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### **Royal Society of Edinburgh Inquiry into Energy Issues**

Thank you for the opportunity to respond to the Royal Society of Edinburgh's above inquiry.

As you are aware, Highland and Islands Enterprise (HIE) is the Government's agency responsible for economic and social development across the northern half of Scotland. The area has a long association with the oil and gas industry and was, of course, home to the UK's first PFR nuclear reactor. This is also the area with some of the UK's best renewable energy resources and a concentration of renewable development activity already underway. The growth of this sector is of prime importance to HIE given the downstream benefits it offers to both our businesses and communities. We therefore have a particular interest in this inquiry. The attached paper sets out our response to the inquiry and as you will see it concentrates on renewable energy related issues given the level of opportunity we believe it offers.

The HIE Network believes that renewable energy currently offers the Highlands and Islands a critical, but time-limited opportunity to develop a world leading industry which could bring to the area significant long term and sustainable economic and social benefits. It believes that the Highlands and Islands will play a crucial role in helping to meet the Government's targets for new renewable generation. The Network's objectives include creation of sustainable, high value employment in manufacturing, research, demonstration and the supply chain; meaningful income generation from community-owned projects; establishment of world-class commercial and academic renewable energy research, development and commercialisation activity; development of strong grid infrastructure across the area; ensuring the area's interests are represented for policy and regulation development purposes; improving public awareness; and ensuring that the area has an appropriately skilled workforce to meet the demands of the sector.

Already the Highlands and Islands is the focus of a range of developments, mainly onshore wind but also biomass, offshore wind, wave and tidal. In addition, there is a huge level of activity at the community level. The area is already enjoying some economic benefit from this emerging sector. Estimates suggest there are 1,500 people employed in the renewables sector across Scotland and of these around 600 are in the Highlands and Islands. This includes around 200 working for Vestas Celtic in Macrahanish, Argyll, an area which was an economic blackspot before the establishment of that company. It also includes those working at other levels of the supply chain, in manufacturing, civil engineering, electrical installation, craneage, specialist transport as well as environmental consultancy and project management. Experience to date suggests that the sector is already having a positive impact on the area's GDP with wages in the sector typically higher than the area's average private sector wage. At the community level, employment and income generating opportunities are at a level that the positive impact to remote communities is, and will continue to be, important. For example, HIE is currently working with the community on Mull and Iona to develop proposals for a 12 turbine wind farm – the estimated direct and indirect employment to those islands during the operation of the wind farm is estimated at 41 FTEs and around 20 FTEs during the construction programme. Annual average net profit is estimated at £246k over the 25 years. Projects such as these demonstrate the level of opportunity this sector offers to the many remote communities across the Highlands and Islands.

In summary, the attached paper highlights the following issues:-

- It is more appropriate to consider energy needs on a UK rather than Scotland only basis given the way in which the market operates. Over the coming decades Scotland's existing conventional generating plant will close and there are currently no plans to build replacement plant. Further renewables build will help Scotland retain some electricity independence. Issues such as intermittency are not a constraint to renewables, but further development is dependant on the availability of grid infrastructure.
- Opportunities exist for Scotland/UK to lead the development of new renewable technologies, in particular wave and tidal. Further incentives are required to support both pre/commercial deployment of these technologies once proven. Further support is also required if Scotland is to use its forestry resource for heat/electricity production.
- Energy demand in Scotland is set to continue to rise. Further efforts are needed to support increased energy efficiency.
- A balance needs to be achieved between local environmental impacts of new generation and the wider environmental gains associated with tackling climate change. Continued efforts are also needed to encourage public support and awareness of energy issues more generally. Mechanisms to support community ownership of new generation will play an important part in educating the public but also in ensuring local ownership and benefit from projects.

We hope you find our comments helpful. We look forward to giving oral evidence to the Committee during its visit to Stornoway on 19 July.



## **Response to Royal Society of Edinburgh Inquiry into Energy Issues**

### **Energy Needs**

With the introduction of the British Electricity Trading and Transmission Arrangements (BETTA) in April 2005, GB has moved to operating a single market for the trading and transmission of electricity. While ownership of this grid system in Scotland remains in the hands of ScottishPower Transmission Ltd and Scottish Hydro-Electric Transmission Ltd (SHETL), its management across GB is the responsibility of National Grid Company (NGC). As a result it is no longer appropriate to consider Scotland's electricity needs in isolation, but instead they should be considered in the wider GB context.

