How much Carbon would Sizewell C save?

Professor Steve Thomas & Alison Downes[1]

Summary:

The three main arguments for the programme of new nuclear reactors in the UK were that:

- Nuclear power was cheaper than other sources of low-carbon electricity and was therefore the most cost-effective way to meet our emissions targets[2]
- There was a need for base-load power stations that other low-carbon sources like renewables could not meet; and
- Even with a substantial renewables and energy efficiency programme, the UK could not reduce its carbon emissions sufficiently to meet its emissions targets without new nuclear reactors.

The first two arguments have failed: nuclear power is far more expensive than renewables and energy efficiency measures; and the need for base-load capacity is a fallacy. In addition, the evidence that warming is increasing faster than expected has led to consensus that we are in a 'climate emergency' and need to decarbonise much more rapidly than previously expected. In 2007 EDF Chief Vincent de Rivaz said people would cook their Christmas turkeys with power from Hinkley Point C in 2017,[3] but - provided there are no more delays - Hinkley C will not come online until nearly 10 years later; Sizewell C's first consultations took place in 2012 and first power is expected in 2034 - a timeframe in excess of 20 years. If new nuclear plants are not cheap and base-load capacity is not needed, the only remaining substantive argument in favour of nuclear power is the claim that it is essential if the UK grid is to be de-carbonised. However, if nuclear capacity cannot be expanded sufficiently in the time-frame required, it will be too late.

In 2020, construction of Sizewell C (SZC) was expected to begin in 2022. However, on 27 May 2021, EDF's Mike Lavelle told a meeting of the Whitehall Group that a Final Investment Decision (FID) would not be before the end of 2022 or early 2023,[4] making construction starting in 2022 impossible. For SZC, there will be the additional step once EDF has taken a FID, not required for HPC, of identifying and negotiating terms with the institutional investors expected to finance and own the plant. In 2020, EDF claimed SZC would be online in 2034, produce 3340MW net power, contribute 7% of the UK's electricity and operate for 60 years. In its Sustainability Statement, [2] EDF claims of SZC (emphasis added): *"The electrical output would provide a low carbon source for over 20% of the UK's homes and,* ***based on current grid intensity****, offset approximately 7 million tonnes of CO2 per annum by displacing the existing mix of more carbon intensive electricity from the National Grid. The development of the Sizewell C Project would therefore play a significant role in the UK's transition to a low carbon economy."*[5]

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[2] This issue is dealt with in a separate Written Representation "What would the RAB model proposed for Sizewell C mean for consumers' bills?"

[3] https://www.thetimes.co.uk/article/has-nuclear-been-stuffed-by-hinkley-turkey-fzl7nxdkw

[4] Contemporaneous notes of Zoom meeting.

[5] Page 39 https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010012/EN010012-002235-SZC_Bk8_8.13_Sustainability_Statement.pdf

This statement is worthless because SZC will not be completed before 2034 by which time, even on UK government figures, the grid carbon intensity will be less than a third of what it is currently. While nuclear power is sometimes characterised as zero carbon, this is false. The routine operation of a nuclear power plant does not directly produce CO2 but a substantial amount of emissions result from the construction process. EDF's revised proposals for Sizewell C[6] break down the carbon content of construction of **6.24 million tonnes (Mt) of carbon equivalent (CO2e)** – an increase of 8.5% from proposals submitted in May 2020 – as: 86% from the materials used, 3% construction activities, 4% materials transport and 5% worker transport. Any construction delays will inevitably increase person hours of labour and volume of materials, increasing the carbon content of construction. The poor record of all EPR builds suggests a delay is very likely.

EDF notes emissions from back-up diesel generators, a back-up CHP plant and vehicle journeys during SZC's operating life. Long-term disposal of spent fuel has not been carried out yet anywhere in the world and is decades away from being demonstrated. Decommissioning is not included in EDF's CO2 calculations for SZC made available in the DCO application. It is therefore not possible to estimate the carbon content of these operations, but it will not be zero.

Emissions of CO2 occur in the fuel cycle – the various steps from mining of uranium to disposal of spent fuel. EDF asserts that the lifecycle CO2 of SZC from the fuel cycle will be 4.8g CO2e/kWh.[7] Whilst this is much lower than estimates used by other official bodies such as the Intergovernmental Panel on Climate Change (12g CO2e/kWh), and the UK Committee on Climate Change (6g CO2e/kWh), it is not possible to scrutinise EDF's calculations for 4.8g CO2e/kWh as they have not been published. A Freedom of Information request by Stop Sizewell C for an independent *"Lifecycle Assessment of the Carbon Footprint of the proposed Hinkley Point C (HPC) project",* referenced as "available" in the HPC application, and which quoted 4.8g CO2e/kWh[8] confirmed this study was never submitted to the Planning Inspectorate. EDF declined requests on the grounds of "commercial sensitivity."[9] However, we understand a new Lifecycle Assessment is to be published soon.

