

Views from Scotland on a European Strategy for Sustainable, Competitive and Secure Energy

A Scotland Europa Members Paper in response to the
European Commission Green Paper

September 2006

Networking Scotland in Europe

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Introduction

This document contains submissions from Scotland Europa member organisations to the 2006 European Commission consultation on the Green Paper for a European Strategy for Sustainable, Competitive and Secure Energy.

The contributions are the views and opinions of individual Scotland Europa members. This paper can not represent every Scottish point of view or any official voice; and does not seek to do so.

Contact details for the organisations that have contributed to this document are included with their individual submissions.

Scotland Europa promotes Scotland's interests to the key institutions of the European Union and to the regions of Europe.

Part of the economic development agency, Scottish Enterprise, Scotland Europa represents a wide range of Scottish organisations. Our membership brings together diverse sectors such as business, local government, education and non-governmental organisations. This partnership approach gives Scotland Europa an influential voice in European affairs.

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Scottish Enterprise Energy Team

Scottish Enterprise is Scotland's main economic development agency, funded by the Scottish Executive. Our mission is to help the people and businesses of Scotland succeed. In doing so, we aim to build a world-class economy.

The Energy Team supports the oil and gas, conventional power, and renewable energy sectors.

The Scottish Enterprise “Energy Industries Strategy 2005-2010: A strategic framework for Scotland’s energy sectors” recognises the need for continued research and technology development to stimulate investment and economic growth in these sectors. It also acknowledges that the combination of innovative technologies/techniques with North Sea and other energy industry experience gives Scottish businesses the building blocks and credibility they need to diversify into new industry sectors and overseas markets.

Scotland’s energy sectors continue to play a significant and important role in the country’s economy, employing an estimated 120 000 people (about 4% of the total working population) in some 1 700 businesses.

Response to the Green Paper on a European Strategy for Sustainable, Competitive and Secure Energy

Competitiveness and the internal energy market

Energy costs vary in their significance to different industries, but if European industry is to compete effectively in the global economy, then it is vital that the price of energy is competitive. This depends on there being an efficient, competitive power supply industry and the EU has recognised the need to improve the performance of several member countries in this area, by ensuring that their markets comply with EU regulations.

The development of a European grid for electricity will not impact significantly on Scotland, due to our surplus generating capacity, lack of connections and distance from the main markets. However the improved physical links opening shortly to the gas networks will help, offering routes through two different countries to the EU market. This will only assist if the market for gas in Europe is opened up, and contracted supplies are allowed to flow freely in times of shortage.

Care needs to be exercised to ensure that subsidies for low carbon energy electricity in the form of ROC’s, and charges on industry for carbon through Carbon Trading schemes, which ultimately increase costs both to industry and to domestic

consumers, are proportionate and do not put Scottish and EU industry at a disadvantage compared to other world economies.

Scotland has significant energy consuming industries such as electronics and whisky distilling, and these will suffer if energy costs are not competitive. These industries are already having to make strenuous efforts to reduce and manage their energy costs to ensure their survival.

Solidarity

The crisis of last winter showed very starkly the way in which various countries reacted to a gas shortage, and sought to protect their own interests first, rather than to ensure an equitable distribution of the commodity throughout the European network. This issue is a matter for investigation, and must be resolved. However in the final analysis there are finite limits to the movement of energy around the EU regardless of how efficient the networks are, and each country and region must plan its energy resources, and appropriate storage capacity, accordingly.

Diversification of the energy mix

Every country in the EU has a different energy mix, due to many factors including local fuel supplies, political decisions and historic reasons. Whilst a balanced mix of energy sources across the EU is desirable, it is more important to ensure that each Member State (or group of states where appropriate) has recognised the need for diversity and planned accordingly.

Sustainable development

Development of new technologies in renewable energy will be achieved where the financial rewards are greatest. Member countries each have their own regimes to encourage those technologies.

The EU has provided considerable funds to support R&D in sustainable technologies, and should continue to do so. This must be carefully targeted to those areas which show the most promise. And more funding should be made available for demonstration projects, especially those where the technology demonstrated has the potential for world-wide installation. Member governments should be able to support demonstration schemes which have local impact.

Innovation and technology

The EU is a world leader in many energy technologies, with expertise in virtually every form of generation. This has been achieved without the need for action at EU

level, and has resulted from the activities of many successful companies working either alone or in partnership with other EU companies.

The role of the EU in encouraging further innovation and technology in this area is to ensure that appropriate industry networks operate across the EU to ensure that best practice is shared, and that innovation is encouraged and then sustained through appropriate support mechanisms.

Ultimately the provision of power is through power companies who will make their investment decisions based on commercial grounds, in the light of the fiscal and other signals provided by the various state governments.

However given the nature and time-scale of the world's environmental problem, there is a role for the EU to ensure that early stage energy technologies are given extra support to enable them to develop more quickly towards market readiness, and to drive down manufacturing costs to economic levels by encouraging EU consumers to be early adopters of these solutions.

In particular, technologies such as wave and tidal devices, offshore wind, fuel cells, large scale storage batteries and the use of hydrogen as an energy source, all of which are still some way from commercial acceptance, deserve extra support.

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Scottish Natural Heritage

Scottish Natural Heritage is a non-departmental public body funded by the Scottish Executive, with a remit to promote the conservation, enhancement and sustainable use of Scotland's natural heritage, and to foster its enjoyment and understanding. We advise Government and local government on the impacts of energy developments.

During 2006 we have published an overview policy statement on how energy development interacts with the natural heritage. This statement 'Energy and the Natural heritage' is published on our Website at link:

<http://www.snh.org.uk/strategy/enh.asp>

Much of our work is done in partnership with others – public, private and voluntary organisations and individuals. We operate at both national and local levels, with our devolved network of offices throughout Scotland helping us to be accessible and responsive to local needs and circumstances.

Response to the Green Paper on a European Strategy for Sustainable, Competitive and Secure Energy

Diversification of energy mix

While some pan-EU guidance on the use of nuclear energy may be helpful, we would expect EU policy to enable individual Member States to decide on the use of nuclear energy, having regard for their own circumstances of population density and waste storage options. Overarching targets should as far as possible be in respect of carbon reduction, leaving Member States with flexibility in how these targets are met.

Much of the emphasis of this strategy is on electricity generation and transport. Much more emphasis should be placed on heating, and in particular the option of using renewable sources of energy (e.g. solar, ground sources, and biomass) to substitute for oil, gas and fossil fuel-based electric heating.

There should also be greater emphasis on the development of distributed generation, because of the potential to harness renewable energy locally and because of the potentially greater robustness of a distributed energy system.

Sustainable development

The strategy refers extensively to the desirability of energy efficiency. It should also refer to the need to pursue reductions in demand: encouraging people to choose activities and products which use less energy. This is of greatest importance in air

travel, where alongside measures to increase energy efficiency and to substitute rail for air for medium distances, there is also a need to encourage people to be sparing in their appetite for non-essential air travel.

Though we are not ourselves experts in climate change, we are concerned by the phrase 'be reduced by at least 15%' in section 2.4, which does not seem to us to reflect the scale of reduction in carbon outputs which climate change advisers are indicating. Energy policy in the UK is based on an aspiration to reduce carbon outputs by 50% by mid-century.

We note the comment that energy policy needs to favour cost-effective options; however, it should also have regard for environmental sensitivities. This is of particular relevance to the development of renewable energy, which as a use of land and water, has significant environmental impacts. In Scotland, great care is needed to ensure that the development of renewable energy is undertaken without overall loss of quality of the landscapes and habitats for which Scotland is renowned.

Innovation and technology

CO₂ capture and sequestration is an important option. One focus of an EU energy technology should be on appraising the long-term security of any such storage. Even small risks of long-term leakage could annul the apparent benefits of this technology.

Developing smart electricity networks is vital, not only to enable more widespread use of distributed generation, but also to facilitate local demand management, such that a supplier's response to peak electricity demand may include action to reduce or defer that demand as well as bringing more generation on-line.

Fuel cells and use of hydrogen fuel seems essential as a long-term means of developing carbon-neutral transport systems; while use of biofuels reduces carbon outputs they are not carbon neutral.

European energy policy

We support the development of an EU energy strategy. We suggest that key elements of that strategy should be:

- an aspiration for the level of carbon reduction to be achieved by 2050;
- further development of renewable electricity, with targets beyond 2010;
- requirements for energy efficiency and demand reduction;
- further development of the use of biofuels beyond 2010;
- targets for the use of renewable heat; and
- promote distributed energy and demand management systems.

Other comments

We have found it difficult to offer our view on the Green Paper using this questionnaire, because there are some areas in which we have expertise and many others in which we lack expertise; therefore our response reflects our particular expertise rather than genuine priorities. Mostly we find agreement with the statements made in the Green Paper. We have commented on those areas where we would advise a changed emphasis from that set out in the Green Paper.

