Expediting Civil Nuclear Power in the UK

The new 'Golden Age'

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Contents

Glossary

AGR – Advanced gas-cooled reactor
ALARP – As Low As Reasonably Practicable
AMR – Advanced Modular Reactors
BSOs - Basic Safety Objectives
DCO – Development Consent Order
DEGB - Double-Ended-Guillotine-Break
DESNZ – Department of Energy Security and Net Zero
EDF – Électricité de France
EPR – European Pressure/Power Reactor
FID – Final investment decision
FOAK – First of a kind
GDA – Generic Design Assessment
GW – Gigawatt
HPC – Hinkley Point 'C' nuclear power plant
HRA – Habitat Regulations Assessment
HVAC - Heating, Ventilation, and Air Conditioning
IAEA – International Atomic Energy Agency
ICRP - International Commission on Radiological Protection
LNT - Linear No Threshold theory
NAT – Nuclear Appeal Tribunal
NRC – Nuclear Regulatory Commission (USA equivalent to the ONR)
NSIP – Nationally Significant Infrastructure Project
ONR – Office for Nuclear Regulation
RAB – Regulated Asset Base
SMR – Small modular reactor
SZC – Sizewell 'C' nuclear power plant
TWh – Terawatt hour

Executive Summary

- The UK faces the risk of a shortfall in electricity supplies in the 2030s as gas power plants and existing nuclear power plants are due to close, and electricity demand is predicted by the government to double by 2035 and double again by 2050. Urgent reform is needed to meet expected increases in electricity demand.
- The current nuclear regulatory framework imposes extreme, gold-plated, safety requirements, some of which are of doubtful utility in a non-seismic region protected from direct exposure to the ocean. These rules make modern nuclear projects slow to build, vulnerable to judicial review, and extremely expensive.
- Hinkley Point C (£46 bn) and Sizewell C (£38 bn+) demonstrate that ratcheting regulatory creep has driven the cost of building nuclear plants to eye-watering levels, not least due to spiralling interest costs caused by lengthy construction times.
- Doctrines such as 'As Low As Reasonably Practicable' ('ALARP') and the Linear No Threshold ('LNT') model are predicated on extreme risk aversion, frequently resulting in costly measures with negligible safety gain. The UK should shift from an absolutist to a more nuanced regulatory culture – balancing some of the more extreme safety gold-plating against practicality and cost.
- Development consent orders ('DCOs') for nuclear power plants also cause very serious delays and expense. There is significant scope for expediting the grant of DCOs, with the suggestions in this paper being particularly suited to geographically contained projects such as nuclear power plants.
- Proposed Reforms:
  - Using Hybrid and Private Acts of Parliament to address planning paralysis by Parliament granting DCOs directly, thus removing the possibility of judicial review.
  - Establishing a Nuclear Appeal Tribunal ('NAT') to resolve technical disputes and other regulatory concerns quickly, and prevent delays in the courts, with the power to weigh proposed safety and other measures against the overall benefit to society.
- Streamlined approvals and timely next-generation deployment could deliver secure, low-carbon electricity at lower cost and position the UK as a world leader in nuclear regulation that recognises the balance between extreme safety measures at the margin and the benefit to society of stable, long term power generation.

Introduction

In 1954, Lewis Strauss, the chairman of the USA Atomic Energy Commission famously claimed that the energy available from burning nuclear fuel would provide 'unlimited power' and that people would therefore 'enjoy in their homes electrical energy too cheap to meter'.[1] Seventy years on from that startling assertion, the cost of electricity generated by nuclear power is far from fulfilling its early promise. The civil nuclear power sector remains fixated on what might be described as the Zeppelin model, imposing regulations that require costly, painstaking and extensive safety measures to manage the inherent risk of traditional nuclear power design. Modern nuclear reactors, whilst wonders of engineering in many ways, remain significantly encumbered by the legacy effects of historic public concern about the perceived risks of civil nuclear power.

Not everyone agrees that nuclear is necessarily expensive. This paper draws extensively on work done by Jack Devanney, an expert in nuclear regulation in the USA, who also has considerable experience in project management of the construction of large-scale commercial shipping.[2] He has argued that nuclear power is 'inherently cheap'.[3] What is expensive, on close inspection, is the regulatory regime. This paper suggests two procedural reforms in the UK. These are aimed at expediting future domestic civil nuclear approvals and construction. It is hoped that this may reduce some of the ancillary costs imposed by the existing regulatory regime. The paper sets out to explain how these proposed reforms on the future of civil nuclear power can potentially close the gap between current reality and the famous prediction made by Lewis Strauss. Significantly cheaper electricity sourced from nuclear power is still entirely feasible, with sufficient political will.

The United Kingdom is currently taking major steps to reduce its reliance on energy generated by fossil fuel.[4] Such fuels currently supply a large majority of overall energy usage, predominantly through home heating and transport.[5] Electricity usage constitutes around 25% of total energy usage.[6] Gas power plants continue to supply a significant proportion of electricity generation. Unfortunately, a third of the current gas plant fleet is now nearing the end of its operational life.[7] Electricity consumption is due to increase significantly as we transition towards domestic heat pumps and electric vehicles – this is before mentioning other growth possibilities including powering artificial intelligence.[8]

The UK electricity generation sector therefore faces twin pressures of projected rapidly increasing electricity demand coupled with unavoidable near-term reductions in supply from traditional, firm power sources. Peak

1. Lewis Strauss, speech delivered to the National Association of Science Writers, New York, 16 September 1954: https://www.nrc.gov/docs/ML1613/ML16131A120.pdf.
2. Jack Devanney, *Why nuclear has been a flop* (3rd ed, CTX Press: 2024).
3. *ibid*, 257.
4. https://www.neso.energy/publications/clean-power-2030.
5. *ibid*.
6. 2024 Electricity demand was 44.7 mtoe. Total 2024 energy usage was c.164.4 mtoe, Digest of UK Energy Statistics Annual data for UK, 2024 , Chapter 5 and Chapter 1.
7. 'Assessing the deployment potential of flexible capacity in Great Britain – an interim report', DESNZ research paper number: 2023/051, February 2024, page 9: 'In the Baseline scenario, there is nearly 15 GW of existing CCGTs retiring by 2035 with more than 8GW retiring by 2030 – down from 27GW now, to 19GW in 2030 and with 12GW expected to remain by 2035'. https://watt-logic.com/2025/11/14/ccgt-retirement-risk/
8. 2024 peak winter demand was 47.4GW, per Digest of UK Energy Statistics 2025 (DUKES), Ch 5: Digest of UK Energy Statistics Annual data for UK, 2024, Chapter 5. https://questions-statements.parliament.uk/written-questions/detail/2024-04-23/23335/: (Forecasts: 2030: 74GW; 2035: 94-107GW; 2050: 131-191GW, considered further below).

winter electricity demand is predicted by the government to increase by half in the next five years and to at least double in the next ten years.[9] Government policy is focused on increasing wind and solar power to bridge the gap between the projected enormous increase in demand and future supply.

Domestic civil nuclear power

The UK has not completed a civil nuclear power generating plant since 1995. Currently under construction, but suffering very significant delays, is the Hinkley Point C ('HPC') power station which is slated to produce 3.2GW (gigawatts) of power once it comes online. A second nuclear plant, called Sizewell C ('SZC'), has recently secured Final Investment Decision ('FID'), a critical stage in the pre-construction process.[10] SZC is supposed to be an almost exact replica of HPC, and is therefore designed to produce 3.2GW when it comes online. Further such replicas are theoretically possible. Current nuclear power generation is around 5GW at maximum capacity, but most of the existing fleet is nearing the end of its productive life.

In addition, there are plans to commission and build nuclear plants based on conventional nuclear technology known as Small Modular Reactors ('SMRs'). It is hoped that SMRs will supply power over and above that supplied by the traditional large-scale generators at Hinkley and Sizewell. The government recently announced that the Rolls Royce SMR had been selected as the 'preferred bidder to develop small modular reactors'.[11] The first three will be built at Wylfa in North Wales.[12] The Office for Nuclear Regulation ('ONR') is the official body that regulates the construction and operation of nuclear power in the UK. It announced in July 2024 that the Rolls Royce SMR had passed Step 2 of the three-stage process to secure design approval. The final stage is expected to be completed in 2026, with Final Investment Decision expected in 2029, so we are many years away from actual production from SMRs.[13]

Finally, there is the possibility of the development of transformative next generation nuclear power, labelled by the government as Advanced Modular Reactors ('AMRs'), although they are not necessarily modular in construction.[14] The importance of next generation civil nuclear power was acknowledged by the government in its publication of 'Civil Nuclear: Roadmap to 2050', published by the Department of Energy and Net Zero ('DESNZ') on 11 January 2024.[15] Furthermore, a recent Inquiry by the Energy Security and Net Zero Committee invited submissions on future construction including the potential for deploying next generation nuclear power.[16] Advanced nuclear reactors have the potential to unlock enormous existing residual uranium resources in the UK and could in theory provide a long-term solution to the goal of cheap, or even free, electricity supply in due course. The AMR sector recently received a significant boost when the US Government announced that it will make its stocks of plutonium - a critical feature of many AMR designs - available for commercial use by energy companies.[17]

9. *ibid*. Some have doubted whether these forecasts are accurate, but that does not change the thrust of the argument in this paper.
10. *https://www.gov.uk/government/news/size-well-c-gets-green-light-with-final-investment-decision*, 23 July 2025.
11. https://www.gov.uk/government/news/rolls-royce-smr-selected-to-build-small-modular-nuclear-reactors. Announced on 10 June 2025.
12. https://www.rolls-royce-smr.com/press/wylfa-confirmed-as-rolls-royce-smrs-first-uk-site.
13. https://www.gov.uk/government/publications/office-for-nuclear-regulation-corporate-plan-2025-to-2026/office-for-nuclear-regulation-corporate-plan-2025-to-2026. Discussed further below.
14. https://www.gov.uk/government/publications/civil-nuclear-roadmap-to-2050/civil-nuclear-roadmap-to-2050-accessible-webpage
15. *ibid*.
16. https://committees.parliament.uk/work/8942/revisiting-the-nuclear-roadmap/
17. https://www.ft.com/content/2fbbc621-405e-4a29-850c-f0079b116216. 'US offers nuclear energy companies access to weapons-grade plutonium', 21 October 2025.

The transition from fossil fuels

Civil nuclear power is an essential element in the future of electricity generation in the UK. This is because it is capable of providing stable, consistent and potentially high volume power generation in all weathers and circumstances. Importantly, and unlike fossil fuel power generation, nuclear power is recognised to be low carbon.[18] The global resources of nuclear fuel are sufficient to provide the entire electricity needs of the planet for many millennia.[19]

The UK is currently engaged in a 'sprint for wind' some decades after the country famously went for a 'dash for gas'. This is because electricity demand is projected to rise sharply in the coming years. The reason so much new electrical power generation is being developed at such pace is because it is government policy to transition the country towards electric vehicles and electrical home heating as part of removing fossil fuels from the grid – and this before even mentioning the potential for increased AI electricity demand.[20]

The current gas powered fleet is nearing the end of its operational life with some 30% of current gas fired stations (8GW/27GW) due to close down by 2030.[21] A large swathe of the existing nuclear fleet is also already receiving regular, time limited, extensions to the original planned lifetime of the plants.[22] Imports of electricity are intrinsically unreliable and can be expensive during emergency peaks in demand, especially if any shortage is continent wide.[23] The imminent changes in the UK electricity generation sector mean that the UK will soon be reliant on wind and solar power for the bulk of its electricity generation.

The policy decision to focus on renewable generation carries with it a significant but well known problem, however, which is that wind and solar power are intermittent. Importantly, 'zero-wind' periods, or even just low wind periods, can last for many days at a time - far exceeding what can be effectively stored in batteries or equivalent technology. Parliament has imposed a statutory obligation on the UK to achieve net zero by 2050.[24] This will require a rapid reduction in fossil fuel power generation in the coming years. The only realistic low-carbon backup dispatchable power generation option that can cover such 'zero-wind' periods and is even potentially available in the short-medium term, at scale, is civil nuclear power.[25] Increasing the supply of electricity from nuclear power on a reasonable timescale would require regulatory reform that materially shortens the current time scale for the construction of nuclear power plants in the UK. The urgency of that necessary reform underpins this paper.

