Nuclear Power: A Price Worth Paying For A Stable Climate?

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Thanks to the recent troubles at Sellafield, nuclear power has been in the news again. But focussing on BNFL alone inadequately reflects the current debate over nuclear. In fact, the nuclear industry has until recently been increasingly upbeat, making a case for a 'nuclear revival' in the light of climate change, at least in the developed world. Recently in this newspaper, the Secretary General of the World Energy Council wrote that "nuclear energy will play an essential role in electricity production and strategies against global warming."

The case for nuclear is simple: nuclear power is CO_2 free and its waste can be reprocessed. It already provides a significant share of the world's energy (one quarter of the UK's electricity for example), and unlike other alternatives it is proven – nuclear works. Nuclear electricity is more expensive than gas, the favourite fuel of the liberalised electricity market, but this is only because the true costs of burning fossil fuels are avoided. Create a level playing field by taxing carbon emissions and the market might decide to buy nuclear. Or so the argument goes.

So is there a stark choice to be made between climate change and nuclear waste? It is not this simple. In practice, energy policy in the developed world is being driven by two major forces: market liberalisation aimed at lower costs and greater flexibility – the 'business driver', and tackling climate change – the environmental driver.

Liberalisation has brought many benefits, and is spreading round the world. But liberalised markets do not favour nuclear. Despite decades of public R&D support, nuclear is still too expensive; recent research[1] shows that with current technology and under private sector investment criteria a new nuclear station would produce electricity at more than twice the cost of the cheapest alternative. Private investment in new nuclear capacity will thus only make sense if carbon taxes are very high indeed. A level playing field would arise only at carbon taxes that at least double and possibly quadruple the current price of fossil fuels. Equivalently, to be competitive each new nuclear power station would require £2bn of public subsidy. Neither is on the agenda.

Electricity markets currently favour gas. By comparison nuclear stations cost too much and take too long to build, take too long to pay back, are not flexible enough in use and do not fit with a growing trend towards decentralised electricity generation.

A new generation of smaller, more efficient stations could change the bare economics, but who will pay for the necessary R&D? Is more public money justified? The nuclear industry received £7.8 billion in subsidy from the fossil fuel levy in the 1990s alone. This compares with around £0.4 billion for renewables over the same period. The private sector? Clear prospect of major technological breakthrough would seem to be a prerequisite for this. After 40 years of intensive R&D this seems unlikely.

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[1] For detailed analysis of the economics of electricity generation under liberalised markets see Pena-Torres and Pearson, Imperial College, 1999, 'Carbon Abatement and new investment in liberalised electricity markets: a nuclear revival in the UK?' Forthcoming in *Energy Policy*

There is another good reason why private investment is unlikely. As recent events make clear, political uncertainty and financial risks go together. The long term nature and associated political uncertainties of nuclear waste storage create huge financial risks for private investors. Reprocessing of waste is even worse, as it combines both high cost and the problem of plutonium proliferation – a threat so severe that most governments, including the US, want a complete end to reprocessing of civilian nuclear waste.

Far from providing the answer to climate change nuclear thus faces considerable challenges. So what is the right policy response to climate change? Liberalised markets will not do the job alone. Although carbon emissions have fallen since liberalisation of the UK's electricity market, this was entirely fortuitous, in that a lower carbon fuel (gas) was cheaper than a high carbon fuel (coal). But reliance on gas will not bring deep and long term cuts in emissions, particularly when existing nuclear stations have all reached the end of their lives, in around twenty years.

So what should be done? How can we match energy policy to the business and environmental drivers that require cheap, flexible, low-risk and low carbon power? Carbon taxes alone are inadequate, at least in the short term, as energy sources cannot be changed quickly and prices have to rise a long way before consumption is reduced. To change this we need low carbon options that are attractive to privatised markets.

At present, many such options, mainly renewables, are either in the same uneconomic position as nuclear (or worse), or face political/practical limitations of their own. But this can be changed. The key role now for policy is to bring forward options that will allow climate change to be tackled in a cost-effective way.

This might not be so difficult. Many of the more innovative renewable and low carbon technologies are already attracting the interest of private industry. Costs are falling rapidly. The costs of solar panels (photovoltaics) are dropping by 15% each year. In 1980, wind power cost around 50p per unit (kWh) – it is now 6 - 7p/kWh hour and falling. The oil and motor car industries now talk of climate change as a 'business opportunity'. The result is significant investment in developing renewable energy and other 'clean' technologies – fuel cells, solar photovoltaics and micro-turbines for example. Market drivers, such the 'green' electricity market, also have a role to play. Policy should work with this trend.

Measures which promote innovation and encourage the development of new energy technologies are particularly important. They include tax incentives for R&D and innovation and for those investing in the early use of new technologies – for example accelerated depreciation for companies investing in PV or high efficiency CHP. The governments' existing role in supporting basic and applied research, and demonstration, dissemination and knowledge spreading activities needs to be expanded.

Some technologies/industries also deserve strategic support. Clear programmes, with definite targets and close collaboration with industry can kick-start important new industries – something our competitors in Denmark and the Netherlands clearly recognise for offshore wind, for example. The lesson from onshore wind is clear - companies from 5 countries have 95% of the rapidly growing market for wind

machines and are well placed to benefit from the move offshore. These countries provided effective and strategic support for wind energy and continue to do so. The UK, by contrast has become a major importer of wind technology.

Many of these support activities are already part of government policy, but they need to be scaled up significantly if we are to catch up with the countries that lead in these areas. Providing the revenues for these should be a key short term role for a fairly modest carbon tax.

And the future of the nuclear industry? To focus on the enormous technical and financial problems of decommissioning and radioactive clean-up. One paradox is that alongside failures at Sellafield, BNFL has proven highly successful at expanding its environmentally-friendly business cleaning up US military sites and dealing with the nuclear legacy of the communist era. This is the real task for the nuclear industry.

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Graphic 2 - Historical development of solar panel (photovoltaic) Price and Conversion Efficiency