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Viewpoint

Competitive energy markets and nuclear power: Can we have both, do we want either?

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ABSTRACT

In 1987, the UK Conservative Party was re-elected promising to transform the electricity industry into a privatised competitive industry and to promote an expansion of nuclear power. Fulfilling both objectives was not possible. The nuclear plants were withdrawn from the sale and plans to build new plants were abandoned, but privatisation proceeded. In 2007, the Labour government began a new attempt to build nuclear plants to operate in the competitive electricity market, promising that no subsidies would be offered to them. By 2010, the utilities that were planning to build nuclear plants were beginning to suggest that 'support' in some form would be needed if they were to build new plants. More surprisingly, the energy regulator, Ofgem, cast doubt on whether a competitive wholesale electricity market would provide security of supply. In 1990, the UK government opted for a competitive electricity market over expanding nuclear power. Now, the option of opting for a competitive electricity market may not exist. However, this might not leave the way open for new nuclear plants. The expected cost of power from new nuclear plants is now so high that no more than one or two heavily subsidised plants will be built.

1. Introduction

In 1987, the UK Conservative Party was re-elected to government. Their manifesto included promises to transform the electricity industry into a privatised competitive industry and to promote an expansion of nuclear power (Conservative Party, 1987). Many commentators believed that these two objectives were incompatible. In 1989, in order to fulfil the promise to privatise the electricity industry, the government was forced to withdraw the nuclear capacity from the sale and abandon all nuclear expansion plans. This was interpreted by these commentators as confirming the incompatibility of new nuclear build with a competitive electricity industry. Despite this experience, in 2007, the British (then Labour) government launched a new policy to build nuclear power stations that would be built by the private sector and compete without subsidies in the electricity market. However, by the start of 2010, the utilities, which had earlier endorsed the government's nuclear plans, were becoming nervous and broaching the need for various forms of support if they were to build nuclear plants. Much more surprisingly, in February 2010, the government and the economic regulator, the Office of Gas and Electricity Markets (Ofgem), seemed to signal the likely abandonment of the wholesale electricity market.

From 2000 onwards, worldwide concern about climate change has grown and finding measures that will deal with this issue has come to dominate the energy policy agenda. Many governments have based their energy policies on a combination of revitalising the nuclear power option and introducing competition to energy markets as instruments to meet their energy policy goals. If the UK, the pioneers of competitive energy markets and one of the leading nations trying to revitalise nuclear power[1] , were to have to acknowledge that this combination of policies will not work, the basis for many current national energy policies would crumble. This article examines the two attempts, in 1987 and 2007, by the UK to combine expansion of nuclear power and competitive energy markets, explains the failure of the first attempt and comments on the prospects for the second attempt.

2. Why might liberalisation and nuclear power be incompatible?

It is clear that existing nuclear power plants can be fitted into competitive electricity markets. The fact that construction is complete and a track record of reliability exists significantly reduces the economic risk and if the construction cost is already

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[1] The structure of the model was pioneered in Chile, but the competitive elements were largely not implemented there.

amortised, the plants may be so profitable that governments will want to recover some of these profits through a windfall tax.[2]

There are two simple arguments why building new nuclear power plants that had to survive in a competitive electricity market with no further assistance might not be possible. First, nuclear power costs are dominated by the construction cost and this makes nuclear power economically inflexible. If wholesale electricity prices fall, for example due to over-capacity in generation and/or low fossil fuel prices, there is no scope for nuclear plant owners to reduce their costs and if the wholesale price falls below the level needed to repay these fixed costs for more than a short period, losses will quickly accumulate. To some extent this argument applies to some renewables like wind and hydro, but, unlike these two, nuclear operating costs are not minimal. As discussed later, British Energy, the privatised nuclear generation company, collapsed in 2002 because its operating costs alone were higher than the prevailing wholesale electricity price. So while the marginal costs of wind and hydro are so low they can cover these with almost any conceivable wholesale price[3], nuclear power cannot necessarily survive low wholesale prices.

The second factor is the poor record of nuclear power in meeting forecasts of construction cost, construction time and reliability. Even if nuclear power appears economic in an investment appraisal using these forecasts, if there is a significant risk that costs will be higher than planned, it represents a risky investment that financiers will be reluctant to support.

