Electricity Generation Policy Statement – 2013

The Scottish Government
Riaghaltas na h-Alba

ELECTRICITY GENERATION POLICY STATEMENT – 2013

INTRODUCTION

1. The Scottish Government published an initial draft Electricity Generation Policy Statement (EGPS) in November 2010, to support our Climate Change Report on Proposals and Policies (RPP). The RPP is required under the Climate Change (Scotland) Act 2009 to set out proposals and policies for meeting annual emissions reductions targets from 2010 to 2022.

2. A further revision of the EGPS was published in draft in March 2012 for consultation. The 2012 draft set out the pathway to meeting the Scottish Government target of delivering the equivalent of at least 100% of gross electricity consumption from renewables by 2020. It set out how Scotland generates electricity, and gave an overview of the changes needed to meet Scottish Government targets and deliver a low carbon generating mix.

3. This document sets out a final version of the EGPS:

- **to reflect views, suggestions and comments submitted to the consultation;**
- **to update on electricity sector developments and changes;**
- **following an extensive programme of targeted engagement, consultation and discussion with generators, transmission system owners, engineering, academic and market experts in Scotland and UK;**
- **to reflect significant political and policy developments at UK and EU level, and the nature of on-going discussions with UK and EU policy makers;**
- **to finalise the requirements for strategic environmental assessment (SEA) of the EGPS and the 2020 Routemap for Renewable Energy in Scotland, as required by the Environmental Assessment (Scotland) Act 2005**

4. A more detailed overview of the responses to the 2012 consultation is also available on the Scottish Government website, alongside this EGPS.

5. This document will now form a basis for further and on-going modelling of the future electricity generating mix in Scotland, beyond 2020. This work will be informed by continued industrial and political developments, and through consultation and engagement with Government, industry and other stakeholders. This will include commissioning more detailed work in a number of areas where the initial modelling has found that this is needed, including the development of a Scottish Heat Generation Policy Statement and the assessment of Scottish potential for future generation sources such as geothermal, solar and interconnection development.

6. Importantly, the modelling of future Scottish electricity generating scenarios will be based on a specific Scottish Electricity Dispatch Model which the Scottish Government is developing and which will represent the UK's first regional electricity dispatch model. This will allow for far greater scrutiny of the issues affecting Scotland's electricity generation than any alternative model to date.

EXECUTIVE SUMMARY

1. Electricity plays a central role in the life and lives of the nation. Its generation, and the economic and the environmental benefits which could arise through a shift from fossil fuel generation to a portfolio comprising renewable and cleaner thermal generation, are matters of considerable importance to the Scottish Government.

2. This Electricity Generation Policy Statement 2013 (EGPS) examines the way in which Scotland generates electricity, and considers the changes which will be necessary to meet the targets which the Scottish Government has established, and reflects both views from industry and other stakeholders and also developments in UK and EU electricity policy.

3. It looks at the sources from which that electricity is produced, the amount of electricity which we use to meet our own needs and the technological and infrastructural advances and requirements which Scotland will require over the coming decade and beyond.

4. The Scottish Government's policy on electricity generation is that Scotland's generation mix should deliver:

- **a secure source of electricity supply;**
- **at an affordable cost to consumers;**
- **which can be largely decarbonised by 2030;**
- **and which achieves the greatest possible economic benefit and competitive advantage for Scotland including opportunities for community ownership and community benefits.**

5. The EGPS is constructed around a number of relevant targets and related requirements:

- **delivering the equivalent of at least 100% of gross electricity consumption from renewables by 2020 as part of a wider, balanced electricity mix, with thermal generation playing an important role though a minimum of 2.5 GW of thermal generation progressively fitted with Carbon Capture and Storage (CCS);**
- **enabling local and community ownership of at least 500 MW of renewable energy by 2020;**
- **lowering final energy consumption in Scotland by 12%;**
- **demonstrating carbon capture and storage (CCS) at commercial scale in Scotland by 2020, with full retrofit across conventional power stations thereafter by 2025-30;**
- **seeking increased interconnection and transmission upgrades capable of supporting projected growth in renewable capacity.**

6. Scotland's renewables potential is considerable. Figures published on the UK Department of Energy and Climate Change website in May 2013 estimated that, between April 2010 and January 2013, the industry announced projects amounting to over 9,000 jobs and £13 billion investment in Scotland. We know that our renewables potential will be capable of generating much more than enough to meet domestic demand for electricity. The remainder could

be exported to the rest of the UK and continental Europe to assist other countries in meeting their binding renewable electricity and decarbonisation targets.

7. The EGPS is structured as follows:

- **Energy demand reduction** – brief look at the Scottish Government's Energy Efficiency Action Plan (EEAP), against the backdrop of a fall in final energy consumption of 7.4% in 2009 compared to the previous year.

- **Renewables** – the importance of renewables in the light of the Scottish Government's 100% target mentioned above, our target for at least 500 MW of renewable energy (electricity and heat) to be in local and community ownership by 2020, and in the context of the Renewables Routemap and the related heat and transport targets.

- **CCS** – the Scottish Government's policy is that renewable generation should operate alongside upgraded and more efficient thermal stations, and that there should be a particularly strong role for CCS, where Scotland has the natural advantages and resources which could enable it to become a world leader.

- **Nuclear** – the EGPS confirms that nuclear energy will be phased out in Scotland over time, with no new nuclear build taking place in Scotland. As we have seen with regards to Hunterston B, subject to the relevant safety case being made, this does NOT preclude extending the operating life of Scotland's existing nuclear stations to help maintain security of supply over the next decade while the transition to renewables and cleaner thermal generation takes place.

- **Bioenergy** – confirmation that biomass should be used in small heat only stations and those fitted with good quality CHP, off gas-grid where possible, the better to contribute to meeting the Scottish Government's target of 11% of heat demand to be sourced from renewables by 2020.

- **Role of electricity storage** – developments in this area, while financially and technologically challenging, can help address the variability of certain forms of renewable generation

- **Transmission and distribution** – the EGPS reaffirms the important role that Scotland can play in developing greater onshore and offshore grid connections within and across the UK and Europe. It continues to press for a sensible regulatory regime – in particular an equitable outcome on charging – and also looks at the importance of (and need to build upon) the Irish Scottish Links on Energy Study (ISLES)[1] and the importance of developing North Sea grid.

[1] http://www.islesproject.eu/

- **Modelling the target of the equivalent of 100% of gross electricity consumption from renewables by 2020** – modelling commissioned by the Scottish Government has confirmed that this target is technically feasible. The work, summarised at Annex B of this report, also looks at the changes to the generation mix and power flows which will be required.

- **Market factors** – the EGPS also reiterates the need for a coherent and effective outcome to the current process of Electricity Market Reform (EMR) and the need for that outcome to respect the devolution settlement and help deliver Scotland's renewable energy and CCS potential.

8. A Strategic Environmental Assessment (SEA) of the EGPS (and Renewables Routemap) has also been completed, balancing the objectives and targets contained within those documents with more localised effects on environmental features such as landscapes and biodiversity.

ELECTRICITY GENERATION POLICY STATEMENT

Introduction

1. This **Electricity Generation Policy Statement (EGPS)** ('the report') sets out the Scottish Government's views on the role of renewable electricity and fossil fuel thermal generation (coal, gas, oil) in Scotland's future energy mix. Scotland has massive green energy potential with a quarter of Europe's tidal and offshore wind potential and a tenth of its wave power. This is reflected in our target, which is to deliver the equivalent of at least 100% of gross electricity consumption from renewables by 2020, the most ambitious target in the EU. This target does **NOT** mean that Scotland will be 100% dependent on renewables generation: renewables will form part of a wider, balanced electricity mix, with thermal generation continuing to play an important role.

2. The report is built around a sustainable, low carbon vision of Scotland's energy future. It contains our view on the need for a rapid expansion of renewable electricity across Scotland, alongside new or upgraded efficient thermal capacity, progressively fitted with Carbon Capture and Storage (CCS). It also confirms our policy on nuclear generation. Existing nuclear power stations will provide important baseload generation over the coming years as we make the transition to renewables and other low carbon generation. This was evidenced by Scottish Government support for the extension of the operating life of Hunterston B power station until at least 2023, as announced by EDF Energy in December 2012. However, Scotland's long term energy needs can be met without the need for new nuclear capacity and there will therefore be no new plants in Scotland.

3. The report is based on research studies looking at future energy supply, storage and demand[2]; it also takes account of the changing policy context in Scotland, the UK and the EU since we published the Second National Planning Framework[3] in June 2009, and since we published the initial draft Electricity Generation Policy Statement in November 2010. It also reflects the views, suggestions and comments submitted to the March 2012 consultation on the EGPS and an extensive programme of engagement, consultation and discussion with generators, transmission system owners, engineering, academic and market experts in Scotland and UK.

4. We have also completed a strategic environmental assessment (SEA) of the EGPS and the 2020 Routemap for Renewable Energy in Scotland,[4] as required by the Environmental Assessment (Scotland) Act 2005. The SEA aims to ensure that our overall objective of addressing climate change is appropriately balanced with more localised effects on environmental features such as landscapes and biodiversity. We published an Environmental Report for consultation in March 2012, setting out the findings of the SEA[5]. The completed Post Adoption SEA Statement is being published at the same time as this report.

[2] http://www.scotland.gov.uk/Resource/Doc/328702/0106252.pdf
[3] http://www.scotland.gov.uk/Resource/Doc/278232/0083591.pdf
[4] http://www.scotland.gov.uk/Publications/2011/08/04110353/0
[5] http://www.scotland.gov.uk/Publications/2012/03/2294

5. The Climate Change (Scotland) Act 2009 set emission reduction targets .of 80% reduction of greenhouse gas emissions on 1990 levels by 2050, with an interim target of a 42% reduction on 1990 levels by 2020. The renewable energy targets, alongside our climate change emission reduction targets, and the desired changes in Scotland's future energy generation mix set out in this document, will combine to deliver our ambitions for a low carbon Scotland.

6. Section 35 of the Act requires Scottish Ministers to publish a report on proposals and policies (RPP) setting out how our actions across a range of Government activities, programmes and policies help to make progress towards meeting those targets. The first RPP, Low Carbon Scotland: Meeting the Emissions Reduction Targets 2011 – 2022[6], was published in March 2011.

7. The RPP focuses on four transformational outcomes identified in the Scottish Government's Climate Change Delivery Plan (2009)[7] that will help achieve the 80% carbon reduction target. The areas are:

- A largely decarbonised electricity generation sector by 2030;
- A largely decarbonised heat sector by 2050, through a combination of energy efficiency, reduced energy demand and low carbon heating;
- Decarbonisation of road transport by 2050;
- Ensuring that carbon (and carbon cost) is factored into strategic and local decisions about rural land use.

8. A draft of the second report on proposals and policies (RPP2), focussing on the period from 2013-2027, was published in January 2013. [8]This EGPS supports the development of the RPP process and reporting, and will assist the Scottish Government in complying with further statutory requirements under the Climate Change (Scotland) Act 2009 to report on electricity generation and consumption in the context of action to reduce greenhouse gas emissions.

9. The Scottish Government's commitment to securing the transition to a low carbon economy is one of the six strategic priorities laid out in the Government Economic Strategy[9], published in September 2011. This transition is vital to maximising Scotland's sustainable growth, and therefore securing jobs and investment, as well as for supporting the achievement of our climate change targets.

[6] http://scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/lowcarbon/rpp
[7] http://www.scotland.gov.uk/Publications/2009/06/18103720/0
[8] http://www.scotland.gov.uk/Publications/2013/01/3958/0
[9] http://www.scotland.gov.uk/Publications/2011/09/13091128/0

Targets

10. Our targets and aspirations for electricity generation, and other targets which are relevant to it, are as follows:

- delivering the equivalent of at least **100% of gross electricity consumption from renewables by 2020** – having surpassed the original interim target of 31% in 2011, we have now set a new, challenging interim target of **50% by 2015**;
- this predominant role for renewable energy in electricity supply in Scotland by 2020 will be supported by a **minimum of 2.5 GW of thermal generation** progressively fitted with Carbon Capture and Storage (CCS), and helping ensure security of supply in the GB market;
- **demonstrating CCS at commercial scale** in Scotland by 2020 with full retrofit across conventional power stations thereafter by 2025-30;
- our aim is to ensure that we have a largely decarbonised electricity system by 2030. This is supported in the second RPP by the introduction of a **non-statutory target to achieve a 2030 carbon intensity of 50gCO2/kWh** for electricity generation in Scotland. This will not only help us deliver on our emission reduction ambitions but will provide the policy clarity and certainty required by industry stakeholders
- seeking **on-going transmission upgrade and reinforcement across Scotland**, including work to address some of grid access issues faced by developers in Scotland's islands, and increased connections to other parts of the UK and wider interconnection capable of supporting the projected growth in renewable capacity and connecting Scotland to export markers in the UK and Europe;
- sourcing **11% of heat demand and 10% of transport fuels from renewables by 2020**;
- enabling **local and community ownership of at least 500 MW** of renewable energy by 2020;
- **reducing final energy consumption in Scotland by 12%.**

11. The electricity target should not be considered in isolation from the other energy and climate change targets above, all of which are interdependent. For instance, overachievement of the energy consumption reduction target could directly reduce the installed capacity required to meet the electricity target, while progress towards the target for renewable heat via heat pumps, might **increase** electricity demand and hence the challenge of the electricity target. Similarly, a 10% market penetration of electric vehicles by 2020 could require an additional 1 TWh of electricity generation which, while relatively small, is nevertheless an additional electricity demand pressure.

12. These targets underpin our vision of a stable and desirable future generation mix for Scotland, which is built around the following key principles:

- **a secure source of electricity supply;**
- **at an affordable cost to consumers;**
- **which can be largely decarbonised by 2030;**
- **and which achieves the greatest possible economic benefit and competitive advantage for Scotland.**

Secure supplies

We must ensure that Scotland continues to have a secure energy supply throughout the transition to low carbon energy. It's possible that around a quarter of the UK's existing generating capacity will be retired over the next decade with OFGEM analysis[10] published in October 2012, estimating that the UK's de-rated capacity margin will fall from 14% in 2012/13 to 4% in 2015/16. An update to these figures in the Electricity Capacity Assessment Report 2013[11] was published on 27th June 2013. This shows electricity supplies are set to tighten faster than previously expected in the middle of this decade While actions on energy demand and energy efficiency will help to reduce the need for energy, longer term demand for electricity is likely to increase due to its being used more often in areas such as transport and heat. Our aim will be to meet these needs with a generation mix which is sustainable and as low in carbon emissions as possible.