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Scottish and Southern Energy

Scottish and Southern Energy (SSE) is one of the largest energy companies in the UK. It is involved in the generation, transmission, distribution and supply of electricity; energy trading; the storage, distribution and supply of gas; electrical, environmental and utility contracting; and telecoms.

- SSE supplies energy to 6.1 million customers;
- SSE distributes gas to 5.6 million customers;
- SSE distributes electricity to 3.4 million customers;
- SSE produces electricity from 9.7 gigawatts of generating capacity;
- SSE owns and operates 324 million cubic metres of gas storage; and
- SSE manages and maintains 1.0 million street lights.

Response to the Green Paper on a European Strategy for Sustainable, Competitive and Secure Energy

Competitiveness and the internal energy market

Section 2.1 of the Green Paper makes two particularly important points. The first is that many differences remain between Member States' approaches to market opening, preventing the development of a truly competitive European market. These differences include the powers of regulators, level of independence of network operators from competitive activities, grid rules, balancing and gas storage regimes. The second is that significant differences persist in the level and effectiveness of the unbundling of transmission and distribution from competitive activities.

SSE believes that the UK has developed an effective and genuinely competitive energy market. As we discussed when you visited Perth in July, the Utilities Act 2000 created legal separation of network and supply activities, featuring full legal, managerial and operational independence of networks businesses. This legal separation is supported not only by the legislation applicable to the separate legal entities, but also by a robust regulatory and licence framework, at the heart of which lies the split between the transmission owner and operator and the electricity system operator (in the UK, National Grid Electricity Transmission is the Great Britain System Operator, responsible for the supply and demand of electricity across the country).

As a result of this model, the market share of former monopoly suppliers of electricity and gas in the UK continues to fall. As the Chief Executive of Ofgem put it

in July 2006, competition is 'so vigorous that not only can you change your supplier but you can also choose a selection of tariffs'. The model for Great Britain enshrines the principle that one company cannot be both the electricity transmission system operator and a generator and supplier of electricity.

This principle should be applied and enforced throughout the EU, thus addressing the point in the Green Paper that significant differences persist in the level and effectiveness of the unbundling of transmission from competitive activities (**section 2.1(iv)**).

Overall, SSE believes that the Commission's first goal should be to ensure there is full and rigorous implementation (and policing) of the existing electricity and gas Directives. The overall model in the UK is fully consistent with EU Directives, and is a demonstrably successful example of a genuinely competitive energy market in practice. In seeking to move towards completion of the internal European electricity and gas market, the Commission should not in any way undermine the successful UK model.

As part of this need to focus on key current problems, top priority needs to be given to ensuring there is a comprehensive and substantive outcome to the Commission's competition inquiry into the functioning of the European gas and electricity markets. The Commission's preliminary report into European energy markets identified a range of issues in respect of competition, including a marked lack of the kind of information and transparency upon which all properly-functioning markets depend. The importance of the outcome of this inquiry cannot be over-estimated.

The Green Paper envisages the possible development of a European grid code (**section 2.1(i)**) and states that the Commission will examine what needs to be done to address the differences between the powers of national regulators and whether greater collaboration between or integration of national regulators is needed. Indeed, the President of the Commission was reported by the *Financial Times* on 12 September as stating that 'if you want an internal market to work in Europe in energy then you need some more muscle in terms of regulators' effectiveness'. The need to ensure they are effective, well-resourced and independent regulators in each Member State is compelling.

There is no doubt that some moves towards greater compatibility of grid codes within the European Union, and greater cooperation between regulators, provided they are genuinely supportive of a competitive model such as exists in the UK, and are properly enforced, could make a significant contribution to the development of the internal European electricity and gas market (in particular, allowing secure and efficient transportation of both forms of energy).

Overall, however, SSE believes that the Commission's priority should be the implementation and enforcement of all of the existing legislation which is designed to open up European gas and electricity markets. Focusing too much on future legislation or future regulatory arrangements while the existing framework is not

fully implemented and observed could fatally undermine the Commission's ambitions for an internal European market.

Moreover, European-wide competition will always be restricted while the market can (rightly) be characterised as a string of national markets with bilateral connections, some of which are physically weak or fail to respond to price signals. Indeed, the Green Paper rightly points out that there can be no truly competitive and single European market without additional physical capacity (**section 2.1(ii)**). It is correct to state that private and public investments in infrastructure need to be stimulated and the authorisation procedures contained within accelerated. This needs to be done both within and between Member States. The extent of the challenge should not be underestimated: electricity infrastructure requires major investment, and is often subject to environmental opposition – much of which is founded on EU-derived legislation (see below).

In summary, the key to the delivery of the Commission's ambitions in respect of fully competitive energy markets in the EU is the development of the necessary infrastructure and fully-enforced rights of generators and suppliers to use it, as in the UK. The overall priority of the Commission, before moving on to new developments, should be to ensure the enforcement of existing legislation (as the Green Paper stated, the provisions of the second electricity and gas Directives on unbundling need to be fully implemented, not just in their letter, but also in their spirit). Any new developments that are eventually envisaged should be subject to the most rigorous regulatory impact assessment and should be consistent with the principle of subsidiarity.

Solidarity

Section 2.2 of the Green Paper sets out a series of possible future actions to support the physical security of Europe's energy infrastructure: the establishment of a European Energy Supply Observatory; increased collaboration between transmission system operators to define common European security and reliability standards; and mechanisms to provide assistance for countries facing difficulties following damage to their essential infrastructure (**section 2.2(i)**). Subject to consideration of the detailed proposals, SSE believes each of these measures makes sense.

Similarly, the time is clearly right to re-think the EU's approach to emergency oil and gas stocks and preventing disruptions, including whether Europe's gas stocks can meet the challenge of short-term supply disruptions (**section 2.2(ii)**). In its submission to the UK government's review of energy policy, SSE stated that the first step which needs to be taken in the UK is to define what 'reliable' (or 'secure') energy supplies – in particular, supplies of primary fuels - actually means. The same applies at EU level, although the position is inevitably much more complex.

The development of such a definition of security of supply would then allow the development of a framework for action to be invoked when such agreed security of supply measures are breached. Such a framework would also allow the

implementation of some practical steps, such as requiring all new gas-fired power stations to have a back-up fuel capability, to maximise their contribution to the reliability of the EU's energy supplies.

Diversification of the energy mix

The Green Paper states that the proposed Strategic EU Energy Review, to be presented to the Council of Ministers and the European Parliament on a regular basis, would 'offer a clear European framework for national decisions on the energy mix' and would 'analyse all of the advantages and drawbacks of different sources of energy'. Provided the decisions are genuinely national, and provided all of the analysis can be seen to be well-informed, objective and transparent, such a Review could contribute towards a transparent and objective debate on future energy needs within (and to some extent between) Member States.

The Green Paper's proposal for an overall strategic objective focusing on a minimum level of the overall EU energy mix originating from secure and low-carbon energy sources is commendable. As the Green Paper states, such a benchmark would reflect the potential risks of import dependency and would have the virtue of identifying an overall aspiration for the long-term development of low-carbon energy sources. It would also reinforce the overall confidence of investors in renewable energy, making future developments more likely. The freedom of Member States to choose between different energy sources should, of course, be retained.

Sustainable Development

SSE agrees with the Green Paper's assessment that effective action to address climate change is urgent and that the EU must continue to work towards the widest possible international action. It also agrees that the EU Emissions Trading Scheme provides a nucleus for a gradually expanding global carbon market.

In terms of energy efficiency (**section 2.4(i)**), SSE has called for the UK government to show leadership in reducing demand for energy by explicitly aiming to out-perform the objective for the EU of saving 20% of the energy that would otherwise be used by 2020. As the Green Paper states, energy efficiency needs to become a global priority. All of the examples of possible action set out in the Green Paper have merit.

Similarly, the EU's ambition to become world leader in renewable energy (**section 2.4(ii)**) is something which SSE strongly supports. SSE agrees that if the EU is to meet its longer term climate change goals and reduce its dependence on fossil fuel imports, it will need to meet - and indeed go beyond - the target that the share of electricity from renewable sources in the EU should reach 21% by 2010. The most effective means of delivering this should be through policies devised at Member State level, which best reflect the circumstances within each EU country.

To complement the activity at Member State level, the development of a Renewable Energy Road Map is to be welcomed. At the same time, the EU needs to understand the negative impact on renewable energy developments which its Directives can – and often do – have. All too often, ‘international statutory obligations’ are cited by those hostile to renewable energy developments as reasons for opposing them. The result is that it is becoming increasingly difficult to secure consent to develop on shore wind farms in particular. This is, therefore, ‘a key issue for an effective EU policy on renewables’ and the Renewable Energy Road Map must, therefore, deal with it and other practical matters of this kind.

