



2020 ROUTEMAP FOR RENEWABLE ENERGY IN SCOTLAND – UPDATE

19 December 2013

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MINISTERIAL FOREWORD



Renewable energy is a central element of our strategy for a successful Scotland. Scotland's vast renewable energy resources create major job and investment opportunities and – as part of a wider, balanced energy mix - will deliver secure, low carbon and cost-effective energy supplies.

The Scottish Government's 2020 Routemap for Renewable Energy in Scotland, published in 2011, established a target for the equivalent of 100% of Scotland's electricity demand to be supplied from renewable sources by 2020. After exceeding our interim target to meet 31% of electricity demand from renewables by 2011, we confirmed in the first annual update of the Routemap last year that we had set a new, more ambitious interim target for 50% by 2015. It is complemented by equally an important target for an increase in renewable heat generation, as well as an increase in community and local ownership of renewable energy schemes.

As this second annual update to the Routemap makes clear, we continue to make excellent progress towards these targets. Scotland's strong pipeline of renewable projects gives us every reason to believe that this progress can be maintained.

This update highlights recent developments in areas crucial to unlocking Scotland's full renewables potential, as well as considering what still needs to be done. The range of challenges to be addressed illustrates the need for the strong leadership being provided by the Scottish Government, and the collective, co-ordinated action which is at the heart of the Routemap.

Alongside short status reports on the wide range of technologies and sectors which make up our renewables industry today, we provide an update on some of the technologies which will support both large scale and local deployment of renewable energy. Energy storage, for instance, could help integrate renewable and low carbon electricity, heat and transport. Exploring the potential role, technology options, barriers, and impacts on the energy system of an increase in storage capacity has become an increasingly important part of our strategy.

We are also publishing the findings of an equalities monitoring programme. This builds on the Equalities Statement included in last year's Routemap update, and provides a baseline

against which progress on gender and other equality and diversity issues in the renewables sector can be assessed.

Scotland's substantial natural resources, energy expertise, skilled workforce and capacity for innovation are enormous advantages for our country. We will continue to work with you to make the most of these assets and to deliver a secure, sustainable energy future.

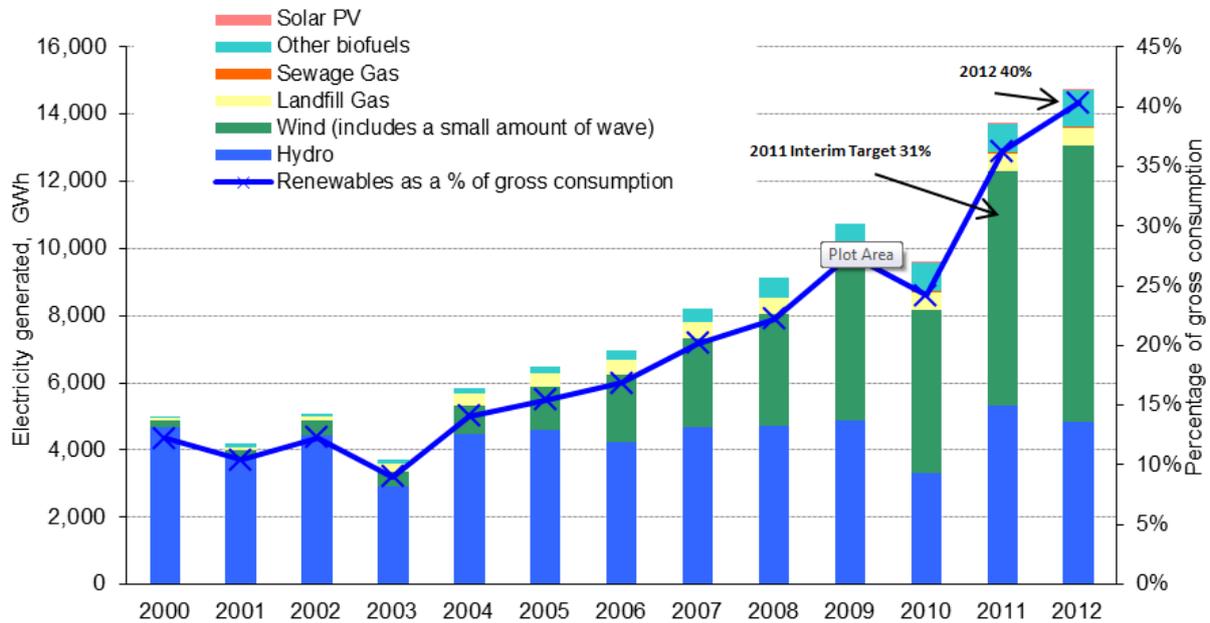
A handwritten signature in black ink, reading "Fergus Ewing". The signature is written in a cursive style with a large loop at the end of the word "Ewing".

Fergus Ewing
Minister for Energy, Enterprise and Tourism

1. Deployment Update

Renewable Electricity Generation

Figure 1: Renewable Electricity generated (GWh), Scotland, 2000-2012

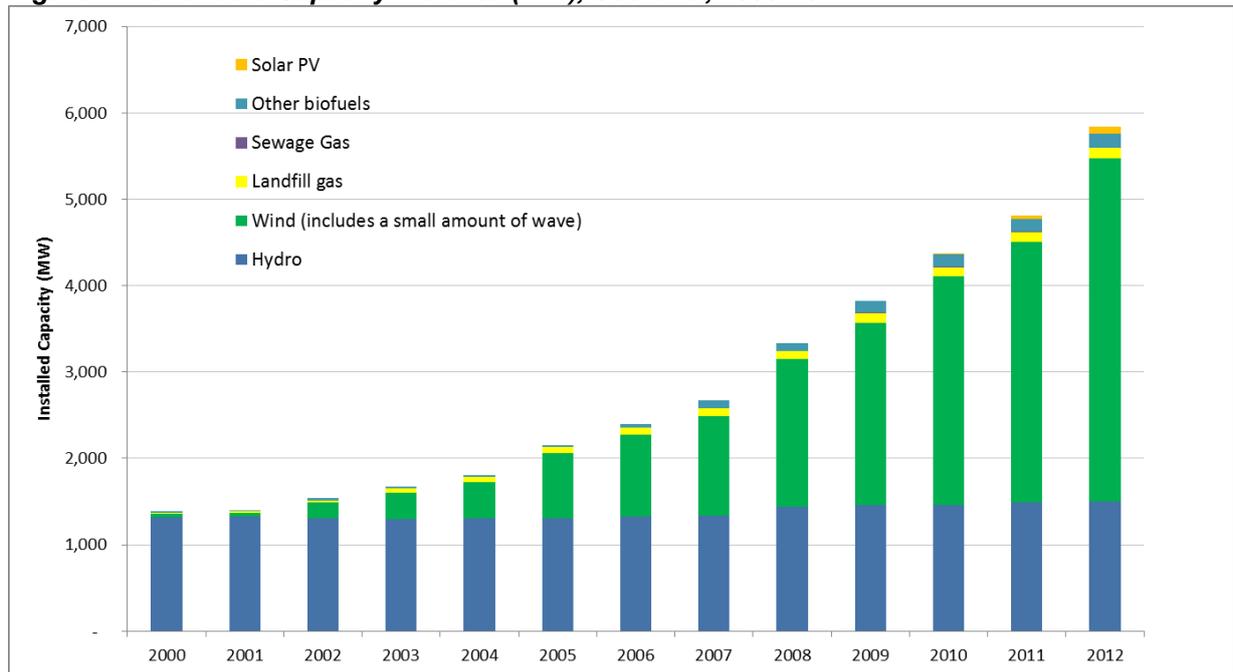


1.1 Renewable electricity generation figures for Scotland show that generation during 2012 was 14,756 GWh – up 7% on 2011, the previous record year for renewables. Our target for renewable electricity generation is to generate the equivalent of 100% of gross annual consumption by 2020, with an interim target of 50% by 2015.

1.2 The previous interim renewable electricity generation target of 31% by 2011 was met, and in 2012 renewable sources delivered 40.3% of gross electricity consumption – up from 36.2% in 2011 (see Figure 1). Renewable electricity generation in Scotland made up approximately 36% of total UK renewable generation in 2012.

Renewable Electricity Capacity

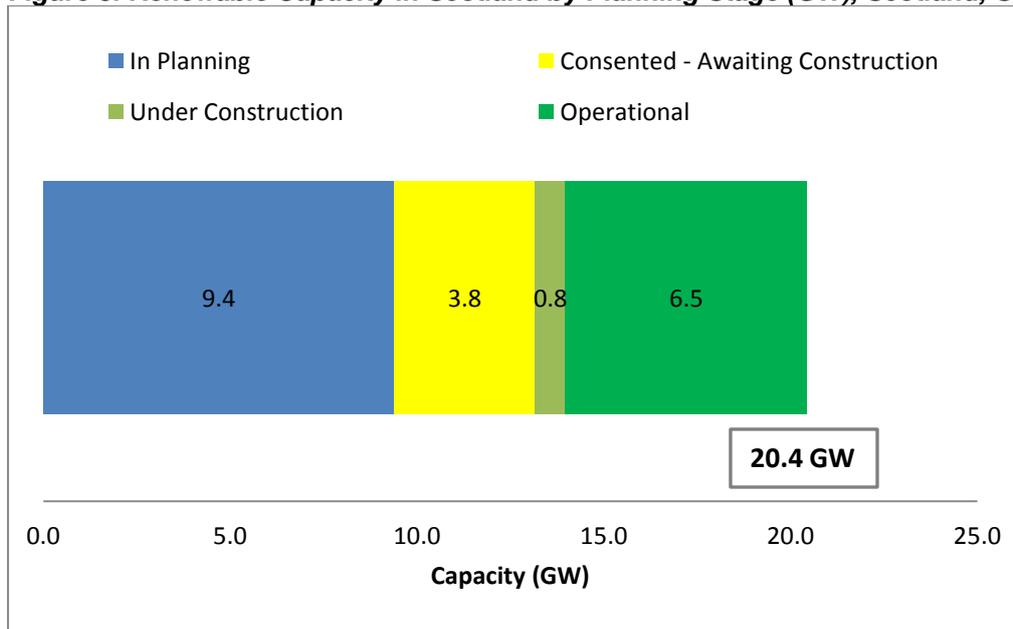
Figure 2: Renewable Capacity Installed (MW), Scotland, 2000-2012



1.3 Renewable electricity capacity figures show that at the end of 2012, there was 5,801 MW of installed renewables electricity capacity in Scotland (see Figure 2), an increase of 21% (991 MW) from the end of 2011.

