INTRODUCTION

Scottish Enterprise (SE) welcomes the invitation to contribute to this important and timely inquiry. In our response we have concentrated on those questions we are best placed to answer.

Renewable energy will play an essential role in supporting Scotland’s transition to a low carbon economy and presents significant opportunities for the Scottish economy, creating a new industry founded on our natural resources and serving both domestic and global markets.

The Low Carbon Economic Strategy for Scotland\(^1\) states that the low carbon environmental goods and services sector (including renewable energy) is forecast to grow at 5.3% per year from £3 to £4.3 trillion, 2008-2014, with the Scottish market growing from £8.5bn to £12.5bn, 2007-15.

Renewable energy will play a critical role in supporting Scotland’s transition to a low carbon economy, within the broader context of taking bold and early action to address the global issue of climate change.

This is a transformational opportunity for Scotland and, through a swift response by the public and private sector working together to adapt to climate change and exploit the emerging global low carbon market opportunities, we will put the economy on a more prosperous, resilient and sustainable footing.

The ambition, as articulated in Government Economic Strategy\(^2\), is for a Scotland that is economically prosperous, environmentally sustainable, and resilient in the face of climate change and energy security.

RENEWABLE ENERGY OF STRATEGIC IMPORTANCE

The analysis\(^3\) that underpins the 2020 Renewables Routemap estimates the potential benefits of the offshore wind sector:

- Up to £1.3 billion in GVA in 2020 and £7.1 billion in total this decade, with an additional £6 billion of GVA from wider supply chain and employee spending.
- The potential to create 28,000 full-time equivalent jobs in the sector, supporting an additional 20,000 jobs in the wider Scottish economy by 2020.

These projections are based on decisive action being taken to deliver 6 GW of installed capacity by the same date. The routemap also aspires to the installation of 1GW from marine sources by 2020, which could create up to £5,300 direct jobs and £4 billion of GVA this decade.

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\(^1\) Low Carbon Government Economic Strategy, 2011, Scottish Government

\(^2\) Government Economic Strategy (2011)

\(^3\) Scottish Offshore Wind: Creating an Industry, IPA Energy and Water for Scottish Renewables, 2010
The lasting economic benefits resulting from this concerted action has the potential to benefit people and businesses across Scotland. The building of a new industry based on the manufacture, assembly, deployment, operation, maintenance, research, development, and design of offshore renewables projects will benefit communities throughout Scotland, e.g. Methil in Fife, where regeneration of ports and harbours will breathe new life into communities with unrealised potential and provide new infrastructure for generations to come.

The immediate effects of this long-term work are already starting to be felt, with investment in Scotland, by both domestic and international sources, in the last year by Samsung Heavy Industries, Gamesa, Mitsubishi Heavy Industries, NGenTec, and Steel Engineering to name but a few.

SCOTTISH ENTERPRISE’S ROLE

Renewables and the low carbon transition are two of the key priorities in SE’s 2011-14 Business Plan and this has been reflected in a significant allocation of both financial and people resource, working closely with the industry and developing projects. SE is firmly committed to making a strong and active contribution to the delivery of the 2020 targets and helping the Scottish economy take full advantage of the wider low carbon opportunities within the global context. The new Business Plan (2012-15) will mean investment into renewables of up to £120m over the next 3 years, building on a significant increase and focus in the last few years. See the Annex for a summary of the support provided to the sector.

SE supports all of Scotland's growth sectors and companies to respond positively to the opportunities and challenges of the low carbon transition, including support across a wide range of renewables technologies. Whilst all of the sub-sectors that make up the renewable energy sector are growing, offshore renewables – marine wave, tidal and wind - have the greatest potential for economic impact and supporting these is our principal focus at present. We understand that the balance and mix of support for other renewables technologies will change over time and we will continue to monitor this and adapt our activities accordingly. We continue to support renewables technologies such as biofuels, small scale biomass and hydrogen fuel cells, largely through our innovation and Research and Development (R&D) programmes where appropriate. This is, of course, in addition to our focus on low carbon technologies which supports both renewable technologies and energy demand reduction. Scotland has the potential to reap major economic benefits through the development of new low carbon energy resources such as Carbon Capture and Storage (CCS), offshore renewables, smart grids, offshore grids and interconnection to markets outside Scotland.

