Scottish Enterprise

29 September 2017

Dear Sir / Madam

Royal Society of Edinburgh Inquiry into Scotland's Energy Future

Scottish Enterprise (SE) welcomes the opportunity to respond to the Royal Society of Edinburgh's inquiry into the future of energy in Scotland, which is a subject of profound importance to the Scottish economy. Affordable, reliable supplies of energy underpin the growth of any modern, industrialised economy, so as Scotland seeks to reshape its energy system in line with its international climate change commitments, it will be important to do so in a manner that minimises adverse economic impacts from the disruptive forces of change, while also maximising the economic value from the resultant investment in new energy technologies and infrastructure. In responding to the inquiry we have concentrated on the areas for which we have responsibilities and expertise as Scotland's main economic development agency and a non-departmental public body of the Scottish Government.

Yours faithfully

Seonaid Vass
Head of Energy, Renewables

1. What are the most significant challenges to, and influences on, the energy landscape that any future energy strategy needs to take into account?

Amongst the most significant challenges to the development of Scotland's future energy landscape are the challenges associated with the decarbonising of Scottish heat and transport systems. While Scotland has already made significant progress decarbonising its electricity system, generating the equivalent of 59.4% of its electricity demand from renewables in 2015, progress on heat and transport has been far slower, with just 5.3% of the nation's heat requirements and 3.2% of road transport fuels provided by renewable sources in the same period.

The transition to a Scottish energy system where 50% of the nation's energy requirements are met from renewable sources — as proposed by 2030 within the *Scottish Energy Strategy* — will require rapid and widespread adoption of new forms of heating and transport across Scottish society. Unlike the recent decarbonisation of the Scottish electricity network, which has been achieved through a combination of government policy, legislation and investment within the energy industry, the transformation of heating and transport depends on consumers making a conscious choice to invest in new products and services. Achieving the shift in consumer behaviour required for mass adoption of low carbon heating and transport will be very challenging in an environment where many solutions remain more expensive, more difficult to access, and / or perform less effectively than their fossil-fuel based equivalents. Therefore, there is a requirement for government to implement measures that ameliorate these shortcomings, while also supporting industry to develop lower cost, better performing, more attractive low carbon energy solutions.

The Scottish and UK governments have already implemented some mechanisms to help companies and householders adopt low carbon technologies, such as the Renewable Heat Incentive (RHI), as well as mechanisms to help companies develop solutions for future low carbon energy markets, such as the Low Carbon Infrastructure Transition Programme (LCITP) and Renewable Energy Investment Fund (REIF). However, it is clear that much more needs to be done to leverage the enormous levels of public and private investment required to bring about the rapid, extensive change envisaged within the *Scottish Energy Strategy.*

Scotland's heat decarbonisation challenge is enormous and there is presently no obvious 'one size fits all' solution to replacing existing, predominantly gas-fuelled heating systems. The transport decarbonisation challenge is similarly huge, particularly the requirement for new charging / refuelling infrastructure to support mass market penetration of electric vehicles (EVs) and, potentially, fuel cell electric vehicles (FCEVs). The additional electricity demand from low carbon heating and transport applications will also present a considerable challenge for the electricity network, which will require significant additional generation capacity in combination with system flexibility technologies (e.g. energy storage, active network management, etc) in order to effectively respond to increasing demand. This in turn presents a challenge to regulators to adapt the existing regulatory framework so that it supports rather than restricts this change.

While the challenges of decarbonising the Scottish energy system are complex and legion, the progress made in decarbonising electricity serves as evidence of the market's ability to rise to these challenges, given the right support and encouragement from government. Therefore, strong signals of a long-term energy policy framework, from government at all levels, will be essential for mobilising the market to deliver solutions to address the considerable challenges of the low carbon energy transition.

3. What are the biggest barriers faced to meeting the demand we will have for energy by 2030, 2040, and 2050?

As referenced in response to question 1, the most significant challenges to Scotland's future energy landscape relate to the decarbonisation of the Scottish energy system; therefore, the biggest barriers to meeting future energy demand are likely to arise from the requirement to replace existing fossil-fuel based technologies and infrastructure with low carbon alternatives.

The high capital cost of most existing low carbon heating solutions is a key barrier to Scotland meeting a greater proportion of its heat demand from low carbon sources. The comparatively small size of the Scottish / UK low carbon heating industry may also prove a constraint to any rapid increase in consumer demand. There are also some technical barriers and engineering challenges associated with novel heating solutions like hydrogen heat networks, which have yet to be demonstrated at scale in the UK.

