Response to questions in the RSE Inquiry Into Energy Issues For Scotland

General

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

A prudent energy policy would suggest that Scotland should aim for access to diverse sources of energy derived from both fossil fuels and new sources of energy. Most would predict that, barring a technical breakthrough of real magnitude, fossil fuels will remain the dominant energy source over the next 50 years with a slowly growing input from renewables.

Availability of fossil fuels from UK indigenous sources is in inexorable decline and thus Scotland, as the whole of the UK, will become increasingly dependent on imports, especially of natural gas. By virtue of geographic location and infrastructure, however, Scotland is well placed for access to competing supplies of natural gas from multiple sources.

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

Self sufficiency in energy for Scotland is inevitably tied to the availability and cost of indigenous resources. As we have noted, indigenous supplies of fossil fuels are running down. The country already has a proportion of indigenous supply provided by water (hydro) and nuclear. Further enhancements of these sources will depend on a combination of technical feasibility; economics and politics. One assumes that Scotland *could* be self sufficient in electricity generation were there to be a major expansion of nuclear but this seems fraught with economic and, above all, political difficulties. Self sufficiency from renewables, especially wind and wave power, seems a considerable way off even if the current economic, environmental and technical issues can be overcome. New technology offers the possibility to generate electrical power from de-carbonised fuels such as natural gas, but increasingly this will have to be imported. The same technology may have applications where coal is the primary fuel source but whether Scotland still has coal resources that could be economically utilised for this purpose is unclear.

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

The principal implications are economic, i.e. the cost of energy. As we have seen in the first half of 2005, perceptions of imbalances in oil supply and demand particularly, drive prices. In 2004, with economic growth at a 15 year high, primary energy consumption increased globally by 4.3%. with the

strongest rise in Asia Pacific. Coal was the fastest growing fuel at 6.3% but all primary sources posted increases in consumption - oil up 3.4% ; natural gas up 3.3%; hydropower up 5% and nuclear up 4.4% * *(*BP Statistical Review of World Energy 2005)*

The surge in demand for oil in particular significantly reduced the level of spare capacity despite new supplies coming on stream. That in turn drove prices.

Oil is of course globally traded and priced, with North Sea oil (Brent) one of the benchmark crudes. Pricing of natural gas is more complex, but prices in general tend to follow those of oil.

As to security of supply, the global market for oil has so far responded effectively to increased demand as investments in exploration, development and transportation infrastructure continue to deliver new supplies.

In a significant change, the UK and Scotland is now a net importer of natural gas. This in itself should not normally give rise to undue concerns since there is potentially a wide availability of international supplies to the UK including Norway, Algeria, and Russia. The UK's future gas position thus needs to be looked at in the context of an integrated European market. A liberalised and integrated energy market in mainland Europe will be a key factor in the UK's long term security of gas supply to ensure that the widest choice of supplier is available and that prices reflect gas-on-gas competition. In this context the uneven pace of change in Europe gives some cause for concern. There is still much to do in removing barriers to full and transparent third party access to pipeline transportation systems.

Other factors which will assist the UK's supply position are the development of new seasonal gas storage facilities; improved infrastructure links to Norway and mainland Europe, and the development of terminals to import supplies of liquefied natural gas.

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

This question is obviously better answered by those dealing specifically with the various generation technologies available. BP has some interests in gas fired power generation and more than 40% of the company's daily production of hydrocarbons is natural gas. We believe that natural gas offers significant advantages as a generation fuel in terms of efficiency and as a cleaner technology.

As to availability, world proved reserves of natural gas are significant at nearly 180 trillion CubiC metres.* ***(*BP Statistical Review of World Energy 2005)***
Bringing the gas to the point of utilization is another issue, but advances in liquified natural gas technology together with major new investment are improving the economics and availability of this form of gas transportation

all the time. Significant LNG markets are now operating in the USA, Europe, and the Far East with natural gas sourced from the Caribbean, North Africa, the Gulf, and Indonesia. New LNG terminals, as has been noted, are also being built in the UK.

