The Royal Academy of Engineering

Renewable energy framework in Scotland

Response from The Royal Academy of Engineering to the Scottish Government

December 2008

1. Achieving 20% of energy consumption from renewable sources

- **Do consultees agree that we should aim at 20% to meet the 2020 target and that progress should be made in all three sectors of electricity, heat and transport?**
- **If not - why not?**

Reaching the target of 20% of the Scotland's total energy supply to come from renewable sources by 2020 will be extremely challenging. The Academy agrees that a wide range of policy instruments and technological solutions will be needed to tackle climate change and progress will be needed in all sectors of the economy. Renewable energy clearly has a central role to play. There is, however, some concern that setting such a difficult target for renewable energy will detract attention from other low-carbon technologies, such as nuclear power or carbon capture and storage, which have an equally important role in mitigating climate change.

Effective policy must have clear and realistic goals. In terms of climate change, the goal must be to reduce emissions of greenhouse gases in order to limit predicted rises in global temperature. The Scottish Climate Change Bill will enshrine in law the necessary emissions reductions and this must be the main target for its energy policy.

Most of the relevant technologies and infrastructure have a lifespan of several decades. Policies must therefore be similarly long-term in nature. There is a danger that focussing on a single target in 2020 will result in short-term solutions that will not be sustainable. The case of biofuels has shown that care needs to be taken before committing to a particular technology.

2. Renewable electricity

- **Are the expectations for each technology reasonable?**
- **Have the main constraints to development been identified?**
- **Bearing in mind the need for costs to be taken into account, are there further actions which need to be taken by relevant parties in order to release renewables potential?**

Generating half of Scotland's electricity from renewable sources by 2020 would be an enormous challenge. While it would be difficult to claim that the assessments of the various renewable technologies in the consultation document are incorrect, they do seem to represent an extremely optimistic forecast at the limit of what might be possible.

We would agree that the biggest growth is likely to come from wind – both onshore and offshore. Over the past few years onshore wind technology has matured faster than other renewables such as solar or marine and has now reached a point where it is a well established form of electricity generation. Continued growth in this sector is to be expected, but the rate of growth cannot be guaranteed. Constraints in the supply chain, planning consent and grid connections still exist and could easily affect the projected growth. The prime locations are quickly being used up and the failure of large projects such as the Lewis wind farm are indicative of the sort of setbacks that could result in targets being missed.

The projections for growth in offshore wind give even greater cause for concern, based as they are on a much lower base level and shorter history. It is likely that

offshore wind projects will not be held back by planning constraints as much as onshore. But supply chain constraints and grid connections are even more of an issue as there are extra technical difficulties to deal with when installing and connecting wind turbines at sea. It is also expected that offshore turbines will have a higher load factor than their onshore equivalents, but this remains to be proved, especially when maintenance issues are taken into account. It is likely that offshore turbines could suffer more prolonged periods of down-time owing to access restrictions; a fact that appears to be borne out by existing installations.

So while the projections for wind energy may be met, even the slightest of technical setbacks or miscalculation in the models could easily result in a serious shortfall. Equally, bottlenecks in the supply chain or planning process – both of which are highly possible - could also result in the targets being missed by a significant margin.

An additional area of concern is the issue of intermittency. Research has shown that although many renewable sources of energy are intermittent in nature, the national grid is able to cope with a certain amount of intermittent generating capacity (about a fifth) without requiring a significant amount of back-up thermal generation and with only modest rises in costs. If the potentials laid out in the consultation document are fulfilled it is likely that this proportion will be exceeded and the UK will be moving into unknown territory. Indeed, even the models used to predict the performance of the grid generally only assume a maximum of 20% intermittent supply. Moving beyond this level will raise the potential risks in terms of costs and security of supply and may prove to be a serious barrier to achieving the target without additional expenditure.

3. Renewable Heat

- **Do consultees agree that we should work towards a target of 11% for renewable heat?**
- **What more could we or other parties so to encourage renewable heat deployment specifically with regard to: air quality, awareness raising, planning, and other areas?**
- **Do consultees agree that renewable heat should be promoted through a regulatory incentive mechanism? Do consultees consider that there are Scotland specific issues in the choice between a Renewable Heat Incentives and Renewable Heat Obligation?**

The target of 11% of heat demand to be sourced from renewables represents a considerable increase from the current 1% level, but if the overall target of 20% is to be reached significant advances will be needed in this sector. Unfortunately, progress in this area has been difficult. In order to better understand the problems and attempt to identify solutions the Academy, in conjunction with the Energy Research Partnership and the Energy Technologies Institute, are planning a seminar on the subject of heat on 22 January 2009. We would be happy to welcome representatives of the Scottish Government at this seminar or, if no one can attend, provide feedback after the event.

4. Distributed Energy and Community Based Schemes

- **How can distributed energy systems be promoted in Scotland?**
- **Do you agree with the Scottish Government's proposed measures for maximising community benefit from renewables, including the production of guidance and the development of an improved grants scheme?**
- **What role can social landlords play in developing local renewable energy schemes and what is the best way of supporting and enabling this?**

The Academy would, in general, support the introduction of a feed-in tariff or nett metering as the most effective mechanism to support distributed energy. The full potential of distributed energy in reducing carbon emissions is difficult to gauge and a careful life-cycle analysis of each of the possible technologies would be strongly encouraged. In the majority of cases, distributed energy will look like demand reduction from a distribution network operator's point of view as generation will rarely exceed the specific site's demand.

Information should be directed at medium sized community schemes such as educational institutions, businesses and public buildings. In these cases, the information provided should produce better results than for individual domestic installations because of their larger size.

While new build homes and businesses must be built to the highest standards of efficiency and employ renewable energy sources where possible, the housing stock has a particularly slow turnover rate. As a result, the main focus must be on retrofitting the existing stock if the targets are to have any chance of being met. The Scottish Government could do two things to help incentivise retrofit of distributed energy technologies.

Firstly, it could streamline its procedures for approving new technologies and materials for use in the building trade. At present this can take a considerable length of time – up to 10 years – and is a major barrier to the uptake of potentially beneficial developments.

Secondly, it could ensure that its own procurement chain adopts distributed energy technologies as much as possible. This will give a necessary boost to the market and help renewable technologies reach maturity in a shorter time.

5. Bio-energy

- **Do consultees agree that there is significant potential for developing bioenergy through wood and recyclable waste**
- **Is there anything more that can be done to encourage next generation bioenergy, including marine biomass?**

In terms of sustainability and efficiency, utilising biomass waste is to be encouraged. A comprehensive reassessment of the classification of waste materials is needed in order to ensure that all materials that could be used to generate energy can be used.

Co-firing of biomass offers a significant opportunity for increasing the use of renewable energy. This is a proven option and can be adopted at existing plants,

thus eliminating problems from planning or grid connection. Care must be taken, however, that the biomass is compatible with the relevant technology.

6. Sustainable Transport

- **How can we best incentivise renewable and low carbon transport in a sustainable and cost effective way in Scotland?**
- **What potential is there for the introduction of vehicles powered through the electricity grid in Scotland? What impact would the widespread introduction of these kinds of vehicles have on:**
  - **Energy demand and carbon emissions**
  - **Providing distributed storage capacity**
  - **Smoothing levels of electricity demand on the grid?**
- **What factors might affect the scale and timing of these impacts?**
- **Over what timescales do you think electric vehicles could contribute to our renewable energy and carbon reduction targets and what could the Scottish Government do to accelerate the introduction of these vehicles in Scotland in a cost effective way?**

Biofuels will clearly play a part in reducing emissions in the transport sector but, as the consultation document points out, this must done in a sustainable way. We support the consultation's view on the recent Gallagher Review of the Indirect Effects of Biofuels; that promotion of biofuels for transport must continue in a cautious manner.

Also, as the King Review of Low-carbon Cars points out, emissions reductions can be achieved not only by a change in fuel, but also by changes in vehicle efficiency and by behavioural changes. Efforts to increase the average efficiency of the road stock have met with varying success. Thus far, the car industry has agreed to voluntary targets for average vehicle emissions but has been lagging behind in meeting even these modest targets. If this continues to be the case then enforcing such targets would appear to be the only option.