1.4 As at September 2013, Scotland had 6.5 GW of installed renewable electricity generation capacity, with an additional 4.6 GW of capacity either under construction or consented, the majority of which is expected from wind generation, particularly offshore. Taking into account pipeline projects in planning, this figure totals 20.4 GW (see Figure 3) – over three times the level deployed by the end of 2012.

Figure 3: Renewable Capacity in Scotland by Planning Stage (GW), Scotland, September 2013



1.5 The breakdown by technology type and capacity (see Table 1), shows that onshore wind constitutes a large majority of those renewable projects that are either under construction or have been consented and awaiting construction (around 85% in both cases). The projects currently in planning (in terms of capacity) are dominated by offshore wind (5 GW) and onshore wind (4 GW).

Table 1: Pipeline Renewable Projects in Scotland, by Technology and Status, September 2013

Technology	In Planning		Consented - Awaiting Construction		Consented - Under Construction	
	No. of Projects	Capacity (MW)	No. of Projects	Capacity (MW)	No. of Projects	Capacity (MW)
Biomass - Co-firing	1	170	0	0	0	0
Biomass - Dedicated	3	245	24	236	5	80
Geothermal	0	0	0	0	0	0
Hydro	52	32	91	67	6	9
Landfill Gas	0	0	0	0	0	0
Municipal and Industrial Waste	0	0	9	127	0	0
Solar	1	0	13	5	1	0
Sewage Gas	0	0	0	0	0	0
Tidal and Tidal Stream	2	9	2	96	1	0
Wave	0	0	1	40	0	0
Wind Offshore	8	5,047	1	100	1	6
Wind Onshore	332	3,883	191	3,106	29	720
TOTAL	399	9,387	332	3,776	43	815

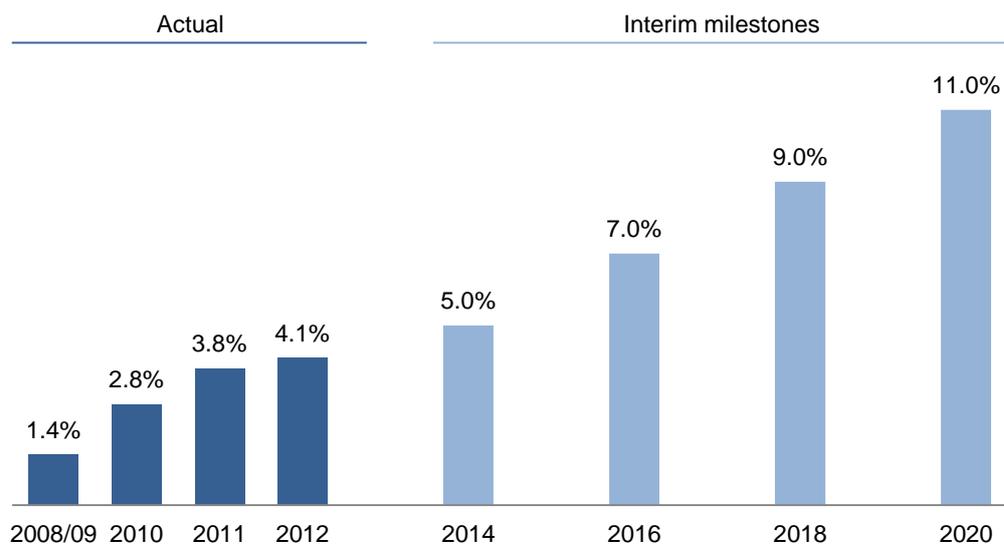
Source

DECC, Renewable Energy Planning Database, October 2013, <https://restats.decc.gov.uk/cms/planning-database/>

Renewable Heat

1.6 Renewable heat generation in 2012 equated to 4.1% of Scotland's total forecast non-electrical heat demand in 2020 (Figure 4). This is well ahead of the indicative milestone provided in the Renewable Heat Action Plan (2009) for meeting the 2020 target. The target set out in 2009 for 2012 was 3.5%.

Figure 4: Renewable heat output to 2012 (as a proportion of 2020 forecast non-electrical heat demand) and indicative interim milestones towards the 2020 target



Note: Data was not gathered for calendar year 2009. The estimate for 2008/09 is on a financial year basis.

1.7 Progress on the renewable heat target is currently measured as a proportion of estimated non-electrical heat demand in 2020. As part of the concerted efforts to continually improve all Scottish energy data and renewable target measurements, Scottish Government has developed a robust method of monitoring heat demand in Scotland on an annual basis. A wide range of key data providers and stakeholders have been consulted and this improved methodology will provide a more accurate annual measure of progress towards the renewable heat target. Further detail on this methodological change was published¹ in Summer 2013 as part of the consultation process.

1.8 To ensure transparency the Scottish Government propose to publish both measures in parallel, for a transitional period, as the evidence base regarding heat use in Scotland is continuously being improved.

1.9 Using the improved methodology allows an estimate of progress based on the current level of heat demand as opposed to a projection for 2020. Scottish Government estimate that renewable heat generation in 2011 equated to 2.6% of Scotland's non-electrical heat demand in 2011. As heat demand in 2011 is higher than the forecast heat demand in 2020 this results in a lower percentage of renewable heat generation. 2011 is now the latest available estimate due to a lag in the final energy consumption data for Scotland published by DECC.

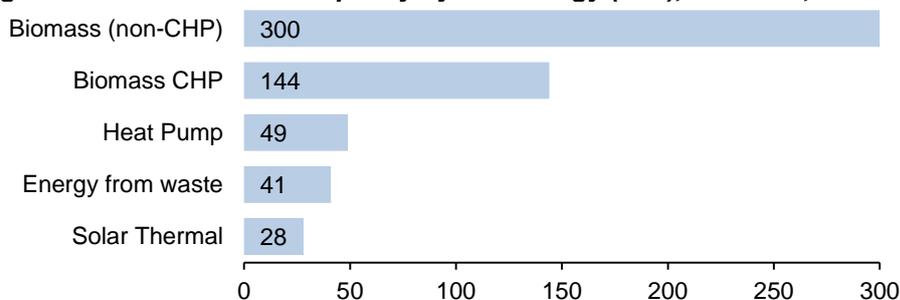
1.10 The Scottish Government's Draft Heat Generation Policy Statement will be published in early 2014, and will set out how low carbon heat can reach more householders, business and communities and a clear framework for investment in the future of heat in Scotland.

Renewable Heat Capacity

1.11 In 2012, around 561 MW of renewable heat capacity was operational in Scotland, producing an estimated 2,481 GWh of useful renewable heat.² Compared to 2011, this represents a 77 MW increase in capacity and a 218 GWh increase in heat generated.

1.12 As Figure 5 shows, biomass accounted for around almost 79% of total renewable heat capacity in 2012. Heat pumps, energy from waste, and solar thermal generation accounted for the remaining 21% of renewable heat capacity.

Figure 5: Renewable heat capacity by technology (MW), Scotland, 2012



1.13 In 2012, there were an estimated 11,251 renewable heat installations in Scotland. Of these, the 375 large (1 MW or more) installations accounted for 67% of renewable heat capacity and 83% of annual output.

Notable developments

1.14 Two notable developments since 2011 account for significant differences in output and capacity between 2011 and 2012. These are:

- The estimated capacity of renewable heat in energy from waste installations has increased by 21 MW due to the introduction of some new plants to the database. The largest is an 8 MW

¹ Appendix 3: Measurement of Heat Demand in Scotland, Renewable Heat in Scotland, 2012: A report by the Energy Saving Trust for the Scottish Government (Energy Saving Trust).

² Renewable Heat in Scotland, 2012: A report by the Energy Saving Trust for the Scottish Government (Energy Saving Trust).

plant burning the waste from leather processing. Previously, 14,000 tonnes of leather was sent to landfill at the plant but now the heat produced from the thermal plant is used for leather processing.

- A reduction in the annual output of Biomass CHP systems. This is because one plant purchased around 24,500odt less wood fuel than the previous year. This could be due to over-ordering in 2011.

Future capacity

1.15 Projects under construction, consented but not yet built, or in planning, could potentially bring total heat output to around 4,558 GWh a year, or 7.6% of estimated 2020 non-electrical heat demand.

1.16 An estimated 125 MW of installed capacity from (mostly large) projects is currently under construction in Scotland, which could provide a further 896 GWh of renewable heat. Adding these figures to current operational installations will provide a total of 686 MW of renewable heat capacity and 3,377 GWh of renewable heat output, equivalent to 5.6% of non-electrical heat in 2020.

1.17 In addition, an estimated 423 MW of capacity is either consented but not built, or submitted to local planning authorities for planning permission. These installations could provide around 2,364 GWh of renewable heat. Assuming that 50% of these projects come to fruition before 2020 (providing a further 212 MW and 1,182 GWh of heat), and added to those installations currently under construction and operating, this would give a total capacity of 898 MW and 4,558 GWh of renewable heat, equivalent to 7.6% of non-electrical heat in 2020.

Community and Locally Owned Renewables

1.18 At the end of June 2012, an estimated minimum of 204 MW of community and locally owned renewable energy capacity was operational in Scotland. This was 39% higher than the estimate for a year previously. It should be noted that some of the increase in estimated capacity is likely to be due to an increase in the amount of data collected and being provided by the different owners of renewable installations.

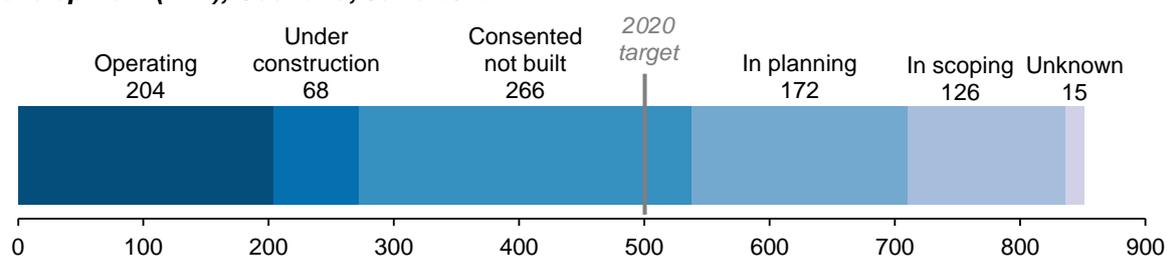
1.19 These figures for 2012 spread over a total of more than 5,000 individual renewable energy installations.³ The total capacity was split between 88 MW of electrical capacity and 117 MW of thermal (heat) capacity. Over a year, community and locally owned renewable installations could be expected to produce around 489 GWh of renewable energy, consisting of 233 GWh of electricity and 256 GWh of heat.