Affordable cost to consumers

Energy provision will always come at a cost; our aim is to make sure that this is as low as possible, and affordable for consumers. It's important to remember that the price rises over recent years were driven primarily by rising international prices for fossil fuels.[12] Evidence from the independent Committee on Climate Change suggests that bills for gas and electricity rose by £445 between 2004 and 2010. They found that 64% (approx. £285) of this rise was the result of increases in wholesale costs with only £75 associated with low carbon support mechanisms, many of which subsequently reduce energy consumption.

Ofgem's Project Discovery report pointed out that the next decade could be characterised by far greater price hikes and volatility if energy supplies are more reliant on fossil fuels than low carbon sources. By fulfilling our renewables ambitions, we can reduce Scotland's exposure to such sources and the related costs. UK Government analysis continues to suggest that low carbon policies will result in a net saving on average household energy bills.[13]

Decarbonised generation

As highlighted above, we aim to decarbonise Scotland's electricity generation sector by 2030, in line with the recommendations of the Committee on Climate Change, to achieve a carbon intensity of 50gCO2/kWh for electricity generation in Scotland. This will help deliver our overarching obligations under the Climate Change (Scotland) Act, and

[10] http://www.ofgem.gov.uk/Markets/WhlMkts/monitoring-energy-security/elec-capacity-assessment/Documents1/Electricity%20Capacity%20Assessment%202012.pdf
[11] http://www.ofgem.gov.uk/Markets/WhlMkts/monitoring-energy-security/elec-capacity-assessment/Documents1/Electricity%20Capacity%20Assessment%20Report%202013.pdf
[12] For further details, please see the 2012 Energy in Scotland Statistical Compendium
[13] Estimated impacts of energy and climate change policies on energy prices and bills (UK Government Department of Energy and Climate Change, March 2013) https://www.gov.uk/policy-impacts-on-prices-and-bills

will be complemented by moves to decarbonise the heat and transport sectors, as well as by addressing emissions from agriculture, land use and forestry.

Economic benefit

We believe that Scotland can enjoy major economic benefits and competitive advantage by successfully developing new low carbon energy resources such as CCS, offshore wind, marine energy, smart grids, offshore grids and interconnection to markets outside Scotland. Over the decade to 2020, renewables alone could provide up to 40,000 jobs[14] and £30bn investment to the Scottish economy, with a transformational opportunity for local ownership and benefits.

The Western Isles, the Orkney Islands and the Shetland Islands in particular have some of the best renewable energy resources in Scotland, but developers face significant challenges in bridging project finance and grid access issues. Addressing these issues could enable these areas alone to provide up to 10,000 jobs[15] by 2020, and deliver massive social and economic benefit to Scotland and its island communities.

Scotland also leads the way across the UK in how it supports local ownership of renewable energy projects which provide wider community benefits, and our target of 500 MW to be in local and community hands by 2020 could bring in up to £2.4 billion directly to communities in FITS revenues alone over 20 years.

13. There are several options for replacing the nuclear and fossil fuel generating capacity which is due to retire over the coming decade with Carbon Capture and Storage, and renewables. The Scottish Government's policy is clear – alongside actions to reduce demand for energy, we want to see both a rapid expansion of renewable electricity across Scotland and new or upgraded and efficient thermal capacity, with commitment to recover waste heat and progressively fitted with Carbon Capture and Storage (CCS). We believe that all of Scotland's future energy needs can be met without the need for new nuclear power stations, and that existing nuclear power stations should be phased out as they reach the end of their safe operating lives.

14. This report is built around the Scottish Government's 2020 target, which our modelling has shown to be technically feasible, plus some scenarios and major challenges affecting its delivery. Our 2020 target is a **challenge** – to the energy supply sector, to our renewables industry and innovators, and to Scotland's communities; it is a both a statement of intent and a rallying call, embodying our firm belief that Scotland can and must exploit its huge renewables potential to the fullest possible extent – to help meet demand here and across Europe. It is as much about the value and importance of the journey as it is about the destination.

[14] Skills Investment Plan for the Energy Sector (Skills Development Scotland, March 2011) http://www.skillsdevelopmentscotland.co.uk/our-story/key-publications/skills-investment-plan-for-the-energy-sector.aspx

[15] https://www.gov.uk/government/publications/scottish-islands-renewable-project-final-report

15. The electricity system is constantly evolving. Over the last 12-18 months, we have been working with partners across the industry to develop and build an electricity dispatch model to allow us to better understand this evolution. The Scottish Electricity Dispatch Model (SEDM) will be completed during 2013, at which point it will be subject to independent peer review.

16. The SEDM represents the UK's first regional electricity dispatch model and will allow far greater scrutiny of the issues affecting Scotland's electricity generation than any alternative model. Rather than commission further analysis from one of these less suitable models while the SEDM is being finalised, this report retains the modelling presented in the consultation document. We will use the SEDM over coming months to extend our modelling to consider a number of additional scenarios for 2020 and beyond.

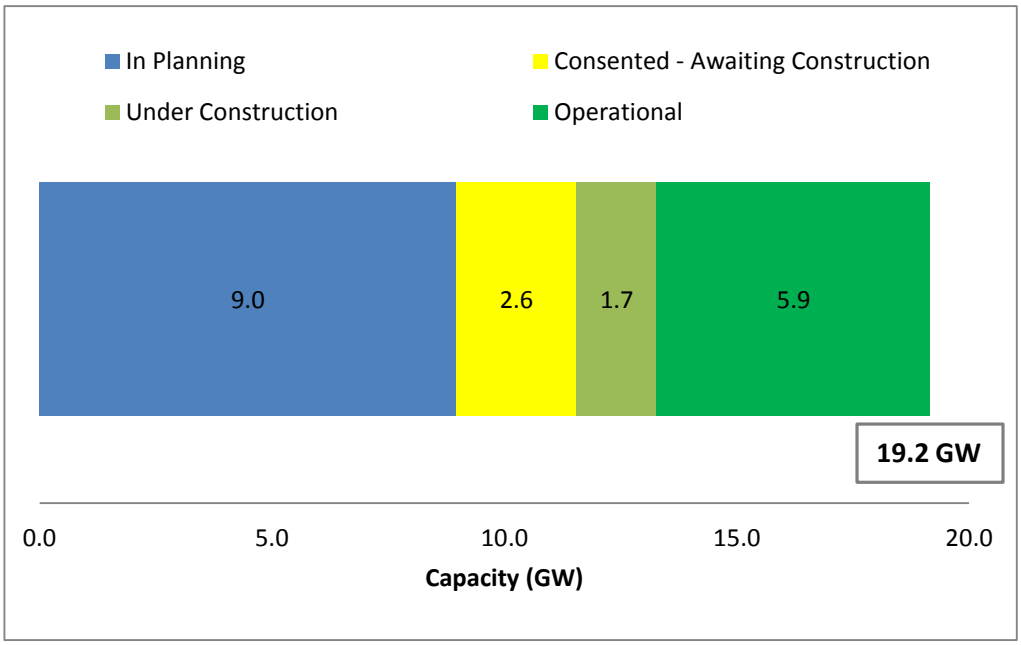
17. Studies such as the 'Offshore Valuation'[16] and the 'Opportunities for CO2 Storage around Scotland'[17] reports have helped highlight that Scotland has low carbon potential well beyond that required to deliver the 2020 target. While we estimate that the 100% target will require around 14-16 GW of capacity to be deployed, Figure 1 below highlights that there is nearly 20 GW of renewable capacity already in various stages of project planning and development.

18. Following a record year for deployment in 2012, there is already 5.9 GW of renewable capacity in operation with a further 1.7 GW under construction and 2.6 GW of capacity already consented – with 9 GW of capacity in the planning system and significant offshore potential still in scoping. Renewables projects will continue to be considered carefully to balance a range of interests, including economic, environmental and community interests. We will continue to publish progress towards our targets in our quarterly Energy Statistical Summaries[18] and will also publish RESTATS statistics on the progress of projects through the Scottish planning system.

[16] http://www.offshorevaluation.org/downloads/offshore_vaulation_full.pdf
[17] http://www.scotland.gov.uk/Resource/Doc/270737/0080597.pdf
[18] http://www.scotland.gov.uk/Topics/Statistics/Browse/Business/Energy

Figure 1 - Renewable capacity at various stages of project planning

Source: Scottish Government Renewable Planning Statistics (28th March 2013)



19. We are wholly confident that our objectives for a resilient energy system, with a high proportion of renewable energy, can be delivered by the market and can be achieved whatever constitutional changes may occur over the next few years. Scotland is, and will remain, a net exporter of electricity owing to renewable deployment.

20. For example, the UK targets to produce 15% of all energy and an estimated 30% of electricity from renewable sources by 2020 will require connection to Scotland's energy resource, and we will continue to work to connect Scotland to an ever more integrated UK and EU market. Indeed, the countries of the British Isles are working towards an All Islands electricity market, and the EU has designated the North Sea as a priority corridor for energy infrastructure which will enhance Scotland's ability to export low carbon energy in the longer-term. The importance of the All Islands approach has been recognised by all Governments in the British Isles, who have committed[19] to cooperate to deliver the major wind and marine resource in and around the British Isles, including from Scotland. This commitment was re-iterated by all Governments of the British Irish Council[20] on 21st June 2013.

21. In addition, the Scottish Government supports GB wide security of supply based on competitive energy markets combined with effective regulation to deliver diversity of supply – including significant amounts of renewable energy – and robust and effective infrastructure for both consumers and industry. The UK and Scottish Governments work closely[21] to align the exercise of both current reserved and devolved powers to deliver secure energy supplies.

[19] https://www.gov.uk/government/news/all-island-approach-to-open-up-renewables-opportunities
[20] http://www.britishirishcouncil.org/sites/default/files/20%20-%20Twentieth%20Summit%20-%20Derry~Londonderry%20-%2021%20June%202013_1.pdf
[21] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65643/7101-energy-security-strategy.pdf

22. Our positions on energy efficiency and energy storage, and the role for different sources of electricity generation, are set out in more detail in the following sections.

Energy Demand Reduction

23. Scotland's ability to supply sufficient renewable electricity and heat to meet its targets in a cost-effective way depends critically on **reducing demand**. High demand requires more generating capacity to be built. As a consequence of uncertainties over individual behaviours, electricity demand could vary; but it is likely to rise in the long term as more electricity is used for transport and heat reasons. This means that energy efficiency measures across all three energy sectors will be crucial.

24. We published Conserve and Save; the Scottish Government's Energy Efficiency Action Plan[22] (EEAP) in Autumn 2010. It established a target to reduce total final energy demand in Scotland by 12% by 2020 from a 2005-7 baseline, covering all fuels and sectors. In the second progress report published in May 2012, the most recent data for 2010 showed a 1.2% increase in consumption compared to 2009, due in part to the economic recovery from the previous year and a particularly cold winter.

25. However, consumption in 2010 was still 6.2% lower than the 2005-2007 baseline against which the 12% Energy Efficiency Target is measured. A report on the formal review of the EEAP was published in May 2013. The review concluded that over 90% of the actions set out in the EEAP have been completed and that we remain on track to meet the 2020 target.[23]

26. The EEAP set a framework for energy efficiency and microgeneration that furthers our climate change, economic and social agendas. It is a key part of the cost-effective actions required if Scotland is to meet our challenging statutory emissions reduction targets of 42% by 2020 and at least 80% by 2050, as set out in the Climate Change (Scotland) Act 2009. It seeks to create employment, promote new technologies, and secure wider economic benefits for the low carbon economy. By reducing energy consumption, it aims to reduce costs for consumers whilst improving levels of comfort, and to improve Scotland's security of energy supply.

27. Being smarter in how we use valuable resources like energy, water, and raw materials will make a significant contribution to sustainable economic development in Scotland and protecting our environment. Energy efficiency is at the top of our hierarchy of energy policies as the simplest and most cost-effective way to reduce emissions whilst seeking to maximise the productivity of our renewable resources. Energy efficiency complements our other energy-related strengths, and works across areas such as housing, business, and transport, all of which are major consumers of fuel.

28. The key achievements relating to energy efficiency include:

[22] http://www.scotland.gov.uk/Topics/Business-Industry/Energy/Action/energy-efficiency-policy/ActionPlan
[23] http://www.scotland.gov.uk/Publications/2013/05/2162

- Creating the Resource Efficient Scotland programme, bringing together expertise on managing energy, water and materials costs into a single service to make it easier for Scottish organisations and businesses, particularly smaller firms, to operate more efficiently and get more value from the resources they do use – saving businesses and the public sector up to £2.9 billion a year;
- Working closely with Scottish Cities Alliance, Scottish Futures Trust, Resource Efficient Scotland and the wider public sector to develop commercial financial delivery mechanisms – attracting the investment required and maximising the opportunities from a programme of low carbon projects across Scottish public sector e.g. low carbon street lighting, district heating, energy efficiency of non-domestic buildings;
- Continuing to support SMEs to uptake energy efficiency, micro generation and small scale renewables measures. Scottish SMEs received Energy Saving Scotland small business loans worth £4.45 million in financial year 2012/13;
- To ensure that SMEs are appropriately skilled to take advantage of the opportunities we continue to work with Skills Development Scotland, Sector Skills Councils and Trade Bodies to monitor uptake of Green Deal certification by SMEs. We are also funding Energy Saving Trust to work with the supply chain to promote and support activity around Green Deal and the wider energy efficiency sector.
- The establishment in 2012 of a £20 million Green Homes Cashback Scheme providing householders up to £1,200 to pay for energy improvement measures in their homes, helping to reduce household energy bills;
- Our Sustainable Housing Strategy – which at the time of publication is due to be finalised within forthcoming weeks – will set out the programmes and measures to provide warm, high quality, affordable homes across Scotland, supporting significantly increased standards of energy efficiency and a transformation in the housing market in attitudes to energy efficiency of homes and use of more efficient modern construction methods. Supported by £79 million Scottish Government funding in 2013-14, we are working with local authorities, utility companies and others to create a fund of over £200 million per annum to improve domestic energy efficiency, help tackle fuel poverty and maximise the impact of the Energy Company Obligation in Scotland.

