Submission by Greenpeace to the issue specific hearing on policy and need ISH 9

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This submission argues there is no need for new nuclear power, and that government policy as represented by National Policy Statements and subsequent ministerial statement relating to new nuclear are outdated and wrong.

New electricity system models

In 2021 there have been three models that demonstrates that there is no need for new nuclear power stations such as Sizewell C. These have been done by established academic or consultant C organisations and indicate that the most cost effective approach to delivering zero emissions in Great Britain electricity is an emphasis on rapid roll out of renewable energy, especially wind and solar, and reshaping the grid with interconnection demand management and storage in order to meet necessary demand.

The first of these studies is by the Imperial College Energy Futures Lab[1]. They looked at the cost-effective pathway to delivering a decarbonised power system by 2035. The model used[2] was one that ensures adequacy of power generation, using real world weather data to indicate the levels of wind and solar power generation on a hour-by-hour basis. It concluded that the most cost-effective route to decarbonisation was a very heavy emphasis on offshore wind and storage. New nuclear power was not on the cost-effective pathway unless costs fall to £45/MWh, around half that agreed for Hinkley Point C at £92.50/MWh. (This presumably refers to real costs, not apparent costs if much of the costs and risks of construction and operation are passed on to taxpayers). Hinkley Point C was assumed to come into operation but no new nuclear was on the pathway to the cheapest overall system.

[1] https://www.imperial.ac.uk/news/223373/uk-offshore-wind-target-must-least/

[2] Imperial College used Whole-electricity System Investment Model (WeSIM), described as "a comprehensive system analysis model that is able to simultaneously balance long-term investment decisions against short-term operation decisions, across generation, transmission and distribution systems, in an integrated fashion"

The second model is one done by the Energy Systems Catapult[3] for Good Energy[4]. The modelling was done using the Energy Systems Modelling Environment, or ESME[5], and again was able to model the energy system on an hour-by-hour basis to ensure adequate supply.

The Zero Carbon Britain scenario in this study shows that a system based on high flexibility, with high renewables deployment and innovation can deliver a secure zero-carbon electricity system with no need for new nuclear beyond the Hinkley Point C station already under construction. As the authors of the report describe it, under this scenario the energy system is:

> "projected to cost between 0% and 1.5% of GDP in 2050, in line with current assessments made by the Climate Change Committee. A key finding from this research is the strong potential to build out a very high renewable, low nuclear, zero fossil fuel system and remain cost competitive."

Notably this model from Energy Systems Catapult had a different renewables technology mix but broadly the same conclusions as those from Imperial College Energy Futures Lab.

The third energy system model of relevance is that produced by energy consultancy LCP Energy[6] for the energy company SSE[7]. Like the other models referred to above, it maintains the current system security standard ('no blackouts' or more accurately GB's current Loss of Load Expectation (LOLE) standard of 3 hours per annum maximum). The objectives of the modelling exercise were to have the gross carbon intensity of GB power system approaches near zero in the 2030s, to be low cost whilst having credible assumptions on technology build rates and cost reductions.

Part of the report's analysis was to compare a 'baseline' scenario for the energy system containing significant new nuclear build with that of a 'low cost high renewables' scenario. The latter included no more nuclear than that represented by a completed Hinkley Point C and the continued operation of Sizewell B. Moving from the baseline to the high renewables scenario, replacing new nuclear – including the proposed Sizewell C – with offshore wind and other technologies to deliver security of supply, meant that

> "Overall there is a system cost benefit of £7.3bn (NPV 2021-50, 3.5% social discount rate) between 2021 and 2050. The majority of this saving is due to reduction in CapEx costs; offshore wind is much less CapEx intensive than nuclear….. Even allowing for the lower load

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[3] Energy Systems Catapult describes itself as "an independent, not-for-profit centre of excellence that bridges the gap between industry, government, academia and research. We take a whole-systems view of the energy sector" and is core funded via UK Research and Innovation

[4] https://www.goodenergy.co.uk/business/exclusive/renewable-nation

[5] ESME is described as "a staple of UK energy systems analysis for many years. It is a peer reviewed, least-cost optimisation model designed to explore technology options for a UK energy system with carbon constraints applied"