Expediting civil nuclear power

The increasingly burdensome regulation of traditional nuclear power plant construction in the UK means building civil nuclear power plants is currently very expensive. HPC is mooted to cost £46bn and SZC has been estimated to cost in the region of £38bn in 2024 prices, or £65-80bn in real terms.[26] Without significant regulatory reform, it is difficult

18. The astonishing energy density and sheer volume of available fuel in the world arguably even qualifies nuclear fuel as 'renewable', particularly given the constraints on the supply of essential rare earths needed for orthodox renewable power generation.
19. David Mackay, *Sustainable energy without the hot air* (UIT Cambridge: 2009), 166. J Storrs Hall, *Where is my flying car* (Stripe Press: 2021), 161.
20. https://carboncredits.com/ais-energy-hunger-is-straining-americas-power-grids-and-your-home-appliances.
21. Above, n 7.
22. https://www.edfenergy.com/media-centre/edf-confirms-boost-uks-clean-power-targets-nuclear-life-extensions, 4 December 2024.
23. https://montel.energy/commentary/lessons-from-the-recent-gb-market-crunch, 15 January 2025 'the run extensions drove prices in the balancing mechanism to as high as GBP 5,750/MWh at one plant.'. https://watt-logic.com/2025/01/09/blackouts-near-miss-in-tighest-day-in-gb-electricity-market-since-2011, 9 January 2025.
24. Climate Change Act 2008 as amended by the Climate Change Act 2008 (2050 Target Amendment) Order 2019/1056. s 1(1) It is the duty of the Secretary of State to ensure that the net UK carbon account for the year 2050 is at least 100% lower than the 1990 baseline.
25. Dispatchable means a power source that can increased or decreased by the system operator. Non-dispatchable sources are dependent on external factors such as wind strength and speed or sunlight.
26. https://www.ft.com/content/5f54592e-50ba-4a1e-8219-7a4eb01f74ed

to see how this level of expenditure will reduce significantly for future traditional nuclear power plants given government insistence on local sourcing of materials and expertise, coupled with the current onerous regulatory regime. SMRs are hoped to be cheaper to build, especially repetitively, but are currently only at the design stage. Next generation AMR nuclear power is many years from commercial deployment.

These costs and delays are in large part the result of the panoply of nested legal and other regulation both in terms of direct nuclear regulation but also environmental and other ancillary regulatory requirements. It is important to disaggregate these two pathways, particularly as it may be considerably easier to expedite the processes in relation to environmental regulation than nuclear regulation.[27] Nonetheless, some of the more extreme nuclear regulatory requirements are questionable in an area with little seismic risk and where a major land mass sits between the exposed coast and the Atlantic Ocean. In relation to non-nuclear regulation, complex and detailed provisions in relation to environment and habitats provide ample opportunities for judicial review, and just as importantly, defensive and expensive decision-making by constructors and others aimed at *avoiding* judicial review.[28] This paper proposes two connected solutions to the twin difficulties of nuclear and non-nuclear regulation.

The first is to deploy a modern variant of the solution used by the Victorians to push through an enormous volume of rail construction in the teeth of considerable and widespread local opposition in the 19th Century. Their solution was to make extensive use of Private Acts of Parliament. In the modern era, Hybrid Acts have also developed that retain important features of Private Acts but are still fundamentally public Acts. The deployment of Private and Hybrid Acts of Parliament could solve some of the delays in nuclear power plant construction, for example through the grant of development consent orders that cannot be judicially reviewed.

The second proposed solution to the inordinate delays in nuclear power plant construction is the creation of a new Tribunal called the Nuclear Appeal Tribunal ('NAT'). The NAT would be mandated to provide decisions far more quickly than is currently possible in traditional judicial review. In addition, the Act setting up this novel tribunal would be designed to take advantage of recent significant developments in judicial review in the UK which have established that, with appropriate and careful statutory drafting, it is now theoretically possible to prevent time consuming appeals to the ordinary courts against tribunal decisions, as long as the tribunal is judicial in nature - as the NAT would be.

The paper suggests a number of areas where the two proposed reforms could have a material impact on the pace of civil nuclear construction in the UK. The first area is the existing traditional nuclear power sector. There exists the potential for expediting the rollout of further domestically approved large and small scale nuclear reactors – these are currently the only types of nuclear power in prospect or already under construction. The second potential area is reactor designs that have been approved by nuclear regulators in certain approved countries with a trusted and proven

27. Although it must be noted that the Generic Design Assessment process encompasses some non-nuclear elements, particularly in the third stage.

28. Sam Guy, 'Putting the Brakes on Infrastructure? Judicial Review Challenges to HS2 and the Critique of 'Litigant Power', (2025) 20 *Oxford Journal of Legal Studies*, 1.

regulatory record. The third potential area is the possibility of expedited approval and rollout of inherently safe next generation, advanced, nuclear power, which has the potential to provide all the electricity, indeed energy, needs of the country for centuries to come at low or even zero cost.

The Looming Electricity Supply Crunch

Section summary

- The UK has phased out coal (the final plant closed in 2024) and continues to rely on gas for a significant proportion of electricity supply, with a maximum fossil fuel capacity of **36 GW**.
- Total available generation currently peaks at about **72 GW** (including renewables and imports), against a winter peak demand of **~47 GW**.
- Fresh peaks in electricity levels from renewables were achieved in 2024 — **22 GW** from wind and **14 GW** from solar — but their intermittency creates risks during so-called *Dunkelflaute* (zero-wind) periods.
- Gas and nuclear plants that provide critical balancing and 'inertia' effects are ageing, while large-scale storage (e.g., hydrogen) remains years, maybe decades, from deployment.
- Peak demand is forecast to rise to **~74 GW by 2030**, **up to 106 GW by 2035**, and potentially up to **191 GW by 2050**, far exceeding current baseload capacity.
- Without timely investment in dispatchable backup, storage, and transmission, the UK **could face periods where there are insufficient power supplies** during future high-demand periods.

Current UK electricity generation capacity

'Dunkelflaute' is one of those charming German words that has no easy translation in the English language. It roughly means 'dark wind lull' and refers to a long period of very low or even zero wind, most particularly in the winter evenings. As anyone familiar with the domestic energy market knows, winter evenings are when the UK experiences peak annual demand. Other parts of the world experience demand peaks at different times of day. California, for example, experiences peak demand during the day in mid-summer due to the demand for air conditioning in homes and offices. The problem for the UK is that these unpredictable but inevitable 'zero-wind' evening periods in winter constitute a material and ongoing risk to a UK electricity generation system that is rapidly transitioning to a primarily solar and wind-based model.

It is a little-known fact that the UK generated a third of its electricity from coal as recently as 2012.[29] The final coal powered plant at Ratcliffe-on-Soar closed in September 2024.[30] In terms of other fossil fuel generation, the current gas-powered fleet produces just under a third of the electricity the UK uses annually.[31] The maximum capacity that fossil fuels can provide at any particular time is currently 36 GW.[32] Peak demand in winter tops out at around 47 GW currently.[33] That peak demand is met by the 36 GW of domestic non-renewables capacity plus solar and wind power as well as up to 10 GW of imports. Total domestic capacity in 2024 was 72GW.[34] This means current maximum capacity comfortably exceeds current demand even before imports, as long as the wind is blowing or the sun is shining. The system operates such that gas generated supply functions as the marginal or balancing source if total demand exceeds what is available from the other sources.

The current gas fleet was mostly built in the 1990s and 2000s with a projected life span of 25-30 years. Some of this capacity is reaching the end of its natural life.[35] Concerns have been expressed as to the disincentives on the gas power industry to build fresh capacity in the light of the statutory net zero obligation which could leave new stations becoming 'stranded assets' over time.[36] The government has set an ambitious target that the country will use gas generated electricity no more than 5% of the time by 2030.[37] This would leave the backup gas fleet standing idle 95% of the time – making economical operations somewhat challenging. It is clear, however, that gas will play a role for many years to come because it is a power source that has important advantages over other electricity generators.

The main advantage is its flexibility. Gas powered stations are 'dispatchable', which means that they can supply variable amounts of power at will. This makes gas plants extremely valuable at a systemic level because as electricity demand fluctuates at the margin, gas plants can respond in a timely manner so that supply always matches demand. This facility is a critical and sometimes overlooked aspect of the systemic supply of electricity. This feature of gas power plants means that electricity supply sources are not fully interchangeable in the way that they used to be historically. Relevant supply management is inevitably becoming increasingly sophisticated as a result because some gigawatts are more useful than others to the system and this is increasingly reflected in operational planning assumptions at the highest level.

Governments of all stripes have demonstrated a strong commitment in recent years to wind and solar power as the primary sources of renewable electricity for the UK in future. The subsidised construction of onshore and offshore wind farms has accelerated in recent years.[38] Solar and wind power lack flexibility because they provide direct rather than alternating current and they are not dispatchable. This means that there is a pragmatic limit on the maximum systemic contribution that can be made by renewables, requiring a significant balancing generation mechanism to make the system function effectively.[39] In the modern system, therefore,

29. https://www.theguardian.com/environment/2013/jul/25/coal-one-third-uk-energy.
30. https://assets.publishing.service.gov.uk/media/688a28656478525675739051/DUKES_2025_Chapter_5.pdf.
31. *ibid*.
32. https://www.gov.uk/government/statistics/electricity-chapter-5-digest-of-united-kingdom-energy-statistics-dukes, Table 5.7
33. *ibid*.
34. *ibid*. Non-renewables capacity includes sources such as bioenergy and waste, hydro, nuclear and fossil fuels. This total assumes zero plant closures for maintenance or repair.
35. Above, n 7. https://watt-logic.com/2025/11/14/ccgt-retirement-risk.
36. https://www.theguardian.com/environment/2024/mar/12/what-does-sunaks-plan-for-new-gas-plants-mean-for-uk-climate-targets.
37. https://www.gov.uk/government/publications/clean-power-2030-action-plan, 9 and 30.
38. https://www.solarpowerportal.co.uk/solar-pv/renewable-power-generation-breaks-records-in-uk-curtailment-increasingly-costly.
39. https://watt-logic.com/2025/05/30/high-wind-and-forecasting-errors-cause-havoc-on-the-gb-grid/.

not all gigawatts are of equal value to the grid. The fact that wind and solar generate direct current rather than alternating current also creates further difficulties. This feature places practical limits on the proportion of the grid that can be supplied from these sources because direct current generated by wind and solar sits in tension with a system fundamentally based on alternating current.[40] The conversion from direct to alternating current is not merely a bottleneck but a source of complexity that demands constant balancing and sophisticated control, essential to prevent instability across the grid.[41]

There is also a further difficulty called 'system inertia'. Inertia refers to the natural resistance of a power system to sudden changes. Traditional electricity generation sources have high inertia because their large spinning turbines store kinetic energy, meaning they cannot speed up or slow down instantly. This inherent stability helps the grid absorb short-term disturbances. Problems emerge when a system has an increasing percentage of renewables sources which have intrinsically low inertia and supply direct current. Difficulties can be caused by rapid alterations in supply such as clouds crossing in front of the sun, or sudden changes in wind speed.[42] These quicksilver changes require robust and effective systemic management and constitute a further reason why there must be significant contributions to a grid fundamentally based on alternating current from plants that generate such current. Alternating current is the default electricity type generated by fossil fuel power plants, so there is an irreducible minimum of alternating current that must be supplied at grid level by nuclear or other sources capable of supplying significant amounts of alternating rather than direct current. If those sources are not nuclear, then it may be that coal or gas supply will have to be reintroduced by force of circumstances.

