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# Reasons why nuclear power is a poor electricity option

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Although the government is pressing for the expansion of nuclear power in England and Wales, in fact nuclear has several manifest disadvantages which are not addressed in government statements.

## 1. Not a low carbon source

Government statements ignore the large carbon emissions arising from the uranium fuel cycle and from nuclear waste disposal, as if these did not exist. But they do exist.

Several Life Cycle Assessments (Jacobson[1], Storm Van Leuwen[2]) have shown that nuclear power generation produces, overall, about 10 to 20 times more CO2 per MWh than renewable sources. And the construction of nuclear stations themselves releases very large, albeit unquantified, amounts of CO2.[3]

While it is clear that Britain should move to electrify its energy sources to reduce its CO2 emissions, the reality is that, compared to the renewables, nuclear power is not a low carbon source of electricity.

## 2. Exorbitant construction costs

In 2016, when the Hinkley Point C contract for two nuclear reactors was signed with the government, the initial cost estimate was £18 billion. This was then about 30 to 40 times the per MW cost of building a conventional combined gas turbine station. Since then, the cost has increased several times. For example, in May 2022, EDF raised the price tag again to £25-£26 billion. EDF now says the cost of building Hinkley Point C is set to spiral further to £32 billion because of inflation.

This means nuclear power's construction costs are considerably higher than those for energy efficiency and renewable energy. Nuclear power, therefore, displaces less carbon for every pound spent. In effect nuclear worsens climate change by buying less solution per pound spent.[4]

As for the government's proposed Sizewell C station, EDF's construction cost estimates vary between £20 billion and £35 billion. The government has stated that it is considering investing £0.7bn in Sizewell C – i.e., 2% to 3.5% of the final cost. Despite introducing new funding models (which mean billpayers will pay in advance for any reactors) and ludicrously labelling nuclear power as 'green' to attract investors, the government has struggled to persuade sceptical pension funds and asset managers to back the project. Now the government is trying to persuade Bahrain and the United Arab Emirates to stump up the cash.

It is unlikely that these efforts will succeed. For example, the government's own workplace pension scheme has ruled out investing in nuclear projects such as Sizewell C. The National Employment Savings Trust (Nest) said it would not revise its policy on nuclear infrastructure investments.

## 3. Too slow

Back in 2007, EDF's then UK chief executive, Vincent de Rivaz, promised to turn on Hinkley Point C "before Christmas 2017… Without it the lights will go out."[5] Four years later, EDF was granted permission to begin work in July 2011, and it took another five years until September 2016 before the UK government signed financial agreements with EDF and the Chinese nuclear company CGN.

In November 2016, de Rivaz vowed that Hinkley Point C would be built by 2025. After several announcements of further delays, Hinkley Point C is allegedly due to start in June 2027, but with the risk of yet another delay of around 15 months to September 2028, i.e., 11 years late.

So, it takes between 10 and 19 years to plan and build a nuclear reactor. But according to the Global Carbon project the world's remaining carbon budget for staying within a 1.5C increase will be used up in about nine years.[6]

As for Sizewell C, in 2017 EDF estimated that it 'could' be producing power by 2031. But EDF's 2020 Environmental Statement assumed a construction period of 12 years – which, assuming construction were to start in 2024, would take us to 2036. Plus, it would take another six years to offset the large carbon emissions arising from its construction, and that is if Sizewell were ever finished on schedule.

### 4. Likely to be unreliable

Around the world, five European Pressurized Reactors (EPRs) exist. These were designed by EDF and are the same type of reactor as the ones being built at Hinkley and proposed for Sizewell. But they have all suffered unanticipated delays, breakdowns, and soaring price tags.

Currently, only one EPR is known to be fully operational. Construction on the Taishan 1 and 2 reactors in southern China began in 2009. The projects, with an estimated cost of US $7.5 billion each and a projected completion date of 2013, were completed in 2018 and 2019. However, one of the units was shut down in 2020 because of faulty fuel rods, a key component in a reactor. And the other reactor only operates from time to time.

