nuclear power – a flawed case

part 1: why we don't need nuclear now

In the first instalment of a two-part article arguing the case against nuclear energy, Andrew Blowers suggests that nuclear power is far from necessary either to maintain sufficient energy supply or to save the planet

The case for nuclear energy is based on two simple and seemingly incontrovertible claims. One is that 'We need nuclear energy to stop the lights from going out'; the other that 'We must have nuclear energy to save the planet'. In this, the first of two articles, I shall attempt to refute these claims and argue the contrary; that we can keep the lights on and tackle the problem of climate change without nuclear energy. Indeed, any further commitment to nuclear energy is more likely to hinder than help achieving those objectives.

To all intents and purposes nuclear energy was dead and buried in the UK until its sudden and surprising revival in the early years of this century. There had been a veritable energy cornucopia with plentiful and cheap North Sea oil and gas, making Britain self-sufficient. Then, as fears about the future security of energy supplies began to grow and climate change created fears about environmental security, a so-called 'nuclear renaissance' seemed in prospect.

In the space of three years, the then Labour Government executed a policy U-turn from a position in its 2003 Energy White Paper[1] holding that new nuclear was an 'unattractive option', to one in which its 2006 Energy Review stated that 'new nuclear power stations would make a significant contribution to meeting our energy policy goals'.[2] Subsequently, after a period of consultation, the Government predictably concluded that nuclear was needed to contribute as much electricity as possible to the 'energy mix'. Furthermore, 11 coastal sites in England and Wales (Scotland had declared a non-nuclear energy policy) were initially identified as 'potentially suitable' for the deployment of new nuclear stations. Eventually the list was reduced to eight, all at locations with existing nuclear facilities – at Bradwell, Hartlepool, Heysham, Hinkley Point, Oldbury, Sellafield, Sizewell, and Wylfa.[3]

Although chosen for pragmatic reasons of land availability and presumed public support, the sites were subject to a convoluted 'Strategic Siting Assessment' that had, in effect, achieved what I called in an earlier article 'premature legitimation for a predetermined policy'.[4] Siting was part of a set of fast-track processes designed to achieve the deployment of a fleet of new nuclear plants by 2025. These included the 'Justification' process – a somewhat technical, legalistic and inaccessible procedure whereby new power station designs are justified in terms of the benefits outweighing the health detriments. Given that the benefits are taken as given and the detriments are minimised and that the Secretary of State acts as both judge and jury, justification was a foregone conclusion, although it was both criticised and challenged by NGOs.

Meanwhile, the new reactor designs were subjected to 'Generic Design Assessments' (GDAs) by the regulatory authorities. Although the outcome was not entirely predictable and some changes would be required, it was unlikely that the designs would ultimately fail to gain approval. And so it has proved, with the regulators able to confirm at the end of 2012 that numerous issues had been speedily

resolved, enabling the two new designs to be declared acceptable.

Finally, and with new nuclear power stations much in mind, a new accelerated planning process, operating under a new Infrastructure Planning Commission (IPC) (now, following the Localism Act 2011, subsumed into the Planning Inspectorate as the Major Infrastructure Planning Unit), was introduced under the Planning Act 2008 to streamline the decision-making process for 'nationally significant infrastructure projects', making it 'faster and fairer, leading to swifter decisions on applications and better opportunities for public participation'.[5] Unlike the previous open-ended planning inquiry system, which reached its terminal incarnation in the long-running inquiries into Sizewell B, the Sellafield nuclear laboratory and Heathrow Terminal 5, the IPC was constrained by National Policy Statements and restricted largely to local siting issues. The IPC was further encouraged to use the eight listed sites 'to allow nuclear to contribute as much as possible towards meeting the need for 25 gigawatts of new [non-renewable] capacity'.[6] To reinforce the political presumption, the IPC was enjoined to invoke the concept of 'Imperative Reasons of Overriding Public Interest' (IROPI) to give priority to nuclear development over other (environmental) considerations.[6,7]

So why, then, has there been such an effort to facilitate a new nuclear programme? Is nuclear such a key element in providing for energy security? Its supporters argue that nuclear is necessary, reliable and flexible and a relatively independent source of electricity supply. In truth it is none of these things.