[6] LCP Energy provides "energy market expertise, mathematical modelling and new technological approaches to the GB and Irish electricity markets" and describes the modelling used as "Our analysis is supported by our in-house modelling framework, which is used by both industry and policymakers. It is the primary power market forecasting tool used by BEIS to assess the impact of changes to energy policy. It is also used by National Grid to model system security and produce their annual recommendations for the capacity auction requirements, by Ofgem to assess changes to charging arrangements, and by the LCCC to set the costs to suppliers of the Contracts for Difference scheme". https://www.lcp.uk.com/energy/

[7] https://insight.lcp.uk.com/acton/attachment/20628/f-d32a3b26-13a3-4334-9d7f-0cb5634e5b9d/1/-/-/-/-/Net%20zero%20without%20breaking%20the%20bank%20-%20LCP%20SSE%20report%202021%20.pdf

factors of offshore wind, and the additional backup capacity required due to the low level of firm capacity provided by each marginal unit of installed offshore wind capacity, this represents a significant saving."

In addition to these analyses specific to Great Britain, there are of course a number of global energy scenarios (often broken out into countries and regions), which say that 100% renewables is perfectly feasible.[8]

Recent History of Energy modelling and analysis

These 3 most recent models have not come out of nowhere but are the culmination of analyses over the past few years, including from official bodies.

The case nuclear advocates make is that the grid system will not be able to cope with only having variable renewable power like wind and solar.

However, the proportion of zero carbon power that can be delivered by renewables with full system security has climbed as smart technology and understanding of how to manage the system has improved, reaching the stage of that of the 3 models described above.

In the early noughties, single figure percentages of variable renewables on the grid seemed to be the upper limit.[9] In 2015, National Grid scenarios anticipated the range of possibilities for renewables in 2030 at 33-48%.[10] But by 2020, the National Infrastructure Commission (NIC) said 65% renewables by 2030 is *cost-effective*[11] - not the limit of what is achievable. The proportion of wind and solar that the grid can accommodate is only likely to keep increasing as the collapsing cost of batteries[12], other forms of storage[13] and green hydrogen[14] allow ever greater proportions to be managed. Insisting on

[8] See for example Stanford University https://web.stanford.edu/group/efmh/jacobson/Articles/I/CountriesWWS.pdf?

Lappeenranta University https://www.lut.fi/web/en/news/-/asset_publisher/lGh4SAywhcPu/content/can-we-get-100-of-our-energy-from-renewable-sources-new-article-gathers-the-evidence-to-address-the-sceptics

Greenpeace International https://issuu.com/greenpeaceinternational/docs/energy-revolution-2015-full-hr

One Earth http://oneearth.uts.edu.au/

[9] See thread https://twitter.com/JohnMurton/status/1268111336447389697

[10] https://investors.nationalgrid.com/~/media/Files/N/National-Grid-IR/reports/future-energy-scenarios-2015.pdf

[11] https://nic.org.uk/news/falling-cost-of-renewables-strengthens-case-for-accelerating-deployment/

[12] https://about.bnef.com/blog/battery-pack-prices-fall-as-market-ramps-up-with-market-average-at-156-kwh-in-2019/

[13] https://www.theguardian.com/environment/2020/jun/18/worlds-biggest-liquid-air-battery-starts-construction-in-uk

[14] https://about.bnef.com/blog/hydrogen-economy-offers-promising-path-to-decarbonization/

a nuclear component for this purpose is a punt on saying that the innovation process will slow or stop.

Given the current state of analysis, the speed of developments of alternatives to nuclear, and that the earliest a Sizewell reactor would be supplying power would be 2034[15], is correct for Government to commit to a highly subsidised project for approaching half a century, where technological advances make it a white elephant?

Given how our understanding is evolving so rapidly, it is unsurprising that nuclear developers EDF are reportedly pushing for 'prompt' government decisions[16]. A pause for consideration and rational reflection about new nuclear would be very bad for the prospects of an agreement to proceed. Saying such decisions are 'urgent' is the stock in trade for supporters of an industry that doesn't want anyone to step back and consider.[17]

Government policy vs new models

All three models have been published since April 2021, showing how the technology and cost changes in recent years allow markedly different conclusions to assumptions which underpin the National Policy Statements from 2011. In particular the section 3.5 from Overarching National Policy Statement for Energy[18] (EN-1) that provides the justification for government support for new nuclear power. For example the statement

> "The Government believes that nuclear power is economically competitive with other forms of generating technology (including the lowest cost renewable technologies) and new nuclear is likely to become the least expensive form of low carbon electricity generation." (para 3.5.8)

is now clearly untrue.

