

Why is the British nuclear power programme failing?

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Steve Thomas (stephen.thomas@gre.ac.uk)

Emeritus Professor of Energy Policy

PSIRU (www.psiru.org), Business School

University of Greenwich

First UK steps

- 2006, Tony Blair: “Nuclear power is back on the policy agenda with a vengeance.” Promise there would be no public subsidies was made to ensure the programme was politically acceptable
- 2008: Government policy document (White Paper) published claiming new nuclear competitive with gas generation & reactor like EPR could be built for £2.8bn (latest estimate £11.6bn)
- 2009: 5 sites selected, all at existing nuclear sites, acquired by 3 consortia. 15GW of capacity by 2030
- NNBG (EDF/Centrica): Hinkley Point & Sizewell
- Horizon (RWE/EON): Wylfa & Oldbury
- NuGen (several utilities): Moorside
- Expected to be competition between several technologies
- 2015: Bradwell selected for Chinese vendor, CGN & technology, Hualong One (expected after 2030)

NNBG: Hinkley Point C (1)

- 2012: Government approved loan guarantees for new nuclear. If project fails, banks will be repaid by UK taxpayers. Expected to unlock the deal as it allowed cheap borrowing for about 80% of cost (£10+bn).
- 2013: Outline of deal published for 2 Areva EPRs (each 1.6GW)
- Power sale price fixed at £92.5/MWh, 2012 prices, to go up with inflation. Cost escalation risk taken by EDF. Based on 'overnight' (exc. interest during construction) construction cost of £14bn. EDF to take 45% & 4-5 other investors to take rest
- 2014: Deal approved by European Commission. EC said the deal included 'state-aid' but Euratom (member states **must** promote nuclear power) & Lisbon Treaty (member states have the right to determine national energy mix) overrule state-aid rules
- EC investigation revealed UK government condition that offer of loan guarantees would be withdrawn if Flamanville 3 (sister plant in France) is not in operation by end-2020
- 2015: UK government finally abandoned claim nuclear would not receive public subsidies

NNBG: Hinkley Point C (2)

- 2015: Cost increased £16bn, no investors except CGN (1/3) & EDF (2/3). Will CGN pay cost increases or will EDF pay them all?
- 2016: Contracts signed, cost now £18bn. EDF rejected offer of 1st part of loan guarantees (£2bn). Too expensive, conditions unattractive? Completion by 2023
- 2016: Reactor supplier, Areva NP, bankrupt. French government rescue involved EDF buying Areva NP, now called Framatome
- Power purchase contract, 'contract for differences', just fixed price take-or-pay contract
- 2017: Cost estimate now £20.3bn & completion 2025
- 2018: EDF rejects second part of loan guarantees. The Flamanville condition probably impossible by then – won't be complete before 2023. How can EDF finance construction?
- Dec 2018: Construction start (first structural concrete) on unit 1. Dec 2019: Construction start on unit 2

NNBG: Hinkley Point C (3)

- 2019: Cost estimate increases to £21.5-23.2bn, completion not till 2027
- 2019: EDF nearly bankrupt & rescue (Operation Hercule) launched by France
- 2020: Covid-19 causes slow-down in construction
- Power price set at £92.5/MWh when cost expected to be £14bn. Cost now £23.2bn+. Most cost escalation occurs during construction which has only just started so highly likely final cost will be significantly more
- How can EDF make a profit?
- Hinkley will cost consumers £50+bn over its life more than if cheaper low-carbon options chosen

NNBG: Sizewell C (1)

- 2016: Hinkley deal includes Sizewell C (clone of Hinkley, 2 EPRs each 1.6GW) 80/20% EDF/CGN & Bradwell B (Hualong One) 66/33% CGN/EDF
- 2018: Hinkley deal very unpopular with public because of high kWh price – 2.5 times cost of offshore wind – so a different way of financing required
- 2018: EDF acknowledges it cannot finance Sizewell & persuades UK government to consider new form of finance, 'Regulated Asset Base' (RAB)
- Plant would be owned by institutional investors (pension funds etc). EDF would be (profitable) contractor supplying, building, operating, maintaining plant rather than (unprofitable) owner