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Nuclear is not necessary

In terms of *necessity*, nuclear is toted as essential to attempts to close the so-called 'energy gap', the point when demand for electricity exceeds the capacity for supply. Admittedly there is a problem, at least in the medium term, created by three factors. One is the prospective fall in supply capacity with the retirement of many power stations, mainly fossil fuel-fired but including nuclear stations. A second is the anticipated increase in demand for electricity, particularly as electricity spreads more into the heating and transport sectors. Third is the requirement to decarbonise the energy sector to meet climate change targets. Altogether it is estimated that £110 billion of investment in power plants will be needed over the next decade.

The 'energy gap' is already being filled by renewables and by gas, with a little contribution from life extensions to keep most of the eight remaining but ageing nuclear plants generating beyond 2020. Renewables are already supplying around 10% of UK electricity, with nearly half from wind, and are well on the way to meeting the government-set 30% target by 2020. For 2050 the Government is looking for 33 gigawatts of electricity from renewables out of a total new capacity of 59 gigawatts. Of the remaining 26 gigawatts, it is hoping that nuclear will produce as much as possible, up to around 16 gigawatts.

There are several scenarios which demonstrate that the 80% reduction in carbon dioxide emissions (compared with 1990 levels) needed by 2050 can come from renewables, with a combination of wind (on- and offshore), wave, tidal, hydro, photovoltaic and biomass supplying nearly all UK electricity. Greater efficiency in the use of electricity can be achieved by moving to supergrids to ensure greater complementarity of power output through inter-regional transfers, and by using smart grids which respond rapidly and flexibly to shifts in output and consumption. Localised power systems, including combined heat and power, will help to avoid wasting the output from power systems.

Energy conservation would need to play a crucial part in tempering demand and this would require acceptable changes in travel behaviour, a greater take-up of home insulation, widespread use of LED lighting, and other changes in energy use. Much of this is already beginning to occur, and UK domestic electricity consumption has been falling in the past few years. To that extent, the lights are already going out.

All of this will take enormous effort, investment and political will. But all of this is possible. Germany, for example, is already pointing the way with a commitment to 80% electricity from renewables by 2050, combined with a phase-out of nuclear energy by 2022. For the UK it seems pretty clear that the need for nuclear energy will wane over time, especially as, for the medium term at least, gas appears to be filling the energy gap – and may even halt the progressive development of renewables, especially if the current priority for quick development of cheap gas, including the prospect of shale gas, continues. That would be perverse since the UK, sea-girt and windy, has far better renewable resource potential than Germany and most other European countries.

Nuclear is unreliable technology

Nuclear energy is also promoted for its *reliability,* as a tried, tested and proven technology. In fact, nuclear is almost wholly unreliable. Nuclear plant, especially as they get older, are prone to unplanned outages. If major breakdowns or accidents occur – and they do – nuclear stations may be offline for long periods, requiring alternative back-up to replace the lost electricity. The ultimate demonstration of

this was after the Fukushima disaster, when, for a time, all 54 Japanese reactors were shut down and short-term closures occurred across the world as reactor safety systems were reviewed.

Nuclear power is also notoriously unreliable in meeting its cost and time commitments. The Finnish French-designed flagship reactor for the European fleet has already doubled in cost and is five years overdue. Similarly, the French reactor under construction at Flamanville has experienced delay and cost overruns. The history of the nuclear industry confirms that cost overruns and completion delays are a routine experience.

