The organization & the costs of the decommissioning of nuclear plants in the UK

Presentation to:
“E’ possibile una ripresa dell’impegno nucleare in Italia?”
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Prof Steve Thomas (stephen.thomas@gre.ac.uk)
PSIRU (www.psiru.org)
University of Greenwich

Outline

• Historic context
• The Nuclear Decommissioning Authority
• British Energy
• New plants
Historic context

- UK electricity consumers have paid provisions for decommissioning since before 1980 but by 2002, there were negligible funds available to pay for decommissioning civil nuclear facilities
- By then, the 2 major UK nuclear companies, British Energy and BNFL, were both effectively bankrupt
- Government decided to save British Energy, which retained ownership of 8 nuclear plants
- BNFL was split up, privatised and ownership of its sites passed to a new agency, the Nuclear Decommissioning Authority (NDA) which would operate them and manage their decommissioning
- NDA began formal operation in 2005

History of provisions

- Pre-privatisation: Funds were collected by the companies. In 1989, the value was £3bn. The funds were unsegregated and at privatisation, no funds were passed on. 'Stolen' by the Treasury
- 1990-96: 10% of consumers' electricity bills paid to nuclear companies (£6bn). Consumers told it was 'to pay for the decommissioning of old and unsafe stations' but the companies could spend it as they wanted. Some unspent, some spent on Sizewell B
- 1996-2005: The Magnox plants were given to BNFL with £2.4bn of the unspent subsidy. BNFL kept an identified internal unsegregated fund that was worth £3.9bn in 2005. When BNFL was broken up Treasury absorbed it into the 'Consolidated Fund'
The civil nuclear facilities

NDA

• The Sellafield site (part operating)
• The Dounreay site (closed)
• 11 Magnox stations (9 closed)
• Enrichment plant (closed), fusion site (closed 2008), R&D centre (closed), LLW repository (operating), fuel manufacture (operating), 2 prototype reactor sites (closed)

British Energy

• 7 AGR stations (operating)
• 1 PWR (operating)

<table>
<thead>
<tr>
<th>Site</th>
<th>Type</th>
<th>Closure</th>
<th>Stage</th>
<th>Decom end</th>
<th>Cost so far £m (2006)</th>
<th>Remaining £m</th>
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<td>?</td>
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<td>TOTAL</td>
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<td></td>
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NDA’s liabilities

- NDA estimated its liabilities at £50bn in 2005 but in 2008, this had risen to £73bn. Reconciling estimates is difficult because NDA includes income from operations.
- 70% of the liabilities accounted for by Sellafield and 5% by Dounreay. Neither site will be released for unrestricted use at the end of the process.
- Magnox liability averages £1.2bn (in 1989 forecast cost was £250m) and is expected to take at least 100 years to complete.

Decommissioning a Magnox: Sizewell A

- Closure 2006
- 2007-2009: Defuelling. (£118m, 15%)
- 2009-2017: Care & maintenance preparation: Construction of ILW store, turbine hall demolition, major redundant plant & building demolished (£207m, 26%)
- 2018-2102: Care and maintenance including removal of ILW store in 2048 (£99m, 12%)
- 2102-2010: Site clearance (£380m, 47%)
- Total decommissioning cost £805m
### Impact of discounting at 3.5%

<table>
<thead>
<tr>
<th>Operation</th>
<th>Undiscounted cost £m (%)</th>
<th>Discounted cost £m (%)</th>
</tr>
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<tbody>
<tr>
<td>Defuelling</td>
<td>118 (15)</td>
<td>118 (37)</td>
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<tr>
<td>Care &amp; maintenance preparation</td>
<td>207 (26)</td>
<td>174 (54)</td>
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<tr>
<td>Care &amp; maintenance</td>
<td>99 (12)</td>
<td>17 (5)</td>
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<tr>
<td>Final clearance</td>
<td>380 (47)</td>
<td>13 (4)</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>804 (100)</strong></td>
<td><strong>322 (100)</strong></td>
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</tbody>
</table>

### NDA: Failed promises

- **2002 White Paper** offered segregated fund & funds committed for 10 year rolling period
- Segregation would not have been important because it would only have contained a small fraction of the required funds
- No segregated fund set up - UK Treasury strongly opposes any hypothecation of public funds - and funds are still committed on a 3-year rolling basis
- NDA tried to cut Magnox decommissioning time to 25 years but had to withdraw this proposal because funds more urgent for Sellafield and Dounreay
NDA funding

- About half annual budget, 2005 £2.2bn, 2007 £2.8bn, should come from income from operating facilities & rest from Treasury
- Budget pays for all costs at NDA’s sites
- Income: LLW repository (till 2050), Oldbury /Wylfa (2008/10), Sellafield THORP Mag reprocessing (2011/2012), Sellafield MOX plant (2025), Springfield fuel plant (2023)
- Breakdown of THORP and failure of MOX plant make future income unpredictable.
- Other plants (Mag reprocessing, Wylfa) may be kept in service longer to fill the gap
- NDA ‘auctioning’ its sites for new nuclear

