The Looming Energy Crisis

This leaflet sets out the risks being run over the foreseeable future with Britain's electricity supply. It explains the urgency behind the need for a substantial contribution from nuclear power if the national interest is to be served.

Background

Britain has known for several years that electricity supply was likely to be very tight over the next 10-15 years. Indeed, SONE sent a pamphlet, "The Looming Energy Crisis", to the Cabinet and all MPs immediately before the 2005 general election warning of the risks being run and calling for a new nuclear power station programme.

At that time, the Government considered nuclear to be "economically unattractive". A year later it revised its position and in 2008 officially welcomed a nuclear renaissance led by private companies. A great deal of work is now in train to prepare for a new nuclear power station programme but many hurdles remain.

The Conservative Opposition has formally lined up behind the Government's pro-nuclear policy but the Liberal Democrats' leader wants an end to nuclear and coal power generation. A number of so-called "Green" groups adopt the same position, claiming that Britain's electricity needs can be met by a combination of renewable and alternative sources of electricity – e.g. wind, tidal, solar – and energy efficiency.

This briefing explains why SONE regards this as dangerously ill-informed and why there is no current substitute for nuclear power if the national objective is to achieve greater security of supply at competitive cost and combat global warming.

Where power comes from

On the accepted basis of measurement, Britain currently has adequate electricity generation plant and, according to the Government, a winter margin of around 25 per cent of seasonal peak capacity. This suggests a comfortable position, but it assumes that reserve plant would be available as required. However, the UK grid has not been tested for many years by a severe winter and it is known that in colder spells over the past eight years there have been some close calls.

Broadly speaking – and the proportions of fossil fuels vary with relative prices – supply is obtained from coal and gas, each around 37 per cent, nuclear 18 per cent, renewables 5 per cent (of which wind accounts for 1.3 per cent), and imports from France of 2-3 per cent.

There seems to be little chance of the Government achieving its target of generating 10 per cent of British power from renewables by 2010, even though ambitious – and many would say totally unrealistic – plans have been unveiled for building up to 3,000 on-shore and 7,000 offshore wind turbines over the next 12 years. In any case, wind power is unpredictable and cannot be relied on to deliver power when it is needed. Its contribution is currently so insignificant as to be irrelevant to the supply problem confronting the nation.

So where's the rub?

The problem lies not primarily in the amount of existing capacity to meet peak demand of about 60,000MW, even if it is sometimes stretched, but in its age. We are approaching a cliff edge.

Nuclear power stations are steadily closing on grounds of age and some, for the same reason, are requiring increasing maintenance, which disrupts their supply. Already 10 of the first three generations of 19 nuclear power stations have closed and the rest, apart from the newest, Sizewell B, will be retired by 2023, most of them well before then. Some 7,000MW will close down by 2020 and nearly 10,000MW by 2023. That means that, if nothing is done, nuclear's contribution will be reduced from 18 to some three per cent in less than 15 years.

Continued over

Looking at coal, all bar three of the 18 major coal-fired power stations are anything from 35-42 years' old. Again, closures have long been on the cards over the next 10-15 years and will be accelerated by the EU Large Combustion Plant directive for environmental reasons. Within a few years it will become uneconomic to adapt the older power stations to meet these legal emissions requirements. Smaller gasoil power stations are in the same age bracket and hydro-electric schemes, with a much longer life, are typically 40-50 years' old, though some are much older.

The only relatively new element in UK power generation is that fired by natural gas (CCGT). Over the last 18 years some 21,000MW of CCGT stations have been built and more than half of this capacity is at the most 10 years' old. This substitution of gas for coal began in the 1990s and was dubbed "the dash for gas". It accounts for most of the claimed reductions in CO_2 emissions since 1990.

In other words, most of Britain's electricity generating capacity is wearing out and progressively needs replacing. This is not in dispute. The argument is over how to fill the looming gap.

