The Royal Society of Edinburgh

Energy for Scotland: A Call for Action

Follow-on Activities from The RSE's Report

Inquiry into Energy Issues for Scotland

May 2007

Energy for Scotland: A Call for Action

Summary

There has been much activity since the publication of our report in June 2006. We summarise this and identify the further action needed to achieve implementation of our conclusions and recommendations. We also summarise the outcomes from visits to schools and public debates around Scotland and a final conference held in Edinburgh.

We remain of the view that the overwhelming priorities for action are:

- **Improvement in the efficient use of energy, and**
- **Reducing the use of fossil fuels in space and water heating and in transport.**

From the debates we have instituted around Scotland for the public and for schools, we are clear that there is a wide consensus on these matters as necessary to constrain the rate of growth of consumption and to reduce the use of fossil fuels, and so reduce the emission of greenhouse gases.

The following specific actions are urgent:

Decision	When	By whom
UK Energy strategy	Mid 2007	UK Government
UK Energy targets	Mid 2007	UK Government
Scottish Energy strategy	End 2007	Scottish Executive
Emissions targets for Scotland	End 2007	Scottish Executive
New electricity generating plant	Mid 2007	Scottish Executive/generators/ National Grid Company
National Grid upgrade in Scotland	Mid 2007	National Grid Company/Ofgem
National Grid upgrade Scotland/England	Mid 2007	National Grid Company/Ofgem

Purpose

This report is an update of the Royal Society of Edinburgh's report, *Inquiry into Energy Issues for Scotland,* published in June 2006. It reflects on recent decisions, and summarises public debates and schools visits around Scotland and the concluding conference in Edinburgh. It identifies the action required to ensure achievement of the Committee's strategic aim – *a secure, competitive, socially equitable and low carbon emissions supply of energy for Scotland*. This report is targeted at decision-makers in the UK and Scottish governments, the energy sector and all those who seek to influence decisions on energy.

Résumé of 2006 Report Recommendations

To achieve our strategic aim, we identified the need for energy from a diversity of fuels, countries, and technologies, helping Scotland to be competitive in global markets, with all sections of society having access to energy at a price they can afford, and using technology with the lowest greenhouse gas emissions throughout their life cycle.

We considered that the situation was urgent and recommended decisions by government and by the market. A comprehensive and integrated approach was proposed, focusing on increasing the efficient use of energy, using cleaner energy sources, researching and developing new technologies to benefit Scotland, and implementing more effective measures to improve the operation of the energy market. We made 37 specific recommendations. We have also reviewed progress and the action now required on the 37 recommendations from our report; these are available at www.royalsoced.org.uk/enquiries/energy.

As the domestic and transport sectors are the dominant areas of consumption (34% and 28% respectively), we recommended that greater attention was required to reduce consumption, to make consumption more efficient and to encourage the switch from fossil fuels to more environmentally benign sources.

Action Since 2006 Report

A great deal of activity and action has taken place over the past year. The main actions and decisions by the EU, UK and Scottish governments and by industry are summarised below.

EU

November 2006: An international consortium has signed a formal agreement to build an experimental nuclear fusion reactor - *Iter*. The project will be based in France.

January 2007: The Commission published its first Strategic Energy Review. The main proposals are reduction of greenhouse gas emissions within the EU and internationally; targets for renewable energy and biofuels; ways to improve the functioning of the internal electricity and gas market; the need to strengthen the EU's Emissions Trading Scheme; priorities for action to improve energy efficiency based on the EU's Energy Efficiency Action Plan of October 2006; a commitment to increase by 50% EU spending on energy-related research; and plans to encourage construction of 12 demonstration plants for carbon capture and storage.

March 2007: European Council adopt an Energy Action Plan for 2007-09, which commit Member States to meeting the following targets by 2020:

- Reduce greenhouse gas emissions by at least 20% as compared to 1990.
- A 20% reduction of EU energy consumption compared to projections for 2020.
- A binding target of increasing the share of renewables in the overall EU energy mix to 20% by 2020.

The European Commission should provide an updated Strategic Energy Review in early 2009, which will serve as the basis for the new Energy Action Plan from 2010 onwards, to be adopted by the European Council in Spring 2010.