Electricity supply constraints

The limits of current electricity generation resources were tested on 8 January 2025 when a Dunkelflaute period occurred that caused the National Grid to issue a formal 'Electricity Margin Notice' and a 'Capacity Margin Notice' in order to 'inform the market' of the tightness of electricity supply generation.[43] This zero-wind period coincided with peak demand of around 43GW.[44] A blackout was narrowly avoided on that occasion,[45] but the incident might be thought to serve as a warning of the vulnerabilities *already* faced by the system - never mind future challenges as the existing gas and nuclear fleets are wound down and electricity demand increases in the years to come.

Wind power in 2024 reached a new record supply of 22 GW.[46] Solar power also hit a new record, supplying a maximum of 14 GW in 2024.[47] Given the intermittency problem, there are nascent plans to try to store electricity to match the inevitable peaks and troughs in renewable supply. These plans, however, rely on technology such as hydrogen that is many years away from delivery.[48] Hydro-power storage in the UK is limited.[49] A Royal Society report published in 2023 by Chris Llewellyn-

40. https://watt-logic.com/2025/07/16/voltage-inertia-and-the-iberian-blackout-part-1-the-theory/.

41. https://watt-logic.com/2025/10/24/ghosts-on-the-grid-vars. https://watt-logic.com/2025/10/24/location-location-location-managing-voltage-in-weak-grid.

42. https://watt-logic.com/2025/05/09/the-iberian-blackout-shows-the-dangers-of-operating-power-grids-with-low-inertia/. https://watt-logic.com/2025/06/18/should-neso-be-allowed-to-lower-its-minimum-inertia-requirement/.

43. https://www.neso.energy/news/what-happened-margins-8-january. https://news.sky.com/story/power-grid-operator-scrambles-to-avert-blackout-threat-13285474. https://www.newcivilengineer.com/latest/blackout-prevention-system-activated-for-third-time-this-winter-09-01-2025/.

44. Not all plants are operational at all times due to maintenance and repair.

45. https://watt-logic.com/2025/01/09/blackouts-near-miss-in-tighest-day-in-gb-electricity-market-since-2011/.

46. National Energy System Operator made this announcement on Twitter/X, 16 December 2024: https://x.com/neso_energy/status/1868687730190033001.

47. https://www.solarpowerportal.co.uk/solar-installations/uk-solar-generation-record-levels-ember.

48. House of Lords Science and Technology Committee: 1st Report of Session 2023–24, HL Paper 68: 'Long-duration energy storage: get on with it'. https://publications.parliament.uk/pa/ld5804/ldselect/ldsctech/68/68.pdf.

49. DUKES Table 5.7, n 32, above,

Smith pointed out that a very considerable amount of storage would be required to underpin a renewables-based system that was 'far more than could conceivably be provided by conventional batteries'.[50] Llewellyn-Smith proposed the construction of a national hydrogen based system as the alternative, even though his suggested long term large scale backup hydrogen powered electricity system would sit idle for long periods.[51]

The elephant in the room, of course, is the potential for one or more extended Dunkelflaute events to occur during peak demand in the early winter evenings in the years to come. If maximum non-renewable capacity is currently 45 GW, and peak demand is projected by the government to increase to 74 GW by 2030 (never mind the projections for 2035), a zero-wind period in winter might well mean that even for just a short period, domestic capacity plus imports would be insufficient to meet that demand.[52] There might be considerable political fallout if this scenario were to come to pass, not least as what is euphemistically termed as 'demand management' was then enforced on the general public and industry out of sheer necessity. These concerning possibilities of course rest on the assumption that the anticipated rapid growth in electricity demand in fact materialises.

Electricity demand increases

Peak UK electricity demand is predicted to rise considerably in future years. In a formal answer given in 2024 in Parliament, the last government forecast that peak demand is likely to be around 74 GW by 2030, rising to between 94-106 GW by 2035, between 105-139GW by 2040 and 131-191 GW by 2050.[53] As we have seen, peak demand is currently around 47GW. The urgent provision of extra renewable supply currently being implemented is designed to meet the increase in demand predicted to occur by 2030. Looking further ahead, it is difficult to see how the ongoing sprint for wind can meet the anticipated peak demand by 2035 at current rates.

These difficulties are compounded by the fact that most of new onshore and offshore wind is located in areas of the country that are considerable distances from where the electricity is needed. This means that significant electricity infrastructure must be constructed, urgently, to transfer the electricity from sources to users. This infrastructure requires planning permission across long distances, which adds uncertainty to the projects and may result in incurring costly curtailment payments which fall due where wind generators are paid not to produce power because the system cannot absorb it either through lack of infrastructure or lack of demand.

It follows, therefore, that there is an urgent need to increase the volume of electricity generated by nuclear power, not just as a fallback to support current renewable power generation during intermittency but also due to the important ancillary benefit that nuclear plants produce alternating rather than direct current and have significant inertia. Nuclear power is a long-term, stable and firm source of baseload, low carbon electricity and is an essential element in the ongoing mix of sources of future power generation.

50. https://royalsociety.org/-/media/policy/projects/large-scale-electricity-storage/Large-scale-electricity-storage-report.pdf https://committees.parliament.uk/committee/193/science-and-technology-committee/news/200345/government-must-act-now-on-energy-storage-or-risk-energy-security-and-net-zero/. For a critique see: https://davidturver.substack.com/p/royal-society-large-electricity-storage-report.

51. *ibid.*

52. The announcement on 2 September of a further extension of one year for two existing nuclear power stations (Heysham I and Hartlepool) to March 2028 is obviously welcome news in this context: https://www.edfenergy.com/media-centre/two-uk-nuclear-plants-generate-longer-supporting-energy-security. Four others were extended to 2030 in December last year: https://www.edfenergy.com/media-centre/edf-confirms-boost-uks-clean-power-targets-nuclear-life-extensions.

53. Written answer, n 8, above.

Global Regulation of Civil Nuclear Power

Section summary

- Nuclear power construction is heavily burdened by increasingly complex international safety regulation, creating cost and time overruns for new projects such as Hinkley Point C.
- The "As Low As Reasonably Practicable" ('ALARP') principle and its US equivalent ALARA drive safety measures that must be implemented even when costs are up to 10× higher than the putative benefit.
- Regulatory ratcheting—through shared international 'best practice'—has produced diminishing returns on safety but sharply rising costs and delays.
- The Linear No Threshold ('LNT') model assumes any radiation exposure carries risk; critics argue it exaggerates low-dose effects and leads to excessively tight UK exposure limits (1 mSv/year for the public, 20 mSv/year for workers at operational power stations).
- Examples of minimal-risk measures (e.g. duct filters reducing exposure by 0.0001 mSv/year, equivalent to eating a banana) arguably illustrate potential regulatory overreach.
- The US has begun reassessing LNT and ALARA under a 2025 Executive Order, potentially influencing future UK–US regulatory alignment.
- The UK's Office for Nuclear Regulation ('ONR') operates independently under the Energy Act 2013, reporting to the Department for Work and Pensions rather than the Department for Energy Security and Net Zero to avoid policy pressure—but this independence contributes to a one-way 'regulatory ratchet'.
- The paper distinguishes between 'absolutist' regulation (pursuing zero risk regardless of cost) and 'dynamic' regulation (balancing marginal safety improvements with economic viability).
- It proposes creating a Nuclear Appeal Tribunal ('NAT') to mediate between safety and economic considerations, ensuring rapid, transparent resolution of disputes.

Nuclear power plants are heavily regulated globally. A culture has developed in virtually all nuclear regulators across the world of sharing

and implementing changes made to one regulatory regime across other regimes. This creates a steadily increasing one-way regulatory ratchet that inevitably increases costs and delays in the construction of new projects. In many ways, of course, the sharing of best available techniques is positive, particularly in the light of lessons learned and shared from the tiny number of radiation release events.

It is of course essential that the risks from radiation are taken seriously and appropriate safety measures are consistently and reliably implemented. The current regulatory regime, however, has arguably resulted in the imposition of some measures at the margin that are of doubtful utility when weighed against the time taken and difficulties incurred in complying with them. The effects can be observed in the delays in building new nuclear plants, and not just in the UK. The increasing multi-layered complexity imposed on constructors has several causes but many of the onerous effects can be ascribed to a few key nuclear regulatory principles and their ripple effects.

As Low as Reasonably Practicable

One critically important core regulatory principle is the insistence that radiation risk should be rendered 'as low as reasonably practicable', sometimes also cited as needing to be 'as low as reasonably achievable' in USA literature.[54] The origin of the British version of this concept in the UK can be traced back to *Edwards v National Coal Board*.[55] The case turned on the interpretation of s 49, Coal Mines Act, 1911, which required that the 'roof and sides of every travelling road and working place shall be made secure'. A collapse of the side of a road, for which the Coal Board were responsible, caused a 'collier timberman' to be killed.[56]

The Board argued that s 102 provided them with a defence where it was 'not reasonably practicable to avoid or prevent the breach'. The Court of Appeal overturned the original judge and held that the Coal Board were liable. Lord Justice Asquith (as he then was) held that 'reasonably practicable' is a narrower term than 'physically possible' but 'if it be shown that there is a gross disproportion between them - the risk being insignificant in relation to the sacrifice - the defendants discharge the onus on them'.[57] The ALARP principle was adopted in the Health and Safety at Work Act 1974, and coupled with the concept of 'grossly disproportionate', has been transported to the core of nuclear safety regulation.

The practical meaning of the concept of 'grossly disproportionate' for the purposes of weighing up whether a particular safety measure must be imposed is shrouded in some mystery. The Office for Nuclear Regulation ('ONR') now formally rely on a definition given by a former Chief Inspector in his evidence to an Inquiry some years ago.[58] In their formal Technical Assessment Guide, they sum up his submission to the Inquiry.

In his evidence, Locke suggested a gross disproportion factor of up to three for workers. For risks to the public, he added that the factor would depend on the level of risk, and where the risks were low (consequence and likelihood) a factor of about two was suggested, whereas for higher

54. Devanney, n 2, above, 271.
55. [1949] 1 KB 704.
56. *ibid*.
57. *Ibid*, 712.
58. Office of Nuclear Regulation Technical Assessment Guide, '[Title]

risks the factor should be about ten.[59]

In practical terms this means that for any system feature whose failure could lead to a radiation release, the cost of remedying that feature is not just weighed against the benefit - if the cost is up to *ten times* as great as any putative benefit, it is still imposed on the plant constructor. This happened at HPC where, for example, massive expense and delays were incurred by the insistence on installing a third, separate and analogue software system that required new corridors to be built to accommodate the cables, discussed further below.

Jack Devanney paints a bleak picture of the ALARA principle in the United States.[60] He argues that ALARA gave an 'explicit mandate to the regulators to raise cost to whatever the applicant can afford'.[61] The ALARA policy was formally adopted in 1975. Devanney alleges that the cost of the safety measures in any construction would 'rise to whatever the competition's cost was'.[62]

> *"And the criteria is not whether the benefit of further reduction outweighs the cost. The criteria is: can you afford the reduction?"*

Devanney explains the effect of the oil price shock in the 1970s on both the coal and nuclear industries, both of which responded to the more profitable environment by scaling up as fast as they could. The effect of this was that previous long term resistance by the nuclear industry to costly and complex regulatory burdens collapsed as the urgency to build trumped the objections. The problem was that when there was an overshoot in generation capacity and consequential price drops, the coal industry was able to adapt but nuclear 'was left stranded with top of the boom costs' in terms of onerous regulatory burdens.

> *"Nuclear power with its 500,000 to 1 advantage in energy intensity is not inherently expensive. It is inherently cheap. So cheap that when it was barely starting down a steep learning curve, it was competitive with coal and oil when they were as cheap as they ever were. Unfortunately… competitive pressures disappeared producing regulatory bloat from which nuclear power has never recovered."*[63]

One example of inappropriate regulatory requirements is the Double-Ended-Guillotine-Break ('DEGB'). Nuclear power stations have considerable pipework at the core of their design. Many of those pipes are critically important in controlling the temperature of the station and in particular the 'primary loop piping' that supplies the coolant for the core nuclear reactor.[64] These sections are thus subject to the most stringent safety scrutiny and measures.