SONE's position

SONE is clear how it should be filled. It welcomes all sources provided they can pass the same tests applied to nuclear. These are:

- Are they safe?
- Do they improve security of supply?
- Do they improve or at least safeguard Britain's competitive position?
- Do they combat global warming?

The case for Nuclear

The case for nuclear can be simply stated:
Nuclear is safe: Over the past 50 years nuclear has demonstrated its safety in the UK - not a single death from a radiation accident. The nuclear industry releases only a tiny fraction of the radiation to which all Britons are naturally exposed – indeed, 140 times less than medical science.

Contrary to assertions, it has no problem with handling its "spent" fuel, waste or decommissioning. Decommissioning is under way on many sites and the industry has been coping with its "spent" fuel (which can be recycled) and waste for 50 years. Ideally, it now needs a repository for the longer-lived nuclear wastes and the Government has belatedly turned its attention towards securing one. The radioactivity in the waste consigned to such a repository would decay in 500-600 years to the relatively harmless levels found in nature in the form of uranium.

Nuclear improves security: Nuclear minimises the use of imported and increasingly expensive fossil fuels, often from unstable countries. Its basic fuel, uranium, is mined in predominantly stable and friendly countries – e.g. Australia and Canada. There is no shortage of it and in any case used or "spent" nuclear fuel can be reprocessed to recover 97 per cent of its energy value for "burning" again in reactors. The fast reactor, securing 60 times more energy than from existing nuclear power stations, is also a proven concept.

Nuclear is competitive: Nuclear is the most competitive electricity available to consumers when all costs are added in – i.e. including mining, decommissioning, waste management and environmental protection. This has been demonstrated by many independent studies. It may be relatively expensive to build but its fuel costs are small and pretty stable. It follows that it offers consumers, businesses and industry cheaper power at a time when electricity bills are soaring.

Nuclear cuts carbon emissions: Nuclear is the cleanest fuel used to generate electricity – about 200 times cleaner than coal and 100 times cleaner than gas and even cleaner than wind. Again these calculations take everything into account from uranium mining to decommissioning and waste management. It emits next to no CO_2. It is just the fuel the doctor ordered to combat global warming.

In addition nuclear has sites for new power stations readily available at existing nuclear facilities. It would make use of the existing power infrastructure and minimise the investment required for distribution which is forecast to more than double the current value of the National Grid largely to cater for wind power. It is also economical in its use of land. A nuclear power station requires an area covered by only 10 soccer pitches whereas a wind "farm" generating (when the wind blows optimally) an equivalent amount of power – 1,000MW – would require an area the size of Dartmoor.

Only nuclear power ticks all the boxes. No other form of electric power generation meets these tests.

How do other sources fall short?

We rehearse the limitations of other sources below:

Renewables – They come with four major limitations – availability, predictability – i.e. reliability – land requirements and price. We also have to distinguish between gleams in the eye, the unproven and the simply limited.

The "Green" vision of an energy-efficient Britain driven by renewable and alternative sources of energy is no more than that – and an unachievable gleam in the eye on the basis of existing technology.

Wavepower, for example, has yet to be a proven supplier of power in any quantity, let alone at what cost. The Osprey plant was wrecked off Scotland within 48 hours. A device called Pelamis is currently being tested but a structure more than 100 miles long would be required to replace a large conventional power station.

In this country **geothermal** power and **methane** from tips are always going to be marginal.

Wind is unpredictable and therefore unreliable. **Solar** is no use at night and achieves its maximum output at midday when it is least required. **Tidal** is predictable but cannot be relied on during the several hours of slack water between tides, which vary in time every day. The French have never repeated their La Rance tidal experiment in Brittany.

Given an adequate flow of water, **hydro-power** is predictable and contributes substantially to clean energy supplies throughout the world. But in Britain it is generally regarded as fully developed.

Biomass – i.e. wood – is one of the oldest sources of energy. But, like crops for fuel, it is a dilute source of energy and requires vast amounts of land to grow it. These are simply not available in Britain. A biomass-fuelled 1,000MW power station would require a forest the size of North Wales. Biomass is certainly a predictable source of energy, but it will inevitably remain marginal.