SSE endorses the view of the Green Paper that carbon capture and geological storage (**section 2.4(iii)**) need a stimulus to create the necessary economic incentives, provide legal certainty for the private sector and ensure environmental integrity. It also supports the view that large-scale demonstration projects are needed to bring the technology towards reduced costs. SSE and its partner BP are currently undertaking detailed front-end engineering design work on the world’s first industrial-scale project to generate ‘de-carbonised’ electricity from hydrogen at Peterhead Power Station in north-east Scotland, and I would be very happy to facilitate a visit by Commission officials to the Station.

Innovation and technology

It is a well-established fact that the development and deployment of new energy technologies is essential to deliver security of supply, sustainability and industrial competitiveness. Few would argue with the point that the EU needs an appropriately resourced strategic energy technology plan – one that accelerates the development of promising energy technologies while also helping to create the conditions to bring such technologies effectively and efficiently to market.

The main issue is a practical one. As in the UK, EU-led investment in energy research and development tends to be fragmented and bureaucratic. The sheer volume of information required and the time involved in seeking (and subsequently accounting for) funding is extremely onerous. The result is that research and development funding is not necessarily directed as effectively as it could be. The overall process, therefore, needs to be consolidated and streamlined.

External policy

The Green Paper rightly states that the effectiveness and coherence of the EU’s external energy policy is dependent upon the progress with internal policies and, in particular, the creation of the internal market for energy. That is correct: dealing with the outstanding issues in respect of existing EU Directives must continue to be the top priority of the Commission.

Nevertheless, there can be a role for the EU in: helping to secure and diversify energy supplies (**section 2.6(i)**); developing a pan-European Energy Committee (**section 2.6(ii)**); developing energy partnerships with producers, transit countries and other international actors (**section 2.6(iii)**); reacting effectively to external crisis situations; integrating energy into other policies with an external dimension (**section 2.6(iv)**); and using energy policy to promote development (**section 2.6(v)**).

Amongst all of these issues, the key one is, as the Green Paper states, to make greater efforts towards widening the geographic scope of the EU Emissions Trading Scheme and to propose and promote an international agreement on energy efficiency.

Any other comments

SSE agrees that the goal for EU Member States must be sustainable, competitive and secure energy, and agrees that energy policy has a European dimension. The Green Paper sets out the issues in a well-structured manner, and SSE looks forward to continuing engagement with Commission officials in the future.

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British Energy

British Energy is the largest producer of electricity in the United Kingdom, delivering about 20% of the country's needs. We operate the eight most modern nuclear power stations, a coal-fired power station, three small embedded gas-fired power plants, and we have interests in a small number of renewable development projects.

The company has a significant trading capability and our direct supply business is now a leading supplier to industrial and commercial consumers. We place considerable emphasis on delivering value and high quality service to our customers.

Nuclear generation is almost emissions free and because of this British Energy arguably makes the single biggest contribution to the UK's climate change programme of any company. We also make a significant contribution to the UK's electricity security-of-supply.

The company is a major contributor to the UK skill base and provides a large number of high quality jobs in scientific and technical fields. There is a very high level of technical expertise in the company and many of the jobs are in remote areas where we provide valuable employment opportunities and economic benefit to local communities.

Response to the Green Paper on a European Strategy for Sustainable, Competitive and Secure Energy

Competitiveness and the internal energy market

In order to achieve the goal of a genuine single market, what new measures should be taken at EU and Member State level?

1. Although there has been significant progress, the liberalisation process is still in transition with significant differences in Member State markets remaining. Slow progress to date has been the greatest barrier to competition – for example there remain large economies where liberalisation of the electricity sector is as yet not complete, as shown in Figure 1.
2. There are also major differences in the nature of liberalised markets of Member States – some have many actors in competition whereas market power is consolidated in relatively few companies in other markets, brought about in part by the starting position in terms of the prevailing energy mix. Member States have independent regulators and different tax regimes. Such differences impact the consumer - for example, in the gas and electricity markets the prices consumers pay can differ markedly in Member States, which is of disadvantage to consumers and distorts competition.

3. Several Member States have been referred to the European Court of Justice for not implementing 2003 energy Directives and the European Commission (EC) launched a major enquiry into anti-competitive practices in the energy industry.
4. *So long as there are such differences it is difficult to envisage a single market in which all Member States compete on the same basis. The European Commission (EC) needs to make sure Directives are adopted with Member States opening their markets fully and in a consistent way.*

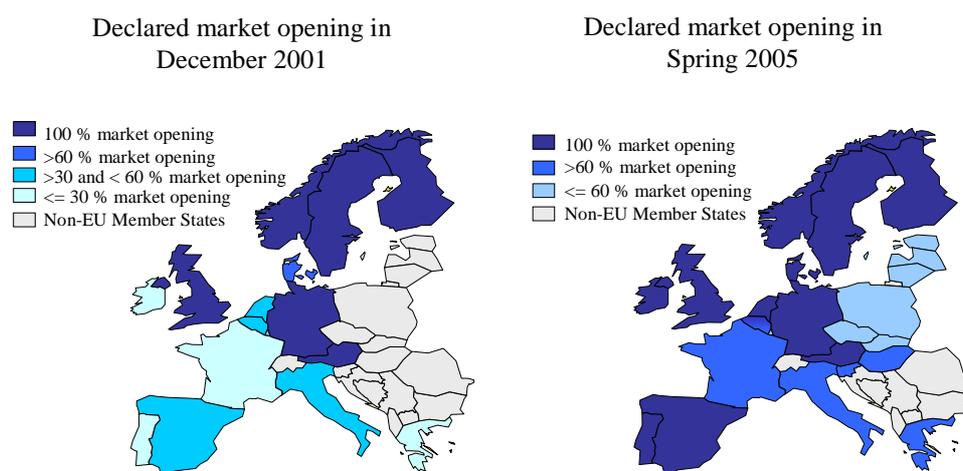


Figure 1: Ongoing liberalisation of European markets

Source: Evaluation of the European electricity market – Eurelectric view and recommendations, Rafael Miranda, XII Florence Forum, September 2005

In order to develop a single European grid, what should a “European Grid Code” contain?

5. In our view Grid Codes are required to describe the technical protocols for connection to, and operation of transmission networks, and should be designed to ensure that the system can be operated safely and securely. For an interconnected system with a number of system operators - as is the situation in mainland continental Europe - it is important that there are clear protocols governing technical requirements and information flows for physical transfers across boundaries between system operator areas.
6. In the UCTE control area which includes much of mainland Europe, the UCTE Handbook provides the framework for this. In Great Britain, the GB Grid Code fulfils this purpose with separate agreements covering the commercial arrangements for connection and for operation of the balancing mechanism. Separate rules apply in Northern Ireland.

7. At the present time there is a 2000 MW DC interconnection between mainland continental Europe and Great Britain, and a 500 MW DC interconnector between Scotland and Northern Ireland. The flows on these interconnections can be determined by the interconnector operator (unlike AC interconnections which are part of a wider network) and the arrangements for despatch are governed by rules specific to the interconnector.
8. The GB Grid Code has been developed specifically for the circumstances that apply here in Great Britain, defining obligations on connectees to the system and enabling the system operator to meet its statutory obligations in terms of operating a safe and secure system. The same requirements will not necessarily apply to the much larger interconnected system in continental Europe and it is therefore inappropriate to attempt to define a single set of requirements within a European Grid Code.
9. *The development of the single market would be best served through greater harmonisation of the commercial arrangements that apply to interconnections, including the DC interconnectors to Great Britain. However, there is no clear advantage in creating a European Grid Code to describe the technical parameters for connection to and operation of the entire system.*

Apart from ensuring a properly functioning market, how can the EU stimulate investments in infrastructure and generation capacity?

10. The energy system today has evolved gradually over the last hundred years or so with increasing consumer demand satisfied by the three main fossil fuels and to a lesser extent nuclear and hydroelectricity. As a consequence of this there is considerable inertia in the system which makes significant changes to the mix on a short time scale difficult to affect; also decisions made today will have long-term implications. *It is important then that the timescales over which policy can deliver are realistic, particularly in key areas such as emerging technology, energy efficiency and so on.*
11. A properly functioning energy market would provide the appropriate signals for new investment in a timely way; unfortunately this does not exist at this time and should be the priority for the European Union (EU).
12. *There is also a lack of certainty in the carbon market which serves to discourage potential investors – the EU needs to re-state its commitment to meaningful carbon reductions through milestone targets, delivered, in the main, via the EU ETS for the industry sector.*
13. *In addition to this, the EU has a role to play improving ‘connectivity’ across Member States in both gas and electricity supply. For example facilitating of gas infrastructure development and supply contracts with other regions, such as Russia and its former satellites, would be highly desirable. However, in a liberalised market it will be the responsibility of private companies to deliver new projects and contracts, and the EU facilitation role can only go so far. Nonetheless, the EU can create more predictability for*

industry through agreements on issues within the control of governments. These may cover, for example, clarity on the legal framework, health, safety and environmental standards, metering and exchange of information for cross-boundary projects.