UK

July 2006: The Government's report on the Energy Review, *The Energy Challenge,* is published. The work aims to position the UK to meet the two major long-term challenges in UK energy policy: (1) the need to tackle climate change by reducing carbon dioxide emissions; and (2) the need to deliver secure, clean energy at affordable prices, as the UK moves to increasing dependence on imported energy.

July 2006: The Committee on Radioactive Waste Management (CoRWM) published its final report and recommendations to the UK government on the long-term management of the UK's higher-activity radioactive waste. Subsequently, the UK government and devolved administrations accept the Committee's recommendations that the UK's higher-activity radioactive waste should be managed in the long term through geological storage, with a continuing need for safe and secure interim storage.

September 2006: The Secretary of State for Trade and Industry published a Prospectus setting out the aims of the Energy Technologies Institute, which has a remit to accelerate the development of secure, reliable and cost-effective low carbon energy technologies towards commercial deployment.

October 2006: The Stern Review Report, *The Economics of Climate Change,* is published. It examines the evidence on the economic impacts of climate change and explores the economics of stabilising greenhouse gases in the atmosphere. The Review also considered the policy challenges involved in managing the transition to a low-carbon economy.

December 2006: The DTI issued new Guidance to power station developers to maximise the use of combined heat and power (CHP) where feasible.

February 2007: Judicial Review ruling found the consultation process that preceded the publication of the UK Energy Review Report had not been adequate.

March 2007: The UK Government draft *Climate Change Bill* is published, setting out a long-term framework for moving the UK to a low-carbon economy.

March 2007: Chancellor's 2007 Budget announces:

- Phasing-out of high energy light bulbs in UK by 2011;
- Incentives for biofuel development and use;
- Competition to develop the UK's first full-scale carbon capture and storage demonstration;
- Further use of Vehicle Excise Duty to encourage the purchase of low carbon cars;
- Car vehicle excise duty rates for the next three years, including rates for the most polluting cars rising to £400 and rates for the most fuel-efficient cars falling to £35;
- A review to examine the vehicle and fuel technologies which over the next 25 years could help "decarbonise" road transport;
- Biofuel duty differential of 20p to be extended until 2010;
- Measures to help householders take cost-effective action to improve the energy efficiency performance of their homes.

Scottish Executive

September – December 2006: *Statutory Consultation on Review of Renewables Obligation (Scotland) (Support for Wave and Tidal Power) 2006*. The consultation proposed the introduction of a Marine Supply Obligation (MSO) on suppliers to source output from wave and tidal sources located in Scotland.

October 2006: Forum for Renewable Energy Development in Scotland (FREDS), Hydrogen Energy Group (HEG) Report, *Hydrogen and Fuel Cell Opportunities for Scotland*. This report details HEG's recommended actions to develop hydrogen and fuel cell capabilities in Scotland.

November 2006: The Scottish Biomass Support Scheme opened for expressions of interest. The Scheme is Scotland-wide and will provide grants to support both supply chain, and heat and CHP installations.

December 2006: *Scotland's National Transport Strategy* set out, for the first time, the Executive's long-term vision for transport, together with its objectives, priorities and plans. It focuses on three strategic outcomes: (1) improve journey times and connections; (2) reduce emissions; and (3) improve quality, accessibility and affordability. The National Transport Strategy is supported by *The Freight Action Plan for Scotland, Scotland's Railways* and *An Action Plan for Buses in Scotland*.

February 2007: Scottish Ministers announced a £13 million funding package for marine energy projects in Scottish Waters. Ministers also confirmed that the Executive has reached its target to have 18% of Scotland's electricity generated (as a proportion of consumption) from renewable sources ahead of schedule.

March 2007: *Scottish Planning Policy, SPP 6 Renewable Energy,* published. The policies support the role of the statutory development plan in providing clear guidance on the relevant issues that should be taken into account when determining renewable energy proposals in the area. It also places a requirement on all new developments to reduce carbon emissions by at least 15%.

March 2007: Scottish Executive published consultation paper, *Achieving a Low Carbon Future*, the first energy efficiency and microgeneration strategy for Scotland. It set out the steps that the Executive is already taking and its proposed way forward to ensure that energy efficiency and microgeneration make an increased contribution to sustainable development, climate change and energy objectives.