Development pipeline

1.20 As Figure 6 shows, a further 647 MW of community or locally owned renewable energy capacity is estimated to be in different stages of development (under construction, consented but not built, in planning, or in scoping).

³ This number of installations includes the total number of individual wind turbines in any multi-turbine development.

Figure 6: Community and locally owned renewable energy capacity in different stages of development (MW), Scotland, June 2012



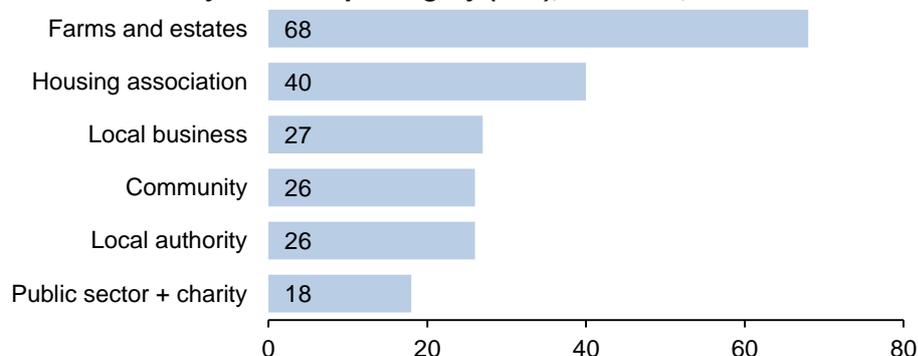
1.21 Based on 204 MW of capacity in operation at the end of June 2012, and the further 647 MW identified as in development, it would appear that Scotland is on-track to meet its target of 500 MW of community and locally owned renewable energy by 2020. However this situation will need to be monitored with regard to the conversion rate of installations from developmental stages to operational capacity.

1.22 The 103 wind turbines at Viking Wind Farm make up a large proportion of the projects that have been granted planning permission but for which construction has not yet started. This project was granted planning permission on 4th April 2012 and will provide a capacity of 167 MW. It should be noted, however, that the consent is currently the subject of legal proceedings.

Categories of ownership

1.23 A breakdown of operational capacity by type of owner is shown in Figure 7. The largest proportion of operational capacity is on Scottish farms and estates (68 MW, or 33%). Community groups own 13% of total operational capacity (26 MW). The largest numbers of individual installations (over 4,000) are in local authority and housing association ownership, together accounting for over 81% of individual installations.

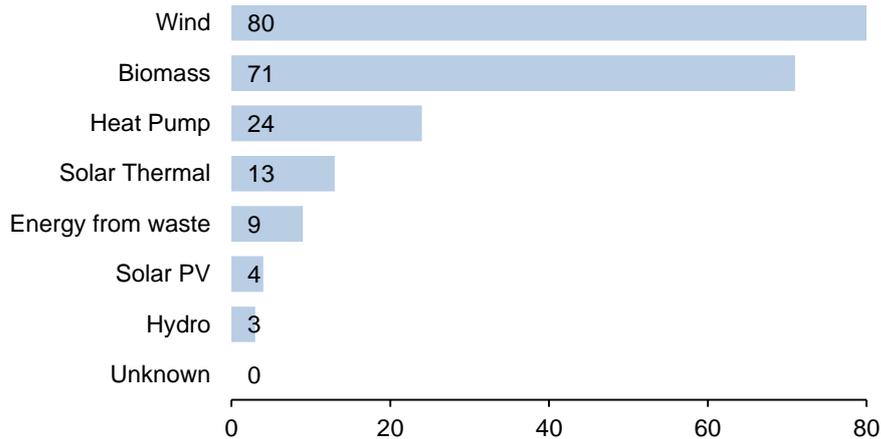
Figure 7: Estimated capacity of operational community and locally owned renewable installations at by ownership category (MW), Scotland, June 2012



Installed technologies

1.24 The majority of capacity in operation at June 2012 was from wind turbines, at 80 MW of electricity, and from biomass primary combustion, at 71 MW of heat. These two technologies account for about 74% of operational capacity at June 2012. A breakdown by technology type is shown in Figure 8.

Figure 8: Capacity of operational community and locally owned renewable installations by technology (MW), Scotland, June 2012



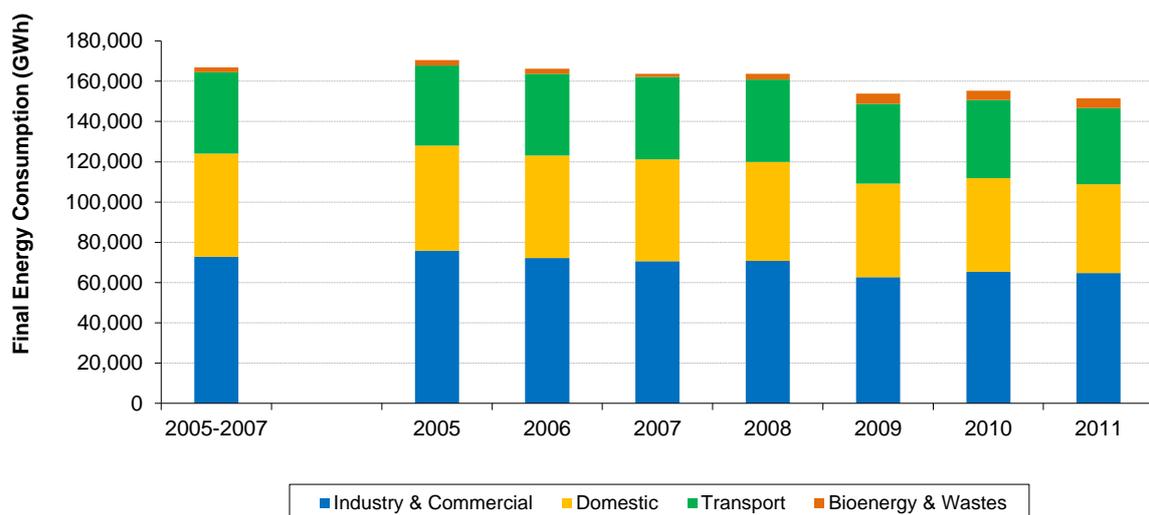
Energy Efficiency

1.25 Our ambition is to reduce final energy consumption in Scotland, and have a 12% Energy Efficiency Target published in the Energy Efficiency Action Plan and established under the Climate Change (Scotland) Act 2009.

1.26 Consumption in 2011 was 2.5% lower than in 2010, and 9.2% lower than the 2005-2007 baseline against which the 12% Energy Efficiency Target is measured (see Figure 9).

1.27 Recognising the importance of economic cycles and weather patterns to energy consumption levels, the energy efficiency target was defined to allow for fluctuations within the longer term trend. The 9.2% fall from the baseline remains well within the 2011 annual maximum associated with the 2020 target.

Figure 9: Total Final Energy Consumption Scotland, 2005-2011



1.28 To complement the energy efficiency target, we also measure how productively energy is being used in the economy. Energy productivity expresses the gross value added achieved in the economy from the input of one unit of energy. Increasing energy productivity means 'squeezing' more out of every unit of energy consumed.

1.29 This is measured as the level of GVA per GWh of final energy consumed in Scotland. Energy productivity in Scotland has increased by approximately 16% between 2005 and 2011, and this is expected to continue rising as the economy recovers.

Decarbonising Electricity Supply

1.30 Our aim is to ensure that we have a largely decarbonised electricity system by 2030. Our 2030 decarbonisation target will be to achieve a carbon intensity of 50 gCO₂/kWh of electricity generation in Scotland. The Climate Change (Scotland) Act requires a report to the Scottish Parliament on the Carbon Intensity of the Electricity Supply System in Scotland.

1.31 The carbon intensity of the grid (including estimates of emissions from backup and balancing services) was officially reported to be 347 gCO₂/kWh in 2010 but is estimated to have fallen to 289 gCO₂/kWh in 2011 using the same methodology. We propose to use the same indicator to measure progress toward our decarbonisation target. The target therefore represents an 83% reduction in carbon intensity between 2011 and 2030.

2. Update on Cross-Cutting Challenges

Introduction

2.1 Making renewables the cornerstone of our future energy supply means that we will need the right infrastructure, processes and support to be in place and fit for purpose. In a regulated energy market, the Scottish Government exerts its influence through its targets, its powers in areas such as planning, consents and the Renewables Obligation (Scotland), and by providing targeted support and incentives. Achieving our full renewable energy potential will require strong partnerships and engagement with other governments, the private sector, and the public, as well as an up to date evidence base to underpin our policies.

2.2 The following update highlights activity in a number of cross-cutting areas of critical importance to the renewables sector as a whole, while the Sectoral Routemap updates summarise recent successes, consider some of the next steps, and refer to some of the key measures being taken to support investment in infrastructure and encourage innovation.

EUROPEAN POLICY CONTEXT

2.3 Scottish Ministers are committed to working closely with the UK Government to demonstrate international leadership on climate change and drive an ambitious EU agenda for the low carbon economy. Debate is currently underway in Europe on the shape of a 2030 framework for energy and climate. Agreeing a balanced 2030 package is crucial if we are to meet our domestic targets and international obligations, and provide assurances for technology development and long term investment.

2.4 The Scottish Government believes that a successful EU 2030 package must include a legally binding greenhouse gas (GHG) target (with associated burden sharing between Member States) of 50% in the context of a global deal, that demonstrates strong ambition from the EU, keeps us on track to limit the global temperature increase to 2 degrees, and represents an offer that encourages the rest of the world to come forward with ambitious pledges. To achieve ambitious GHG reductions, the 2030 package should also deliver a reformed and strengthened ETS to 2030 for a sustained, robust carbon price that will help to incentivise a shift to a low carbon economy.