Scotland's Energy Efficiency Programme (SEEP) has an important role to play in addressing these barriers through the demonstration of different low carbon heating solutions. The SEEP supported trial projects will be important for building capability within the Scottish supply chain and promoting technology optimisation, thus ensuring that Scottish companies are in a position to respond to growth in consumer demand. Mechanisms to mitigate the current high capital costs of low carbon heating and stimulate consumer demand are also required if mass deployment is to be realised. These could be accompanied by a set of low carbon heat regulations or standards, as well as a process for supporting innovative pre-procurement (i.e. enabling planning prior to a staged process of investment). Ideally, Scotland would also seek to employ existing infrastructure assets, particularly the gas grid, so as to decarbonise heat in the most cost-effective manner rather than favouring rapidly deployable but non-optimal solutions at the expense of more cost-effective, longer-term opportunities.

Cost has also proved a barrier to the adoption of ultra low emission vehicles (ULEV), however, the market for passenger electric vehicles (EVs) is developing rapidly as technologies continue to improve and costs continue to fall. While there remain technical barriers to decarbonising some modes of transport, particularly aviation, the principle barriers to meeting Scotland's future transport energy demands relate to the requirement to upgrade and reshape the electricity network. National Grid's *Future Energy Scenarios* (2017) report predicts that peak demand from EV charging could require up to 8GW of additional UK generation capacity by 2030 if system flexibility technologies and other demand shifting measures are not implemented. Grid capacity constraints are already proving a challenge to new renewable energy developments in Scotland and could prove a major barrier to meeting additional electricity demand from low carbon transport and heating applications. The current regulatory regime also presents barriers to system balancing technologies like energy storage that must be addressed in order to build the flexible, interconnected, low carbon energy system envisaged within the *Scottish Energy Strategy.*

Enormous levels of public and private investment will be required to deliver the vision of the Scottish energy strategy, the leveraging of which may prove a barrier for some new and emerging energy technologies. SE has useful experience to bring to bear here through our involvement in REIF and LCITP, both of which have played an important role in shifting the perception of the investment community toward seeing the low carbon space as investible. However, there is still much to do here as commercial investors continue to be risk averse.

5. What overall role should be played by various elements of the energy landscape, for example: Different sources of renewable energy; Offshore oil & gas; Unconventional oil & gas; Nuclear power; Energy storage; and Others?

SE does not have a view on the ideal composition of Scotland's future energy landscape, but would like to see Scotland continuing to capitalise on its key strengths within the energy sector. For more than half a century, Scotland's North Sea oil & gas supplies have been the foundation of the Scottish energy system and a cornerstone of the Scottish economy, providing relatively secure, comparatively low cost energy to businesses and households while generating £bns in tax revenues and supporting tens of thousands of jobs. As Scotland seeks to transition to a largely decarbonised future energy system, it will be important to do so in a manner that utilises the extensive skills, expertise and infrastructure built up over decades by Scottish oil & gas.

The *Scottish Energy Strategy's* ambitious vision for energy decarbonisation presents an opportunity for Scotland to be at the forefront of developing the technologies required for the global energy transition, and in so doing, capture significant economic benefit for the nation. Energy is currently Scotland's largest traded sector, generating turnover of £45.7bn in 2015, equivalent to 19.7% of total Scottish turnover for the year. While oil & gas still accounts for the largest proportion of this value, Scotland's renewable and low carbon energy sector is becoming increasingly important, generating £5.5bn in turnover in 2015.

Scotland has many attributes that make it a favourable location for low carbon energy development, including abundant natural resources, exceptional oil & gas experience, strong engineering tradition and a joined-up academic base. Our subsea engineering expertise is world renowned and we have a growing reputation as an offshore renewable energy pioneer thanks to innovative projects such as:

- EMEC – The world's first purpose-build, grid connected, open sea test facility for wave and tidal energy devices;
- MeyGen – The world's first MW scale tidal energy array; and
- Hywind Scotland – The world's first floating offshore wind array.

Much of SE's recent activity within energy sector has focussed on the innovation and commercialisation of marine energy, as well as the development of the offshore wind supply chain. We also see considerable potential from Scotland's increasing focus on local energy systems, which present opportunities to develop innovative Scottish solutions with application elsewhere in the UK or around the world. The *Scottish Energy Strategy's* holistic vision for energy to decarbonisation, as well as its emphasis on emphasis on demand reduction and the more efficient use of energy, is also likely to generate a broad range of new opportunities to further develop Scotland's energy sector. SE is currently assessing the economic opportunities from a number of emerging technologies and themes, including hydrogen and low carbon transport.