March 2007: Guidance Note, *Controlling Light Pollution and Reducing Lighting Energy Consumption,* published. Provided guidance on the factors that require to be considered and the actions to be undertaken to ensure that non-obtrusive and energy-efficient exterior lighting installations are provided and operated throughout Scotland.

March 2007: *Biomass Action Plan for Scotland* set out a coordinated programme for the development of the biomass sector in Scotland. It summarises the various existing activities, and provides a framework under which they will be coordinated and also supplemented by further actions. The Plan includes greater use of the forestry and agriculture sectors, together with grant support to encourage greater use of biomass products. As part of the Plan, £3 million additional funding is available for the Biomass Support Scheme.

March 2007: From May 2007, Energy Performance Certificates will be phased-in when buildings are constructed, sold or rented out, including homes, public sector buildings and business premises.

Industry

August 2006: Chevron is to build a new technology centre in Aberdeen which will work on offshore research development.

October 2006: Official opening ceremony of the Norwegian Langeled pipeline, set to deliver up to 20% of the UK's average winter gas needs.

October 2006: INEOS Enterprise is to invest about £70 million in a biofuels production facility at its Grangemouth site. When operational in 2008, it will supply around 35% of the UK's biodiesel needs.

November 2006: Balcas Ltd is to construct a £24 million biomass project at Invergordon, north of Inverness, which will include a CHP plant generating green energy that will be supplied direct to the grid.

December 2006: Gas flowed for the first time through the gas pipeline between UK and The Netherlands. The Bacton – Balgzand pipeline (BBL) will supply 8% of the UK's gas needs.

December 2006: The green light was given for two offshore wind farms in the Thames Estuary, one of which will be the world's biggest when completed.

February 2007: Excelerate Energy has built the world's first dockside regasification facility in the UK.

April 2007: Shell decides to invest £350m in securing the long-term future of the St Fergus gas terminal and Mossmorran plant.

April 2007: British Energy signalled the resumption of nuclear power plant construction in the UK, while admitting that continuing maintenance problems with Hinkley and Hunterston might threaten their future. It said any construction would be on "one or more" of its existing sites, and that the company would decide by April 2008 whether or not to prolong the life of the two existing stations.

Debating Scotland's Energy Choices

We held a series of sessions around Scotland, open to the public, and visited schools at the same locations to stimulate debate with senior students. Attendance was as follows:

Table 1: Open Public Meetings

Public Discussion Forums	Audience Numbers
Aberdeen	50
Dumfries	95
Edinburgh	70
Glasgow	70
Inverness	75
Perth	95
Total	455

Table 2: Schools Debates

Schools Visited	Pupil Numbers
Aberdeen: 4 schools	23
Dumfries & Galloway: 3 schools	105
Edinburgh: 4 schools	130
Glasgow: 1 school	70
Inverness: 1 school	19
Perth: 1 school	60
Total	407

Public views

(1) Areas of general consensus

There were a number of areas of general consensus, as follows:

1. Recognition of the link between emissions from fossil fuels and global climate change;
2. Agreement that renewable sources of energy are a key contributor to energy supply needs because of their low greenhouse gas (GHG) emissions and the abundance of the Scottish resource. Also, recognition of the need to encourage technologies other than onshore wind; for example, tidal, wave, solar, biomass, and offshore wind;
3. Recognition of the need for energy savings to preserve supplies and to reduce environmental effects, and especially the need to reduce the waste of energy, coupled with more effective instruments for encouraging energy saving;
4. Recognition of the technological expertise on energy based in Scotland and the need for further support for technological development;
5 A call for new thinking on the way energy is supplied to the consumers, especially through distributed systems and micro approaches;
6. A call for new fuels, provided they are economic and environmentally neutral; and
7. Recognition of the need for action at political, industrial and societal (including personal) levels following proper debate.