2.5 We believe that an EU wide electricity sector decarbonisation target that incentivises further investment in renewables and CCS beyond 2020, consistent with the trajectories in the 2050 Low Carbon Roadmap, should also be part of the 2030 package. A technology neutral decarbonisation target would allow Member States to retain the flexibility to choose the energy mix that will best allow them to achieve their GHG targets, exploiting comparative advantages whilst incentivising CCS and renewables investment. It would also give greater certainty to investors in the energy sector than a greenhouse gas target alone would.

2.6 The Scottish Government has not called for a binding renewable energy target at an EU level at this stage, until we have seen the European Commission's proposals in January on the levels of renewable energy and CCS that a 40% or 50% GHG target would deliver, and what additional measures might be proposed at EU level to support further development in these energy technologies to provide long term reassurance to investors.

PUBLIC ENGAGEMENT

2.7 We want to see a range of renewable technologies developed across Scotland, in order to strengthen security of supply and maximise economic opportunities in emerging sectors. Deployment to date has been dominated by onshore wind, because it is lower cost and technologically proven - although we continue to target support on emerging sectors and technologies, especially offshore renewables. Onshore wind currently makes up over 90% of renewables projects that are either under construction or which have been consented and are awaiting construction, as well as a significant proportion of proposals in planning.

2.8 Onshore wind development – in the right places – remains crucial to developing the grid and supply chain infrastructure, as well as the investor confidence, which will stimulate offshore renewables development. Public attitudes also continue to be generally positive. A YouGov poll (<http://yougov.co.uk/news/2013/03/20/scots-support-renewable-energy/>) published in March 2013 found that 62% of those surveyed would support large scale wind projects in their local area. 64% of the people surveyed also support the continued development of wind power as part of Scotland's energy mix.

2.9 We know that communities and other special interest groups, including environmental groups, need to be confident that onshore wind is only being developed in appropriate places. The current review of the National Planning Framework and Scottish Planning Policy (SPP) is an opportunity to consider this issue, and a finalised SPP will be issued in June 2014.

2.10 In the past year, the Scottish Government has successfully defended a case brought against it and other parties under the Aarhus Convention, reflecting the consultative approach taken both to Consenting and to our Renewables Routemap overall, including via Strategic Environmental Assessment.

The Aarhus Convention is a UN international convention which protects the rights of individuals in relation to environmental matters in gaining access to information, public participation in decision-making, and access to justice. The UK is a signatory to the Convention, as is the EU. In Case 68, an Argyll resident made accusations of breaches of the Convention related to a local windfarm and national renewables policy. In its findings, which have now been formally adopted, the Compliance Committee did not find the Scottish Government in breach of the Aarhus Convention.

2.11 We are aware that various residents groups have formed, including Scotland Against Spin (SAS) whose stated goal is: "the reform of the Scottish Government's wind energy policy and support for all those adversely affected by it". The Scottish Government continues to listen to the concerns of SAS and others as part of an open dialogue based on mutual respect and an aspiration to build trust in a shared independent evidence base, as part of the wider public interest in Scotland's energy future.

2.12 We have asked ClimateXChange (CXC) to manage a research project looking at whether the noise and visual impacts predicted by wind farm developers in the documentation accompanying their planning applications are consistent with the impacts experienced once those wind farms are operational. The final report is due in autumn 2014 and will inform the Scottish Government's approach to planning policy and good practice in managing the impacts of wind developments on local residents.

2.13 CXC has also engaged academic experts to explore whether there is evidence to explore whether there is evidence of a relationship between wind farm proximity and house prices.

2.14 Finally, CXC is undertaking independent research on what the public feels are the most important issues for decision making about wind farms, and is exploring innovative ways by which citizens could be better engaged in decision making processes.

ELECTRICITY MARKET REFORM

2.15 Electricity Market Reform (EMR) represents the largest reform of the electricity market since privatisation. These reforms are fundamental to the energy sector, both for Scotland and for the rest of the UK. The proposals under EMR represent a significant change to the way renewable technologies are supported, with the RO being replaced by a new support mechanism – a Contract for Difference (CfD) – providing long term price certainty for low carbon generation.

2.16 The UK Government has now confirmed the CfD strike prices which will apply to renewable generation during the first Delivery Plan period (2014/15 to 2018/19), and is due to publish its detailed Delivery Plan proposals and consultation response before the end of 2013.

2.17 Scottish ministers, having already expressed serious reservations about the effect which the EMR process could have on security of supply in Scotland and on the development of offshore renewables, will consider the detailed Delivery Plan before making any further comment

GRID ACCESS, REINFORCEMENT, AND CHARGING

2.18 Upgrades to the Scotland's transmission networks are well underway:

- New Beaulay-Dounreay 275kV circuit now commissioned – bringing another 100MW of transfer capacity between Beaulay and Caithness.
- North section of Beaulay-Denny line now commissioned, including substations at Beaulay, Fort Augustus and Fasnakyle.
- Scotland / England export capacity on track to increase to 4.4GW in 2015.
- Construction of Western HVDC link now begun – will add another 2.2GW to export capacity when complete.

2.19 Funding for the second phase of ISLES (Irish Scottish Links on Energy Study) of £1 million was announced at the British Irish Council in June 2013. ISLES II is a joint project between the Scottish Government, the Northern Ireland Executive and the Government of Ireland which will build on the success of phase one and further assess barriers to cross border trade in renewable energy, and look at cross-border marine spatial planning. ISLES II will run through until 2015.

2.20 Following publication of the independent report on [Scottish Islands Renewables](#), the Scottish and UK Governments are working together through the Scottish Islands Renewables Project to develop financial support which addresses the grid access barriers holding back the renewables potential of the Orkney Islands, Shetland Islands and Western Isles. The Project has recently commissioned a grid access study to examine the challenges facing grid access and upgrades for island renewables developers, and consider associated policy and investment options to help overcome these barriers. This work will be completed in the first half of 2014.

2.21 Scottish Distribution Network Owners submitted their draft business plans for 2015-2023 to Ofgem in summer 2013 and will submit revised plans in March 2014. The business plans, the first submitted under the RIIO regime, include many billions of pounds worth of investment into distribution networks, improvements to customer services and proposals for greater innovation and smart grids.

2.22 The Scottish Government has worked with partners in the UK Government and Europe to ensure that trans-boundary projects in the Northern Seas that are of importance to Scotland are included in the European Commission's list of Projects of Common Interest and therefore eligible for funding under the Connecting Europe Facility. In October 2013, The European Commission designated ISLES as one of approximately 200 EU 'Projects of Common Interest' (PCIs) under the new Trans-European Energy Networks Regulation.

PLANNING AND CONSENTS

Planning

2.23 The [National Planning Framework 3](#) Main Issues Report and draft [Scottish Planning Policy](#) were issued for consultation on 30 April 2013. The consultation period ended on July 23. Over 1500 responses were received on the draft SPP consultation and 500 on the NPF3. All representations, comments and feedback will be taken into account in drafting the proposed NPF3 and finalised SPP. This process will take place during autumn to late 2013, and where necessary respondents will be contacted directly if clarification on responses or further information is required. The review of both documents has so far progressed in tandem and there are benefits to continuing to do this. The timescale for finalising the SPP has therefore changed with both documents now being published together in June 2014.

2.24 Following the consultation on Draft SPP in Summer 2013, the Scottish Government is now considering replacing the Draft SPP principal policies on 'sustainable economic growth' and

'sustainable development' with a principal policy on 'Sustainability and Planning' and introducing a presumption in favour of sustainable development into the SPP. Consequently A short follow up consultation to the draft SPP is being undertaken on Sustainability and Planning until 16 December 2013.

2.25 SNH is currently consulting on core areas of wild land 2013 map until 20 December 2013 and results may inform the final drafting of SPP.

2.26 [Online renewables planning advice](#) on 'Planning and Heat' was launched in May 2013.

2.27 The Scottish Government has continued to work with a steering group to update SNH's Visual Representation of Windfarms with the aim of moving to a single objective verifiable approach across Scotland.

2.28 Additional funds for planning authorities to help them deal with renewables planning applications were reported in last year's Routemap update. Ultimately the fund was increased to £725,000 in support of 17 bids. Further information can be found at: <http://www.scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Policy/themes/renewables/windresources>.

2.29 In response to Public Petition 1469 on the neighbour notification of wind turbine applications, we have advised the Public Petitions Committee of the Scottish Parliament that we will produce good practice guidance in relation to public engagement on proposals for wind turbines. There will be a public consultation in due course on a draft of this guidance before it is finalised.

2.30 A [Draft Planning Circular](#) was out for consultation until 13 November 2013, entitled 'Planning Scotland's Seas - The Relationship Between The Statutory Land Use Planning System and Marine Planning and Licensing'.

Energy Consents

2.31 We have taken a number of steps to improve the efficiency and effectiveness Scottish Ministers' procedures for determining energy applications:

- Introduction of ePlanning Portal expected during 2014, to improve transparency and information management
- Renewed emphasis on pre-application procedures and engagement: drive for meaningful community engagement which influences the design of a development proposal, and; adopting procedures which lead to improved, more bespoke, scoping opinions.
- Conclusion of Short Life Working Group for Onshore Consents early 2014 with conclusions on ways of improving and streamlining process for Section 36 consents.
- Consultation and review of Scottish Ministers' energy consents procedures during 2014.
- Eskdalemuir Working Group set to conclude the re-examination of the 2005 "Styles" model, which is used to calculate the vibration from wind turbines at Eskdalemuir, and associated policy around the allocation of "noise budget" which becomes available, by February 2014.
- Working with wind industry, Scottish Natural Heritage and RSPB to better understand impacts of wind turbines on bird populations through the Scottish Windfarm Bird Steering Group.
- Working with TSOs, stakeholders and through the Energy Upgrade Forum to develop strategic thinking around the wider upgrade of transmission infrastructure and issues relating to grid connection as a barrier to deployment of renewables.
- Continued engagement around aviation issues, with developers, air navigation service providers and other stakeholders, including through re-convening the South Scotland Aviation Solution Group during 2014 in conjunction with the UK Aviation Plan, to promote cooperative working towards mitigation solutions, and with a view towards developing wider regional solutions.

FINANCING THE RENEWABLES SECTOR

Renewable Energy Investment Fund

2.32 The Renewable Energy Investment Fund (REIF) was set up in October 2012 following agreement with Treasury to draw down the Fossil Fuel Levy. REIF is a £103m fund operated by Scottish Enterprise's Scottish Investment Bank. It offers loans and equity investments for renewable energy projects to fill funding gaps, with initial priorities for investment identified as marine energy (wave & tidal), community energy and district heating. There is an "Other" category to allow gap funding for projects with significant economic or community benefits; this has proved a valuable addition to the REIF pipeline.

