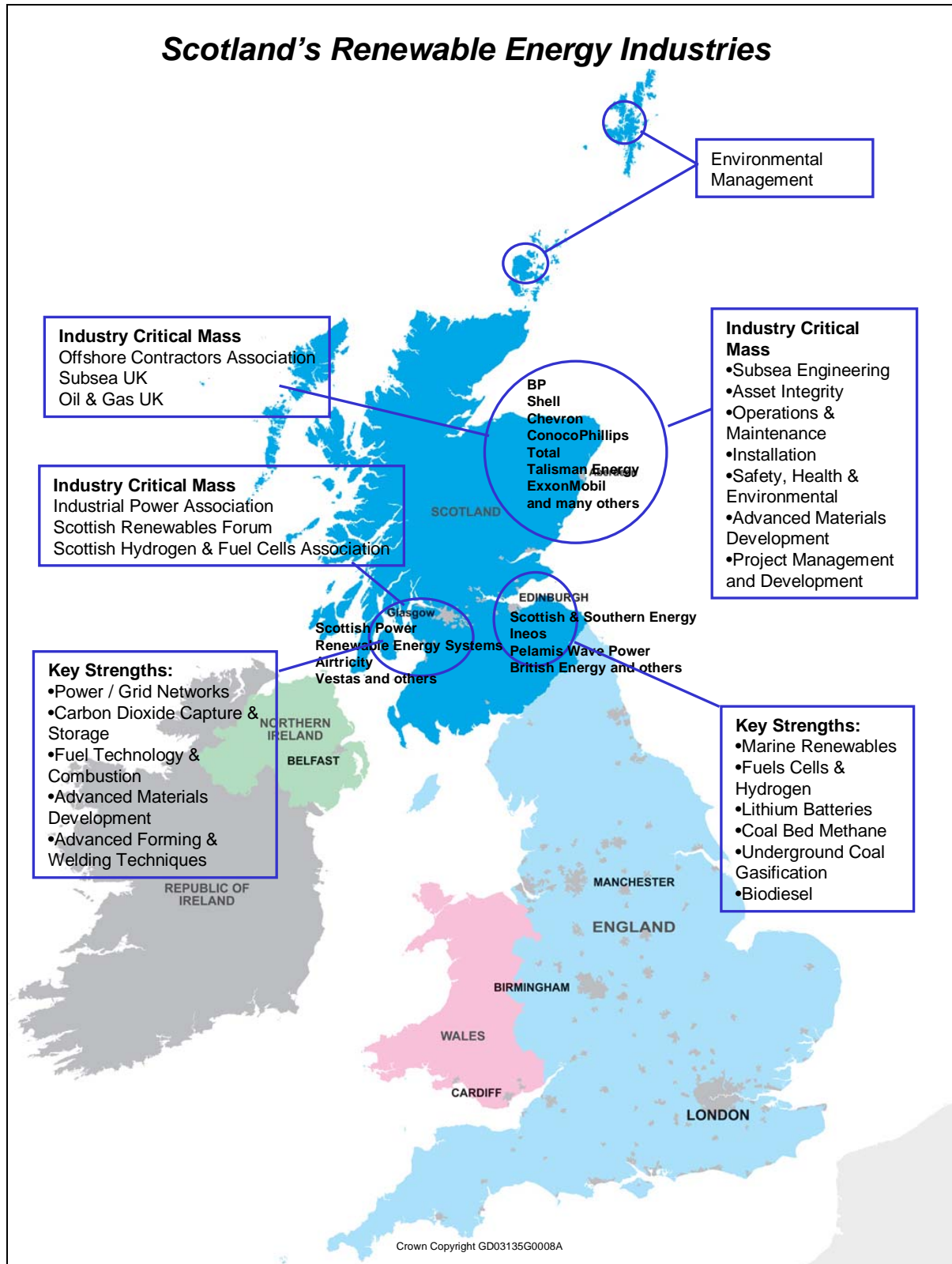
11.12. A business plan for the running of the Centre is currently in preparation, with the aim that it be supported by a combination of funding from European, public and private sources. Further details will be announced in late 2008.

Questions for debate

- **How can we promote a strategic approach to research and development of renewable energy so that Scotland capitalises on its current strengths and becomes a European and world leader?**
- **How can we make sure that partnerships with European and world bodies act to promote Scottish and wider interests in this area?**

12. Supply chain and skills

Objective: to maximise opportunities from this renewed commitment at Scottish, UK and EU level to renewable energy in order to contribute to the purpose of increasing sustainable economic growth to be shared by all Scotland's people.