Without intensive collaboration across all parts of the public and private sectors across all areas – from the development of the National Renewables Infrastructure Plan (NRIP) through to the development of a strong supply chain, impact will be limited. SE’s work in this sector is characterised by strong collaboration.

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4 Support is given to companies across the range of technologies provided that they meet the growth ambition criteria required. All companies are able to access SE’s wide range of products and services. Support has also been given to demonstration projects such as the Hydrogen Office, the Energy Park in Fife, which will support a range of energy technologies etc.
TARGETS

Are the 2020 renewables targets (for electricity and heat) achievable? If not, why not?

The Scottish Government has outlined a set of challenging and ambitious targets for renewables by 2020. SE recognises the interdependence of the energy and climate change targets and that achieving these targets will require significant support from public, private and academic partners. Only by addressing the supply of renewable energy, demand reduction and resource efficiency, the development of associated Emerging Low Carbon Technologies (ECT), and behaviour change by individuals and organisations, simultaneously, and in a concerted way, will the 2020 renewables targets be achieved.

The targets are not solely an end in themselves but also serve as progress milestones towards the creation of a Scottish low carbon economy and a tangible expression of Scotland’s determination to deliver on this agenda. They represent a call to action and this, together with united action on the Renewables Routemap, is widely regarded, nationally and internationally, as sending a clear message to industry that Scotland means business. The strategic importance placed by the Scottish Government on the low carbon transition, and the importance of renewable energy within this, help foster confidence by firms, investors and the general public.

The targets give a strong focus to the industry and the clear signal of the determination of the Scottish Government to support the sector – this is good for confidence and investment. The targets not only provide Scotland with a distinct presence and visibility in the global renewables market but also create the opportunity to create new economic value from maximising the opportunities afforded by excess capacity e.g. energy storage or the development of additional energy export markets.

The targets are, as mentioned above, strongly interrelated and they must be viewed as a collective rather than in isolation. For example, the renewable energy, heat and transport targets are together designed to ensure that Scotland's overall share of renewable energy will be at least 30% by 2020. In addition, achieving reductions in energy consumption will directly make it easier to achieve the other targets.

The potential contribution of offshore wind to the targets is enormous. The recent Offshore Valuation Study\(^5\) estimated that Scotland has 40% of the total UK offshore wind potential alone. Adding Scotland’s wave and tidal potential, and harnessing a third of this off Scotland’s coast by 2050, would result in installed offshore capacity of up to 68 GW – enough to power Scotland 7 times over.

Scotland has the largest offshore renewable energy resources in the EU (25% of EU offshore wind, 25% of tidal and 10% of EU wave power). With 10GW of offshore wind and 1.6GW of wave and tidal projects currently planned, Scotland has the potential to make a major contribution to Scottish, UK and overall EU renewables targets and, together with other low carbon technologies, the potential to more than meet the 2020 targets. Maximising this potential will require a continued unified effort across the public and private sectors.

\(^5\) Offshore Wind Valuation Study - what is the value of the UK Offshore Energy Resource?
The Scottish Government has also recognised the need for a balanced energy mix to overcome any potential intermittency of supply and there is a strong focus on new and upgraded efficient thermal capacity, progressively fitted with Carbon Capture and Storage (CCS) technology, a technology in which Scotland has an opportunity to become a world leader.

Scottish Government estimates that the 100% target will require around 14-16GW of capacity, whereas there is currently potentially up to 30 GW of renewable capacity in various stages of project planning – so it is important that we focus on the delivery of this capacity.

**What contribution will achievement of the 2020 Renewables targets make to meeting Scotland’s CO₂ emissions targets (a reduction of 42% by 2020 and an 80% reduction target for 2050)?**

Achieving the 2020 targets on renewable heat, transport and reduction in energy consumption will make a significant contribution to meeting Scotland’s 42% emissions reduction target. The relationship between the targets is outlined in further detail in the Report on Policies and Programmes (2.11 - 2.14). On the electricity generation targets, the establishment of renewables capacity is essential to ensure Scotland is on the right trajectory to meet the 2030 and 2050 targets.