The risk of a DEGB generates a regulatory requirement that the plant and its operators can cope with a hypothetical instantaneous evaporation of a primary loop pipe in two places. If this happened to a coolant pipe, the reactor would heat up very quickly indeed. Automatic and very high-speed measures would be required in terms of inserting radiation absorbing rods to control the reaction as well as rapid alternative cooling mechanisms

59. *ibid*.
60. Devanney, n 2, above, 271.
61. *ibid*.
62. *ibid*.
63. *ibid*, 272.
64. *ibid*, 269.

including water pumped by diesel engines that are on permanent standby as well as other measures.

The problem with these measures is that we 'can't simulate instantaneous double ended breaks because things don't break that way'.[65]

> *"Designing to handle this impossible casualty imposed very severe requirements on pipe whip restraints, spray shields, sizing of Emergency Core Cooling Systems, emergency diesel start up times (11 seconds to load), etc, requirements so severe that it pushed the designers into using developmental, unrobust technology."*

In other words, the ratcheting regulatory requirements risk causing, in some areas, a situation where the cure is worse than the putative disease. This is because the level of engineering risk, complexity and increasing points of failure ironically risk making the plant as a whole *less* safe. Pipes do not shear in this way. They may leak, they may even break in predictable ways, but the regulatory requirements imposed in differing systems across the world, including the USA, now directly impact on the inordinate cost, complexity and delays facing current manufacturers of nuclear plants in the UK.

When coupled with a well-intentioned desire to implement international 'best available techniques', it is not difficult to see why spiralling costs can ensue. This is before even mentioning, for example, the imposition of extensive measures designed to protect against seismic risk in areas of the world such as the UK where such risk is nugatory. The second of the two remedial measures suggested in this paper may provide future opportunities to interrogate some of the more extreme elements of the current regulatory regime in appropriate areas. It is important to repeat that this paper is not primarily focused on the intricacies of particular regulations in the UK, rather it is aimed at reducing some of the ancillary obstacles that impede the approval and construction of nuclear power generating plants.

Linear No Threshold

LNT can be summarised in three propositions:

- Cell damage is linear in the dose as measured in millisieverts.
- All that counts is the accumulated dose over time. Dose rate is irrelevant.
- Mortality and disease including cancer are linear in the amount of cell damage.[66]

The recently constituted Nuclear Regulatory Taskforce ('the Taskforce') have issued an interim report that expressly highlights the fact that there is some controversy over the validity of the orthodox LNT model for radiation exposure.

> *"[LNT] assumes stochastic risk increases linearly with dose and that no level of exposure is entirely risk-free. Some critics have stated that this model overestimates the risks at low doses and are challenging its use."*[67]

65. Devanney credits Tom Rockwell for this point.
66. Devanney, n 2, 76.
67. https://www.gov.uk/government/publications/nuclear-regulatory-taskforce/nuclear-regulatory-taskforce-interim-report.

The taskforce report is careful to endorse the orthodox position that there is no safe dose of radiation, no matter how minimal, and that any damage caused by radiation is cumulative and impossible to repair. This implicitly denies the countering claim that the human body has effective repair mechanisms for low or ordinary levels of exposure which can be upregulated if exposure increases– indeed many people live in parts of the world with significant levels of natural radiation.[68] The Taskforce are clearly cognisant of the controversy over LNT theory.

> *"Without moving away from LNT, there are questions about its application in the UK. In some areas, the dose constraints agreed internationally are already conservative in terms of harm, and some regulatory targets, such as in some of ONR's BSOs, are even lower."*[69]

It is perhaps worth noting that the International Commission on Radiological Protection (ICRP) dose rate limit for the general public was 2 mSv *per day* until 1951.[70] Standing at 10% or less of provably dangerous dosages, such a limit is very substantially below the levels where there is provable evidence of correlated harm. For comparison, a chest and abdominal CT scan or a coronary CT angiogram exposes patients to 15 mSv.[71]

Public Health England estimates that in the UK 'on average people are exposed to about 2.7 millisieverts (mSv) per year… from a number of sources'.[72] These include transatlantic flights (0.08mSv), 100g of Brazil nuts (0.01mSv) and dental X-rays (0.005 mSv).[73] Workers at nuclear power stations are exposed to 0.18mSv annually.[74] People in the USA on average are exposed to 6.2mSv annually, and similar levels are seen for those living in Cornwall.[75] Schedule 3 of the Ionising Radiations Regulations 2017, details the limits on domestic exposure, requiring that workers at nuclear power stations be exposed to a maximum of 20mSv *per year*.[76] For ordinary people, the limit on exposure is 1mSv per calendar year (over and above natural levels).[77] These tight regulatory obligations clearly reflect official commitment to the LNT approach to radiation exposure. These extremely strict limits can give rise to some striking examples of measures imposed which have only marginal effects on exposure to workers or others.

An example that has been reported recently was when the ONR required a design submitted by Hitachi GE Nuclear Energy ('Hitachi') to install filters on ventilation and other ducts in the design.[78] Alex Chalmers has criticised this decision, drawing on the company's claim that the effect of installing the filters would be to reduce worker exposure by 0.0001mSv per year, roughly the equivalent of the exposure caused by eating a banana.[79] The ONR issued a 'clarification' in response to this criticism in a press release entitled 'Our assessment was not bananas!'.[80] They argued that the 'impact on radiation exposure of the design change … was not the only justification for proposing these design changes.[81] They also claimed that the decision was in fact made by 'Hitachi-GE Nuclear Energy and its UK consultants' after they 'undertook their own review of the proposed reactor's Heating, Ventilation, and Air Conditioning (HVAC) systems',

68. L E Feinendegen, 'Evidence for beneficial low level radiation effects and radiation hormesis', 2005, https://pubmed.ncbi.nlm.nih.gov/15673519. Calabrese, E. J., & Baldwin, L. A. (2003). 'Toxicology rethinks its central belief — Hormesis demands a reappraisal of the way risks are assessed'. *Nature*, 421(6924), 691–692.
69. Interim Taskforce Report, n 67, above. ONR's BSOs are Basic Safety Objectives set by the Office of Nuclear Regulation.
70. Devanney, n 2, 282.
71. U.S. FDA, Center [sic] for Devices and Radiological Health. (2023). 'What are the Radiation Risks from CT?', https://www.fda.gov/radiation-emitting-products/medical-x-ray-imaging/what-are-radiation-risks-ct.
72. https://www.gov.uk/government/publications/ionising-radiation-dose-comparisons/ionising-radiation-dose-comparisons
73. *ibid.*
74. *ibid.*
75. *ibid.*
76. https://www.legislation.gov.uk/uksi/2017/1075/schedule/3, Schedule, Part 1, s 1.
77. *ibid.* s 5. https://www.hitachi-hgne.co.jp/en
78. Alex Chalmers, https://worksinprogress.co/issue/the-bad-science-behind-expensive-nuclear/
79. *ibid.*
80. https://www.onr.org.uk/news/all-news/2025/07/our-assessment-was-not-bananas
81. *ibid.*

rather than being imposed by the ONR.[82] Nevertheless, this story is illustrative of just how strict are the constraints on exposure to radiation in the UK.[83]

In September, the UK and the US signed a nuclear deal with the aim of increasing regulatory cooperation between the two nations to facilitate the construction of new nuclear plants.[84] In this context, it is relevant that early this year, the US Nuclear Regulatory Commission (NRC) was instructed to reconsider its use of the LNT and ALARA principles:

> *"the NRC shall reconsider reliance on the linear no-threshold (LNT) model for radiation exposure and the "as low as reasonably achievable" standard, which is predicated on LNT."*[85]

Absolutist versus dynamic regulation

The ONR is rightly proud of having secured a hard-won reputation for the congruence of its processes with International Atomic Energy Agency ('IAEA') Safety Standards for the design and construction of nuclear power plants, applying 'relevant good practice'.[86] The policies developed and applied by the ONR are set out in detail on their website and their authority is underpinned by the status conferred on them by the Energy Act 2013 - s 79(1) authorises the ONR to issue, revise or withdraw a code of practice. The ONR was established under s 77(1) as a body corporate, with responsibility under s 68 for 'protecting persons against risks of harm from ionising radiation from GB nuclear sites', inter alia. The ONR was originally created in 2011, replacing the Nuclear Installations Inspectorate.[87]

The ONR reports to the government who must lay a report to Parliament at the end of each financial year. Accountability for some of the ONR's statutory responsibilities set out above is shared with Department of Energy Security and Net Zero ('DESNZ') but ultimate responsibility for the ONR resides in the Department for Work and Pensions, rather than DESNZ.[88] This may seem puzzling, but it reflects a fundamental philosophical approach underpinning the regulation of nuclear power in the UK. The reason the ONR reports to a department other than DESNZ is that this reporting structure is supposed to prevent pressure being placed on the ONR by DESNZ to relax its commitment to ALARP, the IAEA Safety Standards and such like. This is designed to ensure the independence of the ONR.

Nuclear regulation has not always operated in this way. Jack Devanney details how early regulation of the nuclear industry in the USA recognised that there was an inherent and unavoidable tension between appropriate levels of safety regulation and suffocating a nascent industry in a highly competitive market where coal and oil were as cheap as they have ever been. In those days, he points out, nuclear regulators were engaged in a 'tug of war', because 'regulatory costs were… strongly resisted' due to the 'life or death competition' but, even more interestingly, the regulator 'was caught between its promotional function and its regulatory function'.[89]

82. *ibid.*
83. See further, NIA submission to the Interim Nuclear Taskforce.
84. Department for Energy and Net Zero, September 2025, Link
85. Executive Order 14300, May 2025, Link .
86. ONR, Nuclear Safety TAGs, above, Section 4, also including the Western Europe Nuclear Regulators' Association (WENRA) Safety Objectives and Safety Reference Levels.
87. Simon Taylor, *The rise and fall of nuclear power in Britain* (Bloomsbury Publishing: 2016), 138-9.
88. https://www.gov.uk/government/publications/energy-act-2013-part-3-annual-report-2023-to-2024/annual-report-to-parliament-on-the-use-of-powers-under-part-3-of-the-energy-act-2013-1-april-2023-to-31-march-2024.
89. Devanney, n 2, 269.

As we have already seen, a spike in electricity prices led to resistance to rapidly burgeoning safety requirements falling away, with disastrous effects on competitiveness when those same prices dropped back down to historic levels again.

The decision to ensure that the ONR cannot be pulled between promotion of increased nuclear power provision and safety is understandable. Unfortunately, however, this principled stance carries a high cost to society precisely because the lack of balancing forces further contributes to the one-way ratchet in regulatory burden. Worse still, there is no recourse for plant designers and manufacturers as there is no mechanism of appeal against a decision and, in any event, there are powerful commercial pressures to maintain and nurture a good relationship with the regulator over time. It makes no sense to damage that relationship on one particular issue when that could have long term consequences for future negotiations with the ONR.

There are therefore two approaches: one approach recognises the tension between cost and safety and seeks to moderate the regulatory consequences in a negotiated and dynamic manner; the other approach takes a purist and absolutist line on safety regardless of cost or wider societal effects. We might characterise the two approaches as dynamic and absolutist regulation. The former seeks to balance safety measures against increased costs including costs to society of damaging alternative to nuclear power. The latter reflects a regulatory philosophy that always strives for an ideal state of zero risk, constantly seeking upgrades and improved safety measures.

There are clear benefits that accrue where a body takes an absolutist approach, not least because such an approach will mean the regulator in question quickly acquires a strong reputation for regulatory fidelity. Such an approach would promote 'best available techniques' at all times and consistently look to adopt developments in regulation from other parts of the world. The benefits of a dynamic approach are also clear. Regulators that balance proposed increases in safety requirements against the competitive effect on an industry struggling to compete with alternative sources of power generation are likely to see a growing and successful sector and overall societal benefits of increased competition with commensurate downwards pressure on price. Society as a whole would benefit from a regulatory regime that balances perhaps some of the more extreme regulatory ideas against the need for abundant, cheap energy for the community as a whole.