Renewables

29. We published our 2020 Routemap for Renewable Energy in Scotland [24] in June 2011, a document which goes hand in hand with our continuing drive to reduce demand. We published an update to the Routemap on October 30th 2012.[25]

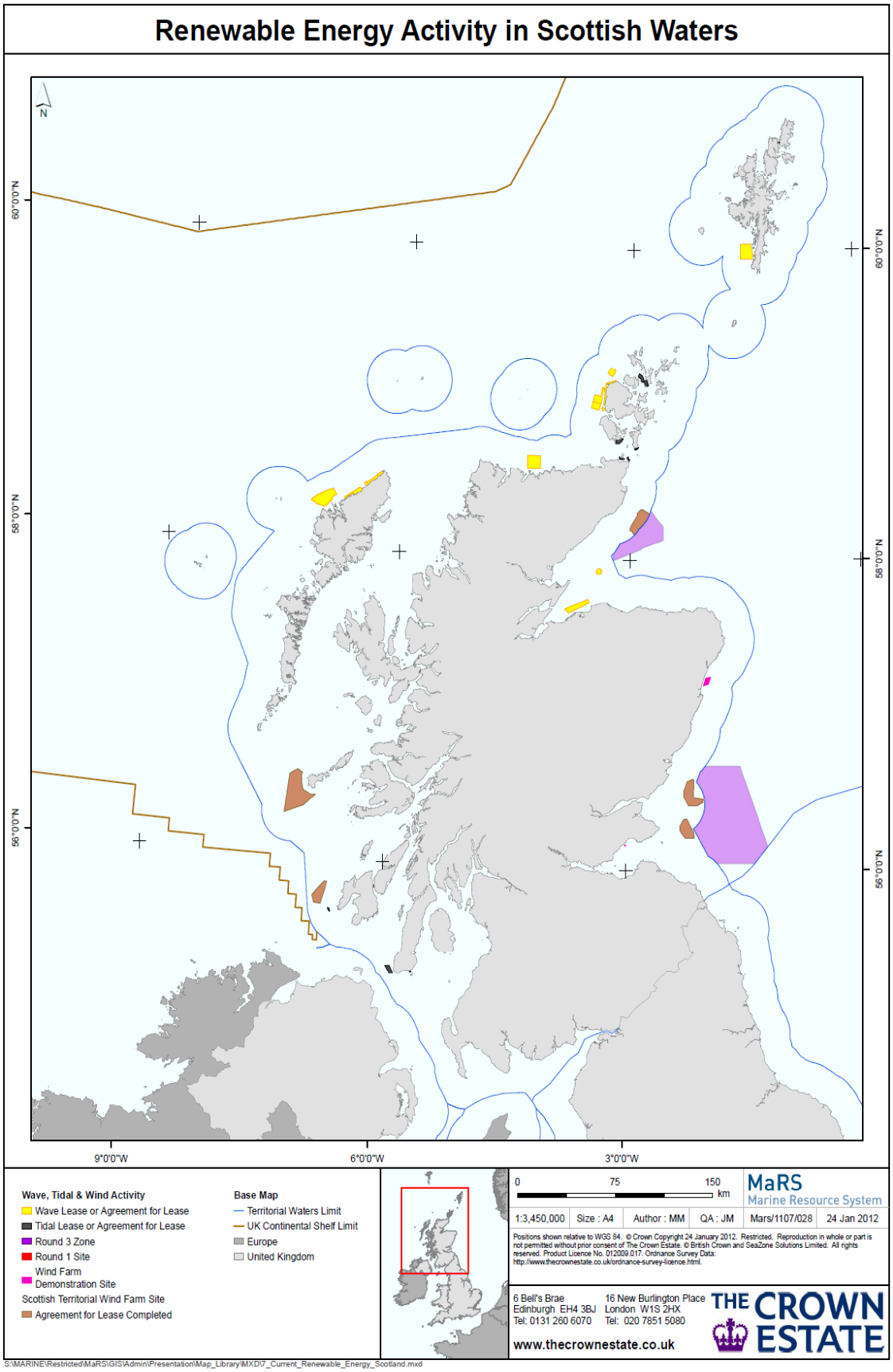
30. Because the pace of renewables development has been so rapid in Scotland, and because we have a potential resource capable of powering Scotland several times over, we believe that Scotland has the capability and the opportunity to generate a level of electricity from renewables by 2020 that would be the equivalent of 100% of Scotland's gross electricity consumption. The target will require the market to deliver an estimated 14 – 16 GW of

[24] http://www.scotland.gov.uk/Publications/2011/08/04110353/0
[25] http://www.scotland.gov.uk/Resource/0040/00406958.pdf

installed capacity. It does not mean or require an energy mix where Scotland will be 100% reliable on renewables generation by 2020; but it supports Scotland's desire to remain a net exporter of electricity. Due to the intermittent nature of much renewables generation, we will need a balanced electricity mix to ensure security of supply, with cleaner, efficient thermal generation continuing to play an important role.

31. Scottish Ministers will work with the regulator and the market to ensure that Scotland continues to have a secure and affordable energy supply as we make the transition towards low carbon energy. This will need increases in Scotland's capacity for electricity import and export to balance renewable intermittency, and the maintenance of a core electricity generation base that meets Scotland's future energy demand and protects our critical supplies and services.

32. Scotland has the largest offshore renewable energy resources in the EU (25% of EU offshore wind, 25% of EU tidal and 10% of EU wave power). With up to 10 GW of offshore wind and over 1.6 GW of wave and tidal projects (see map below) currently planned, Scotland has the potential to make a major contribution to the EU's overall renewables target. This is why we have developed clear links with our neighbouring governments in Ireland, Northern Ireland and across the North Sea to promote the development of offshore grid connections to harness the vast renewable energy potential of the North and Irish Seas (see later section on transmission and distribution).



33. We will continue, as we have always done, to work closely with key stakeholders, including partner Governments, industry, Ofgem and academia

to ensure that electricity generation is a key component of scenario planning and generation capacity assumptions.

34. Resilience is another important area. We work closely with key resilience stakeholders including industry, police, local authorities, UK Government and regulators to help provide a robust electricity network that is resilient to a range of risks and threats. Close working and co-operation with Scotland's renewables sector to identify and mitigate any renewables resilience issues will form a key part of Scotland's future energy resilience programme.

35. We recognise that output from renewables can be variable in the short-term,[26] and that low probability weather events, such as years with very low rainfall in hydro catchment areas or exceptionally low wind productivity, do happen from time to time. For example, hydro output in 2010 was 40% lower than in the previous year before increasing by 64% in 2011 – 8.8% higher than the previous record year for hydro generation.

36. This is not an issue unique to renewables generation; **all** generators are exposed to risks and variability. Indeed, the grid is already designed to cope with loss of power from large power stations, which can also happen from time to time. Although wind output can be variable in the short-term, it can be forecast with some confidence, whereas failures at large power stations – such as the outages of Torness in July 2011 and May 2013 – often come without any advance warning.

37. Wind power, alongside other forms of onshore and offshore renewables, provides an electricity supply which is largely emissions-free[27], and, because of its decentralised nature, contributes significantly to greater security of supply. Scotland has also long been a net exporter of electricity and will continue to have enough capacity from other sources to turn to when necessary.

38. Whilst offshore renewable electricity generation costs are currently high, this is normal for emerging technologies. We work closely with the UK Government and the offshore wind industry through the UK Government's Offshore Wind Cost Reduction Task Force with an objective of reducing costs across the offshore wind industry to £100 per MWh.

39. We expect offshore renewables to play a major role in meeting our targets for 2020 and beyond, and are making every effort to deliver the support and the infrastructure which these technologies and their supply chain will need to develop and flourish. With 25% of Europe's offshore wind potential, the manufacturing, supply chain, job creation and training opportunities present Scotland's communities with a huge economic opportunity.

40. The Regional Locational Guidance work[28] being taken forward by Marine Scotland has identified further areas for potential offshore wind development

[26] The 2012 Energy in Scotland statistical compendium also contains an article on renewable output variability during the transition to a low carbon generation mix (http://www.scotland.gov.uk/Resource/0038/00389297.pdf).
[27] http://www.scottish.parliament.uk/S4_EconomyEnergyandTourismCommittee/NATIONAL_GRID.pdf
[28] http://www.scotland.gov.uk/Topics/marine/marineenergy/wave/rlg

in the medium to longer term and is currently considering similar medium to longer term options for the wave and tidal sector.

Thermal Generation – CCS

41. Our analysis demonstrates that while renewable energy will play the predominant role in electricity supply in Scotland by 2020, the Scottish electricity generation mix cannot currently, or in the foreseeable future, operate without baseload and balancing services provided by thermal electricity generation. The scheduled closure of existing plants, and the construction of a minimum of 2.5 GW of new or replacement efficient fossil fuel electricity generation progressively fitted with CCS, would satisfy security of supply concerns and, together with renewable energy, deliver large amounts of electricity exports. This generation portfolio would be consistent with our climate change targets and reporting under the net Scottish emissions account

42. The market will continue to bring forward proposals for new or upgraded thermal electricity generation capacity in Scotland, and we have granted consent under section 36 of the Electricity Act 1989 for a new efficient Combined Cycle Gas Turbine at Cockenzie. Scottish Power ceased coal-fired electricity generation at Cockenzie Power Station in March 2013. We continue to encourage Scottish Power to fully develop its plans for the site and to determine the design and future timetable for the project.

43. Nevertheless, the introduction of the 300 MWe CCS requirement, the UK Government's Carbon Price Floor and its proposals for an Emissions Performance Standard, mean that thermal plants will – rightly – be operating in a highly regulated and increasingly constrained market.

44. The Scottish Government does not support unabated new coal plants in Scotland, as this would be wholly inconsistent with our climate change objectives. We have made it absolutely clear that any new power station in Scotland must be fitted with CCS on a minimum 300 MWe of its generation from day one of operation. CCS can potentially reduce emissions from fossil fuel power stations by up to 90% and will be a vital part of our commitment to decarbonise electricity generation by 2030. (See Box 1 below)

45. As with renewables, Scotland has the opportunity to become one of the world's leaders in the development of CCS. Research has shown that CCS could create up to 13,000 jobs in Scotland by 2020 with added value in the UK worth between £5 billion and £9.5 billion from around 2025 onwards.[29] There are well-developed proposals for CCS demonstrations at Peterhead and Grangemouth, and Scotland's R&D capability in our universities or test sites gives us a leading position to develop projects in other markets.

46. Storage of CO^2 is one of the most critical, but uncertain, parts of the CCS chain. The CCS Cost Reduction Task Force (an industry led joint taskforce established by DECC) has identified CO^2 storage as one of the areas of the CCS chain where action must be taken, if the UK is to achieve a levelised

[29] http://www.scotland.gov.uk/Resource/Doc/917/0114777.pdf

cost of power generation from CCS enabled power stations of £100/megawatt hour by the 2020s (to be competitive with other forms of low carbon generation). Among its recommendations, the Task Force determined that CCS cost could be reduced through a de-risking of storage offshore.

47. Scotland has considerable natural advantages in CO^2 storage and much work has already been done to characterise this resource. Alongside our world-leading research and development expertise 'Opportunities for CO^2 storage around Scotland,[30] published in 2009, showed that Scotland has an extremely large CO^2 storage resource:

- Offshore saline aquifers, together with a few specific depleted hydrocarbon fields can easily accommodate the industrial CO^2 emissions from Scotland for the next 200 years;
- Scotland's offshore CO^2 storage capacity is the largest in the European Union, comparable with that of Norway, and greater than Netherlands, Denmark and Germany combined;
- 'Progressing Scotland's CO^2 storage opportunities' published in March 2011,[31] confirms the European significance of Scotland's CO^2 storage resource with more detailed evaluation of the Captain Sandstone (beneath the Moray Firth);
- The Scottish Enterprise/SCCS joint report 'Central North Sea CO^2 Storage Hub – Enabling CCS deployment in the UK and Europe' launched in September 2012, which highlighted the potential for a Central North Sea Storage Hub to receive and store as much as 100 million tonnes of CO^2 a year by 2030 and 500 million tonnes a year by 2050.

48. The decision in October 2011 by the UK Government not to go ahead with the Longannet CCS demonstration project in the first round of the £1 billion CCS Commercialisation Competition was extremely disappointing; however, the Front End Engineering and Design (FEED) Study was a successful exercise that has greatly increased the understanding of the engineering and financial pathways to CCS development and deployment.

49. Scotland retains two projects in the second round of the £1 billion DECC CCS Commercialisation Programme Competition. On 20 March 2013, DECC announced the Peterhead CCS Project as one of the 'preferred bidders' in the Competition, with The Captain Clean Energy Project at Grangemouth placed on a 'reserve bidder' list. The Peterhead CCS Project also remains in contention for the EU's New Entrants Reserve funding. We welcome the fact that the Peterhead CCS Project is a preferred bidder in the DECC CCS Commercialisation Programme Competition.

[30] http://www.scotland.gov.uk/Publications/2009/04/28114540/0
[31] http://www.scotland.gov.uk/Topics/Business-Industry/Energy/Energy-sources/traditional-fuels/new-technologies/SGactionCCS/ScotlandsCO2Storage

BOX 1: Carbon Capture and Storage

The building of any new thermal-based stations above 50 MW requires consent from Scottish Government Ministers under section 36 of the Electricity Act 1989. We made the following announcement in November 2009:

- From 9 November 2009, any application for a new coal plant in Scotland will need to demonstrate CCS on a minimum of 300 MW (net) of capacity from their first day of their operation;
- Further new builds from 2020 will be expected to have full CCS from their first day of operation;
- A 'rolling review' of the technical and economic viability of CCS will take place by 2018 looking specifically at retro-fitting CCS to existing coal plants, with the likelihood of having existing plants retro-fitted by no later than 2025; and
- As the work to prove CCS is viable, competitive and commercial progresses we will continue to look at other solutions such as storage.

This policy relates to coal stations only. The Scottish Government's position on gas, oil and thermal stations is that for stations over 300 MWe, applicants will have to demonstrate that any new applications demonstrate carbon capture readiness. Indeed the Cockenzie CCGT consent[32] decision given in 2011 requires the developer to report on the potential for CCS to be installed at the station, and that CCS must be retrofitted once the technology has been demonstrated viable on a commercial scale .