While Scotland currently has a total generating capacity of around 10GW (against a peak demand of around 6GW), over the next 10-15 years this is set to drop substantially. For example, both Longannet and Cogenzie coal-fired power stations are due to close in 2015 (assuming ScottishPower, their owner, chooses not to undertake the refurbishment required at both stations to make them compliant with the Large Combustion Plant Directive). The licences of both of Scotland's nuclear power stations will also expire by 2023, and Peterhead gas-fired power station will reach the end of its life shortly thereafter. Much of Scotland's existing large scale hydro has recently undergone major refurbishment which will extend its life by up to 40 years. There are currently no plans to build any new conventional generation in Scotland.

The anticipated trend for conventional plant closure in Scotland over the coming decades is expected to be replicated across the UK. Energy self sufficiency across UK is therefore the wider issue – it is simply not one restricted to Scotland. However, in the Scotland context there is considerable doubt as to whether new conventional build, in particular, will take place. With the advent of BETTA, a system of locational charging for the use of the transmission system was introduced. The basis for this charging system is the further a generator is away from centres of demand the higher the use of system charge will be. As a result, generators in the North of Scotland face charges of up to £23/kW compared to some areas in the south of England where negative charging exists (e.g. generators are paid to generate on to the system). This significantly impacts on the economics of running both existing generating plant and making the case for new build. It also impacts on the case for new renewables build. Under this charging regime it is intended that the locational incentive will reverse if the circumstance arises that there is a need for Scottish generation. However, the concern of industry and others is that this does not take into account the significant time required to design, consent and build new generating plant. Indeed, there is considerable consensus that future planning must begin now. The charging regime is currently the subject of judicial review by ScottishPower.

The only form of new electricity generation currently planned in Scotland over the next decade and beyond is from renewable sources. The Inquiry will be aware of The Scottish Executive's target to achieve 18% of Scotland's electricity needs from renewables by 2010 and an aspiration to extend this to 40% by 2020. This sits alongside the wider UK

target of 10% from renewables by 2010, 15% by 2015 and an aspiration to achieve 20% by 2020. To meet the 2020 Scottish target will require approximately 6GW of renewable generation in Scotland. The market mechanism to support the achievement of this target has successfully led to a growth in the renewables sector, mainly evident by onshore wind developments but Government has also made efforts to support the development of emerging technologies through capital grant allocations. The growth in renewables in Scotland will delay to some extent the point at which Scotland moves from being a net exporter to net importer of electricity.

The growth of the renewables sector often leads to questions about intermittency and their impact on the ability to manage the electricity grid. The Inquiry is asked to consider the findings of the FREDS Future Generation Sub-Group which considered this issue. The Sustainable Development Commission's report into wind energy also provides a full and comprehensive explanation. Both these reports (and many others published by the DTI and others) find that renewable generation up to the levels planned to meet both the Scottish and UK targets can be handled by the electricity grid. The NGC has publicly stated that intermittency can be managed by the system and in fact future constraints on renewable generation will be market/economics based rather than technical e.g. technical solutions can be put in place to deal with growing levels of renewable generation but at a cost. In fact the GB grid is designed to cope with the sudden loss of generation (e.g. based on the unpredicted loss of Sizewell C, 1320MW, the UK's largest single generating plant) as all forms of power generation are intermittent to some extent or another. Indeed, Scotland coped with the sudden loss of Torness power station in 2003. Wind generation does not cause system stability problems which NGC cannot deal with. In fact, wind forecasting a few hours in advance is quite accurate and as the GB system operates on 'gate closure' one hour in advance of need, most wind generators are able to predict with some accuracy their output for that coming period. As wind generation grows across the UK, there is also likely to be a smoothing effect (e.g. it is unlikely that that the wind will stop blowing across the entire UK). The grid is also designed to cope with sudden and unpredictable fluctuations in demand. For example, during major sporting events there are frequently major spikes in demand during breaks in television scheduling. Intermittency is not therefore a new phenomenon or one that cannot be handled.

