An Energy Research Strategy for Ireland

Comments from the Geosciences Committee of the Royal Irish Academy

The Geosciences Committee's response has been informed by two recent conferences which it has organised through the Royal Irish Academy: "Where will Ireland get its energy?", jointly organised with the Geological Survey of Ireland and held in Dublin Castle on 8th November 2007, and "Geoscience: The Foundation of Our Future", jointly organised with the Geological Survey of Northern Ireland and Geological Survey of Ireland and held at Parliament Buildings, Stormont, on 20th June 2008.

We are concerned at the omission, or insufficient discussion, of the following topics.

Carbon capture and storage: Accepting the short and medium term need for carbon-based fuels for electricity generation, the options for CO_2 capture and storage require urgent evaluation given climate change considerations. Major point emission sources of CO_2 on the island are located primarily in the Dublin and Belfast metropolitan areas and at the Shannon Estuary. An all-island, multi-organizational assessment of the geological storage potential for carbon dioxide from these major point sources is due for completion in July 2008. However, on completion of this initial assessment more detailed studies and site investigations will be required to advance any forthcoming recommendations towards geological and economic realities.

Hydrocarbons: In spite of the targeted growth of wind and other renewables, it is clear that oil and gas will provide a substantial proportion of our energy requirements for several decades. Ireland's offshore remains lightly explored and poorly understood. Maximizing the clean recovery of hydrocarbons requires research into understanding of the 3-D architecture of reservoir fairways, in addition to the acquisition of new data. Deep seismic surveys of selected areas off the west and south coasts are required in order to improve our understanding of the geological setting of potential hydrocarbon reservoirs and to provide a more robust understanding of the geological framework. These initiatives will greatly assist in stimulating exploration interest among the oil industry, which will, in turn, generate additional commercial data for further academic analysis. They may in the longer term provide additional, post-production, offshore carbon storage sites. In addition, there is a need to explore the extent of natural gas frozen at shallow levels beneath the seabed as methane hydrate, and to determine how it can be exploited.

Geothermal energy: Relatively little is known of Ireland's geothermal resources, which could displace significant use of oil and gas for space heating and perhaps for electricity generation. Research is required to establish the distribution of heat-producing elements in Ireland's crustal rocks and to pinpoint the most likely sources of hot dry rocks and aquifers to depths up to 5 km. These could provide abundant warm water for domestic, industrial or agricultural use. Whilst significant domestic use is being made of ground source heat pumps, research is needed to demonstrate the full geothermal heating (and cooling) capacity of already discovered larger scale shallow geothermal aquifers such as the warm springs of north Leinster and buried river channels in Cork. Early stage private sector investment in exploration of deep geothermal resources, such as the current district heating proposal at Newcastle, Co Dublin, will need to be incentivised. The Exploration and Mining Division of DCENR has established a consultation process on geothermal energy (http://survey.euro.confirmit.com/wix3/p126308508.aspx/) whose conclusions will not be available until autumn 2008.

Nuclear power: There is currently no compelling case for construction of nuclear reactors in Ireland given their large size relative to the island's electricity use and their incompatibility with variable renewables such as wind. However, nuclear power may have to be considered as a source of base

load electricity if carbon sequestration cannot absorb enough CO_2 to meet atmospheric emissions targets. A UK Government White Paper "Managing Radioactive Waste Safely" was published in June 2008. From the perspective of North-South cooperation, it should be noted that the Department of the Environment in Northern Ireland supports the Managing Radioactive Waste Safely programme. It would be wise to have carried out research in a number of areas to prepare for this eventuality: research is required to locate potential uranium ore reserves, geological radioactive waste repositories and nuclear reactor sites.

Spatial planning: Comprehensive GIS databases are required for knowledge-based decision making in the planning process to make rational decisions concerning the location of power generation facilities, including renewable plants such as wind farms. Major difficulties can arise due to the particular site requirements for specific types of power generation facility and the geographic locations of environmentally sensitive areas, including recognised conservation areas. Another problem is the need to protect major environmental monitoring stations such as the international Global Atmospheric Watch (GAW) stations at Mace Head, Carna (NUI, Galway) and Valentia Observatory, Co. Kerry (Met Éireann).

Shortage of geologists and geological training: Most areas of energy research require input from geologists. There is insignificant unemployent of geologists across Europe (see recent presentation at http://www.eurogeologists.eu/cms/index.php) and a similar situation exists in North America, Australia and other developed countries. This is due mainly to the continuing rapid economic development of China and India, whose increasing demand for energy and mineral resources has led to a global shortage of geological expertise. It is likely that this situation will continue for some years to come. The previous global boom in geological employment ended around 1980 and a disproportionately large number of practising geologists started their careers during the 1970s. A large proportion of geologists will consequently retire in the next ten years. At the same time, the number of graduates in geology and related disciplines has not risen from the low levels of the 1980s. There is not yet any indication of greater interest in studying geology from aspiring third level students, in spite of the high starting salaries for graduates. Further, there is a lack of postgraduate taught masters courses in energy-related geoscience areas. Consequently many geoscience graduates leave Ireland to obtain postgraduate qualifications and many do not return. To increase the profile of geology and other geosciences and hence attract more students, funding is required to establish taught masters courses and research institutes in the geosciences.

Shortage of mathematical and physical science qualifications: The report correctly notes the need for more students at third level, and above, in energy-related science and engineering subjects. Changing this situation will require more than taking advantage of the interest many young people have in sustainable energy and the related issue of climate change. Many relevant undergraduate and postgraduate degrees require a high level of proficiency in mathematics and/or physical science (physics and chemistry). Unfortunately, the number of students in Ireland who attempt, and especially who excel, in these subjects in the Leaving Certificate is small and falling. One reason is the low proportion of mathematics and physical science secondary school teachers who have a degree in the subjects they teach, which makes them less able to teach, and especially enthuse, their students in these subjects. A second reason is a fundamental weakness in the way these subjects are assessed; average Leaving Certificate grades tend to rise from year to year. It is claimed that this is because students are studying harder and being taught more effectively. Unfortunately students are indeed studying harder, and being better taught, but primarily to pass exams by learning answers to predicted exam questions. The result is higher grades but less understanding of the subject. Evidence for this can be seen, for example, in the provision of previously unnecessary remedial Mathematics courses by many universities for first year Science undergraduates. This problem clearly extends beyond the remit of the Energy Strategy but must be flagged to be addressed urgently.