5. *What are the likely trends and uncertainties in the availability and cost of energy sources in the next 20/4 5 years?*

The three principal factors which will shape the energy market over the next decade or so are economy, demography and geology. As we have seen, economic growth in Asia continues to drive up energy demand. Allied to this economic growth is population growth. Before 2010 the world population is expected to rise to 7 billion — almost tripling in the past 60 years. Geology is important because it is almost certain that to 2020 and beyond, hydrocarbons will not just remain the most important source of energy, they will actually become more important. Much work is being done in renewables but there is still no source of alternative or renewable energy which can be supplied commercially to meet mass energy needs. So while the contribution of renewables will grow, they will remain only a fraction of the world's energy needs over the next two decades and probably longer. According to IEA estimates, by 2020 the world will be consuming, each day, about 36 million toe of energy, of which about 65% will come from oil and gas. Significantly, again by 2020, about 33% of this energy demand will arise in Asia.

12 Can the objectives of environmental improvement and economic growth both be met without a major increase in energy costs?

We believe the objectives of environmental improvement and economic growth can be met. The compelling conclusion from the scientific work being done on the C02 question is that the objective must be to achieve stabilisation - a maximum level of C02 in the atmosphere that is below the level of risk. The costs of taking precautionary actions appear to be lower than many initially feared, and the issue looks to be manageable.
From the perspective of the individual company like BP, which aims to grow, there are two principal ways to contribute to the objective of stabilization. The first is through improving the productivity of the energy we use; and by reducing our emissions per unit of production. We also will continue to reduce the carbon content of the products we produce and will continue to work with major engine manufacturers to accelerate positive developments in both lubricants and fuel technology. We will also continue to develop our solar energy business; to test the viability of other potential energy sources such as hydrogen; and to maintain leadership in carbon capture and geologic storage - a technology which may have applications across energy sectors.

(BP has recently announced a new project to test, at scale and in Scotland, the concept of electricity generation from hydrogen and the sequestration and storage of carbon dioxide - see the attached Press Release.)

BP believes that, while it grows, it can keep emissions from its operations at a level of about 10% below that of 1990. On an industry basis, by using a systems approach, combining the advances in the technology of fuels, lubricants and engines, a reduction of up to 400 million tones of C02 emissions by 2010 is conceivable.
Importantly, progress is also being made in the framework and technology of trading emissions. More needs to be done to expand this on a global basis.

bp

press release

June 30, 2005

BP AND PARTNERS PLAN CLEAN ENERGY PLANT IN SCOTLAND. INCREASING OIL RECOVERY AND REDUCING EMISSIONS

BP, ConocoPhillips, Shell and Scottish and Southern Energy (SSE), announced today that they are to commence engineering design of the world's first industrial scale project to generate 'carbon-free' electricity from hydrogen.

The project would represent a significant new step in providing clean energy to consumers, tackling carbon dioxide emissions believed to contribute to climate change and enhancing the recovery and utilization of known world energy resources.

The planned project - producing 'decarbonised' fuel and using it for power generation - would convert natural gas to hydrogen and carbon dioxide gases, then use the hydrogen gas as fuel for a 350MW power station, and export the carbon dioxide to a North Sea oil reservoir for increased oil recovery and ultimate storage. The project would reduce the amount of carbon dioxide emitted to the atmosphere by the power generation by over 90 per cent. While each of the component technologies making up the project is already proven, their proposed combination in this project is a world first,

Initial engineering feasibility studies into the project have already been completed. The partners will now carry out further detailed front-end engineering design work with the aim of confirming the economic feasibility of the scheme. This work would be expected to be complete in the second half of 2006. This will allow a final investment decision to be taken next year, subject to which the project would then be expected to commence operation in 2009.