The statement in para 3.5.2 that:

> "new nuclear power should be able to contribute as much as possible to the UK's need for new capacity"

Is now eccentric to the point of absurdity given the changes in electricity generation and management technologies and their costs.

Thus the existing NPS, and the justifications for new nuclear power, are so badly out of date they should not be used as any sensible steer on planning decisions.

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[15] https://www.thetimes.co.uk/article/sizewell-c-faces-six-year-emissions-lag-xm72b92tb

[16] https://www.ft.com/content/e69b62cd-4cd4-49e2-81e6-50fba4d093e1

[17] See for example 'urgent' needs for decisions years before they were actually made https://www.thetimes.co.uk/article/pay-up-for-nuclear-or-britain-could-run-out-of-energy-families-are-warned-rc8tr7jt8fh

[18] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47854/1938-overarching-nps-for-energy-en1.pdf

Those outdated assumptions do not seem to be being revised, as ministerial statement on nuclear power from the end of 2017 stated[19]:

> "The assessment of the need for new electricity generation carried out to support EN-1 remains valuable and continues to be relevant…..new nuclear power generation remains key to meeting our 2050 obligations."

Again, this is now clearly untrue.

Guidance for new nuclear power in existing documents is out of date and should not be used in planning decisions.

Subsidies, funding and costs

In 2011 (shortly after the NPS was designated), the Secretary of State promised that new nuclear would be built *"without a penny of public subsidy"*[20].

Today, new nuclear is synonymous with excessive cost, strain on the public purse, and an industry unattractive to investors.

The 2008 White Paper estimated that the price of nuclear energy would be £30/MWh[21]. This has proven to be a gross underestimation, taking the Hinkley Point C (HPC) deal as an example which is more than three times this amount (and more than twice the wholesale price of power[22]). The HPC 35 year contract of £92.5/MWh has been heavily criticised by the National Audit Office (NAO) which describes it as having *"locked consumers into a risky and expensive project with uncertain strategic and economic benefits."*[23] In contrast the average electricity price in the UK in 2018 was £55-65 /MWh[24], and cost of offshore wind in the most recent contract auction fell below £40/MWh.

The Government has also faced strong criticism from the Public Accounts Committee (PAC) for failing to champion the consumer interest in the HPC deal, despite the cost to the consumer having risen five-fold in the time it took to negotiate the deal.[25]

Government has shown itself very willing to be excessively generous to nuclear power, without adequate justification. For example, in relation to another proposed nuclear power station

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[19] Statement made by Richard Harrington Parliamentary Under-Secretary (Department for Business, Energy and Industrial Strategy) 7 December 2017 https://questions-statements.parliament.uk/written-statements/detail/2017-12-07/HCWS321

[20] Taken from speech on Energy and the Environment at the Liberal Democrat Conference in September 2011, available at: https://www.newstatesman.com/uk-politics/2011/09/energy-renewable-jobs-carbon

[21] Para 2.49 of the White Paper on Nuclear Power (January 2008) *Department for Business Enterprise and Regulatory Reform,* available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/228944/7296.pdf)

[22] https://www.theguardian.com/news/2017/dec/21/hinkley-point-c-dreadful-deal-behind-worlds-most-expensive-power-plant

[23] Paragraph 25, Conclusion on Value for Money, National Audit Office Report on Hinkley Point C, 23 June 2017, available at: https://www.nao.org.uk/wp-content/uploads/2017/06/Hinkley-Point-C.pdf

[24] https://www.theguardian.com/environment/2019/jul/14/new-uk-nuclear-funding-model-could-leave-taxpayers-liable-edf-sizewell

[25] Hinkley Point C Inquiry, Public Accounts Committee report, taken from the Summary, available at: https://publications.parliament.uk/pa/cm201719/cmselect/cmpubacc/393/393.pdf

development at Wylfa Newydd, developer Hitachi withdrew in 2019 over financing concerns, despite the reported strike price of £75-77/MWh[26] for a 60 year deal, and despite the UK's commitment to direct investment (which in 2018 was predicted as a stake of at least £5 billion[27], but reported in the Japanese press as arranging the entire 2 trillion yen that Hitachi had requested[28]). Further, the package offered from the public purse was described by Business and Energy Secretary, Greg Clark, following Hitachi's suspension of UK nuclear development, as having gone "*…beyond what any government has been willing to consider in the past."*[29]

On the basis of past behaviour, there is therefore a substantial risk that government expose taxpayers and energy-bill payers to excessive costs and risks for nuclear stations that are not even essential to UK decarbonisation or electricity system security.