**Will increase in demand from electric heat and transport be offset by efficiencies elsewhere?**

Demand for electricity is likely to increase so a focus on developing the renewables sector must go hand in hand with energy efficiency measures. SE has a strong focus on working with businesses to improve resource efficiency (energy, water, waste materials) to reduce cost and CO₂ emissions, and is working to deliver economic opportunity and efficiency solutions across the emerging clean technology sector.

**Has the Scottish Government made any estimation of overall costs of achieving the targets, and identified which parties will bear them?**

The costs of building the generating capacity required to meet the targets will primarily be met by the private sector. However, the consensus view from industry, as highlighted by the Royal Society of Edinburgh, is that subsidies are needed to support early stage deployment of parts of the renewable energy industry as the economic benefits are not yet obvious or sufficiently certain in the short term.

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7 RSE Committee, Facing up to Climate Change (2011).
CHALLENGES AND OPPORTUNITIES

(a) Technology

Is the technology to meet these targets available and affordable? If not, what needs to be done?

The Renewables Routemap describes 7 inter-linked challenges\(^8\), one of which is the need to drive down costs through ongoing innovation of technologies and practices. Like all new industries there are early stage technology challenges to be overcome. Scotland has the benefit of a strong and mature Oil and Gas sector which has unparalleled experience of working in challenging subsea environments. Scotland is also at the forefront of marine technology; the challenge now being about testing and scaling up.

Reducing costs is essential to reduce development risk and to make offshore wind projects commercially viable. The Renewables Routemap sets out the requirement to reduce the costs of offshore wind by 30%, based on a need to offset expected future reductions in revenue as UK Government support is scaled back in 2015, rising material costs, and the cost of deploying structures in deeper waters. Currently, the costs of offshore wind are higher than more mature energy sectors and we are helping to reduce these by filling gaps in the supply chain, through innovation, and through wider supply chain development.

In contributing to delivery of the Offshore Wind Route Map, SE is supporting investment in innovation and Research and Development in Offshore Wind in Scotland in order to drive technology development and reduce project development costs by at least 30%. We will achieve this through ensuring clarity of innovation priorities and by providing highly competitive support packages to accelerate innovation in these areas by 2012. We have undertaken analysis to identify key opportunities to achieve this cost reduction and have shared this with partners and the business community (see Annex – table 2). The outcomes from this research will form the basis of a shared set of priorities with industry for R&D. The research has also been shared with the DECC Cost-Cutting taskforce which is currently focused on reducing the costs of offshore wind.

We have developed a £35m fund\(^9\), open to Offshore Wind turbine manufacturers, which is expected to leverage a further £90 million from industry and contribute to cost reduction.

The Oil and Gas sector has considerable transferable experience and capabilities that can benefit offshore renewables. Scotland’s oil and gas industry has some of the best design, fabrication and installation capabilities in the world, and these offer significant benefits, especially in relation to the challenges associated with deployment of offshore wind turbines in deeper water. Research on the oil and gas sectors’ potential contribution to the development of the offshore wind sector suggests that the skills and experience of that sector could help reduce the costs of

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\(^8\) Investment in infrastructure, development of globally competitive supply chain, ongoing innovation to drive down costs, planning and consents, regulation and access to grid, skills and access to investment.

\(^9\) Prototyping for Offshore Wind Energy Renewables Scotland (POWERS) - Designed to pump prime private sector investment into Scotland’s key ports and harbours and into manufacturing, test and demonstration
offshore wind by 20%. An action plan has been agreed and an offshore wind guide for oil and gas was launched at last year’s Scottish Low Carbon Investment Conference\textsuperscript{10}.

**Are electricity generating or heat producing technologies compatible with the need for security of energy supplies?**

Additional electricity and heat producing technologies all offset our existing reliance on current installed generating capacity. The development of Smart Grids and Supergrids should help to smooth potential issues associated with intermittency of supply, through technology in the first instance and then by linking to new markets in the longer-term. The cost of renewables is reducing year on year and, as such, in the future renewables will be a more competitive energy generation source.