NNBG: Sizewell C (2)

- Investors guaranteed annual 'rate-of-return', eg 5% on the cost of the plant. If the plant costs £20bn, they will be paid their operating costs & 5% of £20bn every year (£1bn)
- Power price varies from year to year going up or down so investors earn their money
- Investors will only be interested if all the economic risk falls on consumers, eg if construction costs escalate or reliability is poorer than expected, consumers pay more
- UK government launched consultation on RAB in June 2019. From January 2020, government said its verdict due very soon but by Oct 2020, still not published
- EDF forecasts completion by 2034
- Without RAB, Sizewell C is dead

NuGen: Moorside

- 2013: NuGen bought by Toshiba/Westinghouse to sell AP1000 reactor technology
- 3 AP1000s planned at Moorside, 3.4GW
- But reactor vendors like Toshiba too small to own an NPP so Toshiba expected new investors to take over the project when it was more advanced
- 2016: Westinghouse bankrupt (Toshiba nearly bankrupted), abandoned Moorside

Horizon: Wylfa

- 2013: Horizon taken over by reactor vendor Hitachi as way to sell ABWR technology. As Toshiba, new investors expected to take over later
- 2 ABWRs (3GW) planned for both Wylfa & Oldbury
- 2018: No investors so UK & Japan governments agree to help with finance. UK government agrees to take 30%, Japan government agrees to find investors to take 30% & Hitachi would finance rest.
- But Japanese investors did not appear & Hitachi did not have the cash so project suspended. Hope that it would be financed by RAB
- Sept 2020: Hitachi gave up & abandoned Wylfa. Oldbury never seriously pursued

Bradwell B

- Bradwell B expected to come after Sizewell C
- CGN's only reason to invest in Hinkley was the opportunity to build Hualong One technology in UK
- China has failed to export its nuclear technology but if other customers saw it was good enough for UK, might make them more likely to buy
- Since 2016, increasing concern about allowing Chinese companies to own key UK infrastructure. 2020, UK government decided Huawei's role in 5G must be phased out
- Will CGN & Bradwell B also be banned?
- Concerns range from general dislike of Chinese government, worries about Chinese QC & design quality, industrial espionage, Chinese control of key services

Where does this leave the UK nuclear programme?

- 15GW by 2030 impossible, only Hinkley Point C possible by then
- If CGN is banned from Bradwell, will it walk out of Hinkley. If it does, who takes their stake? The UK government? EDF has no money
- Moorside, Wylfa & Oldbury abandoned
- Sizewell C will only proceed if RAB approved & investors find the terms attractive
- Bradwell in serious doubt because of political opposition

Lessons from UK

- 2034 is earliest a follow-on station to Hinkley can be complete. By then 4 rounds of off-shore wind auctions expected to take place leading to 20GW of capacity
- By then, there will be negligible fossil fuel generation in UK so Sizewell (& any follow-ons) will not save CO₂. Nuclear power is 2-3 times the cost of alternatives. The need for base-load stations is confused, old-fashioned thinking
- Nuclear is too expensive too slow & unnecessary
- So why doesn't the UK government give up with nuclear & concentrate on cost-effective & timely options?

General Lessons

- Nuclear power programmes always launched on massively unrealistic cost estimates, unrealistic scale & on unrealistic time-scales. UK government promised no subsidies, expected first power in 2017 with 15GW by 2030. At most, there will be 3GW, by 2030, with first power 2027 with huge public subsidies
- Nuclear power always needs large public subsidies
- Obtaining finance one of the major obstacles to new nuclear
- Only Chinese & Russian vendors can offer finance as part of a package but are they politically acceptable, are the designs safe, is the QC adequate?
- All the other latest designs (EPR, AP1000, ABWR, Korea APR1400) either have a very poor record or no experience
- Small Modular Reactors are unlikely to be cheaper than existing nuclear designs & will not be available to order till after 2030 if at all