12.1. The investment required to achieving the targets for renewable energy set at Scottish, UK and EU level will create significant opportunities to:

- generate greater and more widely shared employment;
- create more highly skilled and better paid jobs;
- foster a self-sustaining and ambitious climate of entrepreneurial advance;
- encourage economic activity and investment across Scotland, thereby sharing the benefits of growth;
- bring a culture of confidence and personal empowerment to Scotland; and
- secure a high quality environment today and a sustainable legacy for future generations, which will act to strengthen Scotland's positioning as a great country to do business.

12.2. In the light of the Government's objectives on promoting sustainable economic growth it is essential that Scottish based business and industry takes full advantage of these opportunities at home and abroad. The certainty about investment that is now to be guaranteed by the EU targets will provide the confidence that investors need to ensure that economic benefit can be maximised. The renewable energy industry already supports a significant supply chain in Scotland but much more could be done to capitalise upon opportunities for local sourcing and the export of Scottish expertise. Opportunities exist both in terms of mature technologies such as onshore wind where more equipment (such as towers and cabling) could be manufactured in Scotland and services provided at home and abroad, while in emerging technologies such as marine and offshore wind. Scottish Development International is actively seeking to attract developers and manufacturers to Scotland who can benefit from facilities such as those of, for example, Fife and Nigg, in taking forward their projects.

12.3. Scotland is well placed to transform its technological advances into workable business opportunities in the near future. Key elements of the approach to achieve these goals will include:

- Scottish Enterprise, HIE and SDI support schemes;
- opportunities in manufacture and services with new renewed commitment to deploy (estimate of 1 GW per year in next two years and 0.5 GW per year beyond that);
- challenge to industry to work together to promote local sourcing in light of commitment to deploy;
- making best use of skills opportunities.

12.4. **The Enterprise Bodies are planning to develop, in partnership with industry and other bodies, an action plan with milestones to support the development of the renewable industry supply chain in Scotland.** Among the different actions which could be taken and will be considered in the action plan are:

- making a real and concerted effort to capitalise on the world lead Scotland has in research and development in sustainable energy set out in the previous section to bring about a more effective commercialisation chain, thus delivering real and lasting benefits for the Scottish economy.

- having a recognised and respected relevant industry body that can lead and encourage collaboration within the Sector so companies can share and pull resources. This body could also be responsible for identifying bottlenecks and have the power to try and resolve these;
- the industry body being able to identify certain companies in Scotland who are best placed to take advantage of the renewable energy supply chain opportunities and see where they can best work together so their skills and expertise complement each other. Such companies and collaboration would greatly increase their chances of competing, winning and fulfilling renewable energy contracts;
- market intelligence on the Renewable Energy Sector. That is key information about the Renewable industry that will help inform investors, developers and manufacturers about the opportunities, for instance forecast levels of activity (size and scale) their value and what would be required;
- Scotland developing the manufacturing capability and capacity to carry out and fulfil such renewable energy demand and orders;
- Developing Scottish capacity to capitalise on the economic and employment opportunities that will be offered by the manufacture and installation of the range of renewable heat and microgeneration technologies, including ground source heat pumps and solar panels as well as biomass systems.
- having an Accreditation system for accrediting key industry parts that will be needed in the renewable energy sector. Most of the renewable parts are manufactured abroad but there are up to 3 years delays for instance in offshore turbine supply. The automotive, defence and aerospace industries have experience of supplying parts to the aviation industry where quality control and tolerances are crucial. Renewable energy opportunities could provide such businesses in Scotland with the opportunity to diversify although it may require a leap of faith from developers and investors in buying such parts;
- access to and available materials to fulfil renewable energy orders. This will be an increasing issue as Scotland competes with other industries, Europe and the Rest of the World for the supply of such materials;
- an available and skilled workforce who are able to work within the sector. This may mean that Scotland actively targets overseas people to fill the required skills gaps.
- Linked to this, the Scottish Government is supporting the Sector Skills Councils to underwrite major new research on the future skills needs of the renewables sector, including renewable heat, in order to inform policy

12.5. It will also be important to factor into the approach work done in a UK and European context which is designed to promote the economic viability of renewable energy. For example, the European Wind Energy Technology Platform²⁸ has set the following objectives of offshore wind research as being to deliver:

- more than 13% of Europe's electricity demand from offshore wind;
- offshore generating costs that are competitive with other sources of generation;
- technology for sites of water depth up to 50m at any distance from shore which is commercially mature;

²⁸ <http://www.windplatform.eu/92.0.html>

- technology for sites in deeper water, proven through full-scale demonstration.