The locational element of BETTA is a considerable concern for HIE given its potential impact on new renewable build. In fact, the actual charging regime for the island groups where much of the resource lies is not yet known – the existing NGC zones only cover the mainland. Indicative charges suggest that the cost for island groups could be in the region of £30-£50/kW. The Government has recognised the impact this may have on the development of some of the UK's best renewable resources and for that reason took a power under the Energy Act (section 185) which allows it to 'cap' charges for remote areas. The Government has announced that it is minded to use this power for the island groups and that it may also use it for the north mainland. A consultation is expected this summer.

Decisions taken now in relation to new generation will determine the UK's ability to be self sustaining in electricity terms. In the wider energy context there can be little doubt that increased reliance on imports of oil and gas will continue. Indeed, the UK, along with Canada, is the only industrialised nation not to already rely heavily on imported energy. While this hasn't impacted on their economic growth, it does mean that energy is an important facet of foreign policy. This will increasingly become the case for the UK as well. This issue is recognised in the Government's Energy White Paper.

## **Energy Supply**

The technical issues and economics associated with conventional forms of electricity generation are well known and industry commentators will no doubt provide the Inquiry with detailed responses on these issues. For the Highlands and Islands, as mentioned earlier, our prime concern is the ability to develop the area's substantial renewable energy resources. The area is home to some of the best sites for wind, wave and tidal generation. Evidence from Shetland shows that load factors in excess of 50% are common place for onshore wind – this compares extremely favourably with both onshore and offshore wind everywhere else in the UK where local factors in the region of 30-35% are more typical. These sites are therefore the most efficient areas for renewable electricity generation.

Onshore wind technologies are well established, although there is still some way to go to ensure the level of build needed to meet Government targets. However, other renewable technologies still require development effort and sustained additional support.

Marine renewables are considered a key opportunity in Scotland. In the near term offshore wind will be concentrated around the English/Welsh coasts where seabed conditions suit the stage of technology development. Even in the relatively shallow waters off the English/Welsh coast there are still difficulties to be overcome (associated with technical risk and cost) but Government does expect a reasonable amount of new generation to come from offshore wind within the next decade and beyond. For Scotland, offshore wind opportunities will await deep water developments. Talisman is already pioneering such a development in the Moray Firth. Initially 2 x 5MW demonstrator turbines will be deployed to prove the concept and thereafter a 1000MW wind farm is planned.

However, wave/tidal energy is perhaps the more central focus. The Scottish Executive's FREDS group has published its recommendations for the further development of wave/tidal energy in Scotland and the DTI has recently announced a £42 million fund to support pre-commercial deployment. In the Highlands and Islands, HIE has led the public sector consortium to establish the European Marine Energy Centre (EMEC) on Orkney. The Centre currently offers the world's only grid connected facility designed to test and prove full scale wave energy devices. The construction this summer of tidal test facilities at the Centre will complete the package. This project is an excellent example of cross Government/public sector support for this fledgling industry. Other funding partners include the Scottish Executive, DTI, Carbon Trust, Scottish Enterprise, Orkney Islands Council and the European Union. The aim of the Centre is to lead the

accreditation and independent performance verification of devices to encourage device development in Scotland and to secure the UK's position in leading the development of these technologies. To date, there is one grid connected wave device at the Centre, Ocean Power Delivery's Pelamis, and one off grid device. Three developers have signed up to use the tidal centre over the next year.

While EMEC has an important part to play in helping the UK secure the knowledge end of what we hope will become a major sector, the next critical step is pre/commercial development. The FREDs report mentioned above sets out the next critical steps to support the industry in Scotland and HIE will work alongside Government and industry to take these forward. In the future this will likely include a need for further capital and revenue support along with assistance to deal with other critical issues, such as developing health, safety and environmental procedures and processes as well as finding innovative ways to allow devices access to the grid. The Scottish Executive is currently reviewing the Renewables Obligation Scotland (ROS) and has sought views on amending it to provide additional support for wave/tidal electricity. HIE's response to that consultation supported the concept of offering additional revenue support, whether as part of or outside of the ROS (the latter being preferable given that it would not impact on investor confidence).

