

THE SCOTTISH PARLIAMENT: DETERMINING AND DELIVERING ON SCOTLAND'S ENERGY FUTURE

- 1 The Royal Society of Edinburgh (RSE), as Scotland's National Academy, offers the following briefing paper to MSPs as background for the Parliamentary debate on the Economy, Energy and Tourism Committee's report on Scotland's energy future on 30th September 2009. What we regard as the key issues are summarised in the paper and enlarged on in the appendix.

First-order principles

- 2 The principles for Scotland's energy strategy must be to optimise between minimising carbon emissions; maximising energy security; and minimising cost to the economy and consumers. The optimal outcome will be achieved if energy providers are given freedom, and support to use the widest range of generation technologies; if the electricity transmission and supply network is part of a UK-wide and preferably Europe-wide system so that generation can be brought on line at will to optimise achievement of strategic targets; and if energy efficiency can be maximised and demand reduced. These should be the first-order priorities for the Government's strategy.

Avoiding sub-optimal solutions

- 3 The prospect of an optimal outcome has already been reduced by the decision to withdraw from nuclear generation in Scotland. It is entirely proper for government to make such a decision but strategy does then rest heavily on the hypothesis that secure baseload generation can be derived, and within a timescale consistent with emission reduction targets, from the successful implementation of carbon capture and storage (CCS) technology applied to fossil carbon energy plants.
- 4 In this context, it is particularly important that the concept of energy-self sufficiency for Scotland is rejected as an objective of policy. The strategic objectives should be as set out in paragraph two. Self-sufficiency would be a further constraint that would increase the chance of sub-optimal outcomes. Being part of a larger transmission network will give some insurance against possible failure of the CCS-based strategy.

- 5 It is important that the Scottish Government does not attempt to choose technologies but uses its powers to incentivise companies to profitably implement any technologies that can contribute to optimal solutions. Market competition against a background of long term government commitment is most likely to hit emissions and energy security targets at minimum cost to the economy. The wrong early choices could create an unnecessarily costly system. The ruling out of nuclear generation may already have set us on that track.

Further specific issues

Demand reduction

- 6 Reducing the demand for energy as well as improving efficiency will produce proportional reductions in the overall energy required. The possibilities for energy savings are large but the primary obstacle is behavioural change and the need to ensure for example, that 'savings' in one area do not lead to increased consumption in another. The success of the Scottish Parliament's bold decision to ban smoking in public buildings shows that well-considered, decisive action coupled with political leadership on a major issue of public concern can be highly effective. We have previously indicated that there are many energy efficiency schemes, with low take-up, being managed by a range of organisations, and hence there is a need for more efficient administration and coordination. We urge publication of an action plan for energy efficiency as soon as possible.

Grid access

- 7 The importance of an extensive and intelligent grid system as a tool to maximise efficiency and minimise risk cannot be overestimated. Upgrading grid infrastructure within Scotland will maximise the potential to transmit energy from outlying renewable energy sources. An up-graded two-way Scotland-England connection will both permit valuable exports of excess Scottish power and provide insurance if it proves necessary to import power to make up for any Scottish baseload deficit. We also welcome the dialogue between National Grid, Ofgem and government on encouraging strategic investment in the grid system in advance of need, to help stimulate and facilitate renewable deployment.

- 8 The Scottish Government should give priority to discussion about the connection charges which disadvantage remote suppliers and should also add its voice to those discussing the possibility of an integrated European transmission network.

Heating

- 9 Heating makes up approximately 53% of energy consumption in Scotland. We consider that a much more detailed consideration of heat supply, and relevant innovation, is needed in Scotland. There is serious need for a long term government strategy to stimulate and support biomass heating and supply distribution networks and community heating schemes. There are several schemes in Europe that present models of relevance to rural Scotland for example.

Transport

- 10 Approximately 28% of energy demand in Scotland is from the transport sector with road and air transport dominant. This is a very difficult area for policy, and the Government should have a watching brief on technological developments that have the potential at least to restrain the growth of demand, and should consider setting up an expert working group to consider policy options.

Public acceptance

- 11 Public acceptance has been one of the greatest barriers to the deployment of energy generation technologies, primarily because of government failure to identify and engage effectively with public concerns. It is imperative that preparation is made for public engagement and dialogue, with the intention of creating a degree of public consensus about the need for the development of emerging technologies, prior to the planning application stage. Central and local government are crucial in providing leadership and setting the terms of that engagement, but non-governmental and voluntary bodies will need to energise civic society and promote individual and collective responsibility.

The skills base and deriving economic benefit

- 12 Scotland is well placed to derive benefit from the major changes in energy generation policies that are now taking place world-wide. To do so however it must ensure that it maintains and develops the skills base needed to implement new developments at home that demonstrate its capacity. It must exploit the strength of its research base in the area of energy technologies. And it must exploit the presence in Scotland of major companies in the energy field. The Government's principal role should be to strengthen the already notable commitment to sustained long-term support for development of the energy sector and the skills base needed to sustain it. It cannot however do this in all fields, and we suggest that it prioritises support for areas of activity where there are large global markets, where Scotland is an acknowledged research leader in global terms and where we have companies able to take innovation to market. Two very clear contenders would be intelligent transmission and supply systems and CCS technologies.

APPENDIX

Overarching issues for Scotland's energy strategy

- 1 *We recognise that the Scottish Government has substantial powers to determine energy strategy for Scotland through its responsibility for the promotion of renewable energy, encouragement of energy efficiency, and its powers to grant consent for new electricity generation and transmission infrastructure. However, as much of the responsibility for energy is currently reserved it is crucial that there are open lines of communication and wider connectivity at the Scottish and UK levels to ensure that there is a joined-up approach and alignment of policy.*
- 2 *Scotland's energy priorities should be based on optimising between meeting emissions targets, ensuring energy security and sustainability, minimising cost and maximising the economic benefit that might arise through the exploitation of Scotland's research and development capacity. The approach should be to encourage interdependency with the UK, European and global markets. This should bring technological benefits to Scotland, stimulate enterprise and deliver social and environmental gains.*
- 3 *There is a need for large-scale replacement of electricity generating plant in Scotland within the next ten years. It is also likely that electricity will play a greater role (whether for heating or transport) such that the supply of CO₂-free electricity will have to significantly increase. Whilst the long term goal may be to have a largely renewable source of energy, it will be necessary to utilise non-renewable sources in the short and medium term to maintain security and reliability of energy supply. A diversity of energy sources is absolutely essential and all currently available sources and technologies will need to be considered as part of the energy "mix", including renewables, cleaner technologies for fossil fuels and nuclear powered generation. There is no requirement that all three sources are part of a Scottish mix, but choices to ignore, or de-emphasise, nuclear power means that fossil fuels must be rapidly decarbonised in Scotland, and that a large capacity of renewable generation has to be researched, developed, demonstrated, encouraged, consented and connected at an electricity price competitive with the rest of the UK and EU.*
- 4 *If nuclear energy is to be phased out in Scotland, and if Scotland is to meet its highly challenging emissions reduction targets, the provision of secure baseload generation in Scotland will depend upon the hypothesis that carbon capture and storage (CCS) technology can be developed successfully and implemented in Scotland. For CCS to form a critical part of Scottish electricity supply strategy from the early 2020s, significant additional effort will be needed to promote commercial scale demonstration*

of the entire chain, and especially deployment, in Scotland at an early date. Similar effort must be made to encourage the required major investment so that Scotland is both able to deploy CCS to enable it to reduce its own emissions from carbon-based energy sources whilst benefiting from its contribution to global roll out of the technology. However, other strategies need to be maintained as CCS could prove unexpectedly expensive, slow to develop, fail to attract sufficient investment, publicly unacceptable or (in the worst case) fail to work at sufficient scale.

Energy costs

- 5 *With regard to the deployment of new and emerging technologies including cleaner technologies for fossil fuels, for example CCS, and renewables such as offshore wind, wave and tidal, ultimately, the gap between capital costs, expected operational costs and revenue is a substantial issue in terms of industrial commitment. It is imperative that the Scottish Government work with its counterparts at the UK level to ensure that there is a consistent and stable investment climate which provides investors with a clear signal about potential returns. Ultimately, it is the consumer that bears the cost, and therefore this must be done within costs limits which the consumer and public budgets will tolerate.*

Energy efficiency and demand reduction

- 6 *We agree with the Committee that a key strand of the approach to sustainable energy must include a focus on energy efficiency and demand reduction. If the focus is right, these aspects can have the most immediate impact in terms of energy sustainability. Reducing the demand for energy as well as improving efficiency will produce proportional reductions in the overall energy required. Demand-side reduction is a very important but complex area and effective cross-cutting engagement and action across government departments is essential. The possibilities for energy savings are large but the primary obstacle is behavioural change and the need to ensure for example, that 'savings' in one area do not lead to increased consumption in another. This requires a package of education, information and financial incentives. In this regard we agree that smart meters, which would provide consumers with accurate information on, and greater control over, their energy usage, are an important development.*
- 7 *We have previously indicated that there are many energy efficiency schemes, with low take-up, being managed by a range of organisations, and hence there is a need for more efficient administration and coordination. In this regard we welcome the Scottish Government's continued commitment to an action plan for energy efficiency and along with the Committee urge the Government to ensure that it is published and implemented shortly.*

Grid access, transmission, distribution and energy storage

- 8 *Grid access, connections and transmission infrastructure, and the technical difficulties in maintaining quality of supply in remote areas, are prominent barriers to realising Scotland's substantial renewables potential. These barriers are now being addressed through a number of avenues¹ and it is essential that they are minimised. The greater the diversity and distribution of generating plant the greater the need for investment in grid development and increased in-grid management costs. We hope that the measures identified by the Transmission Access Review result in better access to the grid and operation arrangements in practice and provides greater certainty and incentives to all those involved. We also welcome the dialogue that has taken place between National Grid, Ofgem and government on encouraging strategic investment in the grid system in advance of need, to help stimulate and facilitate renewable deployment and give assurances to investors. It is crucial that the regulatory system provides investors with long term stability and confidence in which to make decisions.*
- 9 *As highlighted by the Committee, the proposed transmission line upgrade between Beaully and Denny is considered to be a prerequisite in harnessing and transmitting Scotland's renewable electricity potential. The need for further onshore reinforcements and sub-sea cables is also being considered to help realise the full potential of Scotland's renewables. It is crucial that decisions for investment in the grid infrastructure are made timeously by the industry, regulators and Scottish Ministers to allow the connection of renewable generation technologies and ensure coordination of construction activities to avoid stranded assets.*
- 10 *As recognised by the Committee, a consequence of the GB electricity transmission charging regime is that generators in Scotland face higher connection charges compared to generators elsewhere in GB because of their distance from centres of demand. This could act as a disincentive to renewable electricity generation in Scotland and needs to be reconsidered by National Grid and the regulator, particularly since the opportunities for renewable generation are much greater in Scotland than elsewhere in the UK.*
- 11 *Large increases in renewables, which are inherently intermittent, have implications for the provision of fast-starting back-up generation. Such back-up generation would have emissions considerations and there would be additional burdens placed on the operation of the grid.*
- 12 *It is likely that small scale and distributed generation will become significant components of generating capacity. There is considerable opportunity for distributed energy systems in many parts of Scotland to create semi-autonomous networks. However, there is a need for significant development of the distribution network in many remote areas. Under these circumstances, an "intelligent" network able to accept distributed generation with multi-directional power flows and customer participation, and with the flexibility to incorporate new technologies, is a priority.*
- 13 *Major research, development and demonstration in energy storage technologies will be needed to meet the needs of increasing intermittent renewables in the system and to balance supply and demand. If renewable electricity from wind, wave and tidal power continues to develop, there is the possibility of large over-production at off-peak periods. This must be stored, sold or dumped. Pumped storage hydroelectricity is the only proven large scale energy storage mechanism and has been operating for decades. The development of electrochemical technologies potentially provides some of the most practical solutions and there is considerable expertise operating in this field in Scotland.*

Renewable Heat

- 14 *Heating comprises approximately 53% of energy consumption in Scotland. We consider that a much more detailed consideration of heat supply, and relevant innovation, is needed in Scotland. This could, for example, be 1) in the use of biofuels for heating in rural regions off the gas grid; 2) in the use of 'waste' heat to supply local industries within 30km of existing large power plants; 3) the design of integrated district heating as part of the planning process during re-developments such as in east Glasgow; 4) providing greater incentives for the use of ground/air heat pump technology for both industrial and domestic applications.*
- 15 *A major new market for wood is emerging in the shape of biomass. The value of biomass as a contributor to our renewable obligations through the production of heat is slowly being recognised by government, although much more needs to be done to support this fledgling industry. There is a need for long term government support, particularly in developing heating and supply distribution networks. Funding to support this new sector has been small in scale and has suffered from a stop/start approach. Long term funding packages need to be emplaced to encourage this market to develop and provide greater security for those taking part.*

¹ The UK Low Carbon Transition Plan, HM Government (July 2009)

Sustainable Transport

- 16 *We understand that given the Committee's remit it has not given extensive consideration to the transport sector. However, it is worth noting that approximately 28% of energy demand in Scotland is from the transport sector with road and air transport dominant. Oil-based resources are likely to remain the dominant fuel source for the foreseeable future, with gradual market penetration of biofuels, hybrid and electric vehicles, and hydrogen (if solutions to cost effective H₂ generation and storage can be found). The transport sector also produces the largest emissions of greenhouse gases after energy supply and land use; for the UK as a whole this is about 20% of total emissions. Any energy strategy for the transport sector should, therefore, focus primarily on the reduction in carbon and other greenhouse gases, and in higher fuel efficiency; these two components should go hand-in-hand.*
- 17 *A range of incentives and restrictions are needed to stimulate the market for hybrid engines, technologies to capture energy from otherwise wasted sources such as braking, incentives for higher car occupancy, and measures to reduce speed in order to reduce consumption. It will take time for new vehicles and new fuels to become commonplace. The move to electrification of transport will have implications for grid capacity and recharging infrastructure. There is a need for joint working with the motor industry and other relevant stakeholders.*

Planning and public acceptability

- 18 *Whilst we understand the fundamental importance of upholding the democratic process and enabling public engagement on issues of national importance we also realise that it is crucial that timely decisions can be taken. We agree with the premise that once a development has been mapped out as a national need in Scotland's National Planning Framework, its need should not be a subject for debate in local public enquiries, which would concentrate on local impacts.*
- 19 *To date many applications for onshore wind turbines have been through a planning system which was not designed to cope with a large volume of applications and has not been updated to allow effective representation by objectors or speedier decision making, both of which are in the interests of all parties. In terms of emerging technologies such as CCS, which will raise new issues which planners have not previously experienced, if there is not a strong public consensus about the vital need*

for these developments, we have concerns whether even the reformed planning system will be capable of dealing with applications in a timely and efficient manner.

- 20 *Along with the planning system, public acceptance has been one of the greatest barriers to the deployment of energy generation technologies in Scotland and the UK, whether they are nuclear, fossil-fuel baseload or a range of renewables. Governments find it increasingly difficult to implement policies that involve complex issues of science and technology, primarily because of their failure to identify and engage effectively with public concerns. It is therefore imperative that preparation is made for public engagement and dialogue, with the intention of creating a degree of public consensus about the need for the development of emerging technologies, prior to the planning application stage. Central and local government are crucial in providing leadership and setting the terms of that engagement, but non-governmental and voluntary bodies will need to energise civic society and promote individual and collective responsibility.*

Skills base

- 21 *Research, development and demonstration of projects are paramount and there needs to be better integration of these aspects. The real benefit of full scale demonstrators is their potential to provide confidence in a technology.*
- 22 *Scotland is currently well positioned to exploit the opportunities in the development of emerging technologies. Considerable expertise in offshore engineering already exists and we note Scottish Government and industry support for the recently established Scottish European Green Energy Centre (SEGEC) which aims to place Scotland at the forefront of sustainable energy development and demonstration through partnership working and maximising engagement with European actors. Scotland is already endowed with major research and development capacity that spans the energy spectrum, particularly within its institutions. The Energy Technology Partnership (ETP)², a pooling collaboration between all of Scotland's universities engaged in energy research, represents the largest and most broadly-based power and energy research partnership in Europe. The members of the ETP are active across the range of energy sectors, and across the research, development and demonstration spheres. It therefore represents a very significant body of expertise working in Scotland.*

2 <http://www.etp-scotland.ac.uk>

23 *Crucial to the pull-through of energy technology is the need for the research and development community to be located close to leading development and demonstration facilities as well as energy sources. In Scotland such facilities include the European Marine Energy Centre (EMEC), the PURE Energy Centre on Unst, and the Scottish Enterprise Energy Technologies Centre. Doosan Babcock at Renfrew is unique in the UK as an international research and test facility for cleaner coal combustion and CO₂ capture. Pull-through and commercialisation is also being aided by the Intermediary Technology Institute (ITI) in Energy, which funds and manages early stage research and development programmes across the energy spectrum, including renewables, power networks and energy storage.*

24 *In order for Scotland to increase the momentum it is crucially important that strategic research and development capacity continues to grow and that there is good connectivity between university and industry activities. We therefore urge the Scottish Ministers to collaborate with Scotland's significant research and industrial base in maximising the opportunities that Scotland could exploit in accelerating the development and demonstration of emerging energy technologies.*

Additional Information and References

In responding to this consultation the Society would like to draw attention to the following Royal Society of Edinburgh responses which are relevant to this subject:

- The Royal Society of Edinburgh's *Inquiry into Energy Issues for Scotland* (June 2006)
- The Royal Society of Edinburgh's submission to the Select Committee on Science and Technology, *Inquiry into Renewable Energy-Generation Technologies* (July 2007)
- The Royal Society of Edinburgh's submission to the House of Lords Select Committee on Economic Affairs, *Inquiry into The Economics of Renewable Energy* (June 2008)
- The Royal Society of Edinburgh's submission to the Scottish Parliament Economy, Energy and Tourism Committee, *Inquiry into Determining and Delivering Scotland's Energy Future* (August 2008)
- The Royal Society of Edinburgh's *Inquiry into the Future of Scotland's Hills and Islands* (September 2008)
- The Royal Society of Edinburgh's submission to the Scottish Government, *Framework for the Development and Deployment of Renewables in Scotland* (December 2008)
- The Royal Society of Edinburgh's submission to the UK Department of Energy and Climate Change, *A Framework for the Development of Clean Coal* (September 2009)

Any enquiries about this submission and others should be addressed to the RSE's Consultations Officer, William Hardie (Email: evidenceadvice@royalsoced.org.uk)

Responses are published on the RSE website (www.royalsoced.org.uk).

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