<table>
<thead>
<tr>
<th>Site</th>
<th>Type</th>
<th>Operation</th>
<th>Est cost (£m)</th>
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<tbody>
<tr>
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<td>AGR</td>
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<td>1984-2019</td>
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<td>Heysham 1</td>
<td>AGR</td>
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<td>Heysham 2</td>
<td>AGR</td>
<td>1988-2023</td>
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<tr>
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<td>AGR</td>
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<td>1995-2035</td>
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<tr>
<td>Torness</td>
<td>AGR</td>
<td>1988-2023</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>9103</strong></td>
</tr>
</tbody>
</table>
British Energy 1

• The AGRs and the PWR were privatised in 1996 as British Energy. A segregated fund set up (Nuclear Decommissioning Fund) to pay for decommissioning, but it only covered stage 2 & 3 of decommissioning
• These are most expensive stages undiscounted but stage 1 is much the largest in discounted terms
• This meant BE had to pay only about £17m per year into the fund despite the entire decommissioning liability then being £5bn
• The company collapsed in 2002 and was eventually re-launched in 2005 by government assuming BE liabilities of about £10+bn
• By end 2003, the NDF was worth about £400m

British Energy 2

• When BE re-launched, the NDF became the Nuclear Liabilities Fund and included uncontracted spent fuel liabilities (£4bn)
• Government will pay any costs not covered by the NLF from income from tax-payers of the day
• Decommissioning completion time is not specified but more than half expenditure occurs more than 50 years from now
• The estimated cost increased from £5.2bn in 2005, to £9.1bn in 2007
• NDA is expected to be given the job of managing decommissioning of BE plants
British Energy 3

- BE must pay only £20m per year into the NLF
- Up to June 2007, Government took 65% of BE’s profits, the Cash Sweep, which it paid into NLF
- But government could convert the Cash Sweep into shares giving 1 million shares equal to 65% of the value of the company
- In June 2007, government sold 400,000 shares raising about £2bn, which was paid to the NLF
- In April 2008, government announced it would sell the other 35% of the shares. This resulted in a bidding war for BE (EDF, RWE, E.ON etc)
- How much will future taxpayers have to pay?

New plants

- Government stated that new nuclear plants built in UK would receive no public subsidies or guarantees
- Energy White Paper 2006: ‘It will be for energy companies to fund, develop and build new nuclear power stations in the UK, including meeting the full costs of decommissioning costs.’
- October 2006, Wicks (Energy Minister): [Is that the Government’s position? No direct subsidies and no indirect subsidies?] ‘No cheques will be written, there will be no sweetheart deals. You could pursue this if you wanted by saying that nuclear waste is quite a complex subject and we are going to look very carefully at that to make sure that the full costs of new nuclear waste are paid by the market.’
Contradictions

• Consultation on Funded Decommissioning Programme Guidance for New Nuclear Power Stations: Feb 2008

• ’The Government would expect to set a fixed unit price based on the operator’s projected full share of waste disposal costs at the time when the approvals for the station are given, prior to construction of the station. Should the actual costs of providing the waste disposal service prove lower than expected, these lower costs will not be passed on to nuclear operators.’

• ’We anticipate that operators will request that the Government provide them with a fixed unit price at the time they seek approval for their Funded Decommissioning Programme. This will occur alongside the regulators’ licensing and permitting processes. At this time, the Secretary of State would …. determine the fixed unit price, including the appropriate risk premium.’

• ’The Government will agree to take title to and liability for an operator’s waste according to a schedule that will be agreed at the same time as the operator’s Funded Decommissioning Programme is approved and alongside setting a fixed unit price for the waste disposal service.’
Conclusions

- Consumer money for decommissioning paid over 25 years has been repeatedly lost
- Time-scales for finishing decommissioning are 50-120 years after closure
- Discounting can be used to distort decision-making
- Most NDA funds will come from future taxpayers
- BE pays a small amount for decommissioning and most will come from future taxpayers
- Future plants will be given a guaranteed waste disposal and decommissioning price the day construction starts: future taxpayers bear the risk
- What other subsidies and guarantees will UK government give?

An ethical decommissioning fund

- A well-designed fund does not prevent a future generation having to carry out the potentially dangerous task
- Cost of decommissioning should be paid by the consumers of the nuclear power
- Estimates should cover all stages of decommissioning and be based on prompt decommissioning to green-field status - assuming a delay pre-empts future generations’ decisions
- A segregated fund covering the forecast cost, invested in low-risk assets, is needed that survives if the company fails
- Estimates of decommissioning cost should err on the high side. Estimates will be speculative until waste disposal facilities and more experience of decommissioning exist
- A positive discount rate should not be assumed for more than about 30 years forward
- Financial instruments should be taken out so that sufficient funds are available if the plant has to close early