2.33 To date REIF has invested £5.6m in 6 deals (£4.031m this financial year). Currently Scottish Investment Bank is working on several deals which will bring projected spend this financial year to around £17m, with projects in two of the priority categories (community energy and marine energy) as well in other areas where the proposals promise significant economic or community benefits. The anticipated leverage from these deals will be approximately double the value of finance offered.

2.34 The REIF team is fully engaged with the Heat Network Partnership and key parts of the District Heating sector – Housing Associations, Scottish Cities Alliance, UK and European industry specialists, Combined Heat and Power Association and others – to understand the funding that is available commercially and the terms under which it might be available, with a view to identifying any gaps, as well understanding the drivers behind choices of technology. This work will ensure that REIF can help to develop and shape district heating projects and appropriate deals.

2.35 In our budget statement this year, we announced that we have re-profiled the REIF budget in order to extend the scheme for a further year to March 2016. This is in direct response to the delays in the market caused by the uncertainty of future support for renewables under the UK Government's Electricity Market Reform. The extension of REIF will give our emerging renewable energy sectors, particularly wave and tidal, more time to develop projects to a stage where REIF can provide funding. Extending the scheme allows us to maintain momentum and provide support at the levels needed to leverage private sector investment and retain both Scotland's competitive advantage in marine energy and our lead in community renewables.

2.36 On the community energy REIF priority, Scottish Investment Bank staff work closely with Local Energy Scotland, the new contractor for the Scottish Government's Community and Renewable Energy Scheme (CARES). Indeed CARES has been refocused this year to act as the first stage of REIF for prospective community applicants, thus providing joined-up support to communities on the ground, as well as streamlining public sector resources. This joint working will be particularly important to ensure that communities are able to make the most of the exciting opportunity to make equity investments in new wind and hydro schemes on the national forest estate. Local Energy Scotland and Scottish Investment Bank are aligning their CARES and REIF support closely in liaison with Forestry Commission Scotland to take advantage of this opportunity.

SUPPLY CHAIN

2.37 For both indigenous and inward investment companies in Scotland there are opportunities to tap into the offshore wind sector. To assist them to do so Scotland's Enterprise Agencies take a proactive approach to assist. For example:

2.38 Scottish Enterprise and Aberdeen Renewable Energy Group (AREG) have held two 'meet the buyer' events for Statoil's Hywind Scotland project. The first was held on the 3rd of October in Aberdeen for companies interested in supplying the proposed Statoil floating wind turbine project. The event generated a lot of interest, with 97 delegates in attendance representing 71 companies. The second event in Peterhead on the 12th November was attended by 23 delegates with 16 company meetings

2.39 Under the banner of the Offshore Wind Expert Support Programme, Scotland's Enterprise Agencies, in partnership with local partners, have undertaken a series of event to support companies to both understand and access the opportunity offshore wind presents. Examples include "Understanding the Offshore Wind Contracting Environment" which explored alternative offshore contracting strategies, from alliancing to EPCs as well as considering the benefits and issues of each approach, and "Winning Business in Offshore Wind", which provided attendees with practical advice on how to approach potential customers, highlighting the different procurement approaches used, drawing on examples of successful UK companies.

2.40 In addition, Scotland's Enterprise Agencies are playing a key role taking part in a pilot project to better understand EDPR's relationship with the supply chain companies and Marine Scotland will contribute £300k towards Enterprise staff costs to allow this intensive inclusive approach to be resourced.

2.41 EDPR intend to go through a process of reducing turbine manufactures from 20+ down to 4, then 2 and potentially 1 by January 2014. Scottish Enterprise will be involved in this process so that we can understand who the real Original Equipment Manufacturer players are and better consider the potential for inward investment with this part of the supply chain.

2.42 This work will be enhanced by Marine Scotland who are currently undertaking Scenario Mapping exercise to assist the east coast Offshore Wind developers to share, evolve and co-ordinate scenarios for the Moray Firth and Forth/Tay developments to maximise local economic content within a pan Scotland strategy. This work is due to be concluded in Spring 2014.

Advice, assistance, and events

2.43 The [HI-energy website](#) includes links to all of the companies and research institutions with websites that exist in the Highlands and Islands energy industry.

2.44 The [Scottish Enterprise website](#) provides details of the wide range of services it offers for renewable energy projects.

2.45 Scottish Renewables, in association with Scottish Enterprise, is hosting an Offshore Wind Supply Chain conference, exhibition, and dinner at the AECC, Aberdeen, on 28 and 29 January 2014. Further info: <http://www.scottishrenewables.com/events/offshore-wind/>

SKILLS

2.46 Energy Skills Scotland (ESS) was announced in May 2013, supported by £6.5 million - doubling the original budget announced in Sept 2012. Led by Skills Development Scotland, Energy Skills Scotland will work with industry to ensure that Scotland has the skilled workforce required deliver the qualified workforce the energy industry needs. Mike Duncan was appointed as Programme Director for ESS in August 2013.

2.47 We supported over 850 training opportunities in 2012/13 in renewable energy through the Energy Skills Challenge Fund in disciplines such as Marine renewable training through Orkney College, Fabrication and Welding, and Wind Turbine Technician Training. We have also supported over 150 episodes of training in renewable energy through the Low Carbon Skills Fund.

2.48 The [Energy Skills Partnership](#) (ESP) has established the Wind and Marine Training Network through the development of regional hubs across colleges in the East (Fife and Dundee); the West (Ayrshire and Dumfries and Galloway); and the North (North Highland and Inverness).

2.49 Through the [Energy Technology Partnership](#) (ETP) we supported 17 PhD studentships in renewable energy technologies during 2012, with a further 10 studentships supported during 2013. This is a jointly funded programme between Government, Industry and Academia.

2.50 We are supporting 37 Modern Apprenticeships in Wind Turbine Operation and Maintenance this year (the only purely renewable energy MA framework) and a new Framework – Wind Turbine Installation and Commissioning at Level 3 – is currently being finalised for approval through the Modern Apprenticeship Group.

2.51 SDS has developed an Energy Skills Scotland Gateway (www.energyskillsscotland.co.uk) – a one-stop-shop approach to providing details of all the support available on energy skills in a single place, making it easier for employers to understand what support is available to them, and to help individuals fully understand the employment opportunities in the sector, and the skills and experience required for these.

2.52 The [Energy Skills Investment Plan](#) first published in March 2011 is being refreshed during 2013/14 to provide a more accurate and up to date picture of renewable and wider energy sector skills demand and current and future activities needed to support the future growth potential of the sector.

2.53 The Renewables Industry Advisory Group (RIAG) is working with Energy and Utility Skills to look at how their workforce planning model could be used more widely for renewable businesses to better understand future employment and skills needs. This work will contribute to the refresh of the SIP.

2.54 The ESP is establishing a Transmission and Distribution training Network to support infrastructure development which will involve activity across Inverness, Dumfries and Galloway, Perth, Fife and Dundee colleges.

2.55 Further transitional training will be undertaken in 2013/14 through the Energy Skills Challenge Fund.

3. SECTORAL ROUTEMAP UPDATES

ONSHORE WIND

RECENT SUCCESSES

- Wind turbines⁴ in Scotland produced a record amount of electricity in 2012, totalling 8,264 GWh.
- A recent study published by Foundation Scotland entitled “Taking Stock” states the current value of community benefit funds from onshore wind farms in Scotland is £6.92 million. Future projections predict this to treble in the next 5 years to just under £19 million and by 2020 could increase to £50 million.

CHALLENGES

- Onshore wind strike price has been cut by £5/MWh from the draft prices published June in each year from 2014-15 to 2018-19 (£95 2014-15 to 2016-17 and then £90)
- Continuing to engage with communities to ensure that public support for onshore wind projects is maintained.
- Continued pressure in some areas experiencing an influx of applications for onshore wind developments.

KEY ACTIONS

- Working with key stakeholders, including the renewables industry, to ensure that accurate messages about onshore wind are being portrayed.
- Research – A number of research projects are underway, including a 14 month comparative study to compare predicted landscape/visual, noise and shadow flicker impacts from wind turbine proposals with the actual impacts of the developed schemes.
- Planning - All representations, comments and feedback from the recent consultations on the [National Planning Framework 3](#) (NPF3) Main Issues Report and draft [Scottish Planning Policy](#) (SPP) will be taken into account in drafting the proposed NPF3 and finalised SPP. A key action will be settling on an approach to preparing spatial frameworks which will help provide an early high level steer on the best locations for wind farms.

⁴ Wind generation includes a small quantity of wave, tidal and solar.

OFFSHORE WIND

RECENT SUCCESSES

- AREVA, one of Europe's largest offshore wind energy companies, has signed an agreement with Scottish Enterprise confirming it will locate its UK turbine manufacturing site in Scotland. The deal could create up to 750 jobs from manufacturing and the supporting supply chain.
- One of the first awards from the £70 million National Renewables Infrastructure Fund (NRIF) when the Hunterston Onshore Test Facility received £4.3 million. The Centre also benefiting from £15 million investment from SSE. October 2013 saw the new Siemens SWT-6.0-154, installed for tested, with the second berth occupied in 2014 and the third the following year.
- The Scottish Government announced consent for the development of the European Offshore Wind Deployment Centre (EOWDC) in Aberdeen Bay. The development consists of 11 wind turbines and their connecting cables, sited between two and 4.5 km off the Aberdeenshire coast, capable of generating up to 100 MW, providing enough energy to meet the needs of over 49,000 homes – almost half of the homes in Aberdeen.
- Samsung Heavy Industries (SHI) received £6.04 million Prototyping for Offshore Wind Energy Renewables Scotland (POWERS) funding to support the development of its latest 7MW Offshore Wind Turbine prototype at the Energy Park in Fife.

CHALLENGES

- The protracted Electricity Market Reform (EMR) process by the UK Government continues to cause uncertainty within the offshore wind industry.
- The proposals outlined by the UK government in the Energy Bill only confirm funding under the Levy Control Framework, used to support development of renewables projects, until 2020. This has had an immediate impact on the market. Wind turbine manufacturers who are currently considering critical investment decisions in new manufacturing capacity in Scotland, to begin delivering in 2015/16, have raised concerns that the current proposals do not give them sufficient assurance of an adequate long term market for their products, with clarity for investment decisions only available over the 4 year period from 2016 -2020. This has caused them to start to reconsider decisions on investment.
- The uncertainty in the long term UK market, therefore greatly increases the risk of manufacturers establishing in other countries or expanding their existing foreign plants around which there are well established supply chains.