How much emissions would be reduced by SZC depends on two main factors; the rate of growth of renewable capacity and the evolution of electricity demand. The more rapidly capacity of renewables grows, the quicker use of fossil fuel plant can be reduced. The lower demand is (and demand has fallen almost every year since 2005) the less the need to generate using fossil fuel plants. As new renewables come online replacing fossil fuels, carbon emissions from UK electricity generation are falling.

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[6] https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010012/EN010012-002919-SZC_Bk6_6.14_ESAdd_V1_Ch2_Main_Development_Site.pdf (page 356). Original proposals: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010012/EN010012-001959-SZC_Bk6_ES_V2_Ch26_Climate%20Change.pdf (page 39)

[7] Page 27 https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010012/EN010012-002922-SZC_Bk6_6.14_ESAdd_NTS.pdf

[8] Page 62 https://webarchive.nationalarchives.gov.uk/20191119152111/https:/infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010001/EN010001-005331-8.14%20Sustainability%20Statement%201.pdf

[9] Hinkley Point Community Forum, 14 May, from https://www.edfenergy.com/download-centre?keys=&tid=175&year%5Bvalue%5D%5Byear%5D=

Based on 2018 forecasts from the Department of Business Energy & Industrial Strategy (BEIS), mean emissions or carbon intensity will fall from about 130g of carbon per kWh in 2020 to about 40g in the mid-2030s.[10] BEIS's figures do not look beyond mid-2030s, but EDF assumes a grid intensity of 20g in 2050[11] despite the UK government's legally binding commitment to '*to bring all greenhouse gas emissions to net zero by 2050*.'[12]

Using the BEIS carbon intensity forecast to the mid-2030s, EDF claims SZC will reduce the UK's carbon emissions by 1Mt carbon in 2034 (excluding the contribution of construction to emissions), and projecting that trend forwards states (emphasis added) *"it is conservatively estimated that GHG emissions from the construction of Sizewell C will be offset* ***within the first six years of operation*** *assuming the equivalent energy were otherwise to be generated by the anticipated mix of grid electricity generation sources."*[13]

Therefore, even on EDF's assumptions, SZC cannot make a positive contribution to the UK's net zero target until 2040, assuming that it is finished on schedule.[14] If demand is lower than forecast and deployment of renewables is accelerated, it will take longer to counterbalance construction emissions. EDF further states (emphasis added) "*By 2050, SZC will have displaced a* ***cumulative total*** *of approximately 12 million tCO2e compared to the estimated future energy mix for generation."*[15] Deducting 6.2Mt CO2 from construction, **SZC will therefore displace net 5.8Mt of CO2 by 2050**.

Alternative assumptions from authoritative sources such as National Grid show that grid intensity will be much lower than forecast by BEIS and EDF and, far from reducing emissions, SZC will actually increase them from the construction process and from the emissions associated with the nuclear fuel.

Conclusion: Even if SZC would save emissions, the need for speedy action to address our climate emergency means that we need sources of energy that we can deploy much more quickly, cheaply and reliably than nuclear mega-projects such as SZC. Given that SZC has yet to start construction and with uncertainty about the method of finance and the risks it would place on consumers the only sensible option is to abandon it now and focus on projects that can meet our targets quicker and more cheaply.

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[10] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/794590/updated-energy-and-emissions-projections-2018.pdf BEIS (2019) Updated Energy and Emissions Projections 2018

[11] Page 32 https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010012/EN010012-001959-SZC_Bk6_ES_V2_Ch26_Climate%20Change.pdf

[12] https://www.gov.uk/government/news/uk-becomes-first-major-economy-to-pass-net-zero-emissions-law P 33. In April 2021 a new target of 78% reduction in CO2 emissions by 2035 was set. https://www.gov.uk/government/news/uk-enshrines-new-target-in-law-to-slash-emissions-by-78-by-2035

[13] See 8

[14] It is worth noting that the Hinkley Point C DCO application, submitted in 2011, stated that the GHG emissions from the construction of HPC would be offset within 2 months. See page 83 https://webarchive.nationalarchives.gov.uk/20191119152111/https:/infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010001/EN010001-005331-8.14%20Sustainability%20Statement%201.pdf

[15] Page 33 https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010012/EN010012-001959-SZC_Bk6_ES_V2_Ch26_Climate%20Change.pdf