The DOWNVInD programme (distant offshore wind no visual intrusion in deepwater) is one of the largest research and technology development programmes in Europe. It was developed by a consortium led by Talisman Energy and Scottish and Southern Energy (SSE), two of Scotland's largest companies. It involved a consortium of more than 18 companies from six European nations. It was funded by Talisman and SSE with grant support of £10 million from the European Commission Sixth Framework RTD programme and the Scottish and UK government.

The project had two key elements a demonstration programme which saw two turbines installed adjacent to the Beatrice oil platform and a research programme. The demonstrator programme saw the first installation of two turbines in international water 25 km from shore. It achieved a number of firsts:

- First 5MW turbine deployed offshore
- First application of jacket substructure in offshore wind
- First onshore assembly of tower turbine and blades
- First offshore installation from a floating vessel
- Successful development of a ladderless safe access system

The pan-European research programme consisted of four separate elements: environment, electrical systems, operations and maintenance and structures.

The key objective of this work is to deliver the technical improvements required to develop the technology, improve performance and reduce costs.

12.6. A further area to be factored in is the work being done under the auspices of the Scottish European Green Energy Centre to promote collaboration amongst North Sea partners to promote diversification from oil and gas into green energy (see section 10 above), In particular in the short to medium term there is a real opportunity to develop economic opportunities for Scottish companies in partnership with companies from around the North Sea region in the current major investment plans for offshore wind energy in the Southern

North Sea, given Scottish expertise, including in the service sector, in designing, building, placing and maintaining fixed structures in difficult maritime conditions.

Question for debate

- **How can Scottish industry seize the opportunities this renewed commitment to renewable energy at Scottish, UK and European level brings to develop a large and prosperous renewable energy sector making a significant contribution to sustainable economic growth in Scotland and providing a wide range of skilled jobs?**
- **What can be done in the short term to promote more effective collaboration in local sourcing and procurement?**

Glossary

BERR	UK Department for Business, Enterprise and Regulatory Reform
CAA	Civil Aviation Authority
CAPS	Cycling Action Plan for Scotland
CERT	Carbon Emissions Reduction Target
CHP	Combined Heat and Power
DE	Distributed Energy
EMEC	European Marine Energy Centre
EPE	Energy Policy for Europe
ETP	Energy Technology Partnership
EU	European Union
EUETS	European Union Emissions Trading Scheme
FP7	Seventh Research Framework Programme
FREDS	Forum for Renewable Energy Developments in Scotland
GDP	Gross Domestic Product
GW	Gigawatt – equal to one billion watts
HICEC	Highlands and Islands Community Energy Company
HIE	Highlands and Islands Enterprise
ITI	Intermediate Technology Institute for Energy
MSO	Marine Supply Obligation
MESPG	Marine Energy Spatial Planning Group
MW	Megawatt – equal to one million watts
MWth	Megawatt, thermal
NERL	National Air Traffic Services En Route Ltd

NPF(2)	National Planning Framework 2
OFGEM	Office of Gas and Electricity Markets. OFGEM is the governmental regulator for electricity and gas markets in Great Britain.
RES	Renewable energy Sector
RHC	Renewable Heat Certificates
RHI	Renewable Heat Incentives
RHO	Renewable Heat Obligation
RO	Renewable Obligation
ROCs	Renewable Obligation Certificates
ROS	Renewable Obligation Scotland
RTFO	Renewable Transport Fuel Obligation
S36	Section 36 of the Electricity Act
SAMS	Scottish Association for Marine Science
SBSS	Scottish Biomass Support Scheme
SCHRI	Scottish Community and Householder Renewables Initiative
SDI	Scottish Development International
SEA	Strategic Environmental Assessment
SEGEC	Scottish European Green Energy Centre
SEPA	Scottish Environmental Protection Agency
SISTech	Scottish Institute of Sustainable Technology
SME	Small and Medium Enterprises
SNH	Scottish Natural Heritage
SPP6	Scottish Planning Policy
SRDP	Scottish Rural Development Programme
SSA	Sector Skills Agreement
SSC	Sector Skill Councils

SSCI

Scottish Sustainable Communities Initiative