14. Where suppliers are within the control of national governments, such as Gazprom in Russia, there may be further scope for political agreements to affect security of supplies. However, recent evidence suggests that Member States are likely to seek solutions for themselves by encouraging national champions to secure the necessary supplies, an activity which works against a unified EU negotiating position.

How can it be ensured that all Europeans enjoy access to energy at reasonable prices?

15. Europe has had access to plentiful supplies of fossil fuels over the last 25 years and until the last couple of years, enjoyed stable prices in real terms. This has been extremely important in developing the economic well-being of Member States and the EU as a whole, and although the energy intensity (energy consumption per unit of gross domestic product) is expected to continue falling in coming years, the link between energy and the economy will remain an important one.
16. With this background the EU was able to discriminate against certain technologies in the recent past, such as nuclear and to a lesser extent coal. In a world in which there will be increasing competition for liquid and gaseous fossil fuels, energy costs will rise and the risk of supply disruptions will increase, and these will have a major impact on Member States' economies. Addressing environmental issues, and climate change in particular, will also have significant energy mix and cost implications.
17. *Looking forward, Europe cannot afford to discriminate against any energy technologies if its consumers are to continue enjoying a high quality of life; all energy carriers including nuclear and coal (fitted with CCS) will be needed in coming decades, not only to help meet, for example, electricity demand but also to help reduce the impacts of volatility in international markets by providing a measure of price stability.*
18. Some Member States are beginning a re-evaluation of these options and it may now be appropriate to do this at the EU level also, perhaps beginning with a clear statement of need. It may even be appropriate to quantify this need through targets for low carbon sources, or indigenous supply.

How can the internal energy market contribute to maintaining employment levels?

19. Energy consumption and liberalised markets are important for economic growth and will remain so for the foreseeable future. A buoyant economy is a prerequisite for maintaining employment.

20. *It is important that the EU is pre-eminent in innovation and technology development since this will naturally spawn new jobs. The EU needs to be able to compete with its major competitor in this area and it can only do this if it invests more of its domestic product to this activity.*
21. *The EU also needs to invest in skills development, particularly in the technical areas not only to support the new technologies that will likely emerge but also in the more mature technologies since these will also be needed in the short to medium term.*

Solidarity

What can the Community do to prevent energy supply crises?

22. *The Community needs to ensure that all energy carriers make a genuine contribution to the energy mix, including nuclear, and that a concerted, long-term programme on energy efficiency is conducted; in this way imports of oil, gas and to a lesser extent coal, are minimised.*
23. *The basic gas and electricity infrastructure already exists in Europe; what is needed is an EU regulatory framework that facilitates strengthening links between Member States and removal of bottlenecks to make the physical movement of these important commodities easier. It is also important that storage facilities are increased significantly, particularly for gas since this is arguably the most important fuel over the next few decades.*
24. *We agree that transparency across the EU is necessary to better manage potential supply shortfalls. However, there needs to be clarity on the role and responsibilities of the two new agencies proposed in the Green Paper (the European Energy Supply Observatory and the European Centre for Energy Networks).*
25. *If the data collected by these agencies is to be used to avert a supply crisis then there may need to be incentives offered for certain plants to remain available on standby, and an understanding of the environmental implications of differing courses of action; it is entirely possible that successfully addressing short-term supply crises may contravene EU environment targets as has occurred in other parts of the world. It is not clear whether these measures should remain within the remit of national governments or whether the proposed agencies would have a role.*
26. *Whilst private power companies would be responsible for delivering energy supply, it is likely that there would be intense national political pressure, affecting many countries, to avoid shortfalls following physical disruption to infrastructure.*

Which measures need to be taken at Community level to manage energy supply crises if they do occur?

27. *In the event of the market failing to deliver the energy supplies needed, recent history suggests that consumers look to the Government to rectify the situation. An area where there is considerable sensitivity is that of gas storage where some Member States, for historical reasons, are better placed than others. This is an area where political agreement by Member States for shared contingency plans, with the support of utilities, is crucial. Ultimately it may be appropriate to require Member States to develop gas storage capacity consistent with their needs in response to increased risk of major supply disruptions.*

Diversification of the energy mix

What should the EU do to ensure that Europe, taken as a whole, promotes the diversification of energy supplies?

28. Diversification of the energy mix is increasingly important for security-of-supply and for mitigating climate change. In the electricity sector, for example, this has occurred as coal has been replaced with gas and nuclear power over the last few decades – going forward, and in the absence of any new initiatives, ‘technology diversification’ will decline with gas dominating supply.
29. There are at least two elements to diversity that need to be addressed: the actual technological mix necessary to deliver the energy needed, and the sources of primary energy around the world. In theory, the market should provide the appropriate signals for private companies to deliver both these aspects of diversity; in reality, Member States and the EC intervene to address what are perceived as market ‘imperfections’ and there are a number of these in relation to diversity.
30. The gradual emergence of a fully operational EU liberalised energy market places responsibility for delivering energy supplies on private companies. However, it is natural that such companies will base their decisions on financial considerations that are in the best interests of their shareholders, customers and employees rather than on the strategic needs of Member States or the EU.
31. It is also natural that companies will develop their strategies around the lowest cost option available to them and this means development of technologies close to, or in the commercial domain; those technologies away from the commercial end of the spectrum at the RD and D and inhabiting niche markets will not be developed until their costs have been proven and they can compete with the mainstream actors. In these situations Member States and the EU should provide additional incentives, so long as consumers do not incur excessive costs, and only so long as is needed for the technologies to join the mainstream.

32. *Member States and the EU can also help improve diversity by providing long-term certainty in the regularity framework in which existing technologies operate, and new technologies emerge.*
33. *There needs to be a clear understanding of those issues best addressed at the Member State level and those at the EU level. For example, there are legal concerns associated with Carbon Capture and Sequestration that are best resolved at EU level. On the other hand, planning uncertainties or arrangements for long-term nuclear waste management should be left to individual Member States.*
34. *A strategic objective for the EU could be a minimum level of secure near-zero carbon energy sources since this would provide the necessary certainty for investors; Member States would be free to meet their commitment in whatever way was appropriate for their market without technological prejudice.*

Sustainable Development

How can a common European energy strategy best address climate change, balancing the objectives of environmental protection, competitiveness and security of supply?

35. *Climate Change has overtaken Sustainable Development in the political agenda, or the two are interchangeable. The EU should continue to take a lead role in international negotiations to secure a broad commitment to greenhouse gas reductions. If the agreements reached are to be successful it will be necessary to identify long-term targets and use all available mechanisms to achieve these.*
36. *Figure 2 (below) attempts to show the effectiveness or otherwise of existing policies and measures. The externalities are the social cost of certain environmental impacts, such as is climate change, which are in part addressed by economic instruments such as emissions trading, taxation and so on; the extent to which stakeholders are involved, and the market reflects the cost of the externalities, are also key considerations.*
37. *The effective 'playing field' at present is rather small i.e. a relatively small part of greenhouse gas emissions are being addressed using a narrow range of instruments; the latter effect a fraction of the stakeholders involved, and only now is the market beginning to reflect the impact on companies. The EU needs to increase the effective 'playing field' so that all the social costs are addressed; an appropriate mix of instruments should be used that involves all stakeholders, and the costs are reflected fully by the market.*

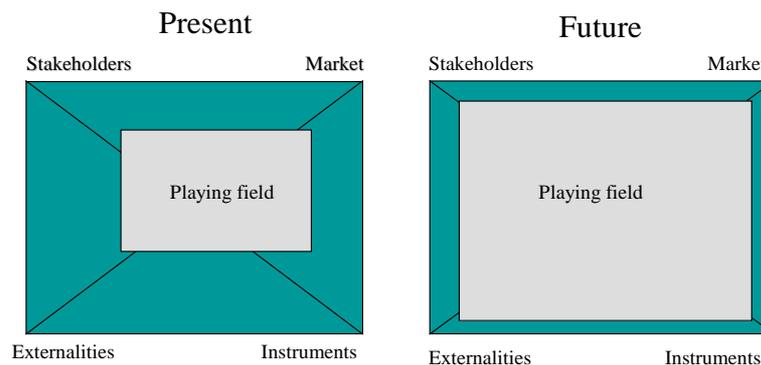


Figure 2: Impact of a carbon constrained world

38. Experience suggests that market based instruments are best suited for delivering emissions reductions at least cost. The newly implemented EU Emissions Trading Scheme (EU ETS), a ground breaking international initiative, can deliver the objectives of reductions and cost so long as the targets are sufficient to encourage investment in new near-zero emissions technologies. For example, abatement curves such as that shown in Figure 3 suggest that when the targets are modest (similar to those prevailing in Europe under the Kyoto Protocol) some fuel switching from existing coal to existing gas may occur to the benefit of the environment; it should be recognised however, that in this particular case security of supply is compromised.
39. As the targets become more challenging companies may replace ageing coal plant with new gas plant. But to affect the changes needed, EU carbon emission targets will have to be set to a level whereby near-zero carbon emission technologies such as nuclear, renewables and fossil technology fitted with CCS are incentivised over gas technology, and early enough before new gas plants become stranded assets.
40. *It is important the EU ETS plays a key role in the carbon reduction strategy of Member States. What is needed is a clear statement that this instrument will continue post-2012, supported by milestone targets to provide the certainty required for industry to invest in new near-zero carbon technologies.*