Finally, there also exists some opportunity for biomass development. The FREDs biomass sub-group looked at the opportunities and found that Scotland could develop up to 450MW of biomass electricity over the next decade or so using its existing forestry resource. Across the Highlands and Islands, there is scope to develop biomass power plant for both electricity and heat use. Again however there are some critical issues. Key to developing commercial scale plant is the availability of capital grants. In 2002, the DTI awarded around £66million of grants to biomass projects – however, of those only one has been built and a number have barely progressed at all. There is a need for unspent monies under that scheme to be quickly reallocated given the growing interest in new projects across Scotland and the UK. At the community end, the Government's Community Energy Programme made a good start at stimulating district heating scale projects. Similarly, that programme is now fully allocated but new projects exist which will only be realised with capital support. The second key issue for biomass is the need to support heat production. Biomass generation is most efficient when used for combined heat and power but incentives to date have focused only on electricity generation. The economics and range of projects which would come forward if grant schemes were to be reopened and augmented with some form of heat support could be significant.

While HIE strongly supports the need for further assistance for emerging technologies such as these, this support should not be to the detriment of onshore wind. HIE has recently participated in the FREDs Future Generation sub-group and wholly endorses its finding that ongoing support for onshore wind is vital to ensure Government targets are met, to support development of the grid which in future will be to the benefit of emerging technologies, and to maintain investor confidence in the integrity of the renewables market.

Key to development of all of renewable technologies in the north of Scotland is the availability of the grid. Attempts by the grid operators and Government to prioritise grid strengthening have resulted in a number of infrastructure investment proposals. In the Highlands and Islands these have included the proposed Beauly to Denny and Sloy to Inveraray lines. Both are considered by the industry regulator, Ofgem, to be economically justifiable given the demand for new capacity in areas served by those lines. Plans are therefore being progressed to consent and build them. The wider issue for the Highlands and Islands is the ability of the distribution system (which makes up the bulk of the Highlands and Islands electricity grid infrastructure) to connect new generation and connection to the islands. New connections are needed to each of the main island groups to allow renewable generation there to be exploited. While route options are being looked at by Scottish Hydro Electric Transmission Ltd, the cost of this work is having to be underwritten by the island generators. In fact, the connections will only be built if their entire cost is also underwritten. This is because Ofgem does not consider these connections to be justifiable and given the risk of them becoming a stranded asset SHETL is not allowed to invest in the normal way (e.g. where the cost is passed to the consumer). This is obviously a serious deterrent to development on the islands, but one which exists partly because Ofgem's prime objective is to limit costs to customers. This is clearly set down in Ofgem's remit from Government and prevents it from adopting a more risk taking approach to new infrastructure investment to facilitate renewables development, despite this also being a key plank of Government energy policy.

HIE would argue that there is a need for regular review of the funding criteria for new infrastructure and that where sufficient real demand can be shown (e.g. through being able to demonstrate consents, finance and a Power Purchase Agreement (PPA) in place) investment in new lines should be allowed in the usual fashion. Alongside this is the need for the proposed 'cap' on transmission charges as described above, and for this cap to remain in place for a pre-designated and sufficiently lengthy period of time.

At the distribution level, Ofgem has put in place incentives to encourage the grid operators to invest in new techniques and technologies to better manage the existing system. HIE hopes to secure such improvements in its area, for example through becoming a pilot area under Ofgem's proposed Registered Power Zone initiative.

Finally, over the longer term the importance of new forms of energy storage are expected to become increasingly important. For example, the use of hydrogen fuel cells to store electricity, particularly that generated from renewable sources, may come to the fore. Early demonstration of this concept on the island of Unst, Shetland, is already providing some useful learning outcomes. It is our intention to replicate this project elsewhere across the Highlands and Islands and to develop the knowledge and expertise for export in the future.

## **Energy Demand**

Energy demand in Scotland is currently growing at around 2% per annum. Government hopes to reduce this to between 1-1.5% per annum through a mixture of better energy efficiency and reductions in demand. It is currently questionable how this can be achieved and there can be little doubt, especially in Scotland, that further efforts are required to improve energy efficiency in both homes and commercial premises. The drive for increased levels of renewable electricity will only positively impact on overall emissions reduction if efficiency savings are also made. Improved energy efficiency is also important given the need to reduce the number of households in the UK in fuel poverty.

Energy efficiency efforts in Scotland tend to be aimed at large energy users, but the cumulative effect of better efficiency within SMES could also be important. Alongside this, continued efforts are required to raise awareness and educate the public of the need for more careful and efficient use of energy. The work of the Scottish Energy Efficiency Office is important and should be further supported to ensure the message has wide reach.