Recent rises in petrol and diesel prices have naturally forced people to consider buying more efficient vehicles, but there is no guarantee that an upturn in the economy or a reduction in fuel prices would not reverse this trend. For this reason, it would be dangerous to rely on the current economic situation to provide the required emissions reduction. In engineering terms it is certainly possible to design cars with lower emissions. However, this will normally result in compromising on other aspects of the design such as safety and performance. Incentives are needed to make emissions the primary design consideration.

Behavioural changes are equally important and recent rises in fuel prices have again forced people to be more economical in their transport decisions. However, as with vehicle efficiencies, the economic situation cannot be relied upon to produce permanent changes in behaviour. Many options exist such as encouraging the use of public transport or bicycles and reducing the distances people travel either for work or leisure. All these options must be fully explored.

It is difficult to predict the potential of electric powered vehicles or their impact. At present, the performance of electric cars lags some way behind traditional counterparts but technological advances, particularly in batteries, could close this gap relatively quickly.

In terms of carbon emissions, any move to electric vehicles must be accompanied by a significant increase in low-carbon electricity supply otherwise the emissions will simply be displaced. The uptake of electric vehicles does not, however, necessarily require a corresponding rise in electricity generation capacity. It would be expected that most electric vehicles would be charged overnight when demand is low. It would therefore result in an increase in the base load demand level rather than an overall rise in maximum capacity.

It is possible that electrification offers the best chance to decarbonise the transport system. This is, however, purely theoretical at present and other options such as hydrogen powered vehicles may also be possibilities. More research is needed and nothing can be ruled out at this stage. Ultimately an alternative to liquid hydrocarbons will be needed but better efficiency and behavioural change currently offer the most effective means of reducing emissions from transport, certainly by 2020.

One initiative the Academy does strongly support is the electrification of the GB rail network. Currently 64% of passenger miles are by electric trains and it is hoped that by the end of a 10 year programme this figure will have risen to 91%.

7. Consents and Planning

- **How can developers be encouraged to work closely with planning authorities and local communities to improve the quality of applications?**
- **Can more we done to develop joint working between central Government, planning authorities and statutory and non statutory consultees in pursuit of the Government's ambitions on renewable energy?**
- **Given the growing number of issues connected with aviation and radar and wind farm development, especially in Southern Scotland, is there scope for cooperation between developers and aviation interests to promote a regional solution to complement the overall UK approach?**

The Academy supports any measures designed to streamline the planning system and remove constraints to the deployment of all low-carbon technologies, including renewables. It is particularly important in the case of large projects as these will provide the greatest benefit in the shortest time.

It is also important that the public are fully engaged on these issues. While the changes to the planning system may speed up the process it will still be possible for objections to slow the process down. Objections could come from a variety of sources such as local pressure groups, NGOs and conservation groups. It must be made clear that difficult decisions will need to be made and potential risks to the environment, through action or inaction, will need to be measured against each other. One possible approach to help resolve such difficulties is the model of volunteerism put forward by CoRWM for dealing with radioactive waste.

Overall, the more open and honest the debate between all parties, the less likely it is that a potentially damaging stalemate will occur. In this regard, the Academy is keen to provide a neutral and independent space for such conversations to take place.

8. Research, development and demonstration

- **How can we promote a strategic approach to research and development of renewable energy so that Scotland capitalises on its current strengths and becomes a European and world leader?**
- **How can we make sure that partnerships with European and world bodies act to promote Scottish and wider interests in this area?**

No comment.

9. Supply chain and Skills

- **How can Scottish industry seize the opportunities this renewed commitment to renewable energy at Scottish, UK and European level brings to develop a large and prosperous renewable energy sector making a significant contribution to sustainable economic growth in Scotland and providing a wide range of skilled jobs?**
- **What can be done in the short term to promote more effective collaboration in local sourcing and procurement?**

No comment.

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