KEY ACTIONS

- Scotland's Offshore Wind Route Map sets out the opportunities, challenges and priority recommendations for action for the sector to realise Scotland's full potential for offshore wind. It is the key document and policy driver for the successful delivery of the industry in Scotland. A refresh of this document was published on 29th January 2013.
- Creation of the £15 million Scottish Innovative Foundation Technologies Fund to assist the offshore wind foundation projects, suitable for water depths of greater than 30 metres. There will be two funding calls initially between April and May 2013 and again in Spring 2014.

MARINE

RECENT SUCCESSES

- In the last year, three marine renewables projects in Scottish waters secured UK Government and European Commission funding.
- In February 2013, we announced additional funding of £4.1m to the European Marine Energy Centre (EMEC) to ensure that EMEC is able to meet the evolving needs of industry. The funds are also supporting a study to assess the capability of marine support vessels.
- Through our leadership of the British-Irish Council, we were successful in ensuring the inclusion of ocean energy within the revised Strategic Energy Technology (SET) Plan, which was announced in May 2013.
- In May 2013, consent was granted for the world's largest wave farm – a development by Edinburgh firm Aquamarine Power – off the north-west coast of Lewis. This was followed by the announcement in September 2013 that MeyGen Ltd had received consent for an 86MW tidal energy project in the Inner Sound of the Pentland Firth.
- In May 2013, we announced that the £18m Marine Renewables Commercialisation Fund (MRCF) would be refocused in line with industry calls to provide a dedicated support mechanism for the wave sector.
- In September 2013, we announced that two Scottish wave energy developers, Aquamarine Power and Pelamis Wave Power, would share a slice of the £13m MRCF wave fund.
- The remaining £5m of the MRCF is being used to fund the enabling technologies that are needed alongside the first arrays, and to establish a Marine Farm Accelerator.
- We witnessed an unprecedented level of investment last year as global engineering firms including Andritz Hydro, Siemens and ABB took controlling stakes in a number of marine technology companies.
- This year also saw the European Marine Energy Centre (EMEC) celebrate ten years of real-sea experience. There have been more grid-connected marine energy converters deployed at EMEC than at any other single site in the world and the centre remains the world's only accredited marine energy laboratory.

CHALLENGES

- We must make sure Scotland maintains its global lead in wave and tidal energy development. This is a key time for the marine renewables industry as it moves from the testing and demonstration of single devices to the development and subsequent deployment of commercial arrays.
- Grid access and transmission charging problems must be addressed so that Scotland's islands can fully contribute to renewables and decarbonisation targets.
- The strike prices announced in December 2013 by the Department of Energy and Climate Change retain an island uplift for onshore wind projects, but not for wave or tidal projects. This puts the commercial development of the wave and tidal sector at risk, and may destabilise the case for a vital transmission link to the mainland markets.
- Accessing the opportunities offered through the revised SET plan and European funding is vital. We must maintain the current level momentum and commitment if we are to continue to raise the profile of ocean energy in Europe.
- EMEC must be able to meet the changing demands of the marine renewables industry if it is to maintain its position as the world's leading test centre.

KEY ACTIONS

- Hold a wave summit in early 2014 to explore with utilities and leading OEMs their appetite to invest in the wave sector; the factors that influence investment levels; and the extent of public sector support needed to retain existing investors and bring new capital and new lenders to the table.
- Work with partners to develop a Scottish Marine Energy Strategy that will set out a long term vision for marine renewables and will help to focus the efforts of the Scottish Government, its enterprise agencies and industry.
- Work with industry, enterprise agencies and the European Ocean Energy Association to promote opportunities within Europe, including participation in the newly established Ocean Energy Technology Platform.
- Work with The Carbon Trust and the Offshore Renewable Energy Catapult to ensure the effective distribution of MRCF funds.

HYDRO

RECENT SUCCESSES

- Announced in April that RO Scotland support for hydro will be retained at 1 ROC per MWh.
- This year celebrates the 70th anniversary of the Hydro-electric development Scotland act 1943 which has kick-started large scale renewable energy development in Scotland. A series of events have taken place throughout the year to illustrate the legacy of hydro power generation in Scotland.
- March 2013 Deputy First Minister launched the UK's first Difgen hydro turbine which is capable of producing 600MWh of electricity each year, enough to power up to 150 homes.
- The development of Harlaw Hydro, an Industrial Provident Society, created by Balerno Village Trust for the express purpose of installing and operating a micro-hydro electricity generator at Harlaw Reservoir. A 65Kw turbine will be installed at the base of Harlaw Dam from which. The scheme will generate approximately 260,000 kWh (units) of green electricity per year. This is the first example of its kind in Scotland

CHALLENGES

- Unease of EMR in the renewable energy and investment sector must be addressed – lack of clarity about how the mechanism will work and when it will be introduced.
- Electricity generation from hydro in 2012 was 4,803GWh – down 9.9% on 2011.
- Ensure long term viability for small scale hydro in Scotland, Address key barriers to development, including FIT degression and access to finance.

KEY ACTIONS

- Continue to provide support through CARES loan fund for community hydro projects.
- Continue to promote Scotland as a Hydro Nation with key activities including Hydro Nation forum, Hydro Nation scholars and an Innovation Hub.
- Ministerial summit early in 2014 to discuss key issues affecting the development of small scale hydro.

BIOENERGY AND ENERGY FROM WASTE

RECENT SUCCESSES

- June 3rd 2013 – Consent granted for Grangemouth Biomass Plant and is expected to generate 120MW of renewable electricity and supply power to 120,000 homes.
- Grangemouth plant will also supply local businesses and industry with up to 200MWth of renewable heat thus making a huge contribution to our target of 11% heat demand by 2020.
- Zero Waste Scotland is investing £26 million in 2013 to deliver Zero Waste policies and will have invested £100 million by 2015.
- RWE npower renewables has signed a 20 year Energy Supply Contract with Tullis Russell to supply all of its electricity and steam. It will have an installed capacity of up to 65MW and will be able to supply up to 120 tonnes of industrial steam per hour to Tullis Russell.

CHALLENGES

- Engage local communities, biomass operators, woodfuel suppliers and other stakeholders in forward thinking approach.
- Developing joined strategies between the planning and consents process for biomass and energy from waste.
- Improve awareness of bioenergy and energy from waste in order for developments to continually gain public support.
- Forest management and harvesting in Scotland must comply with the UK forestry standard and associated guidelines. Scottish Government is working with UK government to introduce sustainability criteria for Biomass plants.
- The larger the proposed scale of plant, the more difficult it will be for the developer to utilise heat generated and to source supply locally.

KEY ACTIONS

- Continue to influence UK government strategy on small scale heat.
- Make aware opportunities for renewable heat through biomass and energy from waste in businesses and industry.
- Biomass event in January 2014 to explore how the Scottish Government can help in development of biomass community scale heat projects looking at how best to maximise benefit as well as considering local supply chain opportunities.

COMMUNITY RENEWABLES

RECENT SUCCESSES

- Ahead of schedule for delivering our ambitious target for 500 MW in community and local ownership.
- As at end of June 2012 an estimated 204MW of community and locally owned renewable energy was operating across Scotland which is a 39% increase from the previous year.
- More than 5,000 renewable energy projects in community and local ownership across Scotland.
- Public register for community benefits gaining momentum with nearly 100 individual projects now on the register.
- Our recommended baseline community benefit rate of £5k per MW and encouragement of the opportunity for direct community investment has now been adopted by Scottish Renewables in a new protocol.
- Appointed a new CARES contractor as from 1 August- New contract will provide chance to focus on growth areas of support including encouraging joint ventures between communities and commercial developers and making the most of the huge opportunity for community investment in wind and hydro schemes on the National Forest Estate.
- Funded two feasibility study pilots under CARES to support communities interested in developing marine projects. CARES-funded [guidance](#) for communities published as a result.
- Published [Scottish Government Good Practice Principles for community benefit from onshore renewable energy developments](#) for public consultation.

CHALLENGES

- Need to ensure that progress towards target minimises cumulative effects of wind projects and maximises community benefits at all scales of development.
- Need a balanced debate on public perceptions of renewables.
- Continue to ensure that communities have the necessary advice and support, through CARES, to develop their own projects or get the best from commercial developments.
- Need to ensure coastal communities are ready to grasp the opportunities as the wave and tidal energy sector develops.

KEY ACTIONS

- Community benefit good practice guidance for offshore projects to be developed in 2014.
- Through CARES promote the Good Practice Guidance to a wide range of stakeholders and interested groups, target onshore [technologies](#) with a weaker history of benefits such as hydro, biomass and solar PV, and encourage benefits from all [scales](#) of development, notably single wind turbine developments in rural areas.
- The Scottish Government will participate in the European Commission funded project, WISE Power which aims to develop tools for engagement to improve local awareness and participation in wind farm projects, thereby contributing to Scotland's renewable targets and optimising benefit to communities.
- CARES Conference to take place in March 2014.

MICROGENERATION

RECENT SUCCESSES

Since the launch of the [Microgeneration Strategy for Scotland](#) in June 2012 we have:

- Convened a Microgeneration Task Group which includes representatives from industry, consumer organisations, colleges, government, Scottish Enterprise, and HIE. The group has had 3 meetings with a focus on stimulating interest including new college courses, and industry training opportunities
- Secured additional funding for the Home Renewables Loans (HRL) scheme including a £2m top-up in July 2013 from the Warm Homes Fund to prioritise lower income householders to take up technologies
- The HRL scheme has paid more than 175 loans in 2013-14 with a value of over £1m and a further £2m of loans are currently being processed.

CHALLENGES

- Identifying lower income households with an interest in taking up the technologies

KEY ACTIONS

- To build momentum for microgeneration via industry groups and the microgeneration task group
- The Scottish Energy Installers Alliance (SEIA) has continued to work with MCS to strengthen the links between industry standards and microgeneration standards.