**Are our universities and research institutes fully geared up to the need for technological development, innovation and commercialisation?**

Scotland has real strengths across many renewable technologies. The Energy Technology Partnership (ETP) is an alliance of Scottish Universities engaged in world class energy related Research, Development and Demonstration (RD&D). It is Europe’s largest power and energy research partnership and promotes greater levels of collaboration between universities and industry to deliver energy RD&D capability across a spectrum of energy technologies and also links to the rest of the UK and beyond through such programmes as Supergen.

The International Technology and Renewable Energy Zone in Glasgow is helping position Scotland as the centre for R&D for renewables in Europe. ITREZ is creating a community of industry and academia, working together on common challenges and future technologies. Scotland has also recently benefited from the Technology Strategy Board’s announcement that the Offshore Renewable Energy Catapult Centre will be headquartered in Glasgow. A UK wide collaboration, the Catapult will bring together innovative companies with key research institutions, to support the development of pioneering low carbon technologies, at all stages from development to deployment, securing significant economic and environmental benefits.

**(b) Supply Chain and Infrastructure**

**Is the supply chain in place to meet the targets?**

SE and partners are working to create a strong renewables supply chain to ensure short, medium and long term benefits to the Scottish economy. This requires intensive and ongoing engagement across all tiers of the industry. We are focused on developing an understanding of the strengths and weaknesses of the existing and potential Scottish supply chain and working with industry to raise awareness of the nature, scale and timing of opportunities and support companies to access these through customised support programmes.

A key element of the supply chain development plan is the effort to secure investment from major turbine manufacturers and cable manufacturers by Scottish Development International (SDI) focused on filling key gaps in the supply chain. With two of the UK's largest wind farm developers in Scotland (Scottish and Southern Energy (SSE) & Scottish Power (SP)) and the successful attraction of R&D investment from turbine manufacturers Gamesa and MHI the potential opportunities are significant. However, there are also significant new investments in renewable capacity in other European countries and while we are confident of securing supply chain opportunities in Scotland we are also ensuring Scottish companies are supported to develop new and existing supply chains outwith Scotland. This activity will become increasingly precise as procurement opportunities are developed and understood by the market. Significant opportunities have already been identified through this work.

It is important to note that many renewable energy technologies rely upon materials which present issues of supply chain security. The Environmental and Clean Technology partnership\(^1\), in collaboration with Zero Waste Scotland, led a research project\(^2\) to identify raw materials critical to the Scottish Economy. The report identified a number of specific risks in relation to the renewable energy sectors. In addition to rare earth elements the identified risks include more common metals such as copper, identified as a risk due to growing global demand – China currently uses 40% of world output of copper and it is estimated that this could rise to 100% of current output by 2018.

**What further improvements are needed to the grid infrastructure or heat supply networks both at national and a local level?** Additionally, are we confident that the necessary infrastructure can be developed and financed so that Scotland can export any excess electricity generated to the rest of the UK and/or the EU? **What is the role for the Scottish Government here?**

The announcement of an £7 billion investment in the grid along with the North Sea proposal is to be welcomed and will go a long way to help provide the kind of grid we need. For electricity the network needs to be able to support integration of the renewables at the target the Scottish Government has set. This will require a mix of traditional upgrade and reinforcement, and smart grid development.

SE has been addressing the role of Smart Grids as a way of reinforcing/improving the capacity of the grid and is currently working with a group which includes SSE and SP, amongst others, to develop a strategy for Smart Grids.

We are also involved (along with University of Strathclyde, Scottish Power and SSE) in the Power Network Demonstration Centre (PNDC), creating a world class facility to support the development/validation of future electrical power distribution technologies. It will play a central role in accelerating the deployment of emerging technologies by demonstrating their functionality within a realistic, controllable grid environment. These will be essential to support the maintenance of aging networks and the evolution towards more distributed electricity generation.

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11 SEPA, SE, Highlands and Islands Enterprise, and the Scottish Government
12 "**Raw Materials Critical to the Scottish Economy**" (2011) AEA for SNIFFER
SE is in favour of equalising transmission charging in order to grow Scotland’s renewable generation base. Ofgem will shortly conclude their consultation on Project Transmit, looking into changing transmission charging. Currently the system is such that generators further away from electricity demand pay to be connected and transmit their electricity, while generators close to demand centres are paid to connect. Project Transmit is looking into reducing this disadvantage.