The Regulated Asset Base (RAB) approach

Following a public consultation, the Government is now considering the Regulated Asset Base model for financing new nuclear and for Sizewell C. This model, which has limited experience financing projects of this scale[30], intends to "unlock revenue from the eventual users"[31], i.e. make consumers pay upfront for energy they may not use until more than a decade later.

The RAB may not be the final form of the financing mechanism that government chooses to use, however it is clear that no new nuclear will be built without substantial risk and cost transfer to taxpayers, and much of the following discussion of the RAB could apply to any chosen financing mechanism with those characteristics.

This RAB model represents yet another controversial departure from the "subsidy free" nuclear promise of the NPS. The NPS objective of protecting consumers and offering subsidy-free nuclear power has plainly not been met and cannot be met. The long term financial viability of these sites has already been undermined and represents a clear change in circumstances for the purposes of section 105(2) of the Planning Act 2008, which negates the ability of the Secretary of State to give significant weight to the NPS as the Applicant directs.

Several points should be made about the RAB:

- It is seen by developers as a regulatory 'commitment device' which helps attract investors[32]. Thus it binds government into a project, even when it turns out to be poor,

[26] Reported by the Solar Trade Association, '*Press Release: Billions for Wylfa Nuclear Power, while Low-Cost Solar still shut Out Of Competitive Markets?'* 4 June 2018, available at: https://www.solar-trade.org.uk/press-release-billions-for-wylfa-nuclear/

[27] Reported by the Guardian, '*UK takes £5bn stake in Welsh nuclear power station in policy U-turn*', 4 June 2018, available at: https://www.theguardian.com/environment/2018/jun/04/uk-takes-5bn-stake-in-welsh-nuclear-power-station-in-policy-u-turn

[28] Article from the Nikkei Asian Review, Business Deals, '*Hitachi clears financing hurdle on British nuclear plant*', 5 June 2018, available at: https://asia.nikkei.com/Business/Business-Deals/Hitachi-clears-financing-hurdle-on-British-nuclear-plant2

[29] Statement on suspension of work on the Wylfa Newydd nuclear project, 17 January 2019, Department for Business, Energy & Industrial Strategy and The Rt Hon Greg Clark MP https://www.gov.uk/government/speeches/statement-on-suspension-of-work-on-thewylfa-newyddnuclear-project

[30] https://www.nic.org.uk/assessment/national-infrastructure-assessment/low-cost-low-carbon/

[31] https://www.power-technology.com/features/regulated-asset-base-model-uk-nuclear/

[32] https://www.oxera.com/agenda/the-regulatory-asset-base-and-regulatory-commitment/

as National Audit Office found with Hinkley[33]. In other words, by adopting a RAB approach, Government is making one of the same strategic mistakes as it did with Hinkley and seems to have learned very little from that experience

- The RAB transfers large amounts of risk to the public sector, which, depending on the structure of agreement, includes covering for project mismanagement or technological failure on the part of the builders. As the National Infrastructure Commission says[34]:

  "This makes projects appear cheaper as consumers are effectively financing the projects at zero interest. At least some of the risk associated with construction costs also sit with consumers, a further hidden cost, since consumers are not paid to hold these risks in the way investors would be"

- A RAB requires a strong, well informed regulator to tackle excessive transfer of risk to the public and excessive returns. The RAB calculations involve estimating fairly opaque future scenarios, such as construction times or problems (which affect cost) and prevailing economic conditions. But the likely regulator (Ofgem) has admitted it has allowed double digit returns to a very low risk business in power distribution[35] even after 2 decades of regulatory experience. The prospect of Ofgem – or any other regulator – getting nuclear right with a one-off project seems remote, as generally commercial developers know much more about real project costs than regulators. As the Energy and Climate Intelligence Unit put it[36]

  "Vastly more complicated than the CfD system, the RAB model has long been criticised for opacity, with governments and regulators struggling to keep up with specialist consultants and accountants constantly pushing for minor rule changes to favour asset owners."