Already the UK's nuclear programme is falling behind as private, mostly foreign investors hesitate or back away from a 60-year commitment, where costs come upfront and returns on investment are deferred. Even the Government's market reforms – a subsidy to nuclear by any other name – may not be enough to tempt investors into making the decision to go ahead with such a long-term and uncertain speculation. Already German companies RWE and E.ON have relinquished their commitment to Wylfa and Oldbury, although the Japanese company Hitachi has paid £700 million as a long-term investment in the nuclear potential of the two sites. Elsewhere there remains British, Spanish and French interest in the Sellafield (Moorside) site and nothing much at all in the other three listed sites at Heysham, Hartlepool and Bradwell.

Indeed, we need look no further than Bradwell to illustrate the problem. The site has been identified as potentially suitable by the Government and the land is up for sale, but as yet no investor has been so foolhardy (or foolish) as to take on such a risky project. Although EDF may well go ahead at Hinkley Point and possibly at Sizewell, the immediate investment prospects at several of the sites can hardly be described as strong.

Nuclear is inflexible

As to *flexibility*, it is urged that nuclear must be 'part of the energy' mix since it alone offers low-carbon base-load electricity (i.e. the minimum supply that must be always available), unlike renewables, which suffer the problem of intermittency. It is obviously true that the wind does not always blow (although it does most of the time) and the sun does not always shine, so there are times (although not necessarily the same times) when wind and solar power are in short supply or unavailable. But, there are other renewables (hydro, marine and biomass) which do not have this problem, and as they become available will be able to supply the back-up needed, especially if complementary grids are developed. Until then, back-up supply will come from gas.

The problem with increasing both nuclear and renewable capacity is that they are most economic if running when available. So, if renewables and nuclear capacity together exceed base load, then either inflexible nuclear energy will have to be used at the expense of more variable renewables, or the other way round – either way will be wasteful, uneconomic and technically unsatisfactory.

Above

Wylfa nuclear power station – one of the sites identified as 'potentially suitable' for the deployment of new nuclear power plant

Nuclear is not independent

The claim that nuclear energy provides a secure and *independent* source of electricity is also open to doubt. Nuclear is not a self-sufficient source of energy; it needs nuclear fuel manufactured from uranium, which is not found in the UK. Admittedly the fuel input is extremely low when compared with fossil fuels, but, with growing demand, uranium sources will become depleted and ore grades will become leaner, making fuel more expensive. It may be possible to use secondary sources through recycling and in mixed oxide fuel (MOX), but pessimistic and authoritative estimates such as those made by the International Atomic Energy Agency suggest that, with the existing global reactor fleet, reasonably assured resources may only last until the end of the century – a kind of 'peak uranium' effect in prospect.

Over time, too, supply may shift from relatively 'safe' sources (Australia, Canada) to less 'reliable' sources such as Kazakhstan or Niger.

The claim for nuclear's independence is also questionable when the sources of nuclear investment are taken into account. Until recently, prospective investors were primarily based in Europe, with EDF (the French national utility) leading the way with its 80% stake in the Hinkley Point and Sizewell projects, and German and Spanish companies involved at other sites. Beyond Hitachi's stake there have been indications that Chinese and Russian companies are showing interest. There is naturally some

nervousness about the security issues such a prospect raises, albeit there will be strict regulatory control and other constraints.

With predominant foreign investment, British taxpayers could be exposed to bailing out companies influenced by governments whose priorities lie elsewhere. British dependence on foreign investors in such a complex, costly and controversial technology does not seem the best way to serve the national interest in ensuring a secure energy supply.

Nuclear energy cannot deliver

The idea that nuclear energy provides the Holy Grail for a low-carbon energy economy looks mired in aspic. The Government's hopes that around ten mega-reactors with a generating capacity of 16 gigawatts of electricity could be developed by 2025 to replace the existing fleet, meet the energy gap and provide carbon dioxide emission savings in the region of 4% of the primary energy total are beginning to look illusory. Indeed, by its own revised forecast the Government concedes that the 16 gigawatts of nuclear capacity by 2025 has now become a mere 3.3 gigawatts (Hinkley Point), with a rather hopeful forecast of a further 9.9 gigawatts by 2030. At some point it must be concluded that, even if we continue to offer subsidies and incentives as well as fast-track planning, the nuclear industry simply will not deliver.