### **Environmental and Social Issues**

The growth of renewables has been marked by growing levels of both environmental and public concern. For the environmental bodies issues include impact on landscape, protected species, birds and disruption caused during construction of projects. This is likely to become increasingly important for marine renewables where there is little base data and no knowledge or experience of renewable device impacts on marine life or ecology. However, the need to protect our environment must be balanced with the wider objective of reducing harmful carbon emissions into the environment. The localised impact of generation compared with the no-boundaries impact of climate change and the threat it brings to our wider environment cannot be ignored.

In terms of public disquiet, much of this is based on misinformation and fear of cumulative impact. While Government has made some efforts to educate the public, the impact of this 'Hearts and Minds' programme has to date had minimal impact in the areas such as the Highlands and Islands. For that reason, HIE intends over the coming year to undertake its own public awareness raising efforts. This will include a series of master classes aimed at local decision makers, public road shows, media tour, information leaflets and a schools programme. The aim will be to ensure that the public has access to unbiased, reliable information on which they can rely when asked to consider local proposals for new generation. This is an area of work urgently required, not just in the Highlands and Islands but across Scotland more generally.

An important facet of increasing public acceptance and support for renewable energy is the extent to which people actually feel there is some benefit to them. Over the last 2 years, HIE has delivered the Scottish Executive's Scottish Community and Household Renewables Initiative (SCHRI) in the north of Scotland. The scheme has been delivered by HIE's dedicated Community Energy Unit and has to date supported over 160 projects at a cost of over £2million. Projects supported cover a wide range of technologies for a diverse range of use, including geothermal heat pumps, photovoltaic and solar heating,

biomass boilers and district heating schemes, small scale wind and hydro. In the main these projects have allowed communities to replace conventional forms of heating/power in community facilities and to reduce running costs. Increasingly however communities have shown interest in owning larger scale plant. To satisfy that growing demand HIE has now established a Community Energy Company (HICEC) to continue to deliver the SCHRI and to support community ownership projects. The company aims to support communities develop and own their own commercial scale projects (typically less than 5MW) through offering a mixture of advice, grant/loan support for pre-development costs and equity investment to support capital costs. The funding model has already been successfully used to support the Isle of Gigha to develop its own 3 turbine wind farm. That project will buy back HIE's equity investment over the next 4- 5 years. The funds currently held by the Company will allow it to invest in a small number of projects in the initial 2-3 years of operation but key to its success and wider roll-out of the programme will be the ability to substantially increase the funds available to it. Efforts are already in hand to that extent.

The next 50 years presents a real opportunity for Scotland, and in particular the Highlands and Islands, to develop sustainable renewable energy systems. Our islands present a unique opportunity to develop local solutions to supply local energy needs and a number of them already aspire to become energy self sufficient over the coming years. The following provides examples of innovative community led solutions already being developed:-

- An energy audit on Unst, Shetland, found that its annual spend on energy is around £1m, very little of which is retained on the island. However, it is also an island with substantial wave, tidal and wind resource. It is already leading the way in developing renewable hydrogen production and has developed a scheme which generates hydrogen from wind energy which is then used to fuel a small car and using a hydrogen fuel cell provide continuous space heating to an industrial unit. This innovative scheme has been developed using only local expertise and in doing so has built up a skills base and knowledge usually only found in research or academic centres. The HICEC aims to replicate the scheme across the Highlands and Islands over the coming years.
- Westray, Orkney, is currently developing a wind project and anaerobic digester which has the potential to handle a number of locally produced animal waste streams to produce methane that can be used to generate electricity and heat. The Westray Development Trust is also researching the potential for locally produced biofuel from Orkney crops.
- Lerwick, Shetland, has a district heating system that supplies economic heat to householders, community buildings and industrial premises. This scheme offers savings to users in terms of actual costs and space needed to house heating equipment. Income from the system is also recycled back into the local economy. District heating offers sustainable heating options and creates local jobs in the fuel supply chain.

This demonstrates the real potential and ability in the Highlands and Islands to develop a sustainable energy supply. Although small scale, projects such as these could lead to significant potential spin offs for the local economy and could be widely replicated.