(c) Planning and Consents

Is the planning system adequately resourced and fit for purpose?

Planning consents are the key to building confidence in the industry. They are a value creating milestone and so the pace of consenting will have a direct impact on delivery of the investment to build the industry and meet targets. Marine Scotland has worked to simplify and streamline planning processes and the regime is viewed as an exemplar elsewhere in the world.

How can national priorities be reconciled with local interests?

The National Renewables Infrastructure Plan (NRIP) is a good example of a single framework to reconcile national and local interests.

NRIP is a national spatial framework developed with the explicit intention to channel investment into those areas that offer the greatest opportunity for economic benefit. Our investment in areas such as Fife Energy Park and Methil, along with Fife Council, is providing access to new economic opportunities in areas with unrealised potential, creating new employment opportunities. The work that we are doing to implement this is part of a programme approach which aims to maximise the economic impact of offshore renewables for Scotland as a whole. We are also working with Marine Scotland to look at how we can maximise the local content of development in Scotland through our supply chain work.

(d) Access to finance

Will sufficient funds be available to allow investment in both the installation and the development of relevant technologies? What can the Scottish Government do to influence this?

There is an asymmetry between; the needs of companies for massive injections of funding; projects that require billions of investment and; the supply of finance. The only way to build an offshore renewables industry is to close this gap. The ramping up of activity between now and 2020 is the biggest challenge of all. SE’s role, together with the SG, is to bring together industry and the financial sector across Scotland and to work with colleagues in SDI to bring in key investments to support the industry. A major issue is the level of risk and understanding of technology. This is a new industry emerging around a set of new technologies and market drivers. In that context, a supporting financial infrastructure has to be developed alongside and in parallel with the industry.
According to a 20:20 thought piece\textsuperscript{13} for the Scottish Low Carbon Investment Conference (SLCIC) the key challenge is that significant capital requirement is needed in a relatively short space of time and in the absence of significant debt financing, new sources of capital will have to be found. Indeed, the size of such essential investment dictates that large-scale private sector finance will be required.

The main challenges currently facing wave and tidal generation relate to proving early stage technology and planning consents to develop the infrastructure. It is recognised that the large-scale private sector investment required to realise the commercial success of the Scottish marine energy sector in the medium to long-term will be levered by continuing to pursue de-risking activities such as the deployment and operation of pre-commercial arrays. Widespread capital funding of arrays is largely outwith the scope of the UK public sector at present but public funding does have a strong role to play in enabling key technological improvements relating to cost reduction, reliability and operability. The recently announced Marine Energy: Supporting Array Technologies\textsuperscript{14} programme is a good example of how that public sector support can be focused.

Through the Scottish Low Carbon Investment Project, and associated SLCIC, we are bringing together the industry, nationally and internationally, to consider and find new ways to bring the required investment to the sector. Most recently, the Finance into Renewables event, organised by the SG and SE, brought together banks, investment organisations, companies and intermediaries to look for solutions in this area.

A number of activities are underway which will help provide additional support to the sector and lever in private capital, for example the support for marine technology development through the WATERS 1 and WATERS 2\textsuperscript{15} Programme.

The Scottish Investment Bank (SIB)\textsuperscript{16} has played a key role in supporting, in particular, marine technology and helping to broker investment from other sources. SE and others are currently looking at how to maximise the impact of the Fossil Fuel Levy funds recently released to the SG. The Green Investment Bank will be a key source of financial support for offshore renewables, as will the Green Deal.

\textbf{(e) Skills and workforce development}

\textbf{Will Scotland have sufficient home grown skills to attract inward investment? Are current policies producing the desired move towards Science Technology Engineering and Maths subjects at schools and universities? Is the skills transfer from oil and gas being realised?}

The Strategic Forum partners\textsuperscript{17} are coordinating a shared evidence base of low carbon market opportunities and their likely skills implications. SE is leading this work.

\textsuperscript{13} http://www.slciconference.com/thought-leadership/susan-rice/

\textsuperscript{14} http://www.innovateuk.org/content/news/marine-energy-supporting-array-technologies-.ashx

\textsuperscript{15} WATERS 1 and 2 - The Wave and Tidal Energy: Research, Development and Demonstration Support fund has supported the testing of new wave and tidal prototypes in the seas around Scotland.