SOLAR PV

RECENT SUCCESSES

- The Feed in Tariff (FIT) has driven rapid growth, with almost 25,000 FIT-registered solar PV installations in Scotland as of end-April 2013:

NUMBER OF INSTALLATIONS REGISTERED FOR FITS - April 2010 - Apr 2013

	Domestic	Commercial	Industrial	Community	TOTAL
Solar PV	24,447	387	13	43	24,890

INSTALLED MW CAPACITY REGISTERED FOR FITS - April 2010 - Apr 2013

Solar PV	80.870	4.829	0.274	0.620	86.593
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- To date solar PV has largely been at a microrenewables scale and has therefore been covered under the micro-renewables Strategy. However there is increasing interest in developing large scale solar PV installations in Scotland.
- Scottish Government mirrored the UK Government's changes to [Renewables Obligation](#) bands and support levels for building mounted and ground mounted solar PV.
- In April 2013 Scotland's first Solar Meadow was opened at Edinburgh College's Midlothian Campus. The £1.2m project has seen over 2,500 solar panels installed on the site. The developer expects the panels to generate around 560,000 kWhrs every year, enough energy to power 170 homes.

CHALLENGES

- Timely & affordable grid access
- Innovation required to reduce costs
- Enabling financial predictability
- Building community and industry confidence

KEY ACTIONS

- Input to UK Government Solar PV Strategy Group that brings together Government across the UK and the private sector to provide a focus for the development of the industry and to address the key challenges above.

RENEWABLE HEAT

RECENT SUCCESSES

- Updated our renewable heat database showing 4.1% of Scotland's heat demand came from renewable sources in 2012.
- Published an outline for a draft heat vision in January 2013. The document includes a statement of ambition for a heat vision for Scotland, and sets out the process for its development. It also provides a heat hierarchy of demand and draft deployment options to encourage best practice
- Funded Fife and Perth & Kinross Councils' heat mapping exercises using the same methodology as that used for The Highland heat map. Seconded a Heat Mapping Programme Manager to develop a Scotland heat map. Produced planning and heat guidance.
- Established an Expert Commission on district heating to promote the benefits and break down barriers to its deployment.
- District Heating Loan Scheme – Last year £1.1m in loans was paid out to six district heating projects through the district heating loan scheme, this year we are offering loans to 10 more projects worth £2.1m which will help provide affordable heat to homes in fuel poverty, leisure facilities, community centres and a school.

CHALLENGES

- Address continuing uncertainty in investment in the renewable heat sector brought on by delays in RHI.
- Break down barriers to delivering a transformational uptake of district heating in Scotland.
- Change approach to map heat by focussing funding where local authorities have limited resources, skills or access to data through a Scotland heat map, Up-skill local authority and other public sector officers to supporting and planning for heat.

KEY ACTIONS

- Develop a Heat Generation Policy Statement that will include a number of scenarios to show how Scotland can deliver our heat vision across domestic, non-domestic and industrial sectors while minimising costs to consumers, ensuring security of supply and maximising the economic opportunities
- Continue to engage with DECC until the full implementation of the RHI to ensure Scottish interests are reflected in the Scheme.
- Address the high capital costs of district heating infrastructure through the District Heating Loan Scheme, Renewable Energy Investment Fund (REIF) and Warm Homes Fund.
- Fast track exemplar district heating projects, linking to the Cities Alliance, Expert Commission on District Heating and REIF.
- Consider how best we can take forward the recommendations from the Expert Commission on District Heating.
- Commission a Scotland heat map and roll out to local authorities through a Scotland wide heat mapping programme.

SUSTAINABLE TRANSPORT

RECENT SUCCESSES

- “Switched On Scotland: A Roadmap to Widespread Adoption of Plug-in Vehicles” was launched on 12th September 2013, and sets out a vision for Scotland’s electric vehicle (EV) future. (<http://www.transportscotland.gov.uk/road/sustainability/low-carbon-vehicles>)
- The Roadmap includes a focus on utilising renewable energy to maximise the carbon reduction benefit of EVs, and the potential to support increased generation from renewable sources. In particular, coordinating the recharging of plug-in vehicles with the fluctuating levels of generation from renewable sources will help to utilise green electricity that may not otherwise be used.
- “ChargePlace Scotland” has been developed and launched on the GreenerScotland website (<http://www.greenerScotland.org/greener-travel/electric-vehicles>) to provide information on how to purchase EVs, their associated benefits as well as a map that details charge point locations.
- As of 30th September 2013, there will be approximately 300 “ChargePlace Scotland” points available to the public across Scotland, and a further 200 in place in non-public locations such as council depots, private workplaces or domestic installations. Work is also underway to provide rapid charge points at 50 mile intervals on Scotland’s primary road network.
- Hydrogen fuel cell EVs are also likely to be an important part of the future low carbon transport. Transport Scotland is now a member of both the EU HyER association (<http://www.hyer.eu/>) and the UKH₂Mobility project (<http://www.ukh2mobility.co.uk/>) ensuring Scotland is well positioned for the commercial roll-out of hydrogen fuel cell electric vehicles.
- The Scottish Government is also a key funding partner in the Aberdeen Hydrogen Project. This will see a fleet of hydrogen powered buses introduced into the city and the development of an integrated ‘whole hydrogen’ system which will produce and store hydrogen to fuel the bus fleet, as well as for generating electricity at times of peak demand.
- Through funding in 2012/13 under the Scottish Green Bus Fund, the Scottish Government has made 3 awards totalling some £1.9 million that will see a further 24 new low carbon emission buses (LCEBs) join the Scottish Fleet.
- The latest round of funding brings the total number of LCEBs purchased under three rounds of the SGBF to date to 94 vehicles with grants totalling £7.7 million awarded.
- A number of refinements to the Bus Service Operators Grant (BSOG) Scheme were made in 2012, for example:
 - alterations to the calculation method from the level of fuel used to distance travelled in order to be more compatible with SG target of reducing greenhouse gas emissions, and
 - the introduction of an enhanced BSOG payment rate for vehicles fuelled by biodiesel for 2012/13.

CHALLENGES

- To create a viable recharging infrastructure across Scotland encouraging increased usage and purchase of EVs. A strategic aim is to promote connectivity in Scotland for EV users and wider connectivity by creating strategic links with England and Northern Ireland.
- Reviewing the challenges and opportunities related to EVs and energy systems and preparing necessary guidance and advice for public and private sector organisations. The strong partnership developed in the production of Switched On Scotland provides an excellent foundation.
- Through promotion of the SGBF, encourage introduction of more low carbon emission buses to stimulate demand for these vehicles to a level whereby manufacturers can deliver economies of scale, reducing production costs to a level economically more attractive to bus operators.

KEY ACTIONS

- Implementation of the range of actions in Switched On Scotland, including working with energy suppliers to encourage the deployment of tariffs and technologies to manage recharging behaviours and maximise the emission reduction benefits across Scotland
- Continued funding for the safe and convenient installation of domestic, workplace and en-route EV charge points.
- Investing £2m in another round of the Scottish Green Bus Fund in 2013/14.
- Continuation of higher payment rates of BSOG for biodiesel fuelled vehicles to encourage more efficient use of fuel.

AGRI-RENEWABLES

UPDATE

- The Agri-renewables Strategy is due to be published early in 2014. It aims to support the uptake of renewable energy generation by agricultural businesses in Scotland.
- It demonstrates how Scottish Government, working in collaboration with industry and other stakeholders, will continue to support development to achieve a sustainable and viable market for agri-renewables to help us deliver the transition to a low carbon economy.
- The strategy sets out the successes to date as well as the key actions we are taking to address barriers which could constrain the uptake of on-farm renewables.

The objectives of the Agri-renewables Strategy are:

- to promote community involvement, community benefits and the advantages of partnership working;
- to ensure that the development of farm scale renewable energy installations minimises the impact on Scotland's environment and landscapes and respects residential amenity;
- to raise awareness of the opportunities provided by the full range of renewable technologies;
- to strengthen links between renewable energy generation and uptake of energy efficiency measures on farm; and
- to demonstrate the range of advice, information and support that is available to agri-businesses in considering their energy needs.

4. Supporting and Emerging Technologies

Introduction

4.1 This section refers to some of the emerging and existing technologies and methodologies which can support the deployment of renewable energy and enable the transition to a low carbon Scotland.

Energy Storage

4.2 With the increased deployment of renewables and increased demand for electricity for heat and transport, energy storage technologies could play an important role – alongside grid upgrades and demand side measures - in balancing electricity generation and demand and enabling the capture of increasing quantities of waste heat. A wide range of technologies, at varying stages of development, and applicable at various scales offer options for storage, including pumped hydro, hydrogen, batteries and compressed or liquid air.

4.3 Energy systems balancing is also likely to play an enabling role which supports the effective integration of renewable energy. This makes use of technology opportunities to bridge between different energy systems, for instance with 'grid-to-gas' using electrolyzers to convert electrical power into gas energy for distribution via the gas networks.

4.4 Energy storage technologies will also have an increasingly important part to play in the development of community renewable energy projects, supporting the ambition to develop 500MW of community owned renewables by 2020. The use of technologies for the storage of heat at medium to large scale will be a key enabler in helping to balance energy inputs with energy demand profiles, alongside the use of alternative clean energy vectors such as hydrogen which can support the growth of mobility applications for local users.

4.5 Through Scottish Government funding under the CARES programme, a number of innovative community led energy storage projects are already underway in Scotland. Examples include the use of electric vehicles for helping manage network constraints in Orkney, and the use of electric thermal storage heaters coupled to local generation to provide an affordable and low carbon alternative to fuel oil. As well as providing a lower cost alternative to traditional network reinforcement, this can directly reduce the high level of fuel poverty in off gas grid communities.

4.6 The pioneering community of Gigha, one of the first community land buy outs and the first community owned wind farm in Scotland, have also been successful in a DECC funded energy storage competition which will see a 1.2MWh Vanadium Redox Flow Battery (VRFB) installed on the island in 2015. This will increase the level of generation possible without wider network investment, and create an opportunity for the island network to be operated independently of the grid in the event of a black out.

4.7 The Scottish Government has commissioned ClimateXChange to conduct a literature review and summary of recent papers on the subject of energy storage. This will provide a helpful platform upon which we will – with the aid of expert stakeholders – develop our strategy as well as practical and deliverable policy options over the coming year. This will help determine if further updates are required to our online renewable planning advice for energy storage.

Hydrogen and Fuel Cells

4.8 Hydrogen is a highly versatile energy carrier with a wide range of applications, including energy storage and conversion, systems balancing, sustainable chemicals manufacture and sustainable transport. Hydrogen can enable Scotland to capture the full benefits of its enormous renewable energy potential and deliver significant economic benefits.