The potential costs are equally obvious, and no less severe. For the absolutist approach, there is no limit to the costs the regulator will theoretically want to impose as it seeks to identify and mitigate for ever more esoteric potential scenarios that could precipitate some kind of engineering failure in some way. Negotiations with such a regulator will be fraught, if not non-existent, as constructors try to manage the effects of regulatory upgrades anywhere else in the world being elevated into regulatory best practice and perhaps necessitating costly and time-

consuming retrofitting. The potential costs of a dynamic approach include the obvious problem that a decision that acknowledges the need to balance cost and regulation could lead to a particular safety feature being absent leading, ultimately, to an increased risk of some kind of radiation release.

The UK has clearly plumped for the absolutist approach. This is notwithstanding the fact that the ONR do not explicitly place targets on constructors but operates by setting goals which the constructor has discretion in achieving. One of the primary purposes of this paper is to argue for an approach that seeks to formalise, institutionalise and regularise a version of the dynamic approach observable in the early regulatory experience in the USA. This can be achieved by creating an independent body, the Nuclear Appeal Tribunal, that is tasked, expressly, with balancing the safety goals set by the ONR against the broader economic and societal benefits that could accrue if a body existed that is empowered to make those balancing judgments. Ideally, it would be a routine and rapid procedure for either the ONR or the constructor to refer a dispute to the NAT for quick resolution, with little or no opportunity for extended further appeals.

The Regulation of Civil Nuclear Power in the UK

Summary

- In the early years, UK civil nuclear power industry was focused on developing material suitable for nuclear weapons – the focus on plutonium left the UK with ~140 tonnes of separated civil plutonium.
- Historic design choices (e.g., AGR programme) proved costly: one unit reached near full power 38 years after construction began and was unceremoniously closed down not many years later.
- Unlike other safety regimes, there is no statutory appeal against ONR licensing decisions.
- Planning permission must be considered separately from the licensing of nuclear plants
- The ONR initially withheld SZC's site licence over corporate governance issues - the site licence was granted in May 2024. Operation is not expected until mid/late 2030s.
- SMRs promise modular repeat manufacturing and quicker builds but the Rolls-Royce design remains at the design stage. Rolls-Royce is the preferred vendor in the UK.
- Financing dominates costs: interest and delay can be two thirds or more of the total cost — hence the sector's use of 'overnight cost' as an important comparative measure.
- Benchmarking: a 1–1.5 GW gas plant costs ~£500m and takes 1–2 years to build (subject to emerging supply issues). By contrast, Hinkley Point C (£46bn) and Sizewell C (£40bn) cost nearly two orders of magnitude more to produce 3.2GW each, due to planning and regulatory requirements.
- Government anticipates ~£40bn/year for the next six years on wind power build-out, plus a total of ~£100bn for transmission to reach remote wind sites.
- The Regulated Asset Base model approved in the Nuclear Energy (Financing) Act 2022 shifts finance costs onto bills during construction to cut risk premium – this has now been applied to SZC.
- Plans to build at Wylfa (Hitachi) collapsed in 2019 before RAB.

The early development of nuclear power in the UK was closely related to the military application of nuclear technology. Writing for Policy Exchange, Edward Barlow has explained that Ernest Bevin and Winston Churchill were both absolutely convinced of the urgent necessity of developing nuclear weapons domestically.[90] This was in large part due to a decision by the USA in 1946 to reduce its 'close military and scientific cooperation with the UK' when it 'abruptly stopped sharing nuclear secrets with its allies, even the UK'.[91] This decision resulted in the overwhelming focus of domestic research and development being on the production of plutonium, precisely because it had the greatest potential for military usage in nuclear weapons. The project was so single-minded, and so successful, that 'the UK presently holds the world's largest stockpile of separated civil plutonium' (around 140 tonnes).[92] This section considers the nuclear regulation regime that developed following the early pivot by the civil nuclear industry from the drive to create plutonium for military purposes to the modern emphasis on large and small scale orthodox reactors, with particular focus on the effects of those regulatory developments on the Sizewell C project, small modular reactors and a recent attempt to improve the financing of these projects.

The modern nuclear regulatory framework in the UK

Since 1965 it has been prohibited for any person to 'use a site for the purposes of installing or operating any nuclear reactor', defined as 'any plant' that produces 'atomic energy by a fission process', unless a valid 'nuclear site licence' has been granted by an 'appropriate national authority' under s 1 Nuclear Installations Act 1965 ('NIA1965'), as amended by s 17, Schedule 12, Energy Act 2013 ('EA2013').[93] Nuclear site licences under this regime were formerly granted by the Health and Safety Executive before responsibility passed to the Office for Nuclear Regulation under EA2013, which by virtue of s 26 of Schedule 12, defined an 'appropriate national authority' as the ONR for England and Wales. The ONR therefore has the sole power to grant nuclear site licences in England and Wales.

When granting a nuclear site licence, the ONR must 'attach to it such conditions' as it considers 'necessary or desirable in the interests of safety'.[94] This includes both 'safety in normal circumstances' as well as 'in the event of any accident or other emergency'.[95] The conditions may include measures relating to the 'design, siting, construction, installation, operation, modification and maintenance of any plant… on the site'.[96] Crucially, the ONR may 'at any time vary or revoke any condition for the time being attached to a nuclear site licence' and the licence as a whole 'may at any time be revoked' by the ONR.[97]

Taylor provides an illuminating and at times alarming narrative of the early years of the nuclear power industry in the UK.[98] Unfortunately, the nuclear sector was undermined by an unholy farrago of contradictory strategic objectives, including the manufacture of plutonium, and considerable political uncertainty and interference. This included a doomed attempt to create an exportable model, endless tinkering with core designs,

90. Edward Barlow, 'A Brief History of Civil Nuclear Energy in the UK', June 2025, https://policyexchange.org.uk/publication/a-brief-history-of-civil-nuclear-energy-in-the-uk.
91. Taylor, n 87, 7.
92. https://www.dalton.manchester.ac.uk/managing-uk-plutonium-stockpile/ - p22.
93. 'nuclear reactor' is defined in 26(1) Nuclear Installations Act 1965. Stephen Tromans KC explains that there was no intention to legislate in a way that affects ships operating under foreign flags in breach of international law. Tromans, *Nuclear Law*, (Oxford and Portland, Oregon: 2010), 80.
94. S 4, NIA as amended by s 19, Schedule 12, EA2013.
95. S 4(2) NIA as amended by s 19, *ibid*.
96. S 4(3) NIA, *ibid*.
97. S 4(5) NIA *ibid*, and s 5 NIA, s 20 Schedule 12 EA2013.
98. Taylor, n 87, above.

and a fateful decision to focus on gas-cooled reactors that had significant technical issues. Taylor describes the advanced gas-cooled reactor ('AGR') construction programme as 'one of the UK's most disastrous industrial decisions, and not all of that judgement is in hindsight'.[99] He quotes Henney who also described the AGR project as 'the single most disastrous engineering project in Britain' and went on to argue that the project was a 'byword for failure of construction, design and project management on a heroic scale'.[100] These claims are perhaps best evidenced by the fact that Dungeness B 'reached close to full power for the first time in 2004, 38 years after construction began'.[101] The reactors were shut down in 2018 for maintenance, never restarted and are now being decommissioned.[102] Taylor's narrative of the history illustrates the care needed when dealing with large scale infrastructure projects, lest the projects spiral out of control in terms of cost, organisation and delay.[103]

The ONR applies a detailed set of policies, set out on its website, in the discharge of its obligations under the statutory regime. It also operates within the framework of formal government policy and in particular the National Policy Statement for nuclear power generation labelled EN-6. This policy is currently being reviewed and a draft amended policy statement labelled EN-7 is currently being considered by the relevant Select Committee as part of the regulatory process set out in Part 2, Planning Act 2008.[104] EN-7 is notable for a move away from a prescribed and fixed list of nuclear sites to a more flexible approach based on relevant criteria. It also specifically includes Small Modular Reactors and Advanced Modular reactors, to 'provide quicker and more flexible deployment'.[105]

As Stephen Tromans KC sets out, s 44 Health and Safety at Work Act 1974 makes provision for 'any person who is aggrieved by a decision of an authority having power to issue licences' to appeal to the Secretary of State for refusing to issue, 'varying or refusing to vary any term, condition or restriction'.[106] In relation to nuclear site licences, however, the 1974 Act specifically denies that right of appeal. Tromans quotes the Health and Safety Executive as justifying the decision because of the 'nature of the hazard being regulated' and the 'particularly complex technical arguments'.[107] This prohibition, and some of its implications, are discussed later in this paper.

Planning permission for nationally significant infrastructure projects

In addition to regulatory barriers there are also conventional planning requirements for large infrastructure projects. It is important to differentiate between the nuclear regulatory framework and the 'complex technical arguments' in that context, and the broader regulatory planning regime governing planning permission for major infrastructure projects.[108] This means maintaining a careful distinction between the ONR's responsibility for granting a nuclear site licence under the NIA1965 as opposed to the grant of general planning permission for the site as a whole. Planning

99. Taylor, n 87, above, 16.

100. *ibid*, 18

101. *ibid*, 20

102. https://www.onr.org.uk/our-work/what-we-regulate/operational-power-stations/operational-sitesfacilites/dungeness-b.

103. "Dungeness B, Hartlepool and Heysham of the AGRs are the best example of the programme failure. Heysham II and Torness were actually built in <8 years each because they learned, restructured and reorganised projects to improve." (Industry source).

104. https://committees.parliament.uk/committee/664/energy-security-and-net-zero-committee/news/208378/call-for-evidence-on-building-nuclear-for-a-new-uk-golden-age-of-clean-energy-abundance/.

105. Draft EN-7, https://www.gov.uk/government/consultations/draft-national-policy-statement-for-nuclear-energy-generation-en-7.

106. Tromans, n 93, above, 113.

107. *ibid*.

108. *ibid*.

decisions for major projects were centralised by the Planning Act 2008 if they qualify as Nationally Significant Infrastructure Projects ('NSIPs'). Any onshore 'generating station' with a 'capacity of more than 50 megawatts' of electricity is automatically included within the NSIP category under s 15(2) Planning Act 2008. This landscape is undergoing some important changes in the forthcoming Planning and Infrastructure Bill as well as following the Energy Act 2023.

The heavy regulatory burdens placed on NSIPs in the modern planning environment are not confined to civil nuclear power. The now infamous bat tunnels that were built by HS2 Ltd at enormous cost as part of the high-speed railway development provide an interesting example of defensive and precautionary decision making that is itself an increasingly concerning phenomenon in the planning context. Natural England specifically deny being responsible for the decision to build the bat tunnel, confining themselves to noting that they had advised that the bat tunnel that was built by HS2 Ltd complied with environmental law. They insisted, nonetheless, that they had 'not required HS2 Ltd to build the reported structure'.[109] No one wants to take responsibility for the decision to build the bat tunnel.

It would seem, then, that the bat tunnel decision can be traced to perhaps overly cautious legal advice given to HS2, rather than something imposed by a regulator – a problem that has affected the development of small modular reactors as well, as we shall see below. This kind of *pre-emptive* decision making further complicates an already convoluted dynamic. Sam Dimitriu from the think tank Britain Remade has noted that the length of relevant Environmental Impact Statements has steadily increased, so that Sizewell C Limited ('SZC') 'had to produce 44,260 pages of environmental documentation'.[110] Other projects such as the Lower Thames Crossing have fared no better. Britain Remade drew attention to the 360,000 pages of the planning application in that case. The planning process in the UK alone cost more than an equivalent project in Norway needed to plan, approve and build.[111] The Lower Thames Crossing project is mooted to cost £9bn.[112]

Planning requirements for NSIPs regularly include, *inter alia*, the need to secure Habitats Regulations Assessment ('HRA') in some areas, Marine Licenses for certain high risk conservation areas, Water Abstraction licences, not to mention local planning permissions for ancillary work that falls outside the primary Development Consent Order ('DCO'). The pathway for these prerequisite approvals is through the Secretary of State not the ONR. All these aspects of planning permission are strictly separate from the application for a nuclear site licence.