The full project would require total capital investment of some $600million. It would also require an appropriate policy and regulatory framework which encourages the capture of carbon from fossil fuel-based electricity generation and its long-term storage.

When fully operational, the project would be expected to capture and store around 1.3 million tonnes of carbon dioxide each year and provide 'carbon-free' electricity to the equivalent of a quarter of a million UK homes.

Lord Browne, BP Group Chief Executive, said: "This is an important and unique project configured at a scale that can offer significant progress in the provision of cleaner energy and the reduction of carbon dioxide emissions.

"For example, if applied to just five per cent of the new electricity generating capacity that the world is projected to require by 2050, such schemes would have the potential to reduce global carbon dioxide emissions by around one billion tonnes a year - a material step in the challenge the world faces. The success of this UK scheme will provide invaluable experience for the further application of this concept worldwide.

"In the UK, and Scotland in particular, the project will offer a new, large-scale source of decarbonised electricity to consumers as well as extending the commercial life and contribution of the North Sea to the UK and Scottish economies. BP will look for opportunities to replicate this scheme and apply the associated technologies and experience in other parts of the world where we conduct business."

The project would be located close to Peterhead in north-east Scotland. A newly built reformer plant would convert up to 70 million cubic feet of natural gas a day into carbon dioxide and hydrogen and the hydrogen would be used as fuel for a new 350MW combined cycle gas turbine power station.

lan Marchant, SSE Group chief executive, said: "The work on which we're now embarking with our partners will enable us to evaluate the benefits of combining a number of technologies in a way which would be a world first. The project demonstrates that the energy sector is continuing to respond to the challenges posed by climate change and by the need for a more sustainable use of natural resources.

"Our work on this development with our partners complements our activities in progressing new and emerging technologies for generating electricity from renewable sources and represents a significant opportunity for the North East of Scotland. Investment in the research, development and demonstration of new and emerging technologies for generating electricity is a key part of SSE's long-term strategy for sustainable electricity generation in the UK."

The carbon dioxide generated by the reformer would be exported through existing pipelines to the mature BP-operated Miller oilfield, 240 kilometres offshore, where the platform would be adapted to allow for injection of the gas into the reservoir four kilometres below the seabed to increase oil recovery from the reservoir and for storage.

The Miller field is currently due to cease production in 2006/7 but the injection of carbon dioxide into the reservoir could increase the amount of oil extracted from the field, potentially allowing the production of up to 40 million additional barrels of oil and extending the life of the field by 15 to 20 years.

Notes to editors:

- In its March 2005 Budget, the UK Government announced that it is examining the potential for new economic incentives to support the development of carbon capture and storage technologies and applications.

- The Miller oil field is operated by BP (52 per cent) with partners ConocoPhillips (30 per cent) and Shell (18 per cent). The field, which began production in 1992, is 240 kilometers north east of Peterhead in water depths of 100 metres. Production peaked in 1995 at 150,000 barrels of oil and 220 million cubic feet of gas a day. The field now produces some 10,000 barrels of oil and 15 million cubic feet of gas a day. Oil from the field is exported via the Forties pipeline system and gas is exported in a sour gas pipeline initially to shore at St Fergus and then on to SSE's Peterhead power station.

- Scottish and Southern Energy is the UK's largest generator of electricity from non-nuclear sources, as well as being the UK's second largest energy distributor and third largest energy supplier. Its assets include Peterhead Power Station. Originally constructed in 1980, it was re-oowered in 2000, with the installation of three new gas turbines requiring a total

investment of £220 million. The reduction in carbon dioxide emissions resulting from the re-powering was equivalent to removing around 400,000 cars from the road.

- BP, with its partners Sonatrach and Statoil, operates the In Salah geological storage project in Algeria that is storing approximately one million tonnes a year of carbon dioxide in a gas reservoir.

- Oil and gas reservoirs are geological formations, often kilometres below the earth's surface, that have held oil, natural gas, and sometimes carbon dioxide trapped for millions of years in capped sandstone.

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