50. The UK Government's proposals for Electricity Market Reform (EMR) have significant implications for the deployment of CCS – in relation to funding support for CCS, potential exemptions from the Carbon Price Floor and in relation to the proposal for a UK-wide Emissions Performance Standard limiting permitted emissions. It will be important that projects such as the Captain Clean Energy Project and others outside of the competition process, can secure an adequate CCS-related Contract for Difference through the EMR process. This will be crucial to ensure their economic viability; it is the only way in which a vibrant CCS industry will be created in the UK, and the Scottish Government will continue to work with UK Government to ensure that this is properly reflected in the EMR process.

51. With the help and expertise of the relevant regulators, agencies and competent authorities – including DECC offshore licensing, SNH, Crown Estate, Marine Scotland, SEPA and the Health and Safety Executive – the Scottish Government has been able to identify and list the approvals required for a large scale CCS project in Scotland. The CCS regulatory framework[33] aims to inform future development plans, help raise public awareness of CCS legislative and regulatory obligations, encourage early developer engagement with local communities and regulators and also enable joint working between

[32] http://www.scotland.gov.uk/Topics/Business-Industry/Energy/Infrastructure/Energy-Consents/Applications-Database/Cockenzie-CCGT-Index/Decision

[33] http://www.scotland.gov.uk/Topics/Business-Industry/Energy/Energy-sources/traditional-fuels/new-technologies/SGactionCCS/KeyConsentsandLicences/Q/EditMode/on/ForceUpdate/on

regulators and planners to closely manage multiple consent applications simultaneously.

52. The regulatory framework has been shared with Governments all over the world and been used by the UK Government, European Commission, International Energy Agency and the Global CCS Institute to promote regulatory best practice and a useful guide for counties to develop and test their regulatory provision to enable emerging CCS projects to be managed and processed efficiently. The framework remains a live document and is subject to review and update to reflect any further legislative or regulatory changes that may come on stream in the future.

Thermal Generation – Nuclear

53. The two large scale nuclear power stations currently operating in Scotland make up a large proportion of the baseload electricity currently supplied to the national grid. Both of these stations will continue to provide important baseload generation over the coming years as we make the transition to renewables and other low carbon electricity generating technologies.

54. The Scottish Government is determined that nuclear energy will be phased out in Scotland over time, with no new nuclear build taking place. This does NOT preclude extending the operating life of Scotland's existing nuclear stations to help maintain security of supply over the next decade while the transition to renewables and cleaner thermal generation takes place.

55. Hunterston B power station had been scheduled to close in 2016. In December 2012, EDF Energy, the operator of the plant, announced the extension of the operating life of Hunterston until at least 2023. The Scottish Government did not oppose this life extension.

56. Torness Power Station is currently due to close in 2023. EDF Energy plan to submit a life extension application for Torness, prior to this expiry date, with a view to further extending the life of Torness by a minimum of 5 years. However, before agreeing to a life extension, the Office for Nuclear Regulation will need to be satisfied that high levels of safety and security could be maintained over the planned lifetime of the installation. The Scottish Government sought, and obtained the relevant assurances from EDF Energy in relation to the extension of Hunterston B. Subject to the relevant safety cases being made for Torness, the Scottish Government will not oppose operating life extension application of that station.

Thermal Generation – Bioenergy

57. We have placed a high priority on achieving our target of 11% of heat demand to be sourced from renewables by 2020 (the reported level of renewable heat generated is around 4.1% of projected 2020 heat demand. Most of the renewable heat generated to date is from biomass heat only and CHP plants). Figures are now available for annual heat demand which show that heat accounts for over 50% of the current total energy demand in Scotland (based on the latest annual heat figures, renewable heat accounted for 1.9% of heat generated in 2010; this latest update increases our ambitions for renewable

heat)[34]. Scottish Ministers are also obliged to publish a Renewable Heat Action Plan and to keep it updated through to 2020. It was last updated in December 2011.[35]

58. Our policy on biomass is set out in the National Planning Framework II, section 36 Thermal Guidance, and in the section 36 Biomass Scoping Opinion guidance. Essentially, because of the multiple energy uses to which biomass can be put, the limits to supply, and the competition for that supply from other non-energy sectors, we need to encourage the most efficient and beneficial use of what is a finite resource. We would prefer to see biomass used in heat-only or good quality combined heat and power (CHP) schemes, off gas-grid wherever possible, and at a scale appropriate to make best use of both the available heat, and of local supply.

59. There are several reasons for this:

- Evidence suggests that the use of biomass for heat-only or CHP will be essential in order to meet Scotland's target for renewable heat;
- Use of available heat in heat-only and CHP schemes achieves 80-90% energy efficiency for the former and 50-70% for the latter, compared to 30% in electricity-only schemes. Given the limited resource, we have to ensure that it's used as efficiently as possible;
- Concentrating biomass use in areas which are off the gas-grid will deliver the highest carbon savings (given that in most cases it will be displacing oil or coal), and can also make the greatest impact on alleviating fuel poverty;
- Our view is that developments should be scaled appropriately so that they can make efficient use of the available heat and local supply. We believe that this will enhance security of supply, minimise carbon emissions and reduce the impact on other sectors competing for biomass material;
- However, we are not categorically opposed to large scale development, for instance in circumstances where there is a clear heat demand to be met and where supply issues can be satisfactorily addressed;
- There may be a significant role for imported biomass. However, the global market is an immature one and is likely to be volatile given projections of increased global demand. Its use will be dependent upon price, availability and evidence of sustainability. As with the local resource, it should be used in plants that support maximum heat use and de-centralised energy production.

60. We reviewed support for biomass electricity as part of our recent consultations on changes to the Renewables Obligation (Scotland), and announced restrictions in that support as a result of the review in February 2013.[36] We will also continue to take into account the impact of the Renewable Heat Incentive which applies across the UK.

[34] The proposed revised methodology using annual data is included in the Annex to the EST report for the Scottish Government, Renewable Heat in Scotland, 2012, published on 18 June 2013. http://www.scotland.gov.uk/Topics/Business-Industry/Energy/Energy-sources/19185/Heat

[35] http://www.scotland.gov.uk/Topics/Business-Industry/Energy/Energy-sources/19185/Heat/RHUpdate11

[36] http://www.scotland.gov.uk/Resource/0041/00414086.pdf

Thermal Generation – Energy from Waste

61. We believe that energy generated from waste (EfW) can play a role in meeting Scotland's energy requirements. Anaerobic digestion, for instance, can help Scotland become a Zero Waste society, diverting food, garden and other organic waste from landfill, reducing methane emissions, producing fertiliser or soil additives for use on local farms, reducing climate change impacts, and creating biogas which can be used as a renewable energy source.

62. EfW combustion processes (i.e. incineration, pyrolysis and gasification) can also contribute to both renewable energy and climate change targets, offsetting consumption of virgin fossil fuels and recovering value from resources that can't be reused or recycled and which would otherwise be lost in landfill. Our Zero Waste Plan[37] includes a commitment to regulate the types of waste that may be used in energy from waste combustion processes, ensuring that only materials which cannot be reused or recycled to yield greater value are used.

Thermal Generation – Waste Heat from Large Electricity and CHP Generators

63. Our Energy Efficiency Action Plan highlights the opportunity for waste heat to increase energy efficiency and reduce Scotland's greenhouse gas emissions. We commissioned research looking at the economic and technical potential for using waste heat from large scale fossil fuel power stations in Scotland to provide heating through local district heat networks. The findings indicated that it's technically possible to recover significant amounts of heat from the existing large power station sites at Longannet and Peterhead, as well as from any new sites that might be proposed/constructed.

64. However, the research also highlighted that the main challenges to heat recovery are economic, and that there is no easy solution to make commercial investment attractive. Direct financial incentives from the public sector were shown to be an expensive and impractical route to support, whereas accelerating the connection of heat loads offers a more cost effective route to encourage commercial deployment.

65. The report contained a number of recommendations aimed at helping to remove some of these barriers. These recommendations helped inform the work of the Expert Commission on District Heating, which reported in November 2012,[38] and which led to the publication of the Scottish Government's District Heating Action Plan[39] on May 31st 2013.

66. We know that:

- Thermal power stations generating electricity are approximately 35% efficient in converting fuel to electricity, with the remainder being discharged as waste

[37] http://www.scotland.gov.uk/Publications/2010/06/08092645/0
[38] http://www.scotland.gov.uk/Resource/0040/00408383.pdf
[39] http://www.scotland.gov.uk/Topics/Business-Industry/Energy/resources/Publications/DHAP

heat. If this waste heat is captured then significant amounts of fossil fuel use can be avoided; and,

- There are approximately 2.4 million households in Scotland, using on average 20 MWh of heat energy each per year. There are other large-scale users of heat such as public buildings, sports and leisure facilities, hospitals, schools and commercial buildings. These buildings have varying heat requirements for space heating or hot water and have peak loads at different times.

67. As part of any future application, either for new or significant retrofitting for any thermal electricity generating station (gas, coal, biomass etc.), developers will need to provide evidence that they have demonstrated how waste heat could be used by residential or non-domestic developments including public buildings and industry. The application will need to demonstrate that a feasibility study on the use of heat has been carried out and that discussions with local authorities have taken place to investigate the potential demand and to identify users of the heat.

68. Scottish Ministers granted consent in October 2011 for the construction of a new CCGT plant at Cockenzie, coal fired generation at the site having ceased in March 2013. At the time of publication, Scottish Power is evaluating its options for progressing this development. A condition of thermal consents in Scotland is that developers must, every two years, submit a review for the Planning Authority's approval which explores the potential commercial opportunities to use waste heat at the site. When such opportunities are identified, the developer must submit the applications for the necessary infrastructure and a timetable for its implementation for the approval of the Planning Authority.

Electricity Storage

69. Electricity storage could play an important and growing role alongside renewable electricity production, helping to address the intermittency of certain forms of renewable generation, complementing interconnection and demand-side response.

70. The benefits of increased use of storage include:

- allowing the best use of existing generation and in particular renewable energy resources;
- scope for using electricity generation to support clean fuel development for transport and heat;
- reduced reliance on fossil fuel stations as back-up capacity;
- helping to stabilise the transmission and distribution grid – using stored energy to avoid temporary constraints on the network and to improve power quality;
- benefits for generators who could store electricity when prices are low and sell it when prices are high;
- potential savings in greenhouse gas emissions; and
- the potential for storage to provide 'black start' capacity.

71. We conducted an Energy Storage and Management Study[40] in 2010. It didn't include a scenario which exactly matched our 100% renewable electricity target, although it did find that, in the event of renewable generation reaching 120% of demand, there could be a role for storage from 2020 onwards, even with planned upgrades to interconnectors.

72. The study also concluded, however, that – **at least with the current existing market and regulatory framework** – storage was not economic in comparison with alternatives such as constraining generation or investment in greater interconnection. It also found other barriers, such as:

- difficulty in capturing the full benefits of storage in the absence of a fully vertically integrated market structure (given that benefits accrue to a large number of different market players); and
- uncertainty in relation to whether transmission and distribution license holders can undertake storage activities.

73. Despite these challenges, the study found that Scotland's commitment to renewables, plus our unique geography, could be extremely conducive to demonstrating storage. It also concluded that developing energy storage technologies represents an opportunity to stimulate Scottish industry and support jobs, estimating that one 400 MW pumped storage plant could support 300 jobs over 3 years and contribute over £200 million to the Scottish economy.

74. Scottish Government officials have met with the Institution of Mechanical Engineers (IMechE) to discuss their position paper and recommendations around the role that electricity storage could play in our future networks.[41] We intend to continue engaging closely with IMechE and other similar bodies and stakeholders as we develop our thinking on the role of Scottish Government policy in developing this area, including synergies with low carbon heat and transportation.

75. The UK Government has also made clear as part of its Electricity Market Reform (EMR) development process that storage will play a part in supporting the transition to a low-carbon generating mix, alongside demand side response and generation capacity. DECC set out initial thinking on design and implementation of capacity markets in November 2012 [42]. .

76. There needs to be a continued focus on the role that storage can play in enabling the market to function effectively, by allowing energy to be stored and matched more effectively to demand. We expect the EMR proposals will include the ability for storage and demand side response to participate in any capacity mechanism, and that there will be transitional arrangements as part of this support. EMR thus represents an opportunity to increase the role played by storage and demand side response, with a known capacity payment providing a commercial incentive to invest and deliver.

[40] http://www.scotland.gov.uk/Publications/2010/10/28091356/0
[41] http://www.imeche.org/docs/default-source/public-affairs/IMechE_Electricity_Storage_v7.pdf?sfvrsn=0
[42] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65637/7104-emr-annex-c-capacity-market-design-and-implementat.pdf

77. We believe that the EMR proposals should support demand side response and highlight the potential role and value of electricity storage, and that both should remain part of the proposed Capacity Market mechanism. We also believe that the Scottish Government must be closely involved in assessing how any future Capacity Market mechanism works in Scotland, and in particular any potential introduction of zonal auctions in the longer term. On 27th June 2013, DECC published design proposals for a Capacity Market[43] The Scottish Government will consider the detail of these proposals and how they impact on Scotland and will continue to engage closely on these issues with the UK Government.

Transmission and Distribution

Delivering Scotland's Future Transmission Grid

78. Our vision is to connect, transport and export Scotland's full energy potential. Scotland can and must play its part in developing onshore and offshore grid connections to the rest of the UK and to European partners – to put in place the key building blocks to export energy from Scotland to national electricity grids in the UK and Europe.

79. We work with – and will continue to work with – Transmission Systems owners in Scotland, developers, the energy sector, local authorities, the UK energy regulator Ofgem and Governments in other parts of the UK and across the EU, to design and deliver strategically-planned onshore and offshore electricity transmission network development and reinforcement to connect and transport Scotland's renewable energy potential.

80. Scottish Hydro Electric Transmission Limited (SHETL) and Scottish Power Transmission Limited (SPTL), own the high voltage transmission network in Scotland. These Transmission Network Owners (TNOs) are regulated by Ofgem, and regulatory policy is currently set by the UK Department of Energy and Climate Change.

81. The Scottish Government engages with the UK Government, SHETL, SPTL, National Grid and Ofgem on future network development and planning and on the regulatory frameworks that deliver this. We have used Scotland's existing planning and consenting powers and functions to deliver a coherent and spatial approach to infrastructure development and planning, placing projects in the national interest at the forefront of our planning and consenting framework. SHETL and SPTL are currently delivering the package of electricity grid reinforcements designated as a national development in the second National Planning Framework[44] and feature in the third National Framewoek which has been published for consultation[45].