Sizewell C

Sizewell C constitutes one of only two major nuclear construction projects in the UK today. It therefore is a useful illustration of the delays and difficulties that can occur under the current regulatory regime with the twin tracks of both the ONR approval of a nuclear site licence and securing planning permission from the Secretary of State for an NSIP. Generic Design

109. https://naturalengland.blog.gov.uk/2024/11/08/natural-england-role-in-high-speed-2/.
110. https://www.britainremade.co.uk/building_back_faster.
111. https://www.britainremade.co.uk/revealed_how_the_lower_thames_crossing_is_breaking_records_for_all_the_wrong_reasons.
112. *ibid*.

Assessment (GDA) approval was originally granted by then ONR for the HPC and SZC design in 2012. SZC is planned to be a duplicate of HPC to save costs and associated delays from adjusting the approved design. SZC initiated the first of multiple rounds of consultation on the project in 2012, receiving 1,300 responses and meeting 4,000 local people[113]. The second round of consultation started in late 2016, securing a further 1,000 responses. Two further rounds of consultation took place in 2019.

The application for a DCO to the Secretary of State was finally made on 27 May 2020.[114] This was amended after further 'helpful feedback' and consultation in 2020 leading to an application to make 'minor changes' to the DCO application in 2021. The government then commissioned an Examining Authority ('ExA') to consider the application.[115] ExA produced a report in early 2022. This latter report was produced remarkably quickly, by any measure. It is four volumes totalling in excess of 1500 pages, plus a draft DCO that has the heft, structure, impact and feel of an extensive Act of Parliament, even though it is in fact just a statutory instrument. It is 220 pages long, with 89 substantive sections and 23 Schedules. Its striking resemblance to an Act is an important data point, to which we will return.

ExA were strongly in favour of the application except for an issue in relation to 'potable water' supply during the construction of the reactor. This was because the 'urgent need for low-carbon electricity generating infrastructure of this type would strongly outweigh the potential adverse impacts'.[116] The potable water problem, however, led ExA to conclude that 'the case for an Order granting development consent for the application is not made out'.[117] Nonetheless, they drafted the DCO in case the Secretary of State disagreed with their recommendation and set out in Appendix E 'the permanent water supply solution' as well as suggestions on some 'unresolved HRA [Habitats Regulations Assessment] issues'.[118] The solution suggested by SZC was to rely on the statutory duty for supply to be provided by a local water company and, failing that, the construction of a desalination plant to generate the relevant potable water 'until a mains water supply… is connected'.[119] The ExA report was delivered on 22 February 2022 and the decision to grant the DCO was made on 20 July 2022.[120] It was immediately, and perhaps inevitably, judicially reviewed.

The judicial review was heard in March 2023 and Mr Justice Holgate handed down his judgment with commendable speed in June 2023. Seven grounds were pleaded but all except the first two were held to be 'totally without merit'. Both of the first two claims were rejected, somewhat less witheringly, being held to be 'unarguable'. The judge was at pains to point out that insisting on 'the supply of utilities such as water' before approval would have 'much wider implications' for 'many, if not all, developments' which would mean 'development projects would have to be delayed leading to 'sclerosis in the planning system'.[121]

The second ground, based on irrationality in relation to the treatment of relevant information, was also swiftly rejected with the judge emphasising that the Secretary of State's 'judgments cannot be faulted as irrational' – and those were the stronger claims.[122] The case is perhaps notable because

113. https://www.sizewellc.com/proposals/consultations/.

114. *R (Together against Sizewell C Limited v Secretary of State for Energy Security and Net Zero ('TASC')* [2023] EWHC 1526 (Admin), [5].

115. In effect a panel of planning experts.

116. https://national-infrastructure-consenting.planninginspectorate.gov.uk/projects/EN010012/project-updates, Volume 4, 299, [7.5.9].

117. *ibid*, 412, [10.3.1].

118. *ibid*, [10.2.23]

119. *ibid*, 21, [6.2.47].

120. *TASC* n 114, [1].

121. *ibid*, [91].

122. *ibid*, [98].

the judge held, presumably as a finding of fact after hearing evidence, that the 'public interest reasons' for the reactor included the 'continuing growth in demand for electricity, the retirement of existing generation capacity' and the 'shortfall in generation of 95GW by 2035'.[123] This stark figure is in line with government predictions discussed above, given that total predicted peak demand is in the range 94-106GW in 2035 according to the government.

The claimant pressure group appealed to the Court of Appeal, but only on the first two grounds. The hearing was in early November 2023, and the joint judgment was likewise handed down relatively quickly, being delivered in December 2023. Leave to appeal to the Supreme Court was refused in May 2024. Despite these relatively speedy appeals, the process took nearly two years to complete. If the Supreme Court had decided to hear the case, many more months would have been added to the delay.

The parallel track leading to nuclear site approval by the ONR was no less convoluted. The original application was refused in 2022 due to concerns expressed by the ONR relating to issues such as the security of land tenure and the structure of the shareholding of the Sizewell C Limited company, as well as some other points.[124] These issues may seem somewhat tenuously linked to the question of whether a nuclear site licence should be granted but at least some of these concerns must relate to the importance of ensuring that in the event of a radiation release, the corporate structures remain sufficiently robust to fund any subsequent reparatory work. Nonetheless, these issues were eventually resolved, and the site licence was granted in May 2024, close to four years after the application was made on 30 June 2020.[125] It is expected to come online in the mid-to late 2030s. From the initial GDA filing in 2008 to completion will be 20-25 years. It is fair to say that within the UK civil nuclear power sector, attention and interest has shifted to an alternative source of nuclear power which is small modular reactors, to which we now turn.

Small Modular Reactors

There is much excitement about the potential for a new type of nuclear reactor called small modular reactors ('SMRs'), even though they are sometimes not that small. These are designed to be built off site and transported to their destination for rapid assembly. The unique selling point is said to be the fact that repeat construction of an accepted design in a factory setting can smooth out the process, speeding up construction and reducing the time to completion with associated cost savings. They remain theoretical, however, at the moment with no reactors based on such designs being completed anywhere in the world so far. China is currently testing an SMR with expected operation at the end of 2026.[126]

Rolls Royce are a leading innovator in this subsector and have recently received UK government approval for their design as 'preferred bidder', with associated funding. They completed Step 2 of the GDA process in late 2024 and look likely to achieve full GDA compliance in 2026/7 with Final Investment Decision expected in 2029.[127] There have been suggestions

123. *ibid*, [9].

124. 'Proportionate reassessment of an application by Sizewell C Limited for a nuclear site licence', https://www.onr.org.uk/publications/regulatory-reports/site-specific-reports/project-assessment-reports/2024/05/sizewell-c-nuclear-site-licence-proportionate-reassessment-reports.

125. https://www.onr.org.uk/media/oeddumil/sizewell-c-22-001.pdf.

126. Cold testing of Chinese SMR completed - World Nuclear News, 16 October 2025.

127. https://www.onr.org.uk/generic-design-assessment/assessment-of-reactors/rolls-royce-smr/step-2-gda-statement-for-the-rolls-royce-smr. https://www.world-nuclear-news.org/articles/rolls-royce-smr-named-as-uks-selected-technology.

that the government was keen simply to choose Rolls Royce as a vendor, given its long history of supplying nuclear submarines to the military, but were warned that legal rules required an auction to be run, which took a significant amount of time. This advice has not been published, obviously, but might be thought to illustrate once again how far decision making in the UK is currently hampered by excessive legal caution designed to reduce perceived judicial review risk.

The Rolls Royce design suffers from being a dreaded 'First Of A Kind' ('FOAK') model with all the attendant delays and difficulties that inevitably accrue as teething problems in engineering, safety and operation are worked through. Nor is it wholly obvious that their design can properly be described as 'Small', as global regulatory norms usually limit that label to designs that are less than 300MW capacity, whereas Rolls Royce is 470MW. Furthermore, there are downsides to smaller designs precisely because of the loss of some economies of scale. There are potentially significant export opportunities, as a recent announcement by the Czechia government arguably already illustrates, although it should be noted that CEZ, the country's largest public company, bought a 20% stake in Rolls Royce.[128]

There is a commonly held view that the ONR is prone to tinkering with approved designs and there is considerable interest in the industry as to the extent to which a factory reproducing an agreed design might prevent that problem. The ONR themselves, incidentally, contest this characterisation of their previous engagement strongly, as we will see in the next section. Nonetheless, the UK is in such a difficult situation in relation to electricity demand in the medium term, that the provision of another source of nuclear energy would be a valuable addition to the energy mix. A long wait for first completion is inevitable, however, as a FOAK design. Indeed, a representative of GB Energy - Nuclear stated at a conference in late 2024 that the very earliest that electricity may be generated is 2035, 'not counting judicial reviews'.[129]

Financing barriers

The sums of money involved in the transition away from fossil fuel electricity generation to renewable alternatives are beyond eyewatering. If we consider construction on its own, leaving aside fuelling costs, a standard 1-1.5GW gas powered plant costs around £0.5bn to build, and takes 1-2 years normally, although recent global market trends now mean that there are now reports of a seven year waiting list for gas turbines.[130] Coal plants are even cheaper, which may be why one of the smaller UK political parties, the Social Democratic Party, has called for their reintroduction, along with new gas plant construction, pending a transition to large scale nuclear power construction.[131] As the current gas fleet is reaching the end of its life, the UK is embarking on a programme of replacement that is significantly more expensive to construct. The government expects to spend around £40bn per year for the next six years on wind turbine farms, not including an estimated £100bn in infrastructure costs to transport

128. https://www.world-nuclear-news.org/articles/cez-and-rolls-royce-smr-sign-temelin-early-works-agreement. https://www.world-nuclear-news.org/articles/cez-takes-rolls-royce-smr-stake-plans-to-deploy-3gw-fleet, 29 October 2024.

129. Southwest Nuclear Hub, Bristol in response to a question from the author.

130. https://www.spglobal.com/commodity-insights/en/news-research/latest-news/electric-power/052025-us-gas-fired-turbine-wait-times-as-much-as-seven-years-costs-up-sharply

131. https://sdp.org.uk/energy-abundance.

electricity from far flung wind hot spots to end users.

HPC and SZC are proving extremely expensive to construct. HPC is mooted to cost £46bn and SZC is mooted to cost £40bn, even taking into account improvements that result from the experience gained at HPC. These huge sums may help to explain why the Second Infrastructure Commission recommended that future replicas of this model should be built 'one by one' rather than concurrently.[132] Nonetheless, when compared to the sums involved in rolling out wind turbine sites, as well as the need to have a diversity of supply, the estimated nuclear plant costs at HPC and SZC may seem less extreme than when considered in isolation, particularly when the projected lifetimes are taken into account. In any event, it is clear that the government is committed to increasing the provision of nuclear-generated electricity in the coming years, despite the projected costs.

What is less well known outside of the nuclear sector is that the projects to build nuclear reactors are so enormous, and take so long, that the financing costs of the projects frequently form a very large proportion of the total costs – not least due to the interest rate levels that reflect the capital risks of such projects. The financing costs can reach two thirds or even three quarters of the total cost. As a result, the sector has developed a measure of the costs involved known as the 'overnight cost'. In simple terms, this means the costs of the construction excluding all the interest costs over time, hence 'overnight'. As anyone with even a passing knowledge of project financing will know, the compounding effects of interest on capital sums can quickly escalate and worsen the longer that completion is postponed due to litigation or other delays. Still, the acceptance of such a term as a standard metric in the industry is not a good sign.

Governments of various hues have long been fully cognisant of this serious problem, to which there is no easy solution other than materially simplifying and expediting the process of building nuclear power plants. Indeed, the issue of financing is a core driver of the urgent need to achieve that goal. Negotiations with EDF to build HPC were made considerably more fraught by the insistence of the then government that the commercial risk should be borne by EDF rather than the government. This led to a highly critical report by the Public Accounts Committee in 2017, an extremely powerful and well respected body, which accused the government of paying an extremely high, index-linked amount for a 20 year long term contract in order to persuade EDF to go ahead with the project.[133] It is notable that there was no suggestion that SZC would be funded in a similar way.

