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Can new nuclear power strengthen energy security?

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The 2007 Energy White Paper reflects an increased emphasis on energy security within UK energy policy. The reasons for this include rapid fuel price increases, the war in Iraq and the electricity blackouts of summer 2003. During recent debates, ministers have used energy security as a rationale for a new generation of nuclear power plants. But does this argument stand up to scrutiny? Will a nuclear renaissance help to address the security threats that the UK is likely to face in the future?

To answer this question, several dimensions of energy security should be analysed. The Government's consultation on new nuclear build emphasises some of these – particularly external threats to supplies of fossil fuels and concerns about investment in new power plant capacity. However, it downplays other potential threats such as infrastructure failure, underinvestment outside the power sector, civil unrest or even terrorism. In this SEG policy briefing we explore the implications of these additional dimensions for the Government's stance on new nuclear power.

Key messages

1 The Government's overall security case for new nuclear power is unconvincing due to its neglect of key aspects of energy security.

2 The Government's analysis fails to account for many of the threats that have had a material impact on UK energy security in recent decades. It is not clear how nuclear power will mitigate risks due to under-investment in gas infrastructure, episodes of civil unrest such as fuel protests and strikes, or threats from electricity grid failures.

3 The Government has tended to emphasise the 'problems' of Russian gas and electricity gaps. In both cases, there is little evidence of an impending threat.

4 To the extent that risks to security might occur, it has not been explained why nuclear power has to be part of an insurance policy against them.

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Fossil fuel scarcity and external disruptions

Many energy security discussions focus on potential fossil fuel scarcity, the concentration of reserves in unstable locations and the vulnerability of supply routes. This tendency is understandable: industrialised economies are dependent on fossil fuels and the economic impacts of disruptions (as in the 1970s) can be severe. The desirability of nuclear power as a mitigation strategy is partly dependent on there being a real prospect of scarcity. While there is increasing speculation that scarcity is looming (particularly for oil), the debate is polarised. Many are still optimistic about future availability as high prices and technical change drive the development of new reserves.

What may be more important is the impact of new nuclear on the UK economy's exposure to fossil fuel price volatility. A substantial programme could reduce exposure – though other low carbon strategies (ie renewables and demand reduction) can also help. The usefulness of nuclear power also depends on whether alternative strategies would be better or worse.

In the absence of Government intervention, the most favoured electricity investment option is still gas. A key argument made by ministers is that new nuclear will lessen UK dependence on gas imports, particularly from Russia. According to Oxera's analysis for the Energy White Paper, the UK's gas is likely to come from a variety of locations including the North Sea, Qatar and continental Europe by 2020. Only the last of these includes Russian gas. It could be argued that gas supplies will be more secure (not less) due to increasing diversity.

Furthermore, the majority of the UK's gas is not used for power generation. This sector accounts for around 30 per cent of UK gas demand. The rest is used for industrial processes and domestic heating. Nuclear cannot therefore significantly replace gas unless a much larger nuclear fleet than we have ever had is developed. This could potentially replace gas-fired power and generate electricity for other end uses (eg home heating).

Lack of investment in UK infrastructure

Most recent discussions about under-investment have focused on a hypothetical 'electricity gap'. Some commentators and lobbyists have argued that this gap is imminent. The Government itself has talked this up, emphasising that 30-35GW of new plant is required in the next two decades. These arguments are weakened by substantial investment in new generation capacity since the UK market was liberalised. Over 25GW of new gas-fired plant have been built since 1990. Renewable capacity has also increased, albeit much more slowly. New nuclear power stations could help to replace the capacity that is due to retire over the next two decades. However, due to long lead times and high financial risks, nuclear power would be one of the slowest ways to do this. Gas-fired capacity, many renewable sources and demand reduction measures can be implemented more quickly.

Analysts such as Jonathan Stern argue that the debate on investment should focus much more on gas. The Rough storage facility fire in early 2006 and the recent disruption to the CATS gas pipeline have exposed weaknesses in gas infrastructure. Both incidents led to abrupt price increases, suggesting a lack of storage and pipeline capacity. In theory, nuclear power could also

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reduce the need for reinforcement if it were deployed under a 'replace and expand' scenario. However, it is unlikely that this would negate the need for some action on gas infrastructure.

Technology and infrastructure failure

Technical failures are a feature of all large infrastructure systems. Many are absorbed due to redundancy, though some have more far reaching consequences. Nuclear plant failures such as that at Chernobyl can be particularly serious. Widespread 'class failures' in energy systems can also have more pervasive impacts. A good example is the series of faults that affected gas-fired power plants in the 1990s. Due to spare capacity, the effects could be managed even when these failures occurred in the middle of winter – but only just. Weather impacts can also be severe. For example, the under-performance of France's nuclear power plants in summer 2003 occurred due to intense heat. This contributed to a blackout that affected a large part of continental Europe.

System reliability can be partly ensured through a policy of diversity. Diversity can hedge technical, economic and political risks. Technologies such as nuclear power are not intrinsically good or bad for diversity since this depends on the overall mix of options

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deployed. If new nuclear were to replace existing capacity, the threat to security from a generic failure would be lower than if a 'replace and expand' strategy were followed. The experience of France shows that an electricity system dominated by one technology can be particularly vulnerable.

A programme of new nuclear plants cannot guard against non-electricity infrastructure failures (eg due to extreme weather impacts on offshore oil installations). Again, the picture could be different if a 'replace and expand' strategy were followed – for example, in which nuclear generated hydrogen supplied a significant proportion of the transport sector. But this would also increase security risks from generic technical failures.

Domestic activism and terrorism

Some of the most important threats to UK energy security have been due to civil unrest. The miners' strike of 1984/85 caused the electricity industry serious difficulties in maintaining supplies. Similarly the fuel protests of 2001 exposed the vulnerability of distribution systems to targeted blockades. There could, in future, be industrial disputes or campaigns by activists that target nuclear power. Furthermore, a programme of new nuclear power plants cannot directly reduce the vulnerability of other fuel distribution infrastructure. Again, it might be possible for nuclear power to do so but only under a 'replace and expand' scenario.

Nuclear power plants have also been discussed as potential terrorist targets – as have other infrastructures such as gas pipelines and LNG terminals. Such risks need to be taken seriously. The potential consequences of an attack on a nuclear plant are more serious than attacks on other forms of infrastructure. To some extent, resistance to such attacks can be incorporated into reactor designs but, as with energy security more generally, there is a trade off between reducing risk and increasing cost.

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This briefing note is based on SEG's response to the Government's recent consultation on new nuclear power. For a more detailed account of these arguments, please refer to the full consultation response available at **www.sussex.ac.uk/sussexenergygroup/documents/seg_spru_nuclear_response.pdf**

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