[43] https://www.gov.uk/government/publications/electricity-market-reform-capacity-market-proposals
[44] http://www.scotland.gov.uk/Publications/2009/07/02105627/0
[45] http://www.scotland.gov.uk/Topics/Built-Environment/planning/NPF3-SPP-Review/NPF3

82. Detail on planned reinforcement, development and investment in the Scottish TNOs' networks can be found in SHETL's[46] and SPTL's[47] business plans for the price control period of 2013-2021. These have been designed in compliance with Ofgem's RIIO investment model,[48] which rewards innovative practices by the TNOs and which encourages a great deal of stakeholder engagement.

83. In response to the Scottish TSO's business plans, Ofgem announced[49] in January 2012 the fast-tracking of SP Transmission Ltd and Scottish Hydro Electric Transmission Ltd plans for over £7 billion investment in Scotland's high voltage transmission network by 2021. This investment to upgrade Scotland's electricity grid will boost capacity, bring new renewables developments on stream and create 1,500 new jobs. The scale of investment is significant. The Scottish Government will continue to work with Ofgem, SPTL and SHETL to deliver these essential grid upgrades a future grid network that connects and transports our outstanding energy potential to homes and businesses across Scotland, and from Scotland to other markets.

84. The period 2012-2020 will see significant activity to reinforce and develop the GB system (and those between Scotland and England in particular) and to connect both our onshore and offshore renewable generators. The Scottish Government is part of the Electricity Networks Steering Group (ENSG), led by DECC and Ofgem, which works closely with industry to identify, plan and deliver the grid reinforcement necessary across the UK to meet the Scottish and UK Governments' 2020 targets.

85. In March 2009, the ENSG published a Vision 2020[50] report highlighting the necessary range of grid development and reinforcement. The ENSG worked throughout 2011 to refresh the report to reflect network developments and cost, and reflect continuing strong demand for network connections across the GB network, including in Scotland. The TNOs have undertaken detailed network studies and an extensive technical and economic analysis as part of this work, and have also drawn on their network Business Plans for the next transmission price control (RIIO-T1), which were submitted to Ofgem in July 2011.

86. The ENSG's updated Vision 2020[51], published in January 2012, identifies a range of grid reinforcement needed in Scotland. It:

- reconfirms the scale of the need for reinforcement across Scotland;
- clarifies the costs;

[46] http://www.ssepd.co.uk/Projects/TransmissionPriceControlReview
[47] http://www.spenergynetworks.co.uk/serving_our_customers/business_plan.asp?NavID=1&SubNavID=8
[48] http://www.ofgem.gov.uk/Networks/Trans/PriceControls/RIIO-T1/Pages/RIIO-T1.aspx
[49] http://www.ofgem.gov.uk/Media/PressRel/Documents1/RIIO%20T1%20fast%20track.pdf
[50] http://webarchive.nationalarchives.gov.uk/20100919181607/http:/www.ensg.gov.uk/assets/ensg_transmission_pwg_full_report_final_issue_1.pdf
[51] http://www.decc.gov.uk/en/content/cms/meeting_energy/network/ensg/ensg.aspx

- supports what SSE and SP have in their network development plans;
- emphasises rightly that these are TSO led plans and do not thus pre-empt any planning processes;
- reiterates how important these grid upgrades will be to meeting Scotland's renewables ambitions; and,
- improves the capability on Scotland's main interconnector assets by adding around a further 3 GW of import and export capacity in central Scotland, therefore strengthening security of supply and system stability as the generation portfolio moves to a greater balance of Renewable energy sources.

87. The Vision 2020 report includes two cables (bootstraps) linking Scotland to the Southern part of the UK.

- a West Coast 1.8 GW High Voltage Direct Current (HVDC) link between Hunterston and Deeside – work to build this link is underway and the target for commissioning is 2015; and,
- an East Coast 1.8 GW HVDC link between Peterhead and Hawthorne Pit in Humberside - the target for commissioning this link is 2018/20.

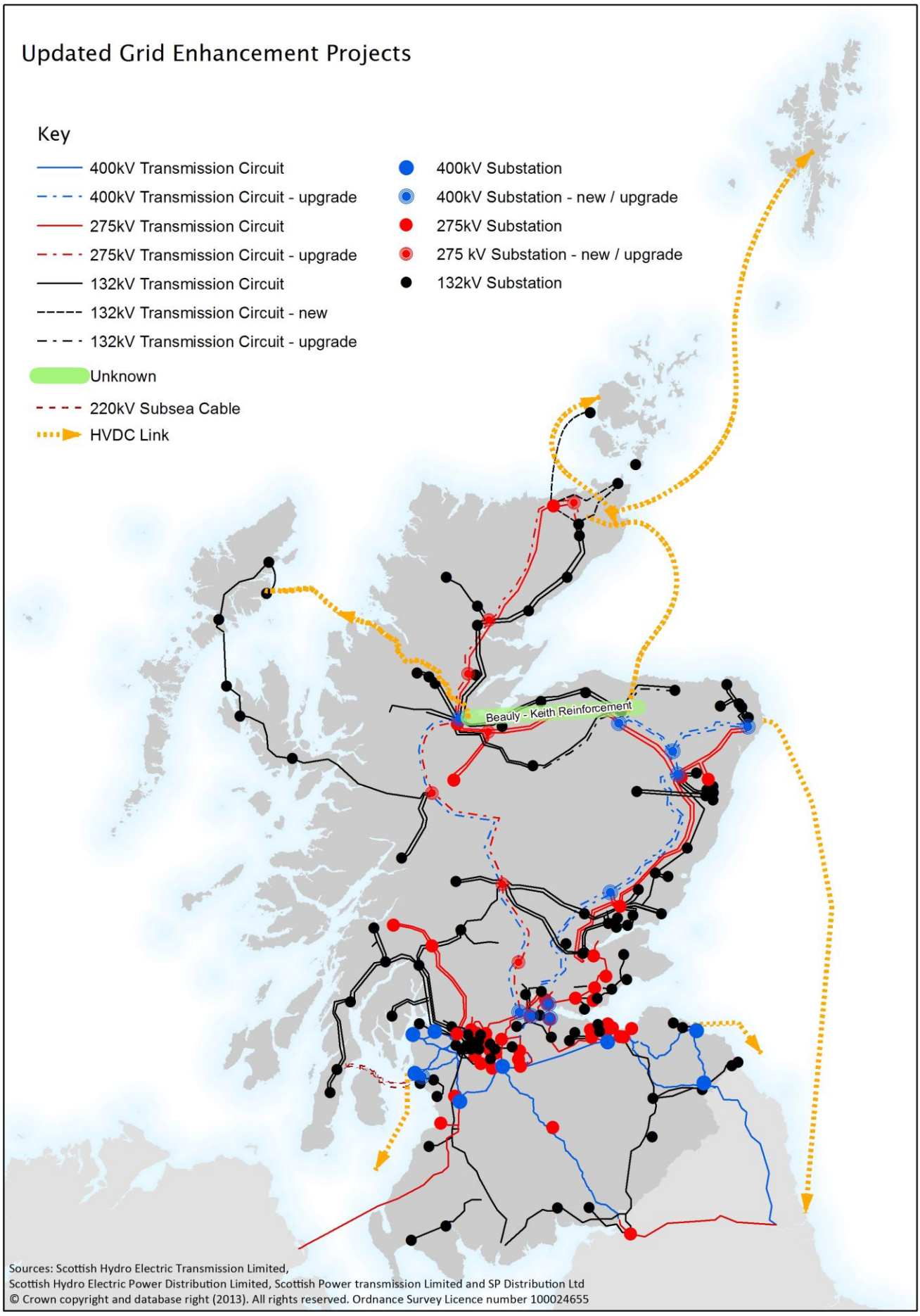
88. The report also includes plans for vital HVDC sub-sea links to the three main Scottish Island Groups of Shetland, Orkney and the Western Isles, and for subsea cables between Hunterston and Carradale in Argyll and Bute.

89. It reconfirms the needs case for the reinforcements highlighted and costed by SHETL and SPTL in their network development plans – including the very strong needs case for reinforcement in Caithness, the east coast 400 kV upgrade and strengthening the onshore links between Scotland and England – to accommodate the export of up to 14.1 GW of electricity from Scotland.

90. The report confirms the requirement for a suite of onshore grid reinforcements. The Scottish Government designated a range of onshore transmission grid reinforcements as a national development in the second National Planning Framework. The National Planning Framework 3 Main Issues Report[52] identifies the Scottish Government's preferred strategy for National Planning Framework 3, which includes retaining and updating the national development for onshore electricity grid, including the onshore infrastructure required to support new and modified offshore grid. Map 5 of the National Planning Framework 3 Main Issues Report, included overleaf, shows the anticipated grid upgrades.

[52] http://www.scotland.gov.uk/Publications/2013/04/2377

Figure 2: Map 5 of the National Planning Framework 3 - Main Issues Report**.**



The GB Regulatory Challenge

91. We support electricity regulatory frameworks that accelerate renewable deployment, improve grid access and remove barriers to grid connection and use. To address the unacceptable waiting times for renewable projects waiting for a grid connection, the Scottish Government worked with the UK Government to support a 'connect and manage' approach to give developers more reasonable connection dates ahead of reinforcement work to the transmission system, with socialisation of the constraints management costs across all grid users.

92. Since its introduction in August 2010, 134 large generation projects, comprising approximately 32 GW, have advanced their expected connection dates as a result of the connect and manage regime. 108 of those projects are in Scotland and have been given early connection and an average reduction in connection date of 6 years.[53]

93. But the challenge is to drive change where electricity and grid regulation in the UK acts against our renewables ambitions, targets and the needs of the sector. The locational transmission charging methodology applied by Ofgem levies higher charges on generators furthest from the main centres of demand for connection and use of the grid. This is a barrier to renewable energy generation and investment in Scotland; it will not help deliver a more sustainable, low carbon energy mix, ensure security of energy supply and meet renewable energy targets.

94. We have consistently pressed for a more equitable approach, and welcomed the review of charging in Project TransmiT launched by Ofgem in September 2010.[54] Ofgem published a final consultation[55] on 20 December 2011, setting out its current thinking to improve the current charging system. These proposals could see charging more closely linked to the use variable generators make of the system and could lessen the scale of the variations in the existing zonal charges. We believe that Project TransmiT must deliver fundamental and lasting change in the form of a more equitable charging regime and for all parts of Scotland, and will continue to press for this. We look forward to the outcomes of Project TransmiT in 2013.

95. However, the proposals in the Project TransmiT consultation do not address the very high transmission charges currently faced by the main Scottish islands. We are clear that charges must come down to a level that will encourage investment in Scotland, including the Western Isles, the Orkneys and the Shetland Islands.

[53] http://www.nationalgrid.com/NR/rdonlyres/C58A2961-91C5-49C4-ADCC-302AE8F4FC04/58783/ConnectandManageQuarterlyReport010912to311212v1.pdf
[54] http://www.ofgem.gov.uk/Networks/Trans/PT/Pages/ProjectTransmiT.aspx
[55] http://www.ofgem.gov.uk/networks/trans/pt/Documents1/Project%20TransmiT%20Dec11.pdf

The Scottish Islands Renewable Project

We know some of the best renewables resources in Scotland are to be found on or around Scotland's islands. We also know connecting and transporting these resources requires new transmission infrastructure to be built.

But the GB regulatory framework, including the costs of underwriting subsea cable projects and the locational transmission charging methodology do not recognise the challenge of developing and connecting energy resources that can be remote from centres of demand. The Scottish Government is therefore committed to working towards a better deal for Scottish Islands on transmission charging. That is why we welcomed DECC's commitment in October 2012 to work with us and establish an Intergovernmental Island Charging Group to examine the economics of island generation to ensure the right support is available.

The Scottish Islands Renewable Project set out to consider the

- **commercial viability of renewable projects (onshore wind and marine) on the Scottish islands within existing support frameworks;**
- **economic value of renewables projects on the Scottish islands and their potential to make a cost-effective contribution to renewables targets and other objectives;**
- **Potential barriers to development of renewable projects and why more projects are not coming forward; and**
- **Potential options for addressing barriers to deployment of renewable energy projects on the Scottish Islands.**

The independent Scottish Islands Renewables Project – published by Scottish and UK Government in May 2013[56] - makes absolutely clear that the Scottish Islands can make a cost-effective contribution to 2020 renewables and decarbonisation targets, if issues around grid access and high transmission charging can be addressed.

The Department of Energy and Climate Change announced[57] on 27th July that they will bring forward a specific islands strike price as part of their Electricity Market Reform (EMR) plans. The Scottish Government is now working with UK Government, to assess what can and must be done to mitigate the impact of high transmission charging in the islands.

The International Regulatory Challenge

96. Scotland plays a key part in the GB electricity market and is a net exporter of electricity. We will continue to work for ever closer integration of electricity markets, and stronger grid connections and interconnections, both at GB and EU level.

[56] https://www.gov.uk/government/news/progress-on-scottish-islands-renewables-project
[57] https://www.gov.uk/government/news/new-energy-infrastructure-investment-to-fuel-recovery

97. Through our work on North and Irish Seas grid, we believe delivering closer market integration and interconnection requires a strategic, co-ordinated and collaborative approach between countries, regions and members states. It also required significant and sustained working with other UK and EU countries to standardise electricity markets, transmission and energy regulation. We are therefore working closely on these issues with Governments in the UK and Europe.

98. A great example of this is the work that we have done in partnership with the Governments of Ireland and Northern Ireland on a feasibility study of offshore transmission grid to exploit offshore energy off Scotland's west coast. This Irish Scottish Links in Energy Study (ISLES)[58] project will become a key building block in delivering sub-sea grid in the Irish Sea, the emerging outcomes of which was published in November 2011.[59] The full technical study was published in June 2012.[60]

The Irish Scottish Links on Energy Study (ISLES)

99. ISLES is an EU INTERREG IVA-funded, collaborative project between the Scottish Government, the Northern Ireland Executive and the Government of Ireland. Scotland is the lead partner and the Executive Summary from the ISLES Feasibility Study is available from the ISLES website: http:///www.islesproject.eu

100. ISLES has assessed in detail the feasibility of an offshore interconnected transmission network and subsea electricity grid to support renewables generation in coastal waters off western Scotland and in the Irish Sea. The ISLES project is an important milestone in understanding this work. It shows that such a network is technologically feasible and economically viable with a supportive regulatory framework and coordinated policy and political will. It raises issues of EU relevance and which will require EU-wide solutions. Further work is now underway in ISLES 2[61] to assess the market and regulatory barriers to cross border trading in renewable energy in more detail. Scotland's third National Planning Framework Main Issues Report proposes ISLES as part of the preferred spatial strategy for Scotland's long term development.