- A mechanism similar to the RAB was used to finance a nuclear power station in South Carolina, which collapsed and will not be built. Notwithstanding this, those payments for the nuclear power station that will never generate power still make up about 18% of customers' bills[37]
- The NAO has also said that using a RAB model for nuclear new build could help achieve a strike price of £63.50 and £67.50, although these low prices are only possible because of large levels of risk transferred to the public purse, a subsidy not required for the major forms of renewable generation. Note that even these prices, with their massive transfer of risk not required by other generators, are not low enough to put new nuclear power on the cost-effective pathway to decarbonisation as modelled by Imperial College.

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[33] See https://www.nao.org.uk/wp-content/uploads/2017/06/Hinkley-Point-C.pdf
"In September 2016, HM Treasury highlighted how the value-for-money case for HPC had weakened. But it concluded that the legal, reputational, investor and diplomatic ramifications of not proceeding meant it was, on balance, better to continue with the deal."

[34] https://www.theguardian.com/business/2019/jul/27/despite-hinkley-new-plan-nuclear-hardly-better-than-old-one

[35] https://www.theguardian.com/business/2019/oct/03/energy-network-firms-allowed-to-make-bigger-than-expected-profits-ofgem-admits

[36] https://eciu.net/blog/2018/where-next-for-uk-nuclear

[37] Section 18 https://www.worldnuclearreport.org/The-World-Nuclear-Industry-Status-Report-2018-HTML.html#fig28

This is not just an analysis from Greenpeace. Writing about RAB proposals being poor value for money, the Economics Editor of the Guardian points out[38]

> *"no financing model can disguise the core truth about nuclear – the technology is hideously expensive….. the UK shouldn't rush to tie itself to an expensive nuclear future and should instead back renewables, notably wind and solar, to continue becoming cheaper."*

And even more bluntly, the Economics Editor of the Times[39]:

> *"[the RAB] might avoid a re-run of Hinkley saddling consumers with rip-off bills decades out, but only at the price of leaving them exposed to construction risk. ….Under the proposed RAB scheme, energy bills will increase to pay for nuclear power stations before they start generating. In short, we'll be paying upfront for EDF's routine screw-ups."*

Cost promises not delivered

Thus the history of the last decade or more has been of nuclear industry promises on cost not being realised, and in practice the level of taxpayer subsidy having to keep rising. There is no evidence basis for thinking that process has stopped[40]. And it is only a year since France's state auditor questioned the ability of EDF to construct new reactors within "acceptable" costs and timeframes.[41] Unsurprising given the cost escalations at all the EPR nuclear power projects EDF is involved with. The newspaper Le Monde is keeping track of the EPR being built at Flamanville[42] – it is now costing 5.8 times as much and taking 3.4 times as long ass originally promised. It cannot be emphasised enough that these problems would become those of the taxpayer under a RAB.

Conclusion

There is no justification for considering nuclear as 'essential' part of UK infrastructure, and certainly not for a financing approach like using a RAB. The lowered headline cost does not justify it. Scenario analysis shows that UK can more cost-effectively reach decarbonisation targets without it.

Nuclear has a very poor track record. At every point since UK pivot toward nuclear power support in 2006, the industry has underperformed on costs and delivery. There is no rational reason to believe this will not continue. The last resort of the industry (and a supportive government) is to make this underperformance the problem of the consumer, not of the companies building nuclear power stations.

The costs for nuclear are much larger for nuclear than for other projects where RAB has been used. So is the complexity and the likelihood of budget overruns given nuclear's track record. This means

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[38] https://www.theguardian.com/business/nils-pratley-on-finance/2019/jul/23/lets-face-it-nuclear-power-is-hideously-dear-and-far-from-ideal

[39] https://www.thetimes.co.uk/article/sinking-nuclear-raft-needs-scuttling-p0qmqs28b

[40] There is plenty of 'expert opinion', of course, but it is 'expert opinion' that has been decisively wrong in the past

[41] https://www.telegraph.co.uk/business/2020/07/11/doubts-cast-edfs-ability-build-power-stations-time-budget/

[42] https://www.lemonde.fr/les-decodeurs/article/2019/06/24/epr-de-flamanville-visualisez-comment-le-cout-et-la-duree-du-chantier-ont-triple-depuis-2007_5480745_4355770.html

the risks involved in the RAB calculations at the start of the projects are much greater, yet energy regulators have a poor track record in getting to grips with excessive profits.

The absence of need for nuclear should allow for its rejection given historic planning guidance is so obviously out of date.