Meanwhile, the fixation on new nuclear is diverting attention, resources and political energy from alternatives that do offer the prospect of a secure low-carbon electricity supply. Along with energy efficiency (the gains from which are routinely underestimated), these alternatives are renewables, providing electricity from unlimited and free wind and water. They are not to be found in further development of nuclear and its derivatives. The new generation of nuclear plants now being planned and constructed with high burn-up fuels has yet to prove its efficiency under operational conditions.

As for the more experimental technologies, whatever their promise, they are still far from practical performance. Fast-breeder technologies, the early great hope for recycling, solving the plutonium-surplus problem and reducing waste, have proved difficult to control and potentially dangerous in operation. The technology has been abandoned in the UK and many other countries, and doubts about feasibility and costs persist in the face of attempts at its revival. Thorium reactors have enthusiastic advocates, and India is one country pursuing the concept. Among the claimed advantages are abundant fuel, reduced waste, no proliferation dangers, and low cost. Against these are the problems of corrosion and the need for costly and controversial reprocessing facilities.

And then there is fusion power, in principle the most attractive of all since it is what powers the sun. Its power has already been demonstrated in the uncontrolled release of the atomic bomb. Controlled fusion, its enthusiasts claim, would be clean, have limitless fuel and, therefore, supply limitless energy, and create very little waste. So, why not go for it? The problem is that there is no possibility of commercial operation before 2050, and it would be imprudent to put all our efforts into it in the hope that research and development will prove successful.

Nuclear technologies all share the same problems. First, they are complex, large-scale technologies which do go wrong; and, when they do, the consequences can be very serious. In the case of new and experimental technologies there continue to be intractable problems that cannot readily be solved. Second, they are very expensive and could easily consume the R&D budgets for the entire energy sector, diverted from other renewable technologies that are already within reach. Third, they are far from being proven in either the experimental or developmental stage and, at the very best, will not be available until mid-century.

The energy problem we have needs to be dealt with here and now with the tools we already have to hand, not with the castles in the air offered by romantic peddlers of nuclear salvation.

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Notes

1 *Our Energy Future – Creating a Low Carbon Economy*. Cm 5671. Energy White Paper. Department of Trade and Industry. TSO, 2003. http://webarchive.nationalarchives.gov.uk/+/http://www.berr.gov.uk/files/file10719.pdf

2 *The Energy Challenge. Energy Review Report 2006*. Cm 6887. Department of Trade and Industry. TSO, Jul. 2006, p.17. http://webarchive.nationalarchives.gov.uk/+/http://www.berr.gov.uk/files/file31890.pdf

3 The original list also included two greenfield sites in Cumbria, Kirksanton and Braystones, perceived to be surrogates for Sellafield and later removed from the list, and Dungeness in Kent, delisted on grounds of adverse effects on internationally designated areas so severe that mitigation would not be possible

4 A. Blowers: 'Why dump on us?'. *Town & Country Planning*, 2009, Vol. 78, Jan., 33-7

5 *Introducing the Infrastructure Planning Commission. A Guide to its Role*. Infrastructure Planning Commission, 2009, p.3. http://mmetag.files.wordpress.com/2009/11/introducing-the-ipc-guide-to-our-role-for-senior-stakeholders1.pdf

6 *Draft National Policy Statement for Nuclear Power Generation (EN-6).* Department of Energy and Climate Change, 2009. www.official-documents.gov.uk/document/other/9780108508332/9780108508332.pdf

7 *National Policy Statement for Nuclear Power Generation (EN-6). Vol. II of II – Annexes*. Department of Energy and Climate Change, Jul. 2011, Annex A. www.decc.gov.uk/assets/decc/11/meeting-energy-demand/consents-planning/nps2011/1943-nps-nuclear-power-annex-volII.pdf