

LUNAR SOCIETY TRANSPORT & CLIMATE CHANGE GROUP
***'What should be the role of nuclear power in a
secure future energy supply?'***

Group meeting, 26 January 2012, Squire Sanders LLP, Edmund St, Birmingham

Prof Martin Freer, Head of the Nuclear Physics Group at Birmingham University and Director of the Birmingham Centre for Nuclear Education and Research spoke to an audience of around 40 people about the need for new electricity generating capacity, and the potential role of nuclear energy in meeting that need. The illustrations from his presentation are on the Lunar Society website. Key points were:

- Around 90% of electricity in the UK comes from coal, gas and nuclear, with gas growing from almost nothing to the largest component in the last 20 years. Factors affecting future electricity generation include:
 - ⇒ The depletion of easily extracted and secure sources of fossil fuels – the supply peak may have passed and escalating and volatile energy prices can therefore be expected;
 - ⇒ Much of existing coal and nuclear generation plant is reaching the end of its life, and will need to be replaced just to maintain output – and meeting projected demand would require extra;
 - ⇒ To meet the Climate Change Act (CCA) target of an 80% reduction of greenhouse gases by 2050 would require ending the use of coal or effective large-scale Carbon Capture and Storage (CCS);
 - ⇒ The high population density and power consumption of the UK place severe limits on the proportion of our energy needs can be met from wind, tidal, solar and hydro.
- The implication is that nuclear power will need to be a substantial part of the mix if there is to be progress on greenhouse gas reductions - if CCS is not feasible, a large proportion. Such a large scale investment in nuclear capacity also has problems:
 - ⇒ Electric power has to be 'on tap' but nuclear capacity cannot be switched on and off in line with day-to-day and hour-to-hour demand fluctuations, which are significant;
 - ⇒ Cost is typically £5bn per plant, and 8-10 will need to be replaced starting by 2017 before there is any addition to existing nuclear capacity. 20-30 may be needed in total to fill the energy gap;
 - ⇒ Private sector investment on this scale depends fundamentally on predictable energy markets, which will be a political challenge for Governments and the regulatory system;
 - ⇒ The lead time for design and procurement of a nuclear plant is around a decade, so the time for decision-making is already constrained;
- Other nuclear issues discussed included:
 - ⇒ Like fossil fuels, supplies of uranium are finite, so the longer term future of nuclear power depends on developing new technologies (e.g. to recycle spent fuel, to make use of plutonium and thorium, and exploit U_{238} (99.3% of natural uranium) as well as U_{235});
 - ⇒ Safety – brought into sharp relief by the Fukushima incident. Prof Freer pointed out that annual deaths on the roads in UK have only recently fallen below the global impact (~2700 pa) of the Chernobyl disaster, and that deaths associated with production are tiny compared with coal and oil;
 - ⇒ Prof Freer outlined several design approaches, ranging from higher efficiency versions of past plant to entirely new concepts such as fast reactors cooled by liquid sodium or lead, or helium gas. Examples of the latter already exist in Japan (Monju) and Belgium (MYRRR). Fusion reactors, however still face fundamental difficulties of materials able to withstand neutron bombardment;
 - ⇒ Two designs are already near approval for use in the UK: the Westinghouse AP1000 (1GW) and Areva EPR (1.6 GW). Both represent huge advances in safety compared with older designs like Fukushima, with both multiple independent safeguarding systems and the passive ability to 'fail safe' even in extreme circumstances such as core melt-down.

There was lively discussion both during and after Prof Freer's presentation, demonstrating a strong awareness of the significance of the issues from a wide range of civic, business, academic and environmental interests. The Convenor of the LS Transport & Climate Change Group undertook to circulate a note of the discussion, and to consult within and beyond the Society on how best to pursue the issues raised. The publication of the report of the Birmingham Policy Commission on (due July) may provide the appropriate occasion for a further event.

Alan Wenban-Smith, Convenor, Transport & Climate Change Group, 30 January 2012