[58] http://www.islesproject.eu/
[59] http://www.scotland.gov.uk/Topics/Business-Industry/Energy/Action/leading/iles/exec-summary-draft/
[60] http://www.scotland.gov.uk/Topics/Business-Industry/Energy/Action/leading/iles
[61] http://www.scotland.gov.uk/News/Releases/2013/06/connecting-the-islands21062013

ISLES is a forensic assessment of the opportunities and challenges around offshore grid and will help inform the work of the DECC/Ofgem led Offshore Transmission Co-ordination Group which is assessing ways of delivering offshore interconnected networks. The ISLES project highlights the importance of cooperation between industry, regulators and Governments with a shared commitment to achieving a low carbon economy.

KEY POINTS:

- there are no technological barriers to the development of an ISLES network;
- there is sufficient onshore network capacity in the UK for the connection of ISLES on the scale, and within the timeframe envisaged by 2020;
- two zones proposed for offshore development: Northern ISLES (2.8 GW resource is realistic) and Southern ISLES (3.4 GW is achievable);
- no significant environmental constraints that cannot be adequately mitigated;
- presenting a key body of evidence to inform the debate on regulatory harmonisation, which is a significant factor in permitting cross-jurisdiction projects throughout Europe;
- the economic findings are complex and are modelled assumptions of alignment of key regulated subsidies (where this is not the case at present);
- business case projects a subsidy level of £85/MWh, commensurate with current offshore ROCs levels thus viable.

The ISLES study also further demonstrates that offshore interconnected transmission networks will require industry, political and policy support across jurisdictions. We are now working with UK and EU counterparts to take these discussions forward at UK/Irish level through the British Irish Council and the EU level via participation in the EU led North Seas Countries Offshore Grid Initiative. In these discussions we are working to help inform EU level work where the Commission is prioritising energy corridors within the Northern Seas of Europe for infrastructure support.

ISLES offers a model which could deliver a transparent mechanism for the trading of renewable subsidies between countries and member-states in exchange for counting renewable output against targets – thus contributing to domestic and EU obligations. Again, this is a key issue at EU level which is now under active consideration in the British-Irish Council – where we are working jointly with BIC partner countries on grid and regulatory development.

101. In December 2010, nine EU Member States and Norway signed a Memorandum of Understanding[62] committing to developing a blueprint for North Sea grid in the following areas:

- grid configuration and integration;
- market and regulatory issues; and,
- planning and authorisation procedures.

102. The Scottish Government is part of this work. We are working with UK and EU governments in the North Seas Countries Offshore Grid Initiative and its working groups in each of these areas, and will continue to do so. We are working closely with the UK and Irish Governments on this, ensuring that Scotland's perspective and experience helps to formulate long-term European policy in this area. This remains a priority area for us. The results and recommendations of the initial stages of the North Seas Countries Offshore Grid Initiative work[63] were published in December 2012, and the Scottish Government remains committed to working with EU partners to deliver a co-ordinated North Seas offshore grid.

Delivering the Scottish Government's Objectives for Electricity Generation

103. The previous sections have explained our overarching electricity and energy policy objectives, and in particular the role we see for various technologies within the electricity mix. Scotland's potential resource and expertise mean that our 100% target is technically achievable as well as desirable, but reaching that level of generation will still be extremely challenging.

104. Some of the actions needed fall within our control, such as technology and market support, planning and consenting; but success will also be heavily dependent on regulatory processes which we will seek to influence but over which we do not currently have any direct control.

105. A synopsis of the main areas to address is as follows:

	100% RENEWABLE ELECTRICITY TARGET
SCALE OF OVERALL CHALLENGE	Target requires a sustained annual renewable deployment rate of more than twice that ever experienced in Scotland, and thus will depend upon investment in and installation of large-scale schemes. Especially offshore wind.
FINANCIAL AND TECHNOLOGICAL	Target will require very large amounts of capacity from offshore renewables – from wind, wave and tidal power. These technologies need the continuity, consistency and visibility of Government

[62] https://www.entsoe.eu/fileadmin/user_upload/_library/news/MoU_North_Seas_Grid/101203_MoU_of_the_North_Seas_Countries__Offshore_Grid_Initiative.pdf
[63] http://www.benelux.int/NSCOGI/

		and market commitment and support to ensure that investment continues to take place, and that costs can be reduced to a level where commercial arrays can be deployed.
	ELECTRICITY MARKET REFORM	Higher deployment rates may require extended and additional technology support. They may also possibly require extra innovation spend for wave, tidal and even offshore wind. Visibility on support levels and the transitional arrangements into the EMR mechanism is vital.
		Extra costs of future grid management activities required for high renewable penetration, including incentives for storage.
	TRANSMISSION BOUNDARY AND INTERCONNECTION	Need to deliver the grid upgrades and reinforcement needed in Scotland (through the ENSG) and consider additional interconnection and grid upgrade over and above existing proposals and have these in place by 2020.
	CONSENTS AND PLANNING	Further increase in consenting/deployment rates required especially for offshore wind - in harmony with environment.
		Need to ensure that, as renewable penetration increases onshore, environmental and land use considerations are not compromised.
	SUPPLY CHAIN & INFRASTRUCTURE	Further work with the economic development bodies to promote supply chain and other economic benefits from low carbon energy development.
		Further and faster support needed for infrastructure, while considering the potential external constraints that high renewables penetration could trigger, e.g. the availability and price of steel, installation vessels and HVDC Cable.

Modelling

106. To inform the EGPS, we commissioned independent modelling of the generation mix and annual power flows necessary to reach and support our 100% renewables target and to help us understand the challenges in greater detail. The modelling scenario presented did not represent a preferred or expected generation mix rather showed a plausible mix based on assumptions and known developments. Since the modelling was commissioned there have been a number of changes to these assumptions,

such as the life extension at Hunterson, but the principle findings of the modelling remain valid and the 100% target is feasible but challenging and will require a minimum level of thermal generation to ensure security of supply.

107. The full consultant's report is on the Scottish Government website and is summarised in more detail in Annex B. Some of the key findings are as follows:

- Achieving the 100% target will require Scottish installed generation capacity to almost double over the 10 year period to 2020 – with wind (offshore and onshore) playing a critical role. This growth rate represents a major challenge, but is consistent with the trajectories identified in our Renewables Routemap[64] and the Blue Seas – Green Energy[65] report.

- Nascent marine technologies can still play an important role but the targeted financial support provided to the sector through our Renewable Obligation, National Renewables Infrastructure Fund and other support schemes will help to ensure the technologies develop to support our ambitions beyond 2020. It is important that the Electricity Market Reform process does not undermine the progress to date.

- The original scenario modelled development of one fossil fuel power plant with carbon capture and storage. Peterhead is now in a very strong position to demonstrate CCS technology on gas and was named as a preferred bidder in the UK Government's CCS Commercialisation Programme Competition on 20 March 2013. We were disappointed that the Captain Clean Energy Project at Grangemouth was only named as a reserve bidder in the same competition process. However, in the event that this project does not receive capital support from the Competition, we believe this project (and others outside of the CCS Competition process) can still be economically viable if the right incentives are in place – but this will require an appropriate Contract for Difference for CCS technology through the Electricity Market Reform process.

- Our huge potential resource means that Scotland is likely to have excess generation capacity over and above that which can be exported through existing and planned export links but can accommodate increased electricity demand to support any electrification of heating and transport in the future. This issue is covered in more detail in the previous section on ***transmission and distribution***.

108. Following the publication of the draft EGPS, consultation with the UK's leading engineering institutions highlighted that load duration curve modelling, while valuable, risked presenting a partial understanding of the issues associated with electricity dispatch. Partly in response to this advice, we have since independently commissioned the production of a Scotland specific electricity dispatch model after an EU-wide procurement exercise. The model, the Scottish Electricity Dispatch Model (SEDM), will provide unique regional analysis of the GB electricity system covering both long term investment decisions and short term dispatch decisions. We anticipate that the model will

[64] http://scotland.gov.uk/Resource/Doc/917/0118802.pdf
[65] http://scotland.gov.uk/Resource/Doc/346375/0115264.pdf

be completed during 2013 and will then be subject to independent peer review and scrutiny.

109. The SEDM significantly enhances our analytical capacity and our ability to test various scenarios and sensitivities to reflect the dynamic and uncertain electricity market. While not undermining the previous modelling, the zonal capabilities of SEDM will allow for more in depth regional analysis than has previously been possible.

110. Rather than use scarce public resources to commission updated analysis to account for changes such as the life extension of Hunterson B or the closure and consent of the respective fossil fuel plants at Cockenzie, we have decided to retain the modelling adopted for the draft report with a view to updating and extending our analysis once the SEDM is completed. We believe this approach robustly addresses the responses made in the consultation. This additional analysis will not only allow us to consider a wider range of scenarios up to and beyond 2020 but will also support us to fulfil our legislative requirements for reporting emissions from the electricity system under the Climate Change (Scotland) Act.

Electricity Market Reform

111. The UK Government is continuing to develop its proposals for Electricity Market Reform (EMR). These reforms are at the core of the UK Energy Bill[66] which was introduced in November 2012 to implement the requisite legislative proposals to enable EMR.

112. The Scottish Government strongly supports[67] the principles of EMR – supporting investment in low carbon generation and delivering a balanced energy mix, whilst minimising costs to consumers. We are working closely with the UK Government on EMR and the UK Energy Bill, agreeing that EMR is crucial to Scotland's future energy mix, to maintain investor confidence and to develop our vast renewables potential and CCS technology in Scotland.

113. Through an Institutional Framework which includes National Grid (NG) as the EMR delivery body administering the CfD and Capacity Market and Ofgem which will continue to be the independent regulator of the market, the key mechanisms introduced by the Energy Bill are detailed in the following paragraphs.

114. **Feed in Tariff with Contacts for Difference (replacing the RO) –** The Renewables Obligation will be replaced with a Feed-in Tariff with a Contract for Difference (CfD). The Renewables Obligation (Scotland) has worked well. The Scottish Government has exercised its powers over the to target support for emerging technologies, including wave and tidal. This has accelerated deployment and investment plans that would not otherwise have happened.

[66] https://www.gov.uk/government/organisations/department-of-energy-climate-change/series/energy-bill

[67] http://www.scotland.gov.uk/Topics/Business-Industry/Energy/Infrastructure/Grid-Connections/EMR-consultation-UK

115. The CfD framework is aimed at providing long term price certainty for low carbon generation by stabilising returns for generators at a fixed level 'the strike price'. Strike prices for the first 5 years of 2014 to 2018 will be set administratively and published by the UK Government in the draft Delivery plan in July 2013 and, following consultation in the final plan published in December 2013. Strike prices beyond 2018 will be published through annual updates to the delivery plan.

116. Scottish Ministers have made clear that they will only confirm an intention to follow the UK's CfD framework timetable when they are assured over the levels of support for renewables – including emerging technologies – and CCS. Scottish Ministers have a statutory consultation role in the Design and delivery of the CfD scheme.

117. **Capacity Agreements with a Capacity Market –** This is aimed at incentivising generating plant to support the balancing of supply and demand in a generating mix with a significant amounts of intermittent renewables generation. The UK Government are proposing to hold capacity auctions, on advice from the Systems Operator (National Grid) and a panel of independent experts.

118. Successful bidders will enter into capacity agreements, committing to provide electricity (or demand side response) when needed, in return for capacity payments, or face penalties.

119. The Scottish Government has emphasised that it will be particularly important that any capacity mechanism addresses localised capacity constraints, and encourages demand-side response and storage technologies; Energy Demand Reduction (EDR) will be included within capacity markets and tested through a pilot project.

120. DECC's detailed design proposals for the capacity market were published in June 2013[68] and include detail on:

- how the RO capacity and interconnected capacity will participate;
- what format the auction will take and when;
- how long the agreements will last, and
- the details of the EDR pilot.

121. These decisions will have an impact on the future of generation plant in Scotland. The Scottish Government is determined to be involved in the application and operation of any capacity mechanism.

122. **An Emissions Performance Standard (EPS) –** As part of the overall EMR package, the Scottish Government has agreed to the UK wide application of the EPS (set at 450g/kwh) to limit emissions from fossil fuel plant. We provide further detail on this within Annex A.

123. Scotland already has stringent emissions standards for any new build thermal generation. The UK wide EPS is aimed at providing a regulatory

[68] https://www.gov.uk/government/publications/electricity-market-reform-capacity-market-proposals

backstop on the amount of emissions new fossil fuel power stations can emit and will apply to all new fossil fuel plant over 50 MWe from 2014.

124. Following an informal consultation on the possibility of a separate EPS for Scotland, the Scottish Government considers that a consistent regulatory approach with a clear stable framework is important for investor certainty, and that the UK-wide EPS strikes the right balance between investor certainty and appropriate support for decarbonisation.

125. Scottish Ministers will have a statutory consultation role on the application of the emissions duty which will ensure that any specific Scottish issues can be taken into account as part of the developing regime which will work across Scotland and will also have responsibility to put in place monitoring and enforcement arrangements.

126. Outwith the Energy Bill, a **Carbon Price Floor** was introduced on 1st April 2013[69] and is designed to deliver support for nuclear and CCS plants through the taxation of carbon generation.

127. Whilst this is potentially a useful mechanism to deliver long term carbon price certainty it will be crucial that a Carbon Price Floor does not result in the premature closure of existing coal and gas plant before CCS is economically and technologically proven.

128. The UK Government has proposed relief from fossil fuels used to generate electricity in CHP plants and relief for CCS demonstration projects and commercial CCS plants equivalent to the proportion of CO2 captured and stored.

129. The Scottish Government has been clear that under EMR, the CfD framework and strike price must work for CCS technologies as well as renewables. Decarbonisation of electricity generation will require a combination of renewable electricity and fossil fuels with CCS. To this end, incentivising CCS is key, and the case for CCS deployment in Scotland is extremely strong. Details of the allocation and price setting process for CCS projects out with the UK Commercialisation programme (which aims to prove the economic and technical feasibility of CCS technology) will be advised by the UK Government in July 2013.