A significant innovation in financing was introduced by the then government in 2022. This is known as the Regulated Asset Base ('RAB') model and was implemented by Parliament through the Nuclear Energy (Financing)Act 2022. The details of this complicated measure are not relevant, but the Act creates a counterparty with the power to require energy providers to supplement the bills paid by consumers with a levy to cover the finance costs of particular projects subject to certain conditions.

132. https://www.nic.org.uk/publications/national-infrastructure-assessment-2018/, p 39, confirmed in the Second National Infrastructure Assessment, https://nic.org.uk/studies-reports/national-infrastructure-assessment/second-nia/, p 40.

133. https://publications.parliament.uk/pa/cm201719/cmselect/cmpubacc/393/39306.htm. £92.50/MWh (2012 prices).

The construction of SZC is to be financed by the RAB model. It is perhaps worth noting that the leading expert on the legal regulation of nuclear power, Stephen Tromans KC, has sagely pointed out that when it comes to the construction of gigawatt nuclear plants, either the consumer or the taxpayer must pay in the end.[134] This is because the sheer size, time scale and critical importance of these projects means that 'state support in one form or another' is basically unavoidable.[135]

It is no small irony that the problems that occurred during the negotiations with Hitachi over a potential nuclear plant at Wylfa in Wales broke down in 2019 precisely over the inability or refusal of the government to implement a RAB model along the lines of the measures introduced very shortly after that potential deal collapsed.[136] It might be thought that if the proposals in this paper to expedite the process are coupled with the passage of the Act introducing the regulated asset base model, Hitachi may be tempted to return. It must be noted that Hitachi successfully completed the entire GDA process with the ONR, taking many years, and were in the middle of a site licence application - so it is not as if the process would be starting from scratch.[137] Interestingly, other companies expressed an interest when Hitachi withdrew.

> *"A consortium including US construction group Bechtel and US nuclear company Westinghouse has already proposed building a new plant on the Wylfa site using Westinghouse's AP1000 reactor technology."*[138]

In addition, a South Korean manufacturer with a strong record of completing on time and on budget called KEPCO were briefly linked to the Wylfa site after Hitachi withdrew.[139] It is clear, therefore, that there is considerable scope for progress in the UK nuclear sector if sufficient and relevant long-term reassurances can be given. The problems with the nuclear sector are not technical, they are solely regulatory and financial in nature.

134. Stephen Tromans KC, 'State support for nuclear new build', Journal of World Energy Law and Business, 2019 (12), 36,

135. *ibid*.

136. https://neutronbytes.com/2020/09/18/hitachi-calls-it-quits-for-uk-wylfa-nuclear-project/. https://www.gov.uk/government/speeches/statement-on-suspension-of-work-on-thewylfa-newyddnuclear-project. https://assets.publishing.service.gov.uk/media/5f9bec-c8e90e070427e1b54a/updated-energy-and-emissions-projections-2019.pdf.

137. https://www.onr.org.uk/our-work/what-we-regulate/new-reactors/licensing-of-new-reactors/wylfa-newydd.

138. https://www.ft.com/content/3404a203-158e-4fe1-9f5d-f5fb64032ffc

139. *ibid*.

Criticisms of UK Regulation

Summary

- The UK is in the middle of a nuclear renaissance, but regulations are "gold-plated" (e.g., the infamous fish disco) and this slows delivery.
- EDF complained that ~7,000 post-approval changes added +35% more steel and +25% more concrete to HPC; ONR said in response that the GDA led to 82 EDF-proposed changes
- Some reliability concerns in the French fleet (e.g., stress-corrosion and vibration) are cited as being the rationale for UK tweaks; if UK EPRs prove more reliable, ONR's caution may be vindicated.
- The burden extends beyond nuclear regulation: planning and environment requirements can be extensive.
- Crucially, the ONR argues that many HPC/SZC design changes were driven by non-nuclear regulators (Environment Agency, HSE) and that post-2012 surprises were few in number.
- Wylfa case: there was criticism of ONR-prompted duct filters that reduce dose by "banana-scale" amounts; the ONR says the vendor chose the change during a 4.5-year GDA and for more than one reason.
- Structural issue: the ONR's incentive/legal duty is safety only; duty holders must argue "gross disproportionality," but there is no appeal to ministers available. This encourages a one-way ratchet.
- Debate over reform: some urge moving the ONR under the aegis of DESNZ and giving it a mandate to promote nuclear power; this paper instead proposes a separate appeals/review body to balance safety improvements with marginal benefits against societal/economic costs.
- International context: emerging UK–US mutual recognition aims to cut licensing process from ~3–4 years to ~2. Preserving ONR's reputation for high standards may be strategically valuable.
- The ONR has defended changes to Control & Instrumentation (third hard-wired analogue backup to avoid common-cause software failure). The ONR acknowledged ripple effects on space/cost but says issues were identified early.
- Judicial review has radically expanded in recent decades as

the system has moved toward a more open system of rules for applicants for judicial review of major infrastructure projects. Recent proposals for reform might be thought to amount to tinkering at the edges of this problem.

This section considers the impact of UK regulations on the development of domestic nuclear power plants. This section addresses three areas where regulatory decisions have delayed, and in some cases continue to delay, vital infrastructure development, particularly in the nuclear power sector. The first subsection considers claims and counterclaims about the responsibility for the slow delivery of HPC. It is suggested that in some areas, the ONR has perhaps been somewhat unfairly maligned. The second subsection considers the withdrawal from the Wylfa site by Hitachi GE Nuclear Energy, a decision that reflects less well on the ONR. The final subsection considers the seemingly inexorable growth of judicial review and recent proposals to limit its effects.

Criticisms of the HPC nuclear licensing processes

Despite the significant delays to SZC, it is clear that the UK is on the cusp of a significant nuclear renaissance. A number of GDAs have been completed, including the design that underpins HPC and SZC. The decision to treat the two reactors at Sizewell as effectively a third and fourth replica of the same design makes considerable sense, given the amount of negotiation, effort and work done to secure the approval of the HPC original GDA in 2012. This was originally based on the previous European Pressurised Reactor ('EPR') design approved in France.

In a recent detailed analysis, Britain Remade argue that the regulatory burden imposed on EDF as constructors of the reactors is 'gold-plated' and overly burdensome.[140] They are scathing about some of the requirements including the installation of acoustic fish deterrents, known as fish discos, and quote with approval a French minister who was once asked by Tony Benn how public consent had been obtained for their huge nuclear building programme and replied that 'you don't ask the frogs when you are draining the swamp'.[141]

EDF themselves have detailed their frustrations with the myriad changes imposed on their design which had been previously approved by French regulators. Stuart Crooks, then managing director of Hinkley Point C, complained that 7,000 changes were imposed on the EPR design requiring '35% more steel and 25% more concrete'.[142] These figures have resulted in widespread public and media comment, most of it highly critical and aimed at the ONR, with the implication that the changes were unnecessary or superfluous.[143]

The ONR have responded to this criticism robustly in a publication that seeks to examine the influence of regulation on the EPR design.[144] They set out the main changes that the process of securing a GDA for the EPR design underpinning HPC and SZC. The ONR insist that the process resulted in only 82 design changes being 'proposed by EDF' and that at 'the end of

140. https://www.britainremade.co.uk/cheaper-nuclear, 2.

141. *ibid*, 29.

142. https://world-nuclear-news.org/Articles/EDF-announces-Hinkley-Point-C-delay-and-big-rise-i

143. https://www.onr.org.uk/publications/regulatory-reports/other-reports/onr-s-regulatory-influence-on-the-epr-design-in-the-uk, 1.

144. *ibid*.

Step 4, 28 design changes were agreed by ONR' with 'a further 54 design changes agreed' as part of the 'GDA close-out phase'.[145] The ONR asked the company to 'identify the key groups of changes they consider are the result of ONR's regulation' and responded, fairly robustly, that those changes were 'familiar to ONR and relate to GDA (2008-2012)' except for concrete volumes.[146]

Sir Adam Ridley, a former governmental adviser on energy policy, has fought a long and lonely battle to draw the attention of UK policymakers to various problems in the French nuclear fleet design. In evidence submitted to the Business and Trade Select Committee in November 2022, for example, Ridley detailed the numerous problems with the reactor which explain why – at the time – 28 out of 56 reactors were offline in April 2022, rising to 32 in September.[147] He cites 'meticulous historical analysis' by Bernard Laponche to highlight concerns about 'stress corrosion cracking' and, in particular, 'disconcertingly high levels of vibration' in the 'reactor pressure vessel'.[148]

It may not be a coincidence, then, that the ONR response to public criticism of its regulatory decisions focuses heavily on the Reactor Pressure Vessel and the 'fracture toughness testing'.[149] Either way, it may be that the ONR has identified and is fully aware of the multiple problems that have been observed in the French fleet and that this may have resulted in many of the design changes insisted on during the GDA, and the subsequent efforts made by the ONR to improve the ability to inspect welding and other relevant work. If the HPC and SZC reactors are significantly more reliable and stable than we have seen in the French fleet, the ONR should be receiving rather more praise than censure, at least on this score. It is worth noting also that EDF in France have gone in the other direction to the UK, deciding to simplify the EPR I design in order to try to build models more efficiently and cheaply with EPR II.[150]

The ONR do not explicitly reference the experience of EDF in France in their published response to the criticism they have faced, but they are extremely clear in rebutting the widely held belief that they imposed multiple changes on EDF *after* the GDA process had been fully completed, thus piling up costs and difficulties for the constructor. In a sense, such changes would be something of an indictment for a regulator, implying that they had missed potential problems during the approval process. The ONR directly challenge such claims, arguing that the bulk of the requirements were all peripheral to the GDA and were confined to 'the nuclear island buildings' rather than the 'nuclear island raft' or other foundations' and claimed that the 'code changes' were 'not judged to have had a significant effect'.[151] The only exception to these claims was in relation to changes following the incident at Fukushima.

The original GDA was granted in 2012, before Fukushima happened. The ONR are frank in admitting that the decision to insist on raising the diesel engines to the second floor and raising 'the safeguard buildings' by two floors were in response to lessons learned from that event. They argue, however, that 'the increased volume of concrete from those changes

145. *ibid*, 5.

146. *ibid.*

147. https://committees.parliament.uk/writtenevidence/109703/default/

148. *ibid.*

149. ONR response, n 143, above, 6-7.

150. https://www.edf.fr/en/the-edf-group/producing-a-climate-friendly-energy/nuclear-energy/shaping-the-future-of-nuclear

151. ONR response, n 143, above, 19.

is estimated to be less than 2% of the total' and the 'overall percentage increase in concrete and steel… is estimated to be less than 5%'.[152] It would seem, then, that the persistent claims of multiple and significant changes imposed on EDF during the construction phase of HPC, other than following lessons from Fukushima, are denied by the ONR.

The ONR's position on the treatment of the Control and Instrumentation Architecture system is perhaps a little more difficult to follow. The main system was already duplicated within the design in case of failure, but the ONR argued that both systems used the same software and therefore there was the potential for a 'common cause failure' because 'these types of errors are hard to find, can lie hidden for a long time' and go wrong in very specific circumstances.[153] They therefore insisted on a hardwired third analogue system to back up the two digital ones. They admit that there were ripple effects of these changes on 'additional building space' but argue that the problem was 'identified early'.[154]

This particular change has been the subject of much criticism. One industry insider stated to this author that the side effects of the decision included much wider cabinets for the wiring which then breached health and safety rules about corridor widths with fairly dramatic consequences in terms of further costs and delays. Kathryn Porter has pointed to the major effects of this change and argued that the claimed advantage of resisting attacks on electronic systems by hostile powers would be dwarfed by many other problems if such an attack ever happened in reality.[155] The ONR point out that the reason that Flamanville 3 did not require the installation of an analogue back up for the control system was because it was 'at a more advanced stage of the design process, and so a different solution was pursued'.[156]

The ONR argue that the 'goal-setting' approach of UK nuclear regulation allowed EDF to 'weigh up the safety improvement… against its safety benefit' suggesting further that an applicant can 'make that argument and, if agreed by the regulators, is not required to implement it'.[157] The difficulty with that argument, of course, is the careful phrase 'if agreed by the regulators', which raises all the issues about long term relationship management, perception management and long term effects that were discussed earlier, recalling again that for nuclear regulation, there is no ability to appeal to the Secretary of State. We will return to this point further below.