(2) Areas of continuing debate

There was a lack of consensus on many issues as follows:

1. The key objectives of public policy (GHG emission reduction, and/or security of supply); but there was a general consensus on the strategic aim set out in the RSE Report. Balancing the benefits and costs to the environment was considered to be very difficult.
2. Ethics is a major issue, specifically whether Scotland, as a small country with low emissions in total in global terms, should do anything at all or whether it should be an exemplar to other countries.
3. Unresolved debate on whether renewable sources bring real economic, social and environmental benefits to Scotland. There are many concerns that one solution is being over promoted, often termed 'the dash for wind', and that other solutions are being given less prominence.
4. Energy price trends are not clear and it is debatable whether the consumer is prepared to pay more. Only consistently much higher prices might change behaviour in favour of greater savings and efficiency, but is this ethically defensible?
5. On alternative sources of supply, there was no consensus on the immediate solutions, such as renewables versus new large generating plant for electricity, and the unresolved arguments about whether supply should be from the source nearest to the consumer or at the most advantageous point of high energy resource. Also, the debate on the balance between fossil fuels and renewables is unresolved.
6. The greatest disagreements consistently were on the technologies for electricity generation. The polarities are:
    - nuclear has to be a key part of shorter-term solution, given the improved technology and costs, and the excellent safety and delivery records of existing civil nuclear reactors; or there should never be any more nuclear powered electricity generating stations in Scotland because of the lack of action on storage of high level radioactive waste and concerns about the military use of fuel;
    - onshore wind has been given too much prominence compared to other renewable technologies;
    - there remain large resources of fossil fuels for decades (oil and gas) and for centuries (coal and uranium);
    - there is no consensus on the need for and effect of transmission lines on the environment and on nearby communities and options for under-grounding or for offshore routes; and
    - there are doubts about the practicality of some new technologies, such as carbon sequestration in clean coal technology.

(3) Perspectives of the younger generation

In the schools' discussions there was a much greater degree of optimism. There was always a clear view that 'the lights will not go out' within a decade, as a result of human ingenuity and a mixture of existing and new technologies being available. Furthermore, the polarities which existed in the public sessions with regard to technologies for electricity generation were much less evident in the school discussions.

There was a strong view that a change in culture was needed to wean society off its dependency on fossil fuels. Alongside this, was an appreciation of the need for energy savings and greater information on what can be done to achieve these savings, and the need for alternative fuels for transport and heating.

Most students recognised the link between global climate change and the use of fossil fuels and therefore the need for precautionary action to mitigate climate change.

There was a perception amongst the students that their views and opinions were not being sought on energy issues and that meant they could not influence decisions.

(4) Location differences

There were differences in the issues raised in the public debates around Scotland. The following were the main issues from each location:

Aberdeen: investment incentives, technologies, heat and energy efficiency.

Dumfries: security and diversity of supply, alternative energy sources; micro and local solutions, reductions and savings.

Edinburgh: tidal, heat, political leadership, reductions and savings, nuclear, life cycle.

Glasgow: nuclear, onshore wind and infrastructure, planning system, fossil fuel technologies, moral issues, economics, education.

Inverness: onshore wind and infrastructure, infrastructure options, micro and local solutions, use of waste.

Perth: moral issues, nuclear, onshore wind and infrastructure, bio-energy, energy objectives, energy prices.

These reflected in part the issues of the moment, for example the Public Inquiry on the Beauly to Denny transmission line and the related development of onshore wind farms. They also reflected the expertise in the audience, leading to debates about technologies, and the strong undercurrent of support in some debates for more nuclear generating capacity.

Commentary

There were many topics in the energy debate which were little considered, despite the clear analysis in the RSE Report and the presentations on it. The longer-term position on demand and supply was considered to be in the very difficult category. We were very surprised that security of supply figured minimally. The relative unit costs of different technologies, together with energy from waste and use of waste heat, received limited interest. Most significant, there was virtually no debate on alternative fuels for transport and heating, despite the fact that these comprise respectively 28% and 53% of energy consumption in Scotland.

Technology for generating electricity was by far the most debated topic, with no consensus on the wind and nuclear energy debates. There remains little acceptance that electricity represents only about one fifth of the energy use in Scotland, because of the highly emotive stances taken on onshore wind and nuclear in particular, and the unresolved issues of how much capacity there should be and where it should be situated.

Public Views on Action Required

There was general recognition from the public sessions of the urgency of making decisions on new energy supply technologies, especially in relation to electricity. This is in tune with the key recommendation of the RSE Energy Report.

Specific areas for action were identified as follows (the relevant recommendations in the RSE Energy Report are noted in parentheses):

1. Higher priority and more funding to cleaner fossil fuel technologies and to alternative renewable technologies (Recommendation 17).
2. Need for decisions on new base-load electricity supply, including decisions on fuel types and final decisions on whether nuclear or not (Recommendations 26, 30 and 31).