7. What are the factors and risks which may impact upon the Scottish Government meeting the targets it has proposed on sustainable and renewable energy?

One of the main factors that may impact upon the Scottish Government's ability to meet its renewable energy targets is the nature of the UK energy system, which is largely operated, regulated and legislated at a UK level. While the Scottish Government has access to some powers and fiscal mechanisms that can employ to encourage renewable energy development — including control over the Scottish planning system and discretionary R&D and T&D funding — it cannot mandate the shape of Scotland's future energy mix as energy is a matter reserved by the UK Parliament. Although this need not necessarily impact the attainment of the Scottish renewable energy targets, there are notable differences in the policy positions of two

administrations with regard to the role for nuclear power, onshore wind and support for marine renewable energy technologies.

As referenced in our response to questions 1 and 3, there are also a number of challenges and barriers to the Scottish Government's ambitious vision for energy decarbonisation as presented within the *Scottish Energy Strategy.*

14. How can Scotland ensure that it retains, and develops, the necessary workforce of skilled professionals needed to meet its energy needs?

Skilled people are critical to the continued growth of the Scottish energy and key to realising the ambitious programme of change set out in the draft *Scottish Energy Strategy* and draft *Climate Change Plan*. The Scottish Energy Efficiency Programme alone will make enormous demands of Scotland's supply chain and skills base, so it is important that we continue to work with industry and engage key agencies to ensure that the right skills are in the right place at the right time. SE is continuing to work closely with Skills Development Scotland (SDS) to ensure that the skilled professionals are in place to meet energy needs both now and in the long-term.

The oil & gas sector is a major constituent of Scotland's total energy workforce and has extensive skills and capabilities that could be leveraged to drive the energy transition. Action to develop Scotland's energy skills has been particularly evident within the oil & gas sector via the work of the Energy Jobs Taskforce (EJTF), which was established in 2015 by Scotland's First Minister to respond to the challenges facing oil & gas. The taskforce has implemented / overseen a number of new interventions as part of its work, including the SDS administered Transition Training Fund, which has supported over 2,500 individuals with training to help them find new jobs and opportunities within or outwith the sector. Over 4,200 people have also received help and advice through five Partnership Action for Continuing Employment (PACE) events organised by SDS.

SDS will take the overall lead to inform future energy skills support, and OPITO, working together with industry, has a key role to ensure skills and talent are not lost from the oil & gas sector. Linking skills requirements to the broader energy agenda will be taken forward by OPITO and SDS. SDS and PACE will also take the lead in co-ordinating support to skilled individuals facing redundancy and returning to employment via the Transition Training Fund and other mechanisms such as Executive Springboard.

15. What issues arise regarding innovation for Scotland's energy future; how might this interact with an industrial strategy for Scotland?

Existing energy technologies have the potential to address the vast majority of Scotland's climate change and resource constraint imperatives, but cannot yet do so at a price conducive to mass market adoption. Therefore, cost lowering technology developments must go hand-in-hand with efforts to develop innovative resource-efficient solutions. Inherent in this process are disruptions and advances that will reshape industries, generate new sources of value, and alter the corporate and international competitive landscape.

Technological innovation is at the heart of the transformation of the energy sector, which is changing from a top-down centralised system model to one that is much more interactive but also decentralised and fragmented. In many areas renewables are replacing or have the

potential to replace fossil fuel generation, and smart grids are delivering the potential for greater interactivity with customers. A breakthrough in the cost and practicality of battery storage technology could be a quantum leap enabler, opening up the possibility of off-grid customer self-sufficiency when used in combination with 'self generation'. Power to gas technology (e.g. hydrogen) also has the potential to transform the current paradigm.

Energy innovation features prominently within the UK Government's *Building Our Industrial Strategy: Green Paper*, which identifies research and innovation in energy storage, smart energy technologies and electric vehicles as being vitally important for the UK's future energy system and areas in which the country can become a global leader. The report also makes reference to the Government's continued support for offshore wind, which has helped to drive down the cost of the technology and attract inward investment in the country.

While the UK Government's *Industrial Strategy* identifies some important energy technologies for the UK as a whole, Scotland has additional competitive strengths in emerging areas like marine energy that could also play an important role in our future energy system and generate significant economic value for the country. SE would therefore like to see these technologies acknowledged and supported in any future Scottish industrial strategy.