If renewable power cannot be predicted or is not available, or even if its collapse is predictable, it has to be backed up by predictable and reliable sources of power such as coal, gas, oil or nuclear. That means that when fossil fuels are used for back up it avoids relatively little CO_2 production. Indeed, it could increase greenhouse gas emissions because conventional power stations have to be kept spinning, with all the inefficiency and production of CO_2 that is entailed, to chip in when renewable sources fail. That is why Denmark, often held up as an example for its exploitation of renewable energy, has twice the carbon emissions per capita of nuclear- and hydro-powered France and Sweden.

There is very serious doubt whether any number of wind power stations and solar panels would render a single conventional power station redundant. E.ON, the international energy company, claims that 90 per cent of it would have to be backed up by conventional power generators. Other authorities say that, regardless of the intermittent renewables provision, enough conventional plant would have to be retained to meet maximum estimated peak demand because of those renewables' unreliability.
This raises the serious matter of wasteful investment and costs to be borne by the consumer. Some experts even argue that, given the huge role proposed for wind, additional fossil fuel stations would have to be built.

Finally, not a single wind turbine would be built or solar panel installed without subsidy. That subsidy, which doubles the price paid for power to wind turbine operators – in other words, a 100 per cent subsidy – is paid for by consumers. It is already costing them at least £50 a year on their electricity bills and some projections suggest that figure could rise to £400 a year.

In other words, available intermittent renewables may be safe but they do nothing to improve security of supply and little to combat global warming. They damage our competitiveness. And because they are dilute sources of energy they require vast amounts of land or ocean. They in no way offer an alternative to nuclear and cannot compete with it.

Gas

Natural gas power stations are relatively quick and inexpensive to build but their running costs are becoming progressively higher. Fuel represents about 75 per cent of the cost of the electricity they generate compared to uranium's 20% of nuclear costs. Moreover, the price of gas is likely to get more rather than less expensive in the future because of rising demand.

As North Sea gas production falls more and more – up to 80-90 per cent of our needs - will have to be imported, notably from some politically unreliable suppliers such as Russia and Islamic countries. Moreover, suppliers in politically stable countries – e.g. Norway - will seek to conserve dwindling reserves and sell to the highest bidder in a seller's market. This undermines the UK's energy security at a time when other nations are striving to reduce their reliance on imports. There are also concerns about the adequacy of supply in the foreseeable future because of a shortage of gas storage in Britain.

While emitting half the carbon of coal, gas is nonetheless a "dirty" fuel – producing roughly a hundred times more carbon per unit of electrical output than nuclear. It contributes to global warming.

Gas cannot compete with nuclear in terms of security of supply and avoidance of CO_2 emissions and, while it will be necessary to burn it for many years to come, it is unlikely to be able to compete with nuclear in the generation of electricity.

Coal

Coal is plentiful and Britain still has large reserves that might become economic in the future. For the foreseeable future we shall rely mainly on imported coal. Its price has been rising because of increasing demand for gas, its major competitor as the generator of electricity in the UK.

It would have an assured future as a power station fuel if it were not the dirtiest apart from peat – emitting 200 times as much carbon as nuclear and twice as much as gas. For this reason, "Greens" are campaigning against plans to build a new coal-fired power station at Kingsnorth in North Kent.

Experiments are in train to demonstrate the feasibility of capturing the carbon emitted by power station flues and piping it for sequestration in former oil and gas bearing sediments under the North Sea. Flushing oil and gasfields with CO_2 is an established technique to improve oil and gas production but its application to the vast electricity industry is another matter. So is the ability permanently to lock up CO_2 in strata.

Two things are clear: it will be some years before we have the measure of clean coal technology – as it is described – and its cost. Early estimates suggest that it could double the price of electricity.

Clean coal would offer coal an expanding future as a power station fuel and, to the extent that the coal was produced in the UK, could increase security of electricity supply. It remains to be seen whether it could ever be competitive with nuclear. As things stand, coal simply cannot compete with nuclear if its environmental costs are included.