130. The components of EMR and the UK Energy Bill are essential to the delivery of this Electricity Generation Policy Statement. In addition to the detailed points above, there is a complex interaction between the powers of the Scottish and UK Government in these areas. The Scottish Government is responsible for specific areas of energy policy, and other areas which energy policies impact on. This includes:

- planning and consenting powers for energy infrastructure;
- marine planning and licensing;
- environmental licensing;
- protection and waste management;

[69] Legislated through the Finance Act 2011

- aspects of CCS where they relate to the environment.

131. As stated above, we have used our devolved powers, including those to create a Renewables Obligation for Scotland, to support Scottish electricity generation priorities and strengths. These powers are a vital part of delivering the targets set out in this report.

132. We believe strongly that EMR must be developed and delivered in a way that respects these powers and the devolution settlement and helps to deliver Scotland's future energy potential. Scottish Ministers are determined that the outcomes of the EMR programme must equally deliver for Scotland and not undermine Scotland's ambitions for renewables and low carbon generation. As such we are committed to being productive partners in the EMR process. Department of Energy and Climate Change published draft strike prices in June 2013[70] and will aim to issue a draft EMR delivery plan in July 2013. To this end the Scottish and UK Governments are working together on the detail of reforms and how they apply to Scotland.

133. Given the complex interface between reserved and devolved areas of competence in relation to promotion of renewable energy and environmental protection – both key areas which impact on the delivery of this EGPS – Scottish Ministers have a statutory consultation role in the UK Energy Bill in relation to:

- Design and Delivery of the Contracts for Difference (detailed above);
- Move to the operation of a fixed Renewables Obligation Certificate from 2027;
- Strategy and Policy statement of Ofgem;
- Emissions Performance Standard;
- Setting the UK Decarbonisation Target in secondary legislation.

134. Significantly, the Scottish Government has also agreed to take forward a joint Concordat with the UK Government to set out the roles and responsibilities under EMR and to embed the principles of good working practices in an enduring framework. The intention is that this will be published prior to the Energy Bill being granted Royal Assent.

Conclusions and Summary

135. Our climate change targets, our huge renewable energy potential, the retiral over coming years of several existing generating stations, and the resultant need to support the build of new capacity all combine to inform the Scottish Government's policies on electricity generation. We aim to develop an electricity generation mix which is built around four key principles:

- **a secure source of electricity supply;**
- **at an affordable cost to consumers;**
- **which should be decarbonised by 2030;**

70 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/209360/Strike_prices_with_Over_1_Gigawatt_of_Potential_Deployment.pdf

- **and which achieves the greatest possible economic benefit and competitive advantage for Scotland.**

136. Moving to a mix of renewables and low carbon thermal generation will be neither cost or risk free; but this EGPS, along with the forthcoming Heat Generation Policy Statement and the Government Economic Strategy, underline our strong belief that the low carbon route is the option that delivers the greatest environmental benefits and economic opportunities – and at a relatively lower financial cost than would be the case were we to continue to rely heavily on fossil fuels and the related exposure to volatile prices.

137. Recent analysis by DECC has shown, for example, that low carbon energy policies and measures could lead to an average household energy bill of £1,331 by 2020[71] – whereas 'business as usual' would result in bills of £1,496. These findings are consistent with similar recent analysis by OFGEM and also the Committee on Climate Change.

138. A rapid expansion of renewable generation capacity – coupled with new or upgraded efficient thermal capacity progressively fitted with Carbon Capture and Storage (CCS) – will ensure that all of Scotland's long term electricity needs can be met without the need for new nuclear power stations.

139. The consultant's modelling attached at Annex B shows that Scotland can achieve its target to deliver the equivalent of 100% of gross consumption from renewables generation, alongside some form of electricity generation from thermal plant as part of a balanced generation mix portfolio – either as baseload or as peaking plant. The evidence suggests that this is now less than we expected in the past – because of the greater penetration of renewables and opportunities for energy storage and greater interconnection – although it will remain significant for some years to come.

140. We know that there are concerns about our 100% renewables target, particularly around the timescale in which we have said it can be achieved, given the technological and whole system integration challenges that lie ahead. In order to maximise our understanding of these challenges we have invested significantly to improve our modelling capability by creating a Scottish specific electricity dynamic dispatch model. This enhanced modelling capacity will allow us to provide more sensitivity testing of key variables.

141. As this document has made clear, that the 100% target does not imply that Scotland will be wholly dependent on renewables for its electricity needs and that a balanced energy mix is needed to ensure security of supply. The target stands very much as a rallying call, a statement of intent. But we also know that the target is technically achievable, and that Scotland has the potential resource to deliver and exceed it. Moreover, we believe that the political will and belief which the target embodies has had, and will continue to have, a galvanising effect on the energy sector.

[71] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/172923/130326_-_Price_and_Bill_Impacts_Report_Final.pdf

142. We know that these challenges exist, and we want – as we have always done – to debate, engage and co-operate with every knowledgeable, interested and concerned party to ensure that they can be overcome. **This is not only because we know that the target is technically achievable, but because we believe that the benefits and the huge opportunities for Scotland are ones to which we should all aspire**.

ANNEX A

RESPONSE TO INFORMAL CONSULTATION ON THE POSSIBILITY OF A DISTINCT SCOTTISH EMISSIONS PERFORMANCE STANDARD

Background

1. As part of the draft Electricity Generation Policy Statement, the Scottish Government informally consulted on the possibility of a distinct Scottish Emissions Performance Standard.

2. The UK Government have legislated for an Emissions Performance Standard (EPS) through the UK Energy Bill[72] as part of its plans for Electricity Market Reform (EMR). The EPS will provide a regulatory backstop on the amount of emissions new fossil fuel power stations can emit. Key elements of the EPS are summarised below.

3. Scottish Ministers have decision making powers relating to applications for large scale thermal power stations under Section 36 of the Electricity Act 1989 and the Scottish Government already has a consenting policy for reducing emissions from thermal generation by imposing conditions for progressively fitting Carbon Capture and Storage (CCS) to all coal and gas thermal plants, following successful demonstration at commercial scale.

4. In addition, the Scottish Parliament has devolved competence in relation to Environmental Protection and emissions control. Given these devolved powers, it was unclear that the UK EPS would have any additional practical impact in Scotland. However, the EMR proposals have already created significant uncertainty in the market and we recognised that working within the UK-wide framework could be the preferred option. With this in mind, we sought views on the potential application of a separate EPS in Scotland. Views from stakeholders were requested on:

- Whether a Scotland-specific approach should be taken;
- If so, how an Emissions Performance Standard should be designed;
- If an EPS should be introduced for power stations already consented to reduce emissions over their remaining life;
- How an EPS could be enforced under existing or amended legislative provision.

Consultation responses

5. Of those who provided a response to the consultation on the possibility of a Scotland specific EPS, the majority were opposed to the idea on the basis that, within a GB electricity market, regulatory certainty is a key factor for investor confidence and a Scottish specific EPS is unnecessary and could create market distortions. Respondents who were in favour of a Scottish

[72] http://www.publications.parliament.uk/pa/bills/lbill/2013-2014/0030/20140030.pdf

specific EPS raised concerns largely related to meeting emissions reduction targets.

Scottish Government position

6. As part of the wider-EMR package (detailed in the previous chapter) we have agreed with the UK Government to the UK-wide application of the EPS on the basis that a consistent regulatory approach is important for investor certainty and will be created by providing a clear and stable framework through the uniform application of the EPS.

7. Scottish Ministers have a statutory consultation role on the application of the emissions duty which will ensure that any specific Scottish issues can be taken into account as part of the developing regime which will work across Scotland.

8. Scottish Ministers will be required to make arrangements for monitoring and enforcement of the EPS. The Scottish Environment Protection Agency (SEPA) will administer the monitoring and enforcement regime for Scotland.

9. We recognise that the EPS on its own will not deliver the Scottish Government's 2030 decarbonisation target and should be seen in the context of wider powers including our policy on Carbon capture and Storage and Section 36 planning powers as detailed above.

10. As discussed elsewhere in this document, the delivery of our 100% renewable electricity target together with developments in grid technology and storage and progress in demand reduction and energy efficiency will also play a crucial role In the delivery of our long-term decarbonisation target. Achievement of our 2030 decarbonisation target will also be dependent on a number of other factors, some of which are beyond the control of the Scottish Government including progress in world climate change talks, delivery of ambitious EU 2030 targets for greenhouse gas reduction and a reformed and strengthened ETS.

Key elements of the Emissions Performance Standard

11. An Emissions Performance Standard is one of the mechanisms proposed in Electricity Market Reform with the aim of providing a regulatory backstop on the amount of emissions new fossil fuel power stations can emit. The UK wide EPS has been set at 450g / kWh and will apply to all new fossil fuel plant over 50MWe from 2014.

12. The level of the EPS is set in primary legislation and will be reviewed as part of the overall EMR review – 5 years after the Act has passed. Any future changes to the level of the EPS will not affect plant already consented. This is known as grandfathering and has been set to 2045.

13. Much of the technical detail of the regime will be set out in secondary legislation after consultation.

ANNEX B

MODELLING

1. In order to gain a better understanding of the implications of the 100% target, Scottish Government commissioned independent consultants Sinclair Knight Merz (SKM) to model generation scenarios and power flows[73]. Since the modelling was commissioned, a number of modelling assumptions have evolved but the principle findings of the model are still valid.

2. The electricity system is constantly evolving. Over the last 12-18 months, we have been working with partners across the industry to develop and build an electricity dispatch model to allow us to better understand this evolution. The Scottish Electricity Dispatch Model (SEDM) will be completed during 2013 at which point it will be subject to independent peer review.

3. The SEDM represents the UK's first regional electricity dispatch model and will allow for far greater scrutiny of the issues affecting Scotland's electricity generation than any alternative model. Rather than commission further analysis from one of these less suitable models while the SEDM is being finalised, the final Electricity Generation Policy Statement retains the modelling presented in the original draft document. This modelling is presented below.

4. Over the coming months and years, we will continue to develop and enhance our understanding of the complex interaction of policies and investment decisions that will impact upon the electricity sector and we will report these findings in subsequent EGPS publications.

5. The SKM modelled scenario is one that outlines a plausible generation mix that could broadly achieve the Scottish Government's current 2020 renewable target. This generation mix does not represent an expected or preferred generation mix rather a plausible mix based upon known projects in construction, planning or scoping. Table B1 shows the resulting modelled generation capacity mix in Scotland over the period to 2030. Clearly other alternatives are possible, and the final outcome will depend upon a range of factors such as, for example, deployment rates, capital costs and load factors.

6. The total generation plant required to ensure that demand is met and security of supply is maintained is determined by a GB generation dispatch model. Once built, plant is dispatched by the model on the basis of marginal cost. Using both market knowledge and the model we can determine, based on our assumptions of electricity demand growth, total generating capacity required, the location and output of this capacity to ensure the system remains in balance and demand is met and security of supply maintained.

[73] http://www.scotland.gov.uk/Resource/0039/00393483.pdf

Table B1: Scottish Generation Capacity (MW)

MW	2010	2015	2020	2030
Fossil Fuels	4,708	3,606	3,035	120
Fossil Fuels with CCS	-	-	571	2,284
Nuclear	2,289	2,289	1,215	-
Other thermal	173	50	50	39
Pumped Storage	740	740	1,040	1,340
Biomass	65	117	150	200
Hydro	1,308	1,364	1,500	1,700
Offshore and Onshore Wind	2,383	6,000	13,000	16,500
Tidal and Wave	21	51	700	1,770
Other renewables	103	103	103	103
Total	11,790	14,321	21,365	24,057
Renewables as % total capacity	33%	53%	72%	84%

Source: Scottish Generation Scenarios and Power Flows – SKM, January 2012

7. Key generation capacity changes that occur include:

- In the model, Scottish installed generation capacity almost doubles over the 10 year period to 2020 – with wind (onshore and offshore) accounting for around 13GW of capacity in this scenario. This growth rate represents a significant challenge but is consistent with the trajectories identified in the Renewables Routemap[74] and Marine Scotland's Blue Seas - Green Energy[75] report.
- The analysis assumes that some additional renewables also grow, including marine generation and, to a lesser extent, small scale biomass. The ambitious growth rate in marine generation is consistent with the targeted financial support provided to the sector through the ROS and national renewables infrastructure plan.
- The scenario assumes one unit of carbon capture and storage is installed. Following failure to secure investment at Longannet, Peterhead is now in a very strong position to demonstrate CCS technology on gas subject to success in obtaining funding from the UK Government's CCS Demonstration competition.

[74] http://scotland.gov.uk/Resource/Doc/917/0118802.pdf
[75] http://scotland.gov.uk/Resource/Doc/346375/0115264.pdf

8. Table B2 shows the generation output by plant type over the period to 2030.

Table B2: Scottish Generation Output (TWh)

TWh	2010	2015	2020	2030
Fossil Fuels	19	13.9	9.7	0.2
Fossil Fuels with CCS	0	0	3	12.7
Nuclear	16	16	8.5	0
Other thermal	0.9	0.2	0.2	0.2
Pumped Storage	1.2	1.2	1.8	2.3
Biomass	0.4	0.7	0.9	1.2
Hydro	2.3	2.3	2.4	2.5
Offshore and Onshore Wind	5.8	15.4	35.6	45.7
Tidal and Wave	0	0.1	1.6	3.9
Other renewables	0.6	0.6	0.6	0.6
Total	**46**	**51**	**64**	**69**
Renewables as % total gross consumption	24%	49%	100%	125%

Source: Scottish Generation Scenarios and Power Flows – SKM, January 2012

9. The key observations from the modelling scenario are to estimate that total Scottish electricity output rises by around 40 per cent by 2020, primarily due to the increase in output from renewable capacity – in particular onshore and offshore wind with wind generation accounting for 55% of Scottish electricity generation output by 2020.

10. Total Scottish generating capacity rises markedly, increasing from around 11.8 GW today to over 21 GW by 2020 and 24 GW by 2030.

11. The 2020 target of generating the equivalent of 100% of Scotland's own electricity demand from renewables is achieved as renewable capacity and output increases.