4.9 Hydrogen and fuel cell technologies can also support the development of community renewable energy projects, as seen in the trailblazing 'Project for Unst Renewable Energy'. The

[PURE](#) project combined wind power with electrolysis to produce hydrogen and the use of hydrogen in storage, back-up power, and also low carbon transport.

4.10 This combination of technologies can also support the development of community renewable energy projects, bringing multiple benefits from the use of hydrogen as a flexible clean energy vector, in particular for locations with limited access to grid. This approach is currently at feasibility stage for a number of Orkney communities looking to make best use of constrained wind energy and create an on-island, low carbon fuel source for local transport and heating needs. Once demonstrated there is scope for scaling up further in other grid constrained areas across Scotland, integrating with low carbon ferry services and the Scottish independent gas grids.

4.11 The [Scottish Hydrogen and Fuel Cell Association](#) (SHFCA) promotes and develops Scottish expertise in fuel cell and hydrogen technologies. It brings together Scotland's specialised fuel cell companies, academic institutions, power generation companies, R&D bodies, energy consultants, and local authorities. With over 70 member organisations it is the most active hydrogen and fuel cell association in Europe.

4.12 Edinburgh-based [Logan Energy Ltd](#) has successfully installed the UK's largest fuel cell system at Quadrant 3, the landmark Regent Street redevelopment project in central London.

4.13 The [Aberdeen Hydrogen Project](#) will see the arrival of the first buses in early 2014 in what will be Europe's largest deployment of hydrogen fuel cell buses. The project is part of wider ambitions to create a successful hydrogen economy in Aberdeen, including the development of a hydrogen strategy and the Hydrogen Transport Economy (HyTrEc) project, which supports the validation, promotion, and adoption of hydrogen as an alternative energy vector across the North Sea region.

4.14 Scottish Enterprise is working closely with CMAL and other partners on the development of world leading zero emission ferries, powered by hydrogen fuel cells. A consortium has been formed to carry out the detailed design work on the zero emission ferry. The design of the ferry and its hybrid systems, incorporating hydrogen fuel cells, is expected to be carried out over the next 18 months. In the meantime, the first battery powered hybrid, diesel-electric ferry, which is expected to reduce pollution and emissions by at least 20%, is currently undergoing sea trials and will shortly enter service on the Skye to Rassay route.

4.15 The [Hydrogen Office](#) in Methil continues to educate and inspire young people in Fife and across Scotland on the use of and opportunities from fuel cells and hydrogen; running an extensive range of workshops for primary and secondary schools, and hosting events like the 2013 Hydrogen Challenge. The Hydrogen Office has also hosted numerous visits from colleges, universities, businesses, and the general public over the past year.

4.16 Earlier this year the [Scottish Cities Alliance](#) commissioned Element Energy to provide a study which sets out the economic and environmental opportunities from hydrogen. The final report has recently been submitted to the SCA members and provides a strong rationale for a coordinated approach to the development of hydrogen projects in Scotland.

Geothermal

4.17 We published a study into the Potential for Deep Geothermal Energy in Scotland on 13 November 2013. The study was carried out by Aecom for the Scottish Government. Links to each of the volumes attached below.

- Study into the Potential for Geothermal Energy in Scotland: Volume 1
<http://www.scotland.gov.uk/Publications/2013/11/2800>
- Study into the Potential for Geothermal Energy in Scotland: Volume 2
<http://www.scotland.gov.uk/Publications/2013/11/6383>

4.18 The results of this desk based study highlight that there may be significant potential for deep geothermal energy in Scotland to provide a renewable source of heat – particularly in utilising the

thermal reservoirs in flooded abandoned mineworkings across the Midland Valley. This is very welcome news, showing that Scotland's renewable energy potential could be even greater than we imagined.

4.19 We recognise that further work needs to be done to fully understand the geothermal resource we have in Scotland, as well to clarify the legislative framework designed for purposes other than deep geothermal heat – learning from experience in Europe and further afield. A number of recommendations have been provided in the report that may assist in offering the necessary certainty to exploit our geothermal potential, and the Scottish Government will consider these recommendations carefully.

4.20 We would like to see geothermal energy play a significant role in our energy future. Over the next 18 months we will work with academics, engineers and industry in order to understand more about our geothermal resource in Scotland, and use this learning to help understand the development pathway of a geothermal industry in Scotland. The Scottish Government will work with this industry to ensure it is aligned with our aims on decarbonising heat and electricity supply at an affordable cost to consumers yet achieving the greatest possible economic benefit and competitive advantage for Scotland, including opportunities for community ownership and community benefits. Our vision for geothermal energy will develop as we work with these stakeholders.

4.21 In addition, the British Geological Society has been working with Glasgow City Council to look at the extensive abandoned mineworkings in the city. Further information is available at the following link: <http://www.bgs.ac.uk/research/energy/geothermal/heatEnergyGlasgow.html>

5. EQUALITIES MONITORING UPDATE

It is recognised that women are under-represented in the renewables sector. The Scottish Government believes that this growing sector should reflect, and benefit from, the diversity of our population. This will allow the sector to grow in a way that embraces equal opportunities, allowing the talents and skills of women, and minority groups, to be fully realised.

Last year, the update to the Renewables Routemap included a section on equalities issues, with some preliminary findings from a small survey of selected developers, and a commitment to monitor progress on equalities issues, including occupational segregation, in future Routemap updates.

This year, an equalities monitoring programme has been established through ClimateXChange (CXC), the independent consortium of academic institutions set up to support the Scottish Government on issues related to climate change. CXC has used a voluntary disclosure method whereby respondents are invited to complete those parts of the survey where they have data and where they are comfortable supplying it. This will be repeated annually as a standardised procedure in order to build up a picture on trends.

A link to the full CXC report, **Voluntary Disclosure on Gender and other Equality and Diversity Issues in the Scottish Renewables Industry**, is here: <http://www.climatexchange.org.uk/index.php/?CID=262>

The survey covered 4 areas of disclosure:

- Representation by gender
- Maternity and paternity
- Flexible working
- Other equality and diversity issues

The survey was distributed by Scottish Renewables to their 348 members, Close the Gap to 373 of their members through the WiRES network and also by Energy Action Scotland during September 2013.

47 organisations chose to make a return, representing 3675 employees – or a third of the 11,000 posts attributed to the sector by Scottish Renewables. The returns covered a good range of scales of organisation – from small to large – as below:

Size of Organisation	No. of organisations	No. of employees
Small (<50 employees)	34	438
Medium (50 to <250 employees)	10	1570
Large (250+ employees)	3	1667
ALL Organisations	47	3675

Those bodies taking part also represent a wide range of specialisms – from consultants, developers and engineers to academics and legal advisers. All the renewables technologies are covered.

The main finding of the survey is that women make up over a quarter (28%) of the workforce, broken down as follows:

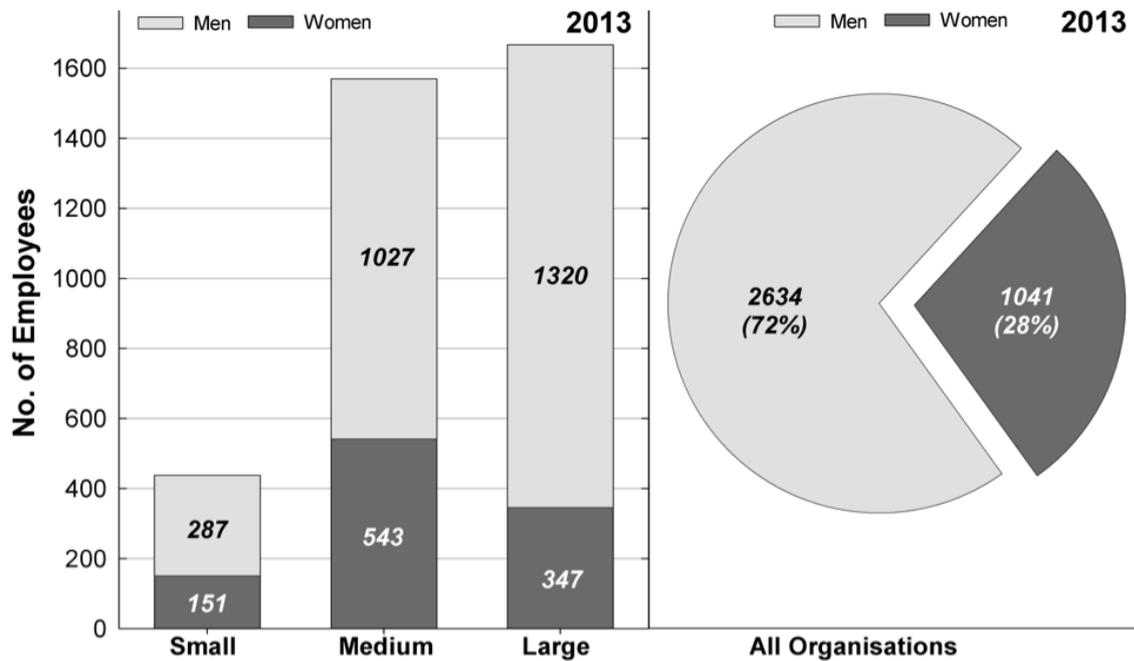


Figure 1: The number of women employees within the workforce (all disclosing organisations)

Within the voluntary disclosure process, there were insufficient returns specifically on occupational category or pay to be able to draw any firm conclusions about the jobs women do or their career progression within participating companies, but there was good evidence that enhanced (pay and/or leave) maternity and paternity schemes are available to about half of the workforce represented.

There is evidence that part-time or flexible working is being offered in most cases. Of those working part-time, 69% are women.

On other equality and diversity issues, most organisations (40 representing 2433 employees) provided information on Dignity at Work policies, and, of these, the majority representing 97.9% of employees confirmed they have formal policies including both Equality and Harassment/Bullying. Too few returns were submitted on monitoring of equalities data and other equalities activities in order to be able to draw conclusions about those areas.

Overall the survey is an excellent start to the monitoring process which the Scottish Government hopes will become routine for the sector. It is difficult to make any meaningful comparisons with the returns from last year's initial survey, since this was limited to 3 companies (albeit representing over 600 employees), and the structure of last year's survey was not as comprehensive. This year's return does however provide a statistically significant baseline against which performance can now be assessed in subsequent years.