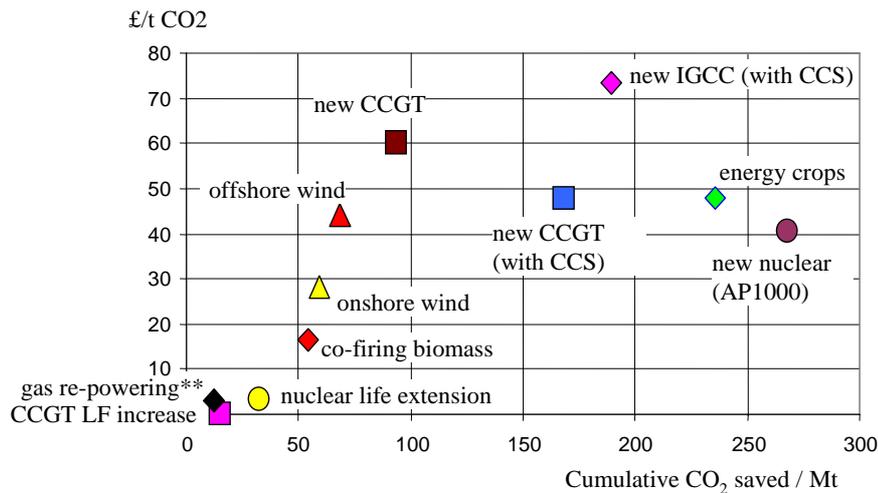


Figure 3 - UK abatement costs*

Notes: * Compared to an existing coal fired power station and over operating life of plant; normalised to 1000 MW capacity. **Re-powering costs for coal stations co-located with a high capacity gas pipeline. DTI costs for new plant, except CCGT = £30/MWh and CCGT (CCS) = £43.4/MWh. Other costs British Energy

What is important for the further development of clean and renewable energy sources in the EU?

41. We believe that nuclear should be considered alongside other 'clean' technologies. It is disappointing then that the Green Paper does not identify nuclear power on the same basis as energy efficiency, renewables and CCS when it comes to climate change. If the EU energy supply is to be based on open and liberal markets then the energy policy should not take a technological bias. It should be left to the market to deliver the cheapest climate change mitigation for the consumer.
42. Nuclear power is the only technology proven to deliver large quantities of near-zero carbon baseload electricity and has been shown to be competitive with conventional fossil generation. If the significant cuts in emissions necessary to avoid climate change are to be achieved then EU energy policy should recognise the need for an ongoing role for nuclear power.
43. The EU has a challenging target for the deployment of renewable energy in Member States, and should go no further at this stage, or at least until the full implications for both the supply industry and the consumer are known. Individual Member States already have mechanisms in place to deliver their particular contribution to the EU target, and the appropriate regulatory framework exists across Europe.
44. It is surprising that the Green Paper makes only a passing reference to the EU ETS as a means of delivering carbon reductions. EU energy policy offers the opportunity to provide significant investor confidence in the long-term role of the EU ETS. Clear

statements are required on the expectations of this policy instrument, preferably through clear long-term carbon reduction targets.

Innovation and technology

What action should be taken at both Community and national level to ensure that Europe remains a world leader in energy technologies?

45. *There is little doubt the EU lags behind its most important competitors in this important area. Major investment over a long time frame and the right institutional support is needed if the EU is to compete successfully in the innovation and technological development area.*
46. There are a number of barriers to innovation both in the public and private domain, as shown in the Figure 4. There are three broad categories:
- Those that are relatively straight forward for government to address such as the total spend in the energy sector, the provision of long-term signals, assessing the effectiveness or otherwise of existing initiatives and addressing their overlap, enhancing the transparency of 'award' processes, ensuring strong intellectual property rights;
 - Those that are related to the framework in which innovation is conducted such as the nature and scale of incentives, the balance between directed and responsive mode, between regulation and the market, and between primary and secondary innovation;
 - The remainder are harder to address because they have a strong element of 'human' behaviour such as cross-sector interactions, public – private relationships, the approach to risk, intellectual capacity, customer behaviour, and new innovation models. All of these are critical for success.
47. At the market end of the innovation process are a number of barriers that need to be addressed:
- Legal and institutional barriers e.g. extensive and lengthy legal requirements needed to implement projects
 - Economic barriers e.g. inability of low-income households to afford investment in energy conservation
 - Social and educational barriers e.g. significant objections to wind development in remote locations, inertia regarding the introduction of more energy efficient technologies and practices.
48. Figure 4 shows that there are a relatively few barriers that are best addressed at the EU or Member State level alone, whereas there are a number that require both the EU and Member States to work closely together to ensure an effective response. What is also clear is that it would be helpful if private sector

companies developed new ways to interact with academic institutions, and vice versa, to bridge the divide between research and commercialisation, with government an important facilitator.

<i>Public sector *</i>	<i>Level**</i>	<i>Private sector*</i>	<i>Level**</i>
• Total spend on energy in comparison to competition	MS/EU	• Balance between regulation and market	MS/EU
• Directed versus responsive mode	MS	• Longer term signals	MS/EU
• Cross-sector interactions	PRI/PUB	• Nature and scale of incentives	MS
• Public-private relationships	PRI/PUB	• Balance between primary and secondary innovation	PRI/MS
• Approach to risk	MS/EU	• Cross-sector interactions	PRI/PUB
• Effectiveness of the existing initiatives	EU	• Consumer education and behaviour	PRI/MS
• Intellectual capacity	MS/EU	• New innovation models	PRI/PUB
• Intellectual property rights	EU	• Public-private relationships	PRI/PUB
		• Transparency of award process	MS/EU

Figure 4: Some 'barriers' to innovation

Notes: *, concerns/ barriers in each sector; **, where concern needs to be tackled; Acronyms: MS, Member State; EU, European Union; PRI, Private companies; PUB, Public bodies

49. In the crucial area of consumer education and behaviour all four entities – EU, Member States, PUB and PRI – have important roles to play. The Member States and private sector are particularly important because the former establishes the implementation framework for new measures, and the latter because of its direct interaction with consumers.
50. The legal and institutional barriers identified above are best addressed at the Member States and EU levels whereas the economic, social and educational barriers are best addressed at the Member States level.
51. EU level innovation measures do not sufficiently take account of the needs of emerging technologies in general, and for those technologies that need to pass through the 'demonstration' and 'niche market' of the innovation process in particular. If such technologies are acknowledged to be far from market then there should be stronger support (and higher funding levels) for research as well as ties to industry.
52. *There are two drivers that would encourage a link between EU innovation and energy policies:*
- *A long-term vision backed up with targets - be they environmental, sustainable development, security-of-supply or fuel poverty and so on - and investment to ensure the targets are reached.*
 - *The promise of economic benefit, not least the 'prize' of exports of new technology to developing markets in the major emerging economies of Asia and Latin America.*

Which topics/technologies should an EU energy technology strategy focus on developing?

53. *Since all technologies will be needed it is appropriate that funding should be made available across the technology spectrum; this should involve both primary and secondary innovation.*
54. Significant support, on a technology specific basis, will be required to deliver innovative approaches to meeting future energy needs. However, to encourage private investment in these technologies, there needs to be a clear framework to give confidence that their attributes will be valued. For example, a long-term commitment to the EU ETS would encourage uptake of commercial or very near commercial technologies but this needs to be complimented with grants aimed at developing new carbon free technologies currently at the RD&D stage.
55. *Whilst a strategic energy technology plan appears a good idea, it is important that EU energy policy avoids over-reliance in as-yet unproven technologies. Such an approach would increase the risk of failure to achieve the long-term objectives. Proven technologies, such a nuclear power, should play an important role in meeting these objectives.*

External policy

What should be the priority of a common external policy on energy?

56. *A common external policy should ensure security of energy supplies and mitigate climate change. However, there needs to be better understanding of the interaction between these issues and the impact of international developments.*
57. *In the area of climate change the EU needs to continue to take a lead role in international negotiations, as it has in the past, and engage more effectively with the major developing countries. The EU should continue to facilitate international negotiations to develop a global framework for addressing climate change.*
58. This 'top-down' approach to climate change policy should increasingly be complimented with a 'bottom-up' approach in which fledgling ETS schemes across the world can interact with the EU ETS. In this way a significant proportion of the world's carbon emissions is under regulation, the lowest cost carbon reduction solutions are made available, the common currency of carbon links the various regions across the world, and the enduring stability of the scheme encourages long-term investment in new near-zero infrastructure.