The Flamanville reactor in France was originally estimated to cost €3.3 billion and to be completed in 2012. Construction began in 2007. Since then, repairing defective welds in the reactor vessel and other technical problems have driven the cost up to €13.2 billion. Fuel loading is not expected until 2024.

Construction began on the Olkiluoto 3 reactor in Finland in 2005. Originally projected to cost €3 billion and to be completed in 2009, its price tag has soared to €11 billion. After several delays, it was scheduled to go online last year, but issues with feedwater pumps delayed its commencement. It finally started in April 2023.

### 5. Renewables are much better

Many research groups around the world have shown that 100% renewable energy (RE) systems are not only technically feasible, but much preferable as they can keep electrical grids stable at lower costs.[7]

Most recently, a study by the world's foremost energy modellers at LUT University in Finland concluded that a 100% renewable energy mix for the UK would save well over £100 billion in achieving net zero by 2050, compared to the government's current strategy.[8] Flexibility is the key. Also, a 2022 study from UCL found that renewables and storage technologies, such as wind, solar and batteries, are becoming so competitive that the government's backing for new nuclear is "increasingly difficult to justify".[9]

### 6. High costs of decommissioning/wastes

The total bill for decommissioning the UK's current nuclear waste mountain is expected to increase to £260 billion. This huge cost will be borne by UK taxpayers and billpayers. It includes:

- the cost of decommissioning Sellafield;
- the cost of decommissioning 11 Magnox power stations, built in the 1950s and 1970s; and
- the cost of decommissioning seven advanced gas-cooled reactor power stations built in the 1960s and 1980s.

The previous Energy Act 2008 had set out a framework "to ensure that operators of new nuclear power stations meet the full costs of decommissioning, waste management and waste disposal".[10] But the government will take title to the nuclear wastes produced for an agreed fixed price, so if costs escalate the taxpayer will have to pay for these increases yet again.

The estimated cost of building a hypothetical Geological Disposal Facility for nuclear wastes has already escalated from £11bn to £53bn.

In other words, the government has not dealt with the nuclear wastes from its previous nuclear programmes, yet it proposes to go ahead with a new nuclear programme with little idea of what it would do with its radioactive wastes.

### 7. Expected sea level rises may flood UK reactors

Due to global warming, global sea levels have been rising much faster than anticipated. All of the UK's nuclear reactors and waste facilities at Drigg and Sellafield are on the coast. Similarly, Hinkley C and especially Sizewell C.

Several commentators have raised questions about the wisdom of constructing nuclear reactors on coasts vulnerable to sea level rises and storm surges.

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2 Storm van Leeuwen, J.W. Climate Change and Nuclear Power, 2017. https://www.stormsmith.nl/Resources/nucl%26climate2017.pdf

3 See for example, Thomas, S and Downes, A. How much Carbon would Sizewell C save? https://stopsizewellc.org/core/wp-content/uploads/2021/04/Sizewell-C-Carbon-Savings-updated-April-2021.pdf

4 Lovins, A. Does Nuclear Power Slow Or Speed Climate Change? Forbes 18th November 2019 https://www.forbes.com/sites/amorylovins/2019/11/18/does-nuclear-power-slow-or-speed-climate-change/

5 Times 23rd Dec 2017 https://www.thetimes.co.uk/article/has-nuclear-been-stuffed-by-hinkley-turkey-fzl7nxdkw

6 Carbon Tracker 28th April 2023 https://carbontracker.org/net-zero-2050-old-before-its-time/

7 Abstracts of the 70 studies are available here: https://web.stanford.edu/group/efmh/jacobson/Articles/I/CombiningRenew/100PercentPaperAbstracts.pdf

8 Breyer, C et al. 100% Renewable Energy for the United Kingdom, LUT University for 100% Renewable UK Ltd, January 2023 https://100percentrenewableuk.org/wp-content/uploads/100-RE-23-Dec-.pdf

9 New Scientist 4th November 2022 https://www.newscientist.com/article/2345743-does-the-uk-neednew-nuclear-plants-like-sizewell-c-to-reach-net-zero/

10 DECC 19th March 2012 https://www.gov.uk/government/publications/funded-decommissioning-programme-cost-recovery-scheme-guidance-for-prospective-nuclear-operators

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