3. The failure to privatise nuclear power in 1990

Britain had a very unusual stock of nuclear power plants in 1987 (MacKerron, 1996). It had nine nuclear stations of the so-called Magnox design, the first-generation designs, all of which were completed in the period 1963–1971; and seven advanced gas-cooled reactors (AGRs), five of which were ordered in the period 1965–1968 and two in 1979. The only plant of a design widely used outside UK was a 1200 MW pressurised water reactor (PWR) on which construction had then just started (Sizewell B). When this was planned in 1979, it was to be the first of 10 units of this design but by 1987, the programme had been cut to just four units, the so-called 'family of four'.

In 1987, the Conservative government was returned to power promising that government would: 'go on playing a leading role in the task of developing abundant, low-cost supplies of nuclear electricity' (Conservative Party, 1987) and to privatise and introduce competition to the electricity industry. The plan for the latter was only later elaborated and involved dividing all the generating plants into two packages, with a larger package including the existing nuclear capacity going to a company subsequently called National Power and the smaller package going to Powergen. National Power would have an obligation to build the four new nuclear plants then planned.

It was not until July 1989 that the government publicly acknowledged there were problems in privatising the nuclear capacity when it announced that the Magnoxes would be withdrawn from privatisation. Then in November 1989, it announced the withdrawal of the other nuclear plants. Two new government-owned companies, Nuclear Electric and Scottish Nuclear, were created to run all the nuclear plants and a moratorium on new nuclear plants was imposed until a review had been carried out, scheduled for 1994. Privatisation of National Power (without the nuclear plants) and Powergen proceeded. Subsequently, it was decided to allow construction of Sizewell B by Nuclear Electric to continue and the plant was completed in 1995. A consumer subsidy paid to Nuclear Electric, the Fossil Fuel Levy (FFL), was introduced and it was set at whatever annual level was needed to ensure that Nuclear Electric would remain solvent.[4] The FFL raised about £1bn per year and, in 1990, comprised about half Nuclear Electric's income.

This failure to privatise the nuclear industry in the UK in 1990 was more complicated than being a simple demonstration of the general incompatibility of energy markets and nuclear power. There were essentially three specific obstacles to the privatisation of the nuclear plants:

- The nine Magnox stations were all beyond their design lifetime and their operating costs alone were about double the expected wholesale price for electricity;
- The seven AGRs were hopelessly unreliable with an average availability of less than 40 per cent. Two of the stations had been in service for about 10 years and their performance was poor but tolerable but three of the other stations had been in testing phase for about five years and it seemed unlikely they would ever work reliably. As a result, the average operating costs of the AGRs were also about double the expected market price. The two newest AGRs, then just being commissioned, were expected to suffer from similar problems to the older plants;
- The obligation on National Power to build a small family of four PWRs was seen as particularly commercially risky given the plan to transform electricity generation from a monopoly to a competitive market. Not only could operating performance be poor but also construction cost and time could overshoot leaving the plant owner with large additional costs that, in a competitive market, could not be passed on to consumers.

It seems that it was the third issue that was the main barrier to privatisation. Well before the Magnoxes were withdrawn, a subsidy was planned, the FFL, which would have paid the excess costs of the Magnoxes and AGRs and funded their decommissioning so the high costs of these plants seemed to have been dealt with. A new owner could not have been held financially responsible for such a problematic set of reactors so the subsidy would have had to be set to cover all their above market costs. However, a new privatised owner would be responsible for the costs and performance of the 'family of four' and this was an unacceptable risk to the new management of National Power and potential investors. John Wakeham, the energy minister, explaining the withdrawal of the nuclear plants, subsequently said that: "unprecedented guarantees were being sought. I am not willing to underwrite the private sector in this way…".[5]

4. The revival of nuclear power's fortunes

By 1995, when the government's review of nuclear power policy was actually carried out, Sizewell B was complete so the risk of construction cost escalation no longer existed and early operation suggested it was likely to operate reasonably reliably.

[2] This is the case in Belgium and Germany.

[3] Note that in October 2009, the German wholesale price was negative for a whole day due to a combination of low energy demand and high wind and nuclear availabilities. See Power in Europe 'Baseload vs wind storm brews', 19 October 2009.

[4] Separate arrangements were made to ensure Scottish Nuclear's solvency.

[5] J. Wakeham (1989) House of Commons Debates. HC Debates, 1988/89, vol. 159, 9 November 1989.