How can the Community and the Member States promote diversity of supply, especially on gas?

59. The available global gas resources are less well known than the other fossil fuels. There is an expectation that more gas supplies will become available around the

world as demand increases, and the cost of oil, and by association gas, remains at a relatively high level. Access to this gas will also become easier as new continental pipelines and liquefied natural gas facilities are developed.

60. *The EU and Member States need to ensure the physical infrastructure is in place to make timely use of these resources and to improve relations, and secure partnerships, not only with the EU's primary energy suppliers, notably Russia and parts of the Middle East but also major African countries such as Nigeria and Algeria and Latin American countries such as Venezuela.*

European energy policy

Do you agree that there is a need to develop a new, common European strategy for energy?

61. *Any energy strategy should evolve with new developments. A priority for the EU is to first ensure that existing policy is fully implemented; it should then aim to build on the existing initiatives, and minimise expensive policy overlap and complexity. Policy development should focus on setting the high level goals for the region, leaving the detailed implementation to Member States.*
62. The EU, potentially, has a strong negotiating position if it adopts a collective approach to energy issues, for example in negotiations with supplier countries, because it has a large market and significant financial resources to draw on.

What should be the core principles of European energy policy?

63. *The core principles of European energy policy should include all of the following:*
- *the provision of reliable and affordable energy for all EU citizens;*
 - *the provision of a level playing field for industry to operate;*
 - *recognition of the particular circumstances of Member States in terms of their economic structure;*
 - *encourages working in concert with others to protect the environment and safeguard resources for future generations;*
 - *encourages cooperation within and outwith the EU*

What should be the core principles of individual energy policy initiatives at Member States and regional levels?

64. *Core principles of individual energy policy initiatives:*

- *should be fair and equitable across Member States;*
- *are appropriate for the desired energy and environmental objectives;*
- *provide a measure of 'commonality' across the EU;*
- *should be consistent in the wider policy 'space'*

Do you think that greater attention to energy at both EU and Member States level can substantially help to achieve the goals of the strategy for growth and jobs (Lisbon process)?

65. *It is crucially important that energy is given a much higher profile in Member States and the EU. As indicated elsewhere the well-being of the economy of Member States and the EU as a whole is highly dependent on the plentiful supply of affordable energy – in the absence of a policy that delivers this objective, Member States' economies will suffer and with them employment.*

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Scottish Environment Protection Agency

The Scottish Environment Protection Agency (SEPA) is Scotland's environmental regulator and adviser, responsible to the Scottish Parliament through Ministers. As well as our role in controlling pollution, we work with others to protect and improve our environment.

In Scotland, SEPA regulates activities that may pollute water and air, the storage, transport and disposal of waste, and the keeping and disposal of radioactive substances. Whilst we have no direct locus in energy or transport policy or building standards, much that is part of the energy review touches on SEPA's regulatory duties and our wider and partnership activities and outcomes. SEPA specifically regulates emissions from power plants, and is involved, either as a regulator or a consultee, in many aspects of energy generation as well as our involvement in implementing Pollution Prevention and Control and the EU-Emissions Trading Scheme. The Environmental Assessment (Scotland) Act 2005 (for Scottish plans) and the Environmental Assessment of Plans and Programmes Regulations 2004 (for UK plans) require the undertaking of strategic environmental assessment (SEA) for qualifying plans and programmes in the energy sectors. SEPA is a Consultation Authority under legislation and must be consulted at various stages in the SEA process and on the draft plan itself.

Response to the Green Paper on a European Strategy for Sustainable, Competitive and Secure Energy

The following is an extract from SEPA's response to the UK Energy Review.

Solidarity

SEPA would wish to see a more balanced approach between environmental and GHG considerations and price to the consumer. Measures to reduce demand and increase low carbon generation could maintain the overall price to the consumer, whilst reducing the overall environmental burden. We believe that the present market in the UK has been dominated by price control, to the detriment of other considerations.

Sustainable Development

To make substantial and lasting inroads into energy conservation and efficiency it is important to demonstrate to society the implications of its own actions. One of the best methods of such education is involvement. By involving the majority of society in the production, monitoring and use of energy we could stimulate a growing commitment to energy conservation and efficiency. One tool for such an

involvement is micro-generation. A sustained campaign, led by grants or even 100% repayments, to promote the adoption of household and on-site generation would involve the majority of the nation in energy generation which would lead to an understanding of individual energy use. Similarly, an ambitious project to place micro-generation and energy efficiency in the nation's schools would inform the next generation about the issues of energy conservation and efficiency.

SEPA would expect that the UK will need to use all sources of low carbon energy to meet overall anticipated demand, even as society begins to reduce and manage its energy requirements. However, we will inevitably need to make choices about the development of one technology over another, and it is important that we can do this from a point of optimum knowledge. SEPA believes it is imperative that the UK develops a credible and comparable set of full life-cycle analyses for the different methods of energy generation and transmission. A large amount of work has been carried out in this area over recent decades (e.g. EU ExternE project), but this needs to be synthesized into information that can be used to make and challenge decisions about the location of energy generation, the type of grid infrastructure we require over the next 50 years, which type of energy generation maximises the delivery of reduced GHG emissions, which supplies provide greatest security, and which technologies we can demonstrate and export to developing economies.

We have also consistently argued that all UK companies should be obliged to undertake environmental audits on a flexible rolling programme to fit with their investment cycles. These audits should be conducted in association with staff, as is the case with health and safety obligations. This will result in around half the population being trained in environmental awareness, potentially creating a large pool of more sustainable consumers who will also adopt some aspects of environmental responsibility in their domestic situations. At the same time, from many voluntary initiatives, it is known that companies will improve their overall profitability by between 5% and 10% in reducing their waste and in minimising their resource and energy consumption.

Innovation and technology

Carbon storage and capture

On an international basis it is clear that to meet global energy demand fossil fuel powered devices are likely to be used for at least 50 years. To ensure that this does not continue to drive climate change, the concept of carbon capture and deep geological storage has been proposed. The UK, and particularly Scotland, is well placed to develop and exploit this technology due to our historic experiences in deep coal mining and North Sea oil exploration. If the present small scale projects under consideration demonstrate the viability and efficacy of this technology, SEPA believes it will have a major part to play in reducing global GHG emissions, as it is readily transferable to developing countries. There is concern over the concept of burying of any "waste", but SEPA would argue that the risks associated with the

storage of CO₂ and the timescales required for its safe disposal (decay) are probably less than those associated with high level radioactive waste.

Combined heat and power (CHP)

All combustion-based processes generate heat. The process becomes less efficient as that heat is transported and/or used to create another energy vector (e.g. electricity). In terms of energy efficiency, it is important to maximise the generation of the desired form of energy, e.g. electricity, but also capture any “excess” energy e.g. heat. Combined heat and power is the most common example of this, where a “unit” generates the required energy for a process, and the surplus heat generated is used as space or water heating. In any centre of population, combustion together with CHP may provide an effective holistic energy and power solution. Such schemes dramatically increase the energy efficiency of the operation. CHP should be an essential consideration for all new combustion-based energy generation processes.

Energy Storage

Energy storage can be used to store energy when the demand is low, and release when the demand is high - thus reducing the need for less clean technologies under high demand. Many storage options have very short, responsive start-up times, and can thus reduce energy wastage due to stop/start use of other less flexible generators. Increased storage may also be required to smooth the load on intermittent renewable resources e.g. wind and wave. There is also significant scope for “micro-storage” to reduce the demand from individual users; this can result in “peak load lopping” which reduces significantly the required generation capacity.

Biomass or Biofuel energy

Currently, bio-generated power is expensive but there is much available forest and other land in UK which could be turned to coppicing which also could have some biodiversity advantages. This is a technology which is complementary to more variable output devices, such as wind energy, as it can readily provide supplementary back-up. There are some local schemes in Scotland which are demonstrating the potential. Co-location within forested areas of Scotland at grid connection points to existing hydro-stations should perhaps be considered. Recent advice from the Air Quality Expert Group ([Defra, UK - Consultations - Consultation on draft report: Air quality and climate change: a UK perspective](#)), suggests that a full life-cycle analysis may be required to ensure that CO₂ emissions are not reduced at the expense of increased VOC and O₃ production by the plants during growth.