\textsuperscript{16} http://www.scottish-enterprise.com/fund-your-business/scottish-investment-bank.aspx

\textsuperscript{17} Scottish Enterprise (SE), Highlands and Islands Enterprise (HIE), Scottish Government (SG), Skills Development Scotland (SDS), and the Scottish Funding Council (SFC).
We are working closely with SDS, the Energy Technology Partnership and the Energy Skills Partnership to ensure that we develop a clear and joined up approach to skills delivery, with SDS in the lead. The SFC is working with SDS to develop programmes of funding for the industry and in guiding the College Energy Partnership. SE’s overall responsibility is to work with the businesses in the sector, identify companies with skills issues, provide information on skills support to companies, and help support companies with appropriate partnership working with the key agencies. We are working with SDS and account managed companies on training academies, such as TRESTA\(^1\) and Doosan Babcock’s Welding Training Centre, and are seeking to work across the industry to join up training provision. We are also working on an engineering excellence project which will support a range of sectors. SE and SDS, and other partners, have held offshore renewable skills events to provide industry with information on progress the public sector is making in this area and to find out from industry what the key challenges are for skills in the sector. These challenges have included: transitional training, graduate work-readiness, and sector attractiveness.

\(f\) Energy Market Reform and the subsidy regime

Are the reforms of the energy markets and subsidy regimes at both UK and EU level sufficient to meet the challenge of the Scottish Government’s Renewables Targets?

An overwhelming message from the 2011 Scottish Low Carbon Investment Conference is the need for clarity of the subsidy regime. This is of paramount importance to the development of the industry. The role of the ERM and the subsidy regime in encouraging and supporting the development and deployment of technologies alongside a broader range of measures, including grants and investment support, is of critical importance to the growth of the sector. This view is also reflected in the UK’s Energy and Climate Change Report\(^1\) which has just been published.

SE recently responded to the RO Banding review\(^2\) and is of the view that it is important in continuing to build on the reputation Scotland has already gained as a location for the development and deployment of innovative new technology that support is available recognising the risks and investment levels required to achieve this. Alongside R&D, prototype and commercialisation support, we feel it is of value that the Scottish Government considers retaining some flexibility within the ROC banding regime to encourage and support these developments. This could include, for example, experimental offshore wind turbine technologies and installations on the basis that innovation will play a large part in overall cost reduction, yet the need to take turbines offline during the prototype phase reduces the available capacity of an installed prototype during testing and certification.

\(1\) The Renewable Energy Steel Trades Academy
\(1\) Energy and Climate Change Committee, the Future of Marine Renewables (Feb 2012)
\(2\) SE’s response to the Renewables Obligation Banding Review 2011
Scottish Enterprise summary for renewable energy and low carbon business opportunities:

- **Port infrastructure** – National Renewable Infrastructure Plan/ National Renewable Infrastructure Fund, Test and Demonstration, European Offshore Wind Demonstration Centre.
- **Supply chain** – Expert help, Scottish Manufacturing Advisory Service (SMAS), Export development, Operations and Maintenance Events. Company Growth Support, Supply Chain Database.
- **Innovation** – Research and Development, Foresighting, Scottish Energy Lab, International Technology and Renewables Enterprise Zone (ITREZ), Power Networks Demonstration Centre, AFRC, Prototype Offshore Wind Energy Renewables (POWERS).
- **Investment** – Scottish Low Carbon Investment Project and Conference, Scottish Investment Bank, Green Investment Bank, Fossil Fuel Levy, WATERS 1 and 2 and UK Catapult Centre.

PRIORITISED PROJECTS FROM INNOVATION STUDY

Potential for innovation to cut cost of energy of offshore wind

- 44 innovation opportunities identified by recent SE Foresighting work
- Covered all aspects of a project but largest number of these were associated with wind turbine
- Best case scenario with max gains 48% Cost of Energy cut
- In longer term if all innovations were successful could see significant reductions in cost of energy
- Some innovation could have knock on benefits for other renewables