Energy conservation

Theoretically, energy conservation has great potential. The problem lies in realising it.

Scientists and engineers have steadily secured more work from the energy we use and will continue to do so, though it gets harder the more you extract from the same technology. Machinery, appliances, vehicles and buildings will become more energy efficient and we should encourage this. But man's ingenuity will also devise more ways of using energy and people will use the money they save from greater energy efficiency to buy more energy-using appliances.

Perhaps the best we can hope for is that energy conservation in all its forms will minimise the increase in demand for electricity, especially in view of the range of power-driven technology increasingly available to children.

It is possible to cut energy use drastically in an emergency through restrictions and severe price increases. But consumers soon grow restive and, outside crises, Governments find it politically difficult to impose swingeing, demand-reducing price increases. In any case, higher prices damage competitiveness if imposed unilaterally.

It does not make sense to waste energy and we should certainly build energy saving into our way of life. But historically electricity demand has been rising by 1-1.5% a year and it would be extremely unwise to rely on energy conservation to reduce demand in the belief that it will avoid the construction of new power stations.

Energy conservation, including the more efficient use of energy, certainly does not invalidate the case for more nuclear power stations.

The immediate future

It ill behoves those "Greens" who continue to campaign against nuclear power to say it is irrelevant to our immediate needs because the first of a new generation of nuclear power stations could not be operational before 2017 at the earliest.

It is probably true to say that, in present circumstances, no new nuclear power station could be on line before then. But the "Greens" have done everything they can first to eliminate nuclear from consideration and now to delay the construction of new nuclear power stations. If the national interest had been served, these would have been started at least 10 years ago.

The "Green" movement will bear a heavy responsibility if, as seems likely, Britain is hampered by power cuts in the foreseeable future and burns more CO_2 producing gas and coal as a result of its opposition to nuclear.

The harsh reality is that without a new urgency in energy policy we shall have to rely increasingly on expensive, imported gas to replace coal-fired and nuclear generated electricity. Renewables, as we have shown, are no solution to our energy needs and certainly no alternative to nuclear.

The fact that nuclear is not an instant remedy for past neglect is no argument against it. We need all the nuclear power we can get as soon as we can get it. Longer term it will be crucial to securing adequate supplies of competitive power, fossil fuel substitution and the effective reduction of carbon emissions.

It is curious that the so-called "Greens" are passionately opposed to the one fuel that could, as they emotively put it, save the planet.

The more coal and gas we rely on to generate electricity the less our chances – already remote – of meeting our greenhouse gas emissions targets and the more vulnerable we shall be to price increases and politically-motivated interruptions in supply.

The diversion

To make matters worse the EU has committed member states to produce 20 per cent of Europe's energy from renewable sources by 2020. It is doubtful whether EU Ministers knew what they were doing when they statutorily imposed on themselves this task. It requires the generation of up to 40 per cent of UK electricity from renewable sources – eight times the present level – to offset all the fossil fuels used in transport, industrial processes and domestic heating.

It is widely regarded as an utterly impossible commitment. But the Government's plans to create a new energy-producing "Gulf" in the North Sea out of wind power at a reported cost of £100bn shows how an irrational faith in renewables is diverting effort and resources from effectively meeting the threat to Britain's power supplies.

In the interests of Britain's energy security and competitiveness and combating global warming, we need new nuclear power stations NOW

Britain requires a new nuclear power programme URGENTLY

If you want to read more about nuclear issues or different aspects of energy policy you can download the following briefing notes from SONE's website at www.sone.org.uk:

Briefing Note
(a factual document about nuclear power in the context of the energy scene)
Uranium Availability
Renewable and alternative sources of electricity
The Hydrogen Economy
Micro-generation Briefing Note
The Management of Nuclear Waste
Plutonium in Perspective
Nuclear Power in Perspective
Energy and Power – Dispelling the Fog

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