Energy from Waste (EfW)

SEPA guidelines support the recovery of energy from segregated waste as part of the National Waste Strategy for Scotland.

http://www.sepa.org.uk/pdf/guidance/air/thermal_treatment_guidance.pdf

Waste minimisation, reuse, recycling, composting and segregation must be maximised, after which point energy recovery from combustion is acceptable, preferably using technologies that can return higher thermal efficiency than the more traditional incineration, such as gasification or pyrolysis. It is estimated that this residual waste stream will be around $\frac{1}{4}$ fossil-fuel based and $\frac{3}{4}$ carbon-neutral due to its relatively high paper, card and textile content. In remote centres of population, EfW together with CHP may provide an effective holistic energy and waste solution, especially if longer term waste disposal costs are taken into account. EfW plants should be scaled appropriately and located so that both heat and power production can be utilised e.g. on business parks, district heating schemes, or large scale public and private sector infrastructures. There should be an integrated approach to the management of all bio-wastes working in conjunction with the bio-fuels sector to maximise the benefit of biodegradable materials as potential energy sources.

It is essential that the development of the underlying principles and the implementation of energy policy are undertaken with full understanding of public concerns and social consequences. Considerable work must be undertaken to be certain that these aspects are addressed.

Technical research is required across the spectrum of energy related technology. Application of research funding in the past has been criticised for being sporadic, intermittent and focused on a few technologies. For example, SEPA considers research into reliable and efficient wave and tidal stream generators should be enhanced as a priority. Reduction in transport emissions remains an urgent priority, with the goal of a zero emission vehicle. Carbon storage technologies offer an opportunity to continue with some “traditional technologies” and need to be investigated further.

There is a requirement to actively promote energy minimisation and efficiency. This will entail a shift in social behaviour; in relation to some other countries, performance in this area is historically poor. The obstacles need to be well understood before effective change strategies can be developed.

An increased proportion of intermittent renewable energy sources may also require an increase in the ability to store energy, perhaps using pump storage, new cell technology or hydrogen generation. Development of such technologies is required in tandem with changing the methods of energy generation.

In order to maximise exploitation of renewable resources, especially in more remote areas, it is our understanding that further research is required to overcome some of the technical difficulties that exist. This may include investigation of the present costing structure.

Any other comments

The UK has championed climate change, leading many international initiatives, and accepting that the developed world has to act as an exemplar and support developing nations. Therefore, it is essential that we also support the developing nations in finding solutions to their energy needs, before they surpass the developed nations as major emitters of GHG. Thus it is important for us to understand and develop technology that we can transfer to those economies and societies. The UK needs to act to reduce emissions and ensure security of supply not just locally, but also internationally.

To achieve our policy goals of limiting climate change and achieving security of supply, we have to ensure that other nations also have sufficient GHG emission-free energy. This may mean that the UK should lead on developing “clean coal technology”, as it is clearly transferable to some of the emerging economies, notably India and China, even if we believe we could develop an internal UK energy scenario where this technology has limited requirement.

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The Royal Society of Edinburgh

The Royal Society of Edinburgh, as the National Academy for Scotland, has a Fellowship containing great expertise across all the sciences, technologies, humanities and the arts. The Fellowship is elected from the worlds of academe, public and private service, commerce and industry. As a membership organisation it has no political allegiance nor does it represent any sectoral interest. As such it is uniquely placed to offer informed, independent comment on matters of national interest. In May 2005, the Council of the RSE established a Committee of Inquiry into Energy Issues for Scotland. The Committee was given a broad remit to consider all aspects of energy supply and demand but also to examine relevant economic, environmental and social matters. I believe that this represents the most comprehensive study of energy issues ever undertaken in Scotland. Energy issues have become a matter of global concern and in Scotland there has been a rapid escalation of public and political interest. We are at a turning point in our history as we move from being a self-sufficient exporter of energy to a possible dependence on imported energy from an increasingly competitive World.

Response to the Green Paper on a European Strategy for Sustainable, Competitive and Secure Energy

The following is the executive summary from The Royal Society of Edinburgh "Inquiry into Energy Issues for Scotland". The full report and all of its recommendations can be downloaded at:

http://www.royalsoced.org.uk/enquiries/energy/full_report.pdf

The report is on energy issues for Scotland until 2050. It provides the global and UK contexts, the current Scottish position and the challenges for Scotland.

The key conclusions on the energy context for Scotland are as follows. Global energy demand is predicted to double by 2050. Energy prices will rise in real terms. There will be greater international market competition for energy. Energy availability will change. Oil and gas will decline continuously, posing particular challenges for transport, heating and electricity generation. Coal reserves worldwide are large but new low emission technologies are needed. Civil nuclear power in the UK has an excellent safety record and its efficiency in power generation will continue to improve, but there are continuing public concerns on waste disposal. Renewables will be in various states of development, economic viability and environmental effect. Continuing use of all fossil fuels will require lower emissions technologies.

Scotland cannot operate in isolation on energy. It is part of the global energy market. It will have to work within the powers reserved to the UK government on energy and use its own delegated powers, for example on promotion of energy efficiency. The Scottish Executive will need to work in harmony with the UK Government and promote the Scottish position.

The best estimates of population and economic activity in Scotland predict an increase in both with the consequential expectation of a 50% increase in energy demand by 2050.

Scotland is making a contribution already to the reduction of greenhouse gas emissions. Although small in global terms, there is a practical contribution and an ethical imperative to continue but the targets must not disadvantage Scotland's competitiveness.

There is no clear societal consensus on energy and no one solution can provide all of the answers. However, Scotland will lose around 30% of its electricity generating capacity from large plants in 10 years and around 75% in 20 years. Given the timescale for approvals and building, decisions are urgent.

Scotland has to think in a global context and act locally using the natural resources at its disposal in a manner which provides social, economic and environmental benefits.

Given the unpredictability of prices, stability of energy source countries, and technological development, along with the need to combat the energy contribution to global climate change, we propose the following approach:

- **a strategic aim:**

a secure, competitive, socially equitable, and low carbon emissions supply of energy for Scotland.

- **four specific objectives:**

- *To encourage energy efficiency to the benefit of economic development,*
- *To ensure that energy availability contributes to improvements in social benefits to Scotland's people,*
- *To minimise adverse environmental effects, both locally and globally, and*
- *To capitalise on the natural energy resources of Scotland in an economically viable and environmentally sensitive way.*

- **four components of action:**

- *energy efficiency,*
- *cleaner energy sources,*
- *research, development and demonstration of renewable and low carbon technologies, and*
- *more effective instruments.*

By 'secure' we mean having sufficiency of supply from a diversity of fuel types and geographical sources using a variety of technologies, encouraging new technological

development to marketability and having the appropriate government framework and instruments. By 'competitive' we mean that the cost of energy will not result in Scotland being uncompetitive in world markets and also competitive in the use of technology and innovation. By 'socially equitable' we mean that all sectors of society should have access to energy at a price which they can afford, implying that some economically and socially poorer sections of society will be aided to rise out of fuel poverty. By 'low carbon emission' we mean that throughout their life cycle technologies should produce the lowest possible levels of greenhouse gas emissions, bearing in mind that there is none that has no emissions. Our strategic aim also implies a safety component that brings at best positive environmental benefits and at worst no significant environmental degradation, and provides assurances on human health.

Energy should be supplied from a diversity of sources and technologies using Scottish prowess and natural resources. Low greenhouse gas emission approaches should be favoured according to environmental benefit, economic viability and technical feasibility.

We propose the following action on **strategy and policy** by the UK Government and by the Scottish Executive.

Recommendation 1: It is essential that decisions are taken by the UK Government by the middle of 2007 to provide a more stable and longer-term policy framework to give greater assurance to the consumer on continuity of energy supply and to give confidence to the providers of energy to make investment decisions.

Recommendation 2: The UK Government should maintain the energy policy objectives set out in the 2003 White Paper: to ensure an adequate, safe and secure supply of energy, to reduce the emission of greenhouse gases with the setting of unambiguous long-term targets, to promote economic development, and to protect vulnerable sections of the population from the adverse effect of market forces.

Recommendation 3: The UK Government should periodically review the instruments and targets used for implementing the policy framework to assess their effectiveness in achieving their intended objectives, and to ensure that unintended consequences have not arisen.

Recommendation 4: We strongly recommend that the Scottish Executive develops a comprehensive energy strategy, within the boundaries of its powers and responsibilities and in consultation with the UK Government, by the end of 2007. This should embrace specific strategies on energy efficiency, transport, heating, electricity generation and the use of renewables. This should also include the strategic aim of **a secure, competitive, socially equitable, and low carbon emissions supply of energy for Scotland**, and the four supporting objectives we propose.

We propose the following changes in **the institutional structures for energy**.

Recommendation 5: The Scottish Executive should seek Parliament's approval for the establishment of an Energy Agency for Scotland as a Non Departmental Public Body. Its responsibilities should include the ability to advise the government and all other relevant interests on all aspects of energy, promotion of energy efficiency, disbursement of all grants and incentives related to energy, independent assessments of technology options and whole lifetime costs, and gathering and disseminating best practice on energy use.

If this is not established, then we make the following recommendation.