3. More effective energy-efficiency and energy-saving measures and gadgets accessible to the public to stimulate higher levels of performance. Better designed and more affordable energy savings in 'white goods'. Break the circularity of save costs on energy/buy more energy-consuming devices through public education (Recommendation 12).
4. More financial support from government for bringing energy technologies from the laboratory to full-scale operation.

Conference – Energy For Scotland: Is There a Consensus?

The RSE convened a conference to bring together Scottish and international experts on energy and to conclude its debates on energy. It was deliberately aimed at identifying whether there was any consensus on energy issues from both the Scottish and the wider geographical perspectives.

(1) Global perspective

There was a clear consensus of the global energy situation: the current position is **unsustainable**. This is not a result of the technical availability of energy resources, as the global reserves of coal will last for at least two centuries, there are higher extraction rates of oil and gas, and new sources of hydrocarbons are being discovered all the time. Rather, the unsustainability is caused by a combination of factors: global climate change triggered by emissions from fossil fuel consumption; projected increases in overall consumption as a result of increasing global populations; the gradual rise in the standard of living resulting in higher per capita energy consumption; and the geopolitical issues surrounding national interest controls on energy exploitation and on energy prices from the key resource areas of the world, notably the Middle East, Russia and West Africa. It is likely that technological advances will allow new energy sources to be exploited and that greater use of locally-available resources will become more significant. However, if the link between fossil fuels and global climate change is to be broken, then a price for carbon has to be set to stimulate the development of clean fuels and clean technologies for fossil fuels; alternatively, but less favoured by industry, would be a carbon tax.

(2) Scottish perspective

There was a fair degree of consensus at the Scottish level, with one notable exception: the need for, or ethics of, further nuclear-powered electricity generating capacity.

There was a strong preference for carbon reduction targets in preference to renewable energy targets, as these were considered to be more effective and also avoided trying to 'pick technical winners'. Both grid-networked and the greater use of locally-distributed systems were favoured, as were more effective efforts to increase energy efficiency and especially to reduce, or use more effectively, waste from urban areas and waste heat from power generation and other sources.

However, the consensus broke down on issues such as whether there would be energy shortages and, for example, whether biofuels were a viable energy source option, given the weak economic case at present and the environmental effects of their use.

There was recognition of the importance of renewables in the electricity supply equation, but disagreement on whether renewables could supply all the likely needs. The distinction was drawn between the 'ever present', such as renewable energy from waste, and the 'intermittent', such as wind and water sources, and the consequent need for flexible back-up capacity from non-renewable sources.

Fundamentally, the consensus broke down on the issue of whether new nuclear-powered generating capacity should be installed in Scotland. There was no meeting of minds on this issue and no apparent likelihood of compromises between the main protagonists. Therefore, there was also, inevitably, no consensus on the energy hierarchy proposed by environmental groups, which has renewables as top priority, followed by clean fossil fuel technologies and with nuclear as the unfavoured last resort.

(3) Short-term necessity

There was a consensus that there is no 'silver bullet' to provide the solution in the short term. Solutions will vary in space and in time. These required active encouragement by the global energy and political community.

An Alternative Policy Scenario was described and achieved a broad consensus. This comprises a diversity of supply of energy sources and recognises that the global price of oil sets the new baseline for alternative energy sources. In addition, clean technologies for fossil fuels, new nuclear powered generation and renewables should be part of the mix. There would also need to be greater use of local energy sources to reduce costs, reduce environmental effects and increase security of supply. Most important, it was recognised that efficiency had to take top priority everywhere: efficiency at the user end and at the power stations where currently too much heat was dissipated.

To prepare for the longer term, investment in development of alternative sources and cleaner technologies was essential. Alongside this was the need to increase the skills available through education and training stimulated by the job opportunities which would undoubtedly become available.

(4) Long-term vision and prospect

For the longer term of a few decades' time to the middle of the century, a clearer vision is required if the prospect of resolving the current unsustainable position is to be achieved. It has to be remembered that not everything is currently possible, because of technological constraints and the lack of markets and the level of prices; but this may not always be the case.