12. The modelling work also considered the power flows between Scotland and GB. As explained in Box B1, positive values in the chart correspond to power flows out of Scotland (exports) and negative values represent power flows in to Scotland (imports).

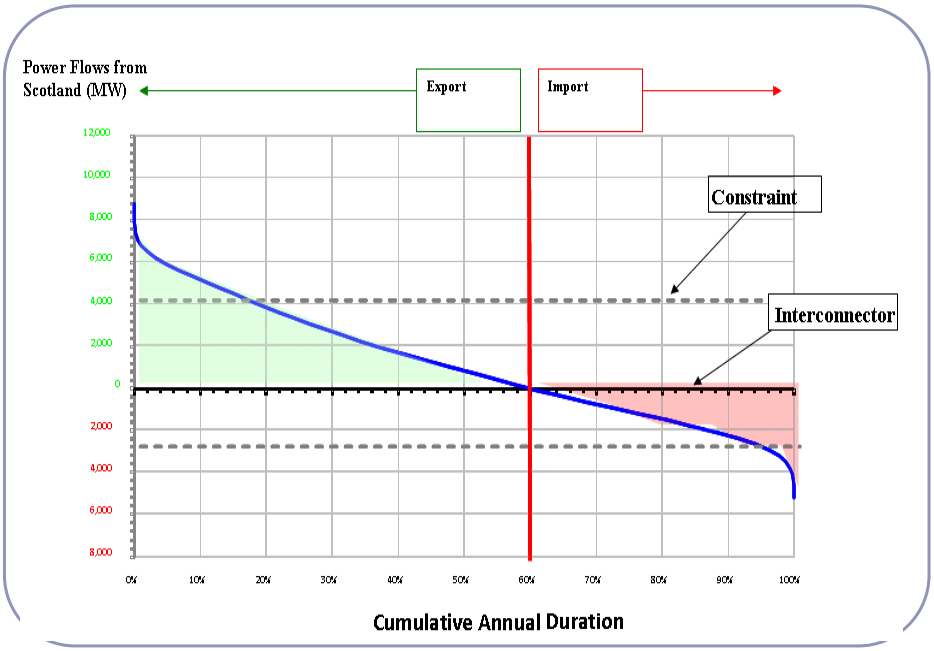
Box B1: What the graphs show:

• The charts show the economic dispatch of a specific generation mix scenario based on merit order using a half-hourly GB dispatch model. The blue line in the chart below represents one generation mix scenario in one year.

• The power duration curves show the amount of time that power flows are above a certain value (net exports would equate to the time above the line minus the time below the line in the example below it would be the green area minus the red area).

• The charts also show the transfer limit for export and imports given the current and proposed interconnection limits, (represented by dotted grey lines).

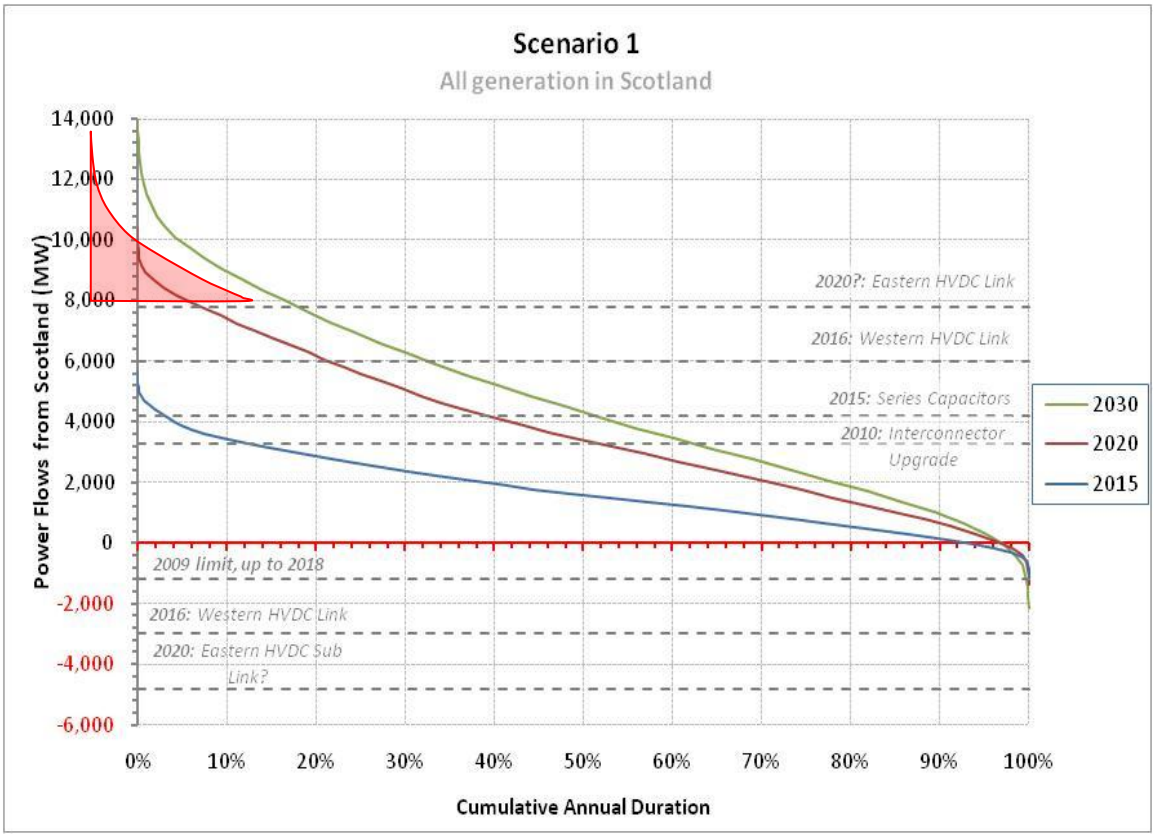
Example 1: Hypothetical Power Flows Diagram



• One point that should be drawn from the example chart above is that the green area where the power duration curve is above the dotted line and the red area where it is below the dotted line represents output that would be constrained off, as it cannot flow over the interconnector.

13. Figure B1 shows the cumulative power flows between Scotland and GB from 2015 to 2030 resulting from the generation portfolio considered in one of the modelled scenarios. Positive values in the chart correspond to power flows out of Scotland (exports) and negative values represent power flows in to Scotland (imports). The analysis includes only existing interconnections to England and those reinforcements that are under consideration at the current time. Clearly if Scottish renewable generation expands substantially, then further reinforcements and interconnection may be required. Examples could include the ISLES project and interconnection to the Continent.

Figure B1: Scotland to England Power Flows 2015 to 2030 – All plant



Source: Scottish Generation Scenarios and Power Flows – SKM, January 2012

14. The power flow results shown in Figure B1 highlight a number of key issues, namely that:

- security of supply is ensured and no security of supply issues will arise providing the Western HVDC link is constructed as planned.

- Scotland has the potential to be exporting almost 100% of the time to 2020 and 96% of the time by 2030. Such is the potential for Scottish generation, further additional system management options over and above the proposed Western and Eastern HVDC links could help fully exploit this potential.

- despite the construction of the HVDC transmission upgrades currently proposed, 'excess' Scottish generation occurs from 2015 onwards (shown as the shaded area on the chart). As confirmed by the Scottish Energy Storage and management Study, in situations of excess generation, there are a number of system management options that could be employed:

- energy storage/demand side measures. As noted previously, it is critical that storage and demand side measures are incentivised through the EMR mechanisms. Demand side measures would help to reduce our aggregate energy requirements while storage solutions would help to maximise the benefits of the natural resources bestowed on the nation through supporting better management of localised and intermittent generation.

- additional transmission capacity is one mechanism through which increased levels of Scottish generation could be managed. Providing an export route for

Scottish generation, increased interconnection represents a highly desirable outcome and justifies and explains our involvement in the ISLES project and Adamowitsch Working Group. The modelling estimates that, in isolation, at least one additional link will be required by 2020 with a further two links required by 2030.

- generation is constrained off. As is currently the case in the short term due to the grid constrained network in Scotland[76], additional constraint payments would be required during periods of peak generation. Following the efforts to reduce grid congestion through the delivery of improvements such as the Beauly Denny upgrade, this would represent an inefficient and undesirable outcome which we would look to avoid where possible.

15. It is not possible to look at these three mechanisms in isolation because ultimately unlocking Scotland's potential will require a combination of all three mechanisms. The need to provide an exact balance between demand and supply of electricity on a second by second basis means that constraint payments represent a necessary and essential component of the balancing system. This will continue to be the case in the future but such payments will be minimised through increased use of demand side measures coupled with storage solutions to help balance the grid and increased interconnection to maximise Scotland's export potential.

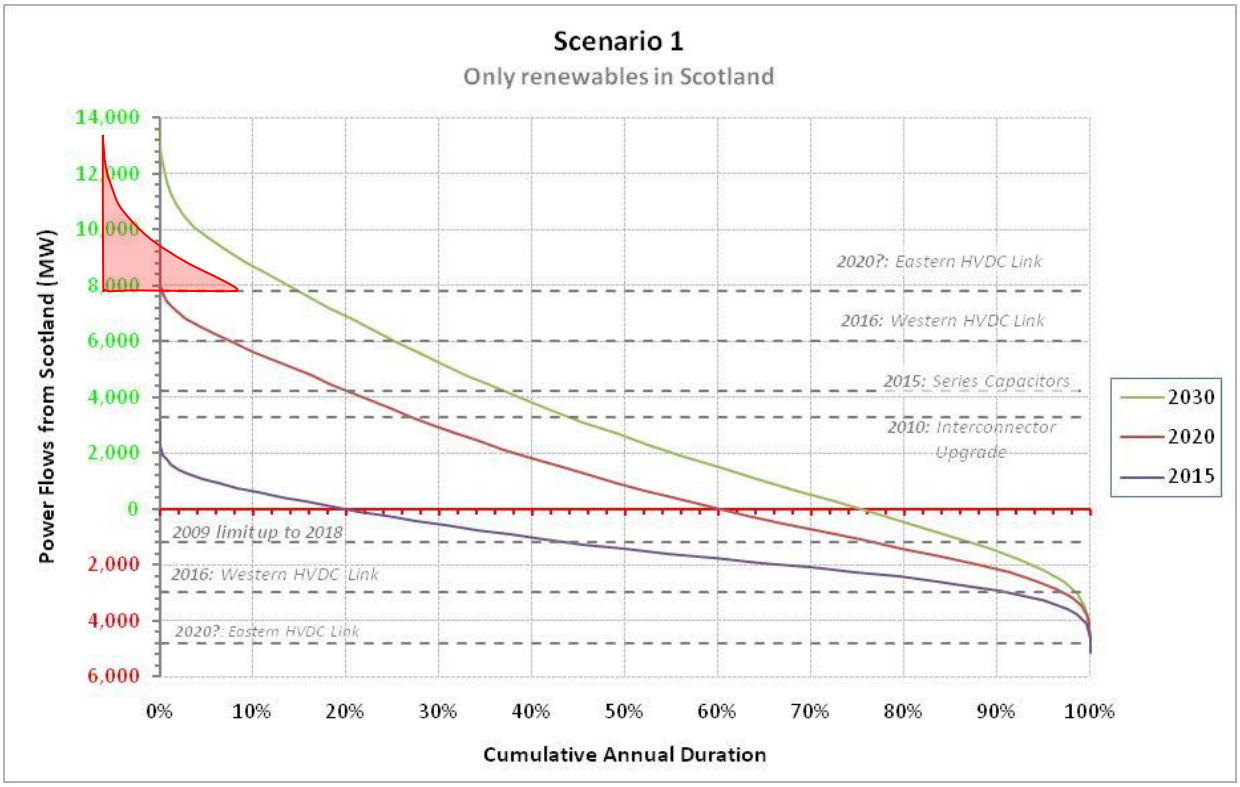
16. The balance of contribution from each will be determined by a complex interaction of factors including market forces and locational factors. E.g. significant demand for high levels of wind generation to complement high levels of Norwegian pumped storage help to make a persuasive case for North Sea transmission upgrades while localised storage solutions linked to generation would help to reduce network demands and reduce the need for network upgrades.

17. The results of our analysis indicate that, by 2020 up to 1.5 GW may need to be constrained off the system if energy storage or additional transmission capacity is not available. As a result constraints could occur for around 10% of the time. By 2030, in the unlikely absence of additional storage/DSM or transmission upgrades, over 5 GW may need to be constrained off the system (the shaded area on the chart), leading to constraints occurring around 28% of the time.

18. In order to attempt to mimic the impact of relying wholly on renewable generation, the model constrained all thermal plant off the system with Figure B2 shows the resulting power flow. The results show that, even if Scottish thermal generation is not operating (or doesn't exist), then by 2020 power flows are beginning to be constrained. Beyond 2020 the constraints rise (the shaded area in Figure B2). As a result, given the generation mix, if no energy storage/DSM measures or additional transmission upgrades are instigated, even in a renewables only mix then beyond 2020 renewable generation may need to be also constrained off the system.

[76] This was covered in more detail in the 2012 Energy in Scotland Statistical Compendium published alongside the original draft of this report.

Figure B2: Power Flows without thermal plant 2015 to 2030



Source: Scottish Generation Scenarios and Power Flows – SKM, January 2012

19. The results show that:

- Beyond 2020, as the contribution of renewables in scenario 1 increases, then without energy storage/DSM measures or additional transmission upgrades, over 4 GW of renewable output may be constrained off the system. As a result constraints could occur for up to 18% of the time, in addition to fully constraining all output from thermal plant.
- Even in this hypothetical model with no thermal generation, both the Western and Eastern HVDC links will be required by 2020 to ensure security of supply. By 2030 two further HVDC links (or other system management options), would be required over and above the two 'bootstraps' already planned in order to maximise the benefits accruing to Scotland are maximised.
- If the transmission upgrades are delayed or not undertaken, then the output of thermal plant in Scotland may need to be constrained off the network. Constraining thermal plant in Scotland and replacing with output from plant in England is likely to incur costs of around £70/MWh in the long term. Constraining renewable plant is more costly due to costs incurred from incremental generation in the South, but also the lost Renewable Order Certificate (ROC) income (or equivalent subsidy system) incurred by the constrained renewable generator – currently around £55/MWh – giving total constraint costs of around £125/MWh. As a result conventional plant will always be constrained ahead of renewable generation. In addition renewable generation should have 'priority access' over and above conventional thermal generation.

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