

Electricity Generation: Nuclear Power

**Presentation to EI/BIEEE/UKERC seminar
'The Energy White Paper: an academic critique'**

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**Sussex Energy Group
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Context: why does nuclear investment seem credible again in the UK?

- Political fall-out from Chernobyl has receded
- Oil and gas prices higher/less stable: prospects of large hydrocarbon imports – all badged as ‘security’
- The international revival in nuclear investment now seems real: a *vital* context
- Climate change now being taken more seriously
- Nuclear power is well-established, offers bulk baseload power and has small carbon footprint

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Why are future economics likely to be more favourable than past?

- Economic record in UK dire, but some improvement is highly probable
- Big project management techniques have improved
- International tendering should restrain costs
- A consortium taking on a nuclear project would offer something closer to a turnkey than a cost-plus contract
- Nuclear operating performance has improved markedly

Arguments for nuclear in White Paper

1. 'Nuclear is a genuinely low-carbon option': a good argument
 - nuclear is comparable in CO2 emissions to renewables
 - uranium is not scarce and will be available at high enough grades for decades to come
 - supports the White Paper argument against reprocessing
2. 'Nuclear improves security of supply': a less clear-cut argument
 - very slow to take effect
 - doesn't help with oil, and gas fears exaggerated
 - excessive reliance on a nuclear programme that fails to take off could worsen security
 - "Security of supply benefits can support – but not make – the case for nuclear" (p. 30 DBERR CBA)

The real world: why are investors not yet queuing up?



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- Economics of nuclear still very clouded in uncertainty: and UK liberalised market is tough for nuclear - suppliers unwilling to sign long-term offtake contracts that would guarantee revenue stream
 - Waste and decommissioning issues are advancing, but far from resolved
 - Doubts about public acceptability/ political risk (including planning/regulation)
 - None of the main contending reactor designs have yet been completed anywhere – technology/financial risk (note delays/escalations in Finland)
 - UK Government opposed to direct subsidy

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Economic analysis of nuclear by Government



- Agree that waste and decommissioning costs not a show-stopper if properly funded up-front, though investors wary of uncertainties/political risk
- Some elements of economic modelling puzzling e.g. why is total generating investment less if nuclear not pursued?
- **Heart of economic analysis:** cost-benefit (CBA) of nuclear vs. gas
- Many individual assumptions quite conservative, in contrast to past official optimism, and significant uncertainties acknowledged
- But analysis flawed – a hybrid part economic/part financial analysis that does not estimate either the real resource economics or the financing
- Uses a ‘financing’ cost of capital but an ‘economic’ estimate of security and carbon benefits, and omits some resource costs
- The resulting ‘welfare’ results have limited meaning

The CBA results (1)

TABLE 4.4: WELFARE BALANCE OF NUCLEAR GENERATION IN £MILLION/GW

	Low gas price, central nuclear cost	Central gas price, high nuclear cost	Central gas price, central nuclear cost	Central gas price, low nuclear cost	High gas price, central nuclear cost
Carbon price = €0/tCO ₂	-2000	-1000	40	1100	1800
Carbon price = €10/tCO ₂	-1600	-600	500	1600	2200
Carbon price = €15/tCO ₂	-1500	-500	600	1800	2400
Carbon price = €25/tCO ₂	-1000	-50	1000	2200	2600
Carbon price = €36/tCO ₂	-600	400	1500	2600	3300

The CBA results (2)

- The most important costs are for construction: EPR in Finland already reported as 25% over budget in 2 years, while top of UK sensitivity range is 30% above base case
- While carbon will no doubt continue to be priced, we have no idea at what level, and if ETS remains main mechanism, UK has no control over carbon price.
- Forecasts of gas prices probably over-influenced by recent turbulence/price rises
- Inconsistencies: “The analysis highlights considerable uncertainty surrounding the economic appraisal” (p. 3): however “ total net benefits of nuclear power justify Government endorsement of new investment as part of carbon emissions reduction policy”
- Reality: we simply don't know what the economics would be

“Facilitative action” package: 4 elements

- Generic design assessment, or pre-certification of designs: following US model. But many designs submitted, few resources available – will take 3 years or more
- Changes to planning regime and ‘National Policy Statement’ – intended to force public inquiries to consider only local issues. But note examples of Hinkley Point C inquiry and more recently wind power inquiries
- Requiring private operators to meet ‘full share’ of back end costs. Unlikely to be problematic
- ‘Justification’ process for new practices involving radiation –will depend heavily on economic justification
- Overall, a very heavy weight being placed on some largely untried initiatives. What is Plan B?

- A new departure is explicit consideration of ethical issues – highly welcome, as fundamental issues about nuclear are mostly ethical
- Radioactive waste is at heart of ethical issues, especially equity between generations, including those in the far future
- Ethical issues surrounding deliberate creation of new wastes are different from those around need to manage legacy wastes
- Different framings possible: Government juxtaposes question of creating more waste for future generations to manage vs. possibly increased risk of dangerous climate change as a result of not investing in nuclear
- No definitive *a priori* resolution of this dilemma, and – as often the case with ethical dilemmas – view taken will depend partly on empirical forecasts of future (e.g. will nuclear be cheap, will socially acceptable means of waste management be delivered?)

Conclusions

- Nuclear has re-emerged as a genuine contending option, and much of this is due to international revival in nuclear fortunes
- Substantial cost uncertainty will persist until reactors have been completed in countries comparable to UK, and even then forecasting will be difficult
- If nuclear makes it, a substantial 'programme' will be likely in order to minimise costs, but it will also raise major CO2 and security risks if programme falters (investment 'lumpiness' problem)
- Government economic analysis not very convincing
- 'Facilitative actions' are critical, yet to be tested - and bear very large weight