THE ENERGY BILL – A Missed Opportunity

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A previous Energy Minster compared the task of writing an autonomous energy policy with that of Hunting the Snark. It need not be as difficult as that if approached logically.

Over the last ten years we have had a number of policy statements, energy reviews and White Papers from the Government about the national electricity supply, but none of them has been sufficiently realistic, workable or affordable to be successful.

One consistent flaw in these reports has been that Governments have been trying in one policy statement to achieve a number of objectives which although commendable in themselves are sometimes mutually incompatible. This approach is tantamount to asking a pharmacist to produce a drug which will treat everything from ingrowing toenails to dementia. This will not work. A successful policy for the national electricity supply needs to identify priorities and concentrate on solving them in turn

Another flaw has been a failure to recognise that electricity supply needs long term planning. Power stations like all mechanical equipment have a working life after which they become uneconomic and need replacing. We need a policy which encourages developers to invest and which ensures new power stations of adequate capacity are ready to come on line as the older ones come to the end of their commercial lives.

A realistic policy for a national electricity supply should start by looking at the demand, and select the most appropriate generating equipment to meet that demand. To ensure security of the supply in order to meet the demand should be the over-riding priority in building new power stations. Daily demand curves are prepared by the National Grid and Fig 1 shows the maximum and minimum daily demand for 2007, the year before the financial recession.

The maximum demand in winter (for which the system should be designed) starts with a base load of about 40GW. At about 5am the demand starts to increase and in a couple of hours reaches a plateau of about 60GW. After about 7.30pm the demand slowly falls away. In summer, when maintenance can be carried out, the general pattern remains the same but demand varies from a base load of about 25GW to a maximum of 45GW.

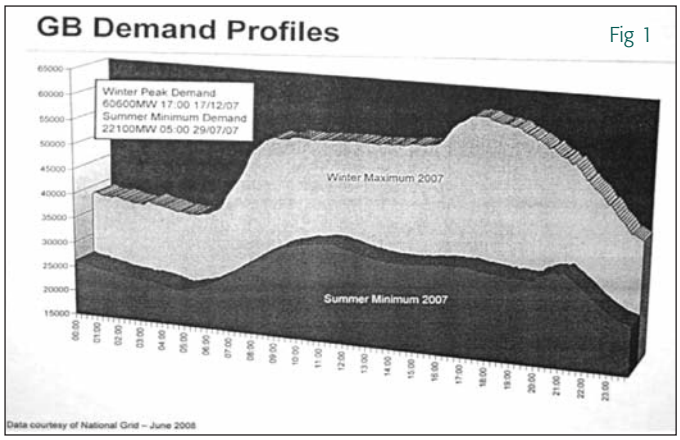

Fig 1

The most economical means of generating the base load has been from large power stations centrally located which at present use coal as their main fuel. Although we can no longer rely on being "an island built on coal and surrounded by fish" coal is likely to be our main fuel for the immediate future, especially if we use underground gasification of domestic reserves (an already established technique) or by using carbon capture and storage (yet to be demonstrated on a commercial scale).

With political pressure to reduce the use of coal the alternatives are gas or uranium. Both are imported, unless shale gas is found in substantial quantities, but the uranium is available from a number of stable countries and is needed only in much smaller quantities. Uranium also has the advantage that its cost is only a small part of the cost of generation and fluctuations in its cost of supply do not materially affect the price of electricity. Using present designs we need about 30-40 nuclear power stations to take the place of coal. This will also substantially reduce carbon emissions. Whichever fuel is used large centrally located power stations using the existing grid is the most technically efficient choice.

The daytime load can be met using gas turbines (CCGT) which are comparatively inexpensive to build and can be started and stopped quickly to match demand.

Small but useful contributions can be made from the thermal recycling of municipal waste (the council collects the rubbish in the morning and it is returned to householders as electricity in the afternoon) and hydro power which is specially useful in meeting peak demands. Both are well established technologies.

Intermittent supplies of energy from wind turbines are of virtually no use in ensuring security of supply.

Instead of taking the opportunity to use its financial support to promote and encourage the use of established engineering technology, especially the building of major new power stations, the Government's emphasis has been to encourage different ways of generating electricity, often on only a small scale, by using complicated, and sometimes illogical, financial incentives for the benefit of developers. And to do this without considering whether or not the customer

Fig 2

can use the electricity produced or to pay for the incentive.

The lack of new build means we are approaching an "electricity cliff" as the older power stations are retired and not replaced. This will put our electricity supply in jeopardy for years to come.

To complicate matters further Governments of the past ten years have developed an obsession with wind generation which requires tweaking the National Grid to accommodate the intermittent and unpredictable bursts of small amounts of energy from wind farms. This is the tail wagging the dog. The National Grid is a major technical achievement built in the1920s and 1930s which allowed the national distribution of electricity to replace the previous inefficient and expensive system of local generation.

Wind energy has the superficial attraction of being "free", which turns out to be an illusion. When fully costed it is more expensive than the alternatives[1]. Wind energy has to be subsidised on a generous scale which is bad engineering and bad economics. This subsidy is consumers' money which could be better spent elsewhere. There is no economic case for wind energy.

Rain is also free but when water is collected, processed and delivered to the home and to industry in a usable form it has to be paid for. And water can be stored whereas electricity cannot be stored and needs to be generated to match the customer's demand.

The Government should change the focus of their electricity policy to encourage the building of a sufficient number of new large power stations with adequate capacity which will ensure security of supply.

There is one part of the Energy Bill which can be fully supported. The Bill does encourage us to reduce demand and use less energy – a solution which Punch proposed in 1868, Fig 2

Robert Freer is a chartered engineer

Reference

1 Ruth Lea Electricity Costs; The folly of windpower. Civitas January 2012

HELIUM

Why Recent Helium Shortages have Forced us to Temporarily Shut Down our Brain Research Centre

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At the Oxford Centre for Human Brain Activity, we use magetoencephalography (MEG) to study the human brain in health and disease. MEG is one of the most advanced methods currently available for non-invasive brain imagining, allowing us to listen in on brain function by measuring tiny disturbances in the magnetic field around the outside surface of the head.

MEG is the centrepiece of our brain imaging facility, and provides researchers and clinicians from all over Oxford, and further afield, state-of-the-art technology for safe, painless and accurate measurement of human brain activity. Recently, we have been forced to shut down our facility on three separate occasions because of critical shortages in liquid helium supplies. We are all hoping for a better year in 2013, but the situation is far from guaranteed.

The superconducting quantum interference devices

. . . critical shortages in liquid helium supplies . . .