There was a consensus on the ingredients for the future. First and foremost, was the need for continuing increase in the efficiency of energy use. Second, carbon sequestration technologies were vital and could achieve three benefits simultaneously: reduction in carbon emissions, more effective use of the large reserves of fossil fuels available; and the opportunities afforded for enhanced oil recovery. Third, there was no simple solution for the development of alternative fuels. Renewable energy sources had downsides as well as benefits and they had to be assessed from all perspectives rather than making ill-considered judgements on their environmental benefits. Biofuels had prospects with the second-generation technologies, especially the further development of fuel cells, but the prospects for alternatives for aviation fuel remained poor. Nuclear fusion technology was progressing, albeit very slowly, and hydrogen as a fuel vector held out a good prospect in the longer term, provided that the source of energy was low carbon. And energy storage remained an important goal.

Investment requirements were very high, but achievable, providing governments sent the right market signals and gave support for scaling-up and incentives for higher extraction rates.

There were also a good many equity issues, especially comparing the industrialised world with the emerging economies and the lesser developed countries. Improvements in the operation of the UN's Clean Carbon Mechanism would be helpful in this regard.

(5) Conclusions

Scotland is no different from other countries and should think in a global context as well as act locally, as articulated in the RSE Energy Report. It should not go alone, given the reserved/devolved powers mix on energy and related matters, but more importantly, it could provide a model for the rest of the UK.

Claims that there were choices to be made between, for example, central and decentralised systems of electricity supply, between specific technologies or a mix, between supply-led approaches or demand-management, or concentration on Scotland as a net energy exporter or importer, were not accepted. The general consensus emerging was that a mix of solutions, rather than selecting specific winners,

was the most sensible course of action. The mix should comprise old technologies with improved carbon sequestration, new technologies, energy efficiency and energy savings (noting that many old issues on efficiency had been around for decades and still had not been resolved).

There was a clear consensus that some very difficult decisions were required by government and by industry. There were many opportunities for technical expertise and also for jobs in the energy industries.

It was noted that progress had been slow on the key issues raised in the RSE Report and there was encouragement to press for speedier action.

Debates could be never-ending on polarised issues. To prepare the ground for timely and effective decisions, it was necessary for more objective information to be provided, and for consensus-building, especially after the elections to the Scottish Parliament in May 2007, as much action was required in the short term.

ACTION REQUIRED

We identified many actions needed, particularly by the UK and Scottish Governments in our 2006 Report. We review progress and note the need for further action on each of the recommendations on our web site (http://www.royalsoced.org.uk/enquiries/energy). Overall, we note a great deal of activity, but the overall frameworks at UK and Scottish levels remain less than clear, and the action on some issues is negated by counter-actions on others. A more integrated and coherent approach is still lacking and is urgently needed.

We also see the opportunity afforded by the development of the *Curriculum for Excellence* to broaden the scope of education on energy as part of the school curriculum, paying particular attention to the interdisciplinary nature of the topic and its vital importance in preparing students for citizenship.

In summary, action is needed as follows:

(1) UK Government on clarifying energy policy and the most appropriate instruments;

(2) Scottish Executive on an energy strategy, improved decision-making systems, targets for carbon reductions to replace renewables targets, improvements in the operation of institutional structures, and speedier decisions on renewables.

(3) The Energy Industry through investment in new technologies and replacement of aging electricity generation infrastructure; and

(4) Consumers and the public through changes in behaviour on energy use, and by lobbying for early decisions and action by government.

The overwhelming priorities for action remain

- **Improvement in the efficient use of energy, and**
- **Reducing the use of fossil fuels in space and water heating and in transport.**

There is a wide consensus on these matters as necessary to constrain the rate of growth of consumption and to reduce the use of fossil fuels, and so reduce the emission of greenhouse gases.

To improve the quality of debate and to ensure that the decision-making process is better informed, we reiterate our recommendations that:

- An objective methodology to assess the relative merits of energy technologies, including full lifetime costs is urgently required (see Recommendation 6); and
- Bodies independent of government and sectoral interests should be active in stimulating the debate and the identification of decisions needed and the urgency of the situation (see Recommendation 37). The Royal Society of Edinburgh has completed its work on energy and it is now for other independent bodies to take up the challenge.

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