Britain Remade acknowledge that the structure of the regulatory regime in the UK is not something that can be laid at the door of the ONR and that decisions made by EDF and others are in part a function of 'incentives created by the regulatory system'.[158] They make an important point, however, about the incentive structure of the ONR themselves. To some extent, it is unfair to blame the Office for Nuclear Regulation when grossly disproportionate safety features are adopted - their incentive and legal duty is to only consider safety - the responsibility to challenge recommendations on gross disproportionately rests with the duty holder.

This is an issue raised also by Jack Devanney, who was struck by a

152. *ibid*, 20-21.
153. *ibid*, 11-12.
154. *ibid*.
155. https://watt-logic.com/2025/07/20/nuclear-regulation-pragmatism-not-paralysis/
156.
157. *ibid*, 13-14.
158. Britain Remade, n 140, above, 21.

comment made by a regulator in Indonesia that their *only* concern was to apply the maximum safety standards without regard for the costs of those measures.

> *"I don't care what the problems with coal are. I'm a nuclear regulator. My job is to make nuclear power as safe as possible."*[159]

This fails to account, of course, for the wider costs of failing to reduce the damaging effects of coal and gas emissions on human health.

It might be thought odd that the ONR reports to the Department for Work and Pensions, not the Department of Energy Security and Net Zero. The policy that the ONR report to a different department is a deliberate and conscious continuing decision that is designed specifically to keep the ONR separate from the DESNZ so that they can remain completely independent from any inappropriate pressure to relax the regulatory requirements. It might also be pointed out that the recent agreement with the USA to mutual recognition in the civil nuclear power field is predicated on the current robust and uncompromising approach taken by the ONR. This is particularly important in the light of the recent news from the USA that next generation advanced nuclear reactors are to receive plutonium that is essential for their reactors.[160] Seeking to water down or alter their culture may jeopardise that new relationship.

Finally, and crucially for our purposes, it is worth noting that the ONR themselves are crystal clear that, in their view, the delays that were caused to EDF in their construction of HPC were in large part a function of *non-nuclear* regulatory issues.

> *"A number of design changes were driven by factors outside of ONR's influence, relating to aspects where the Environment Agency and the Health and Safety Executive are/were the regulatory authorities."*

This is a critically important distinction which it is important to draw out. Nuclear regulation is highly specialised and technical. Nonetheless, once a GDA is achieved, it is clear that the ONR denies that it imposes significant design changes. Indeed, the ONR expressly claim that there were few if any surprises sprung on EDF after the GDA.

> *"All the identified changes were proposed by or discussed with EDF and AREVA during GDA in the period 2008 to 2012, allowing for early consideration of cost and schedule impact…. The modifications reviewed were identified early and have remained largely unchanged since 2012, which supports this objective."*

These are startling claims. They suggest, importantly, that expediting the construction of civil nuclear power in the UK may be partly achievable by a focus on the issues that impede or delay construction that lie *outside* the nuclear regulatory field, *strictu senso*, rather than trying to tweak the nuclear regulations themselves necessarily. Primarily, this relates to the conferral of development consent orders and all that goes with that.

On the other hand, if there are areas even in the nuclear safety context

159. https://jackdevanney.substack.com/p/nuclear-is-too-expensive

160. https://www.ft.com/content/2fbbc621-405e-4a29-850c-f0079b116216. 'US offers nuclear energy companies access to weapons-grade plutonium', 21 October 2025.

that could usefully be streamlined or simplified (perhaps learning from the French experience with EPR II, *inter alia*), those might form precisely the type of issues where constructors could and should feel encouraged to seek a determination by the NAT. This new body could and should weigh up the cost benefit arguments to society as a whole of moving toward cheaper electricity and stress testing nuclear regulatory impositions that are of marginal utility, where that is the case. Clearly the views of the constructor will be valuable in the NAT's assessment, without jeopardising their reputation as committed to high standards of nuclear safety. The ONR is responsible for multiple further stages of inspection and approval during the construction process, which is why the NAT may be thought to be a valuable innovation.

Difficulties at Wylfa

It will be recalled that the difficulties at Wylfa centred around financing, culminating in the withdrawal of Hitachi GE Nuclear Energy from the project. Matters cannot have been helped by the insistence of the ONR that expensive and bulky filters be installed onto vents. The level of radiation prevented by these measures was said to be equivalent to eating a couple of bananas. This criticism, and the analogy, was originally made by Alex Chalmers from Works in Progress and referenced the 'four and a half year' process of securing regulatory approval for the Hitachi design.[161] This criticism also drew a response from the ONR who sought to place the responsibility for the changes on the constructor saying that they 'undertook their own review…and unilaterally concluded it was appropriate', pointing out also that this took place 'early on in the GDA process'.[162] The ONR went on to make a slightly opaque reference to the effect that 'this was not the only justification for proposing these design changes', without specifying what those other reasons were. They closed by explaining that they thought they 'should offer this clarification…but more importantly…please continue to enjoy your bananas!'.[163]

This response is slightly concerning. It is important to make clear immediately that this kind of engagement with external critique must be welcomed in principle. Furthermore, they are right to make clear that the process of securing a GDA took a total time of 4.5 years, and it would be seriously misleading to imply that the filter installation took 4.5 years. Nonetheless, it is confusing to claim that a decision was made by the constructor but at the same time to suggest that there were other unspecified background reasons, no doubt instigated following consultation with the ONR, that also underpinned the decision.

Finally, whilst it may be slightly churlish to quibble at the mild levity of the response, the fact remains that a multi-billion dollar investment by a major constructor in the sector was abandoned by Hitachi. This was in large part because they determined that the fiscal, regulatory and political risks, for which the ONR is at least partly responsible, were clearly too onerous to continue. This is, by any standards, an extremely disappointing outcome. In that context, such a seemingly casual or relaxed attitude to

161. https://worksinprogress.co/issue/the-bad-science-behind-expensive-nuclear/
162. https://www.onr.org.uk/news/all-news/2025/07/our-assessment-was-not-bananas.
163. *ibid.*

the disastrous outcome of the Hitachi application to build a reactor in the UK is, perhaps, less than ideal, particularly if the UK is one day forced by pressure of circumstances to go back to Hitachi and try to restore a working relationship with them in order to encourage them to reengage with the UK regulatory process again in future. These are very serious matters indeed, and the country is in potentially quite a serious situation, and this that has been compounded by the exit of Hitachi from the scene.

Indeed, this episode is a useful illustrative example of precisely the distinction between absolutist and dynamic regulation discussed earlier in this paper. As is well known, humour is dissociative, and it seems reasonable to observe that their public statements give the impression that the ONR are not overly concerned about the decision by Hitachi to withdraw. Certainly, the press release mentioning the bananas contains no expression of regret or disappointment that the relationship between the regulator and the constructor had manifestly broken down beyond repair. On the contrary, the emphasis on the responsibility and autonomy of Hitachi in deciding what to propose perhaps illustrates that disconnect fairly starkly.

It is important to emphasise that the unconditional commitment, at all costs, to a purely safety-first prism is not the fault of the ONR. They did not set up the incentive structure including the decision to have the ONR report to a department other than DESNZ. They are rationally responding to a set of incentives whereby they gain zero benefit, praise or upside if an approval is granted, but would be heavily criticised, or worse, if anything ever went wrong with any reactor under their watch. Jack Devanney suggests that the ideal for a regulator with those incentives would be a sufficient stream of applications to continue in post, but the fewest possible actual new reactors.[164] The effect of an incentive structure that expressly excludes the ONR from considering any wider societal benefit is stark. As we have seen above, firm baseload power is an essential element of any electricity system, but even more so in a system with a large proportion of intermittent power. The costs and delays to the nuclear sector mean that we are very many years from the realisation of a solid nuclear base to our system.

The wider regulatory problem of increasing judicial review litigation

Lord Diplock famously said in 1982 that 'progress towards a comprehensive system of administrative law' was in his view 'the greatest achievement of the English courts in my judicial lifetime'.[165] In a speech in 2011, Christopher Forsyth agreed that the development of judicial review was a 'great judicial achievement', describing 'scintillating and bold judgments made during the 1960s and 70s and 80s' where 'the courts cast the mantle of the rule of law over the exercise of discretionary power'.[166] The substantive grounds of judicial review have developed significantly in the past few decades.

164. Devanney, n 2, 286. See also Britain Remade, n 140, above, 23.

165. *R v Inland Revenue Commissioners, ex p. National Federation of Self Employed and Small Businesses* [1982] AC 617 at 641.

166. Christopher Forsyth, 'Judicial Review: The Handmaiden of Democracy', Inner Temple Lecture, 14 November 2011, 1.

Forsyth explains how these dynamic developments swept away an 'atmosphere of depression and defeatism' in the 1950s that 'hung over public law' and which 'had left many to conclude that the common law had lost the power to control the executive'.[167] So radical was the change in the regulatory environment after the dismal 1950s that in 1987 the Government Legal Department produced a brief guidance document labelled 'The Judge Over Your Shoulder' to aid decision-makers in avoiding the risks of judicial review. Over time, the document has undergone substantial revisions and additions such that the 6th edition of this document, issued in 2022, stretches to 112 pages.[168]

No less important has been the rapid expansion in the requirements of consultation before decisions are made. In the context of domestic UK infrastructure decisions, this requirement forms part of the Aarhus convention, which also places strict limits on the amount of costs that can be incurred by individuals and groups in bringing environmental claims, the rest of the bill being picked up by the state. For example, a victorious defendant can only claim legal costs against an individual bringing an environmental claim to a maximum of £5,000 – the maximum is £10,000 for an organisation. In English law, a victorious claimant can claim their costs against the defendant. This is mirrored in the Planning Act 2008 which includes statutory requirements to consult for all significant infrastructure projects.[169]

The rules governing who may *bring* judicial proceedings have been steadily relaxed over time as well. Even as far back as 1990, Mr Justice Schiemann highlighted the important differences and effects depending on whether a system operated an 'open' or 'closed' approach for those seeking to bring judicial review claims.[170] An open approach would expand the class of people who could bring an action – a closed system would do the opposite. The judge sought to defend a more closed approach, pointing out the risks of litigation may 'cause an administrator to concentrate less on the quality of his decision' and be more concerned about rendering it 'judge proof'. He also argued that costly litigation could be a 'distraction from the business of governing' and that when decisions 'are under legal attack, they are in practice… to a greater or lesser degree in suspense' coupled with the risk that litigants are using the process merely as 'a platform even if sure they will lose the case'.[171]

These sobering concerns expressed by the learned judge resonate strongly with the current judicial review climate. This is particularly the case in a world where crowd funding to bring litigation is now seemingly accepted, even normalised. The hypothetical concerns expressed by Mr Justice Schiemann as to the risks of defensive decision-making that could distract from good administration seem almost quaint today. Public sector decision making is now significantly affected by fear of judicial review, with lengthy consultations across government, cowed civil servants and multiple pressure groups springing up to stymie essential development and other decisions.[172] The pendulum identified by Schiemann when he claimed that the liberality of standing is 'to a degree a matter of fashion',

167. *ibid*.

168. https://www.gov.uk/government/publications/the-judge-over-your-shoulder

169. s 7 Planning Act 2008.

170. Schiemann, 'Locus standi', [1990] *Public Law*, 342.

171. *ibid*, 345, 348.

172. One such group, Together Against Sizewell C ('TASC'), was directly attacked by the Prime Minister, discussed further below.

has certainly swung powerfully towards a more open set of rules governