Nuclear Industry Association

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Evidence submitted by the Nuclear Industry Association to the Royal Society of Edinburgh enquiry into Scotland's energy supply

The Nuclear Industry Association (NIA) welcomes this opportunity to submit evidence to the Committee. This is an important topic that urgently needs to be addressed in the light of the reduction in Scotland's nuclear generating capacity over the next two decades, and the long lead times for the construction of replacement capacity.

The NIA is the trade association and information and representative body for the British civil nuclear industry. It represents 116 companies including the operators of the nuclear power stations, those engaged in decommissioning, waste management, nuclear liabilities management and all aspects of the nuclear fuel cycle, nuclear equipment suppliers, engineering and construction firms, nuclear research organisations, and legal, financial and consultancy companies. Several of our member companies, including British Energy, BNFL and UKAEA, have significant interests in Scotland, and it is the location for a number of large engineering firms, such as Mitsui Babcock and Weir, which are heavily involved in nuclear related activities.

We have divided our evidence under the headings that will be covered by your enquiry. We have also concentrated on the electricity generation sector as this is the area in which we have sufficient knowledge to contribute.

How should Scotland provide for its energy needs over the next 5, 15, 30, 45 years, in the context of the likely UK, European and global energy environment?

On the latest statistics Scotland's two nuclear power stations at Hunterston and Torness supply about half of Scotland's electricity, more than any other source. Hunterston B is scheduled to close in 2011, and Torness in 2023. British Energy has stated that the scope for extending the operating lives of AGR stations is limited. Scotland therefore faces the prospect of needing to replace at least a third of its generating capacity, and probably more as old coal fired stations also reach the end of their lives or are retired on environmental grounds, over the next 18 years.

There are several ways in which this shortfall could be replaced. First, power could be imported from England, although this would require England to generate the required surplus and there is no evidence that such large scale investment is likely in current market conditions. This option can therefore be discounted. Secondly, more fossil fuel plants – probably gas fired - could be constructed to meet the shortfall. However, as fossil fuelled plants emit greenhouse gases, increased reliance on those sources would be seriously detrimental to the environment and threaten national and international commitments to reduce carbon emissions to mitigate against climate change. Scotland is currently the leader in the UK in producing carbon free electricity and it would be regrettable to reverse this situation. Moreover, Britain has become a net importer of gas, a position which will be exacerbated as North Sea reserves are depleted. Relying on imported supplies from regions such as Russia, the Middle East and North Africa, many of which are politically unstable, poses risks to the security and cost of energy supply. While it is likely that some additional gas fired capacity will be constructed because of the commercial attractions of the technology, it should be as part of a balanced portfolio of generating sources to reduce the environmental, security of supply and cost risks associated with over reliance on a single imported source.

Alternative options would be to replace the retired nuclear capacity with renewables or to replace it with new nuclear capacity, or a combination of both. Scotland clearly has significant potential for developing renewable sources of energy. As hydro generation has limited further scope for development, the most promising alternative is wind power, given that the timescales (imposed by plant closure dates) would not allow for the development of solar and wave power to a point at which they could produce sufficient electricity to meet the nation's needs. However, replacing Scotland's nuclear capacity with wind power would require more than 4,000 additional on-shore wind turbines, which would require sufficient conventional back up generating capacity – probably fossil fuelled – to compensate for the intermittency of wind power. NIA fully supports the development of wind and other renewable energy sources as contributors to the creation of a low carbon energy economy. However, renewables at their current level of technological development cannot realistically replace the reliable, large-scale, carbon free output of the nuclear stations. The widespread development and deployment of clean renewable sources is crucially important, but it makes little sense to pursue policies to develop renewables at the same time as presiding over the loss of nuclear capacity. There will be no net improvement in emissions levels by replacing one carbon free source of electricity with another. Moreover, given the intermittent nature of many renewables such as wind, the back-up capacity required is likely to be fossil fuelled – coal or gas – meaning a probable net increase in emissions.

Replacing Scotland's current nuclear capacity could be achieved with one modern twin reactor station which could be located on any of the existing four nuclear sites in Scotland. Developments in nuclear technology are producing safer, simpler, more efficient and cheaper reactor designs that produce significantly less

waste than existing reactors. If two such twin reactor stations were built and combined with an increase in the use of renewables Scotland could move rapidly towards generating over 90% of its electricity without the production of greenhouse gases.

Should Scotland aim to be self-sufficient in energy in general, and in electricity in particular, despite trends towards interdependence within Europe?

Scotland is currently an energy exporter which is a major economic benefit for the country but this is set to be reversed if current trends continue. Unless Scotland's nuclear stations are replaced, and even if there is a massive expansion in renewables generation, it is likely that Scotland will become a net importer of electricity which could be a serious economic disadvantage especially in an era of rising energy prices.

What are the possible implications and consequences for Scotland, and the UK, of becoming increasingly reliant on imported oil and gas for their energy needs?

As North Sea oil and gas production dwindles the UK will be receiving most of its gas either by pipeline, initially from Norway but increasingly from Russia with Britain being at the end of a long trans European pipeline, or by sea in the form of Liquefied Natural Gas (LNG) from the Middle East and North Africa. As much as 80% of the UK's gas supply could be imported by 2020. Scotland will import gas direct from Norway, but as their reserves decline, Scotland may have to import gas via English terminals. Both methods of supply – pipeline and LNG - entail additional costs, and if the general rise in oil and gas prices is maintained the cost of gas – and hence the cost of electricity – could rise significantly with an adverse impact on Britain's and Scotland's competitiveness and on energy consumers. Moreover, reliance on supplies from potentially politically unstable regions poses risks to the security and reliability of energy supply.

What is the feasibility, availability, reliability, sustainability, efficiency, capacity and risks of the different energy generation technologies?

This is a very wide ranging question and is perhaps best addressed by reference to other sources of information. NIA has recently launched a new website, www.energy-choices.com which compares the different available energy sources.

The most authoritative UK source looking at recent data on the comparison of electricity future generating costs is provided by the Royal Academy of Engineering. Their report can be found at http://www.raeng.org.uk/news/publications/list/reports/Cost_of_Generating_Electricity.pdf

This study shows that nuclear generated electricity will be competitive with fossil fuelled technologies – gas and coal – and cheaper than renewable sources.

What are the likely trends, and uncertainties, in the availability and cost of energy sources over the next 20/45 years?
Over the next 20 years and beyond it is likely that the use of renewables will increase and their costs will come down. However, several renewable sources, such as wind energy, are intermittent by their nature and require back up capacity which is likely to be fossil-fuelled. Other renewables – for example solar and tidal power - are at a relatively early stage of development and their costs and availability are unpredictable at this time. Nonetheless, the development and deployment of renewables and other low carbon energy sources, including nuclear energy, will be crucial to the achievement of substantial reductions in emissions of carbon dioxide and other greenhouse gases to combat the threat of climate change.

The cost of fossil fuelled generation will rise if the costs of the fuel sources, particularly gas, continue to increase or remain at their currently high level. Coal fired generation is also likely to become more expensive as environmental pressures demand measures to reduce emissions and possibly sequester carbon from coal fired power stations. On the other hand the generating costs of nuclear are relatively stable and predictable as nuclear generation costs are far less influenced by the cost of uranium fuel (on average about 5% of costs in a nuclear station are fuel related compared to 60% for a gas station). A nuclear component in the energy mix therefore provides a hedge against volatile fossil fuel prices and contributes to the achievement of climate change objectives.

What are the economic issues of capital investment in the supply and distribution of energy that need to be considered?
Capital investment costs are a key driver in this sector and will influence the energy mix that the market will deliver. Some of the most environmentally beneficial technologies for instance nuclear, offshore wind and tidal schemes are the most capital intensive. If there are uncertainties and risks in the market that deter investment in these technologies, then these considerations will drive the system towards more gas generation which is quick and relatively cheap to build and offers a rapid return on investment. However, this trend would raise concerns about electricity prices if gas prices remain high, security of supply as we become more dependent on imported gas, and carbon emissions.

What are the key issues surrounding the development of Scotland's bulk electricity transmission and local distribution systems?
Increased reliance on imported supplies and an increase in renewables generation in remote parts of the country will require substantial investment in upgrading and adapting Scotland's transmission and distribution network infrastructure.

What will the impact of energy availability and price be on the demand for energy by commerce and industry in Scotland?
Increased prices and potential shortages of energy could have severe economic consequences for Scottish industrial, commercial consumers and adversely effect their competitive position. This could provide an incentive to improve the efficiency of energy production and consumption, but energy efficiency improvements have not historically been accompanied by reductions in demand.

What are the likely trends in the demand for energy for transportation in Scotland? What is the likely time-scale and scope for substituting other power sources for fossil fuels? What are the likely investment costs?
Substantial reductions in overall carbon dioxide emission levels will require measures to reduce transport emissions, which is the fastest growing cause of emissions. Alternative transport fuels which do not emit carbon dioxide are being developed. At present the leading alternatives are electricity (from low-carbon emitting sources such as nuclear and renewables) which will increase electricity demand, or hydrogen produced from electrolysis of water, which will again increase electricity demand that will need to be generated from low carbon sources. Therefore this extra electricity demand will require as much electricity as can possibly be generated from nuclear and renewable sources. In the slightly longer term, high temperature nuclear reactors which form part of the research into the next generation are capable of producing both electricity and hydrogen.

What are the environmental concerns that need to be taken into account, in terms of the impact on ecological and other natural resources, as well as waste management and impacts on the landscape?
All forms of energy production have environmental impacts so a judgement has to be made on the relative effects of the different means of production. In terms of climate change neither nuclear generation nor renewables have any net carbon dioxide output (there will actually be some lifecycle emissions associated with all of them but they are negligible). However fossil fuel generation does produce emissions that are vented to the atmosphere, and their polluting effects are felt in Scotland and beyond its borders. Nuclear waste on the other hand is being safely contained and stored pending policy decisions on its long term management. In terms of their impact on the landscape nuclear and fossil fuel power stations are rarely considered to enhance the landscape, but because of their concentrated power production the physical footprint is relatively small and their impact is localised in a few locations. In contrast onshore wind turbines can cover a huge area and provoke objections on the grounds of visual intrusion.

Can the objectives of environmental improvement and economic growth both be met without a major increase in energy costs? What steps should be taken to enable an informed debate on the issue?
There are several ways of generating electricity which minimise the environmental impact including nuclear, renewables and fossil fuels with carbon

sequestration. A balanced fuel mix including a range of these clean energy sources and in which no single source predominates enhances environmental protection, improves security of supply and contributes to price stability.

What are the social values and consequences of energy generation and distribution on employment opportunities, health, and energy affordability?

High electricity prices and potential shortages of supply will have negative social and health consequences particularly for those in fuel poverty, with the elderly and the young most vulnerable. One way to counter this is by having a balanced fuel mix in which no one source predominates. Climate change will also have adverse consequences for society as well as people's health and well being and the reduction of carbon emissions must be a prime goal of energy policy. The energy sector is also a major employer in Scotland and it is in the nation's economic interests to maintain its position as an energy producer and exporter. It is also in Scotland's interests to develop its energy sector including renewables and to replace its current power stations which will be coming to the end of their operating lives in the next 10-15 years.

Conclusions

Nuclear energy currently supplies the largest proportion of Scotland's electricity generating capacity, but that capacity will need to be replaced over the next 20 years. In the medium term, renewables are highly unlikely to be able to replace the lost nuclear capacity and increased reliance on imported gas for electricity generation poses environmental, security of supply and cost risks. Scotland has a long tradition in nuclear energy and many Scottish companies possess valuable skills and capabilities in nuclear technology. The replacement of Scotland's nuclear capacity with new, more advanced reactors would provide long term environmental, economic and energy supply benefits. NIA acknowledges that arriving at an acceptable long term solution to the problem of radioactive waste management is an important step in the public acceptance of new build in Scotland and elsewhere in the UK. However it should not be a pretext for delaying any decisions on replacing Scotland's nuclear capacity. If Scotland is to maintain its position as a low carbon producer of electricity then it must start planning new nuclear capacity now.

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July 2005