Recommendation 10: The Scottish Executive should seek Parliament's approval for the establishment of an Energy Efficiency Agency for Scotland as a Non Departmental Public Body. It should have both advisory and executive powers with authority to scrutinise and make recommendations on energy efficiency action in the public sector, disburse incentives for reducing energy use, increasing efficiency and supporting novel initiatives, and for disseminating best practice.

Energy efficiency

More efficient use of energy is needed with more effective instruments and an improved response from providers and consumers. We make the following recommendations.

Recommendation 7: Industry should be persuaded, through economic instruments and approval mechanisms in the statutory planning system, to utilise waste energy, especially heat, for beneficial purposes. In particular, we recommend that all future small thermal generating plants, near to population centres, should have specific arrangements for the use of waste heat.

Recommendation 8: Local Councils should stimulate more energy efficient housing designs through the Building Regulations system and should substantially improve the enforcement of Building Regulations in relation to energy efficiency.

Recommendation 9: A more comprehensive and integrated package on energy efficiency should be developed at both UK and Scottish levels to reduce the current confusion and increase effectiveness. This should be linked to strengthening the targets and ensuring their achievement under a revised Energy Efficiency Commitment.

Recommendation 11: The Scottish Executive should require Local Councils to achieve specific and measurable improvements in the efficient use of energy through the Town and Country Planning system and Building Regulations.

Recommendation 12: As part of encouraging the change of behaviour needed on energy efficiency, a comprehensive set of measures including education, information and incentives should be developed by the proposed Energy Agency for Scotland (or failing that by the Scottish Executive).

Recommendation 13: The UK Government should consider measures, such as the use of lane preference and variable charging systems, to encourage higher occupancy in private vehicles.

Recommendation 14: Bus transport operators should be given greater incentive through the Scottish Executive's current service support mechanism to operate a wider range of vehicle types to cope with variable passenger loads.

Cleaner energy

In order to reduce emissions of greenhouse gases and to achieve security of energy supply, a multi-pronged approach is proposed comprising emissions controls and substitution of fuels. We make specific proposals for the main energy using sectors: transport, heating and electricity.

(1) Emission control

Recommendation 15: Scottish Enterprise should engage with Scottish Coal, Scottish Power, Mitsui Babcock, the Scottish Universities and other stakeholders, to determine a significant clean coal research and development programme in Scotland.

(2) Fuel substitution

Recommendation 18: The Scottish Executive should ensure that the definition of forest waste used by SEPA enables state and private forest owners to utilise forestry thinning and other wood materials in energy production.

Recommendation 19: The Scottish Executive, as part of the development of its energy strategy, should develop fuel substitution targets for all of the main energy consumption sectors: transport, heating and electricity.

We consider that the current system for stimulating renewables – the Renewables Obligation Certificates – is ineffective. Our preference is for a system of incentives and disincentives which would stimulate low greenhouse gas emission technologies. This could take many forms.

Recommendation 20: We recommend that the UK Government, supported by the Scottish Executive, replace ROCs as soon as possible with a carbon emission reducing measure, such as a carbon levy applied at the point of

carbon production. This should build on the existing EU Emissions Trading Scheme. Existing commitments should be honoured.

Fuel Substitution for Transport

Recommendation 21: The UK Government should review and improve the incentives to encourage fuel substitution in transport and the production of biofuels and associated infrastructure.

Recommendation 22: In the next Spending Review, the Scottish Executive should change the priorities in its transport budget to more adequately reflect its climate change priorities.

Recommendation 23: The Scottish Executive should develop an energy policy and targets for the railway system as part of the Scottish Railway Strategy.

Fuel Substitution for Heating

Recommendation 24: Local Councils should undertake the following to improve fuel substitution for heating:

- amend Structure Plans and Local Plans to stimulate the development of combined heat and power and district heating schemes in urban areas;
- do not approve Planning Permission and Building Warrant to developments on brownfield and greenfield sites without these facilities;
- work with the building construction industry to put into effect systems for the delivery of combined heat and power and district heating systems; and
- increase the targets for the reuse of municipal waste for energy production coupled with a reduction in material sent to landfill sites in Local Waste Plans.

Recommendation 25: The UK and Scottish Governments should introduce a tax disincentive on waste disposal, especially to landfill, and a greater tax incentive for the reuse of waste for space and water heating as part of District Heating, and Combined Heat and Power Schemes. They should also introduce a tax credit system to stimulate the use of biomass and waste for the production of heat for all buildings; and should consider an energy efficient dependent stamp duty and Council Tax as incentives for improvements in building design and construction.

Fuel Substitution for Electricity

Without decisions in the next 12 to 15 months there are likely to be shortages of electricity in a decade. We identify the key dates in the Table below.

Timescales for key energy decisions

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

Recommendation 26: The UK and Scottish Governments should ensure that the framework for energy at both UK and Scottish levels encourages investors to produce electricity from a diversity of supply sources.

Recommendation 27: The Scottish Executive should redefine the 2020 target for the proportion of electricity generated from renewable resources in terms of reduction in greenhouse gases to meet the UK's 2050 target on emissions reductions, and set out a detailed and comprehensive strategy for meeting it.

Recommendation 28: A locational strategy and accompanying planning guidance for onshore wind development should be drawn up immediately by

the Scottish Executive to guide Local Councils, investors and third parties, and speed up the process of decision-making.

Recommendation 29: Subject to agreement on implementing a satisfactory solution to the very long-term treatment of radioactive waste, we encourage both the UK Government and the Scottish Executive to keep open the nuclear electricity generating option in the interests of diversity and security of supply and suppression of greenhouse gas emissions.

Recommendation 30: Government, industry and political parties should retain options for new build electricity generation from a variety of technologies, specifically renewables, clean coal, gas and nuclear, subject to public engagement to decide whether any technologies should be excluded from consideration.

Recommendation 31: The Scottish Executive should discuss with the major generating companies and National Grid Company the decisions required by UK and Scottish Governments and also by generators for the replacement of large-scale electricity generating stations in Scotland. They should take into account the public engagement in Recommendation 30.

Recommendation 32: Government authorities with approval powers, and generating companies should favour the construction of new large-scale electricity generating plant adjacent to existing plant, with easy access to the grid.

Recommendation 33: The Scottish Executive should carry out a review of the electricity infrastructure implications of its renewables policy, especially in light of the National Grid Company's grid connection charging policy.

Opportunities for Scotland

There are many opportunities for Scotland in the utilisation of its natural energy resources, its scientific and technical prowess, and its innovative local approaches.

(1) Distributed generation

Recommendation 34: The various energy use advisory bodies should compile examples of distributed systems and ensure their wide dissemination.

Recommendation 35: Joint initiatives by local enterprise companies, applied research and development groups, private enterprise, and especially local community groups, should exploit locally available energy resources for local use.

(2) Technology development

We are concerned about the lack of a rigorous approach in the assessment of energy technologies and consider its development to be an urgent priority.

Recommendation 6: A common methodology could and should be developed by the proposed Energy Agency for Scotland to assess the relative merits of energy technologies, using the nine factors identified. It should include full lifetime costs and a carbon audit. Assessments using the methodology should be undertaken independently of specific interests and be open to public scrutiny.

Ongoing scrutiny of the opportunities from emerging technologies should be undertaken.

Recommendation 16: An energy technology scrutiny and advisory service should be established by the Scottish Executive. Ideally this should be part of the functions of the proposed Energy Agency for Scotland with ITI Energy.

There are many opportunities for technology development. We specifically identify: 'clean coal' and carbon sequestration, the electricity distribution network, low carbon generation of hydrogen, and offshore wave and tidal energy.

Recommendation 17: The research community, government, ITI Energy and the private sector should work together to provide the financial, intellectual, policy and enterprise stimulus for the development and use of appropriate renewable technologies and the development of cleaner fossil fuel based technologies in Scotland. A Centre of Scientific Excellence in Energy could be an important means of exploiting Scotland's skills and opportunities. The Scottish Scientific Advisory Committee is encouraged to produce a strong proposal for it, which the Scottish Executive is encouraged to support.

Recommendation 36: The Scottish Executive should carry out a detailed appraisal of the potential for hydrogen to contribute to Scotland's energy mix.

Public engagement

There are many views on energy issues in Scotland and these are frequently polarised. A process of public engagement and dialogue is a vital ingredient in seeking to achieve consensus on energy policy and on the key decisions in Scotland.

Recommendation 37: The Scottish Executive should invite independent bodies, such as the Royal Society of Edinburgh, jointly to design and conduct a process of public dialogue and deliberation. Based on the outcomes of this process, they should make recommendations to the Scottish Executive about the range of technologies that should be acceptable as part of an energy mix

in Scotland to ensure security of supply and economic competitiveness and to support the transition to a low-carbon economy. The process should be launched as soon as possible after publication of the UK Government energy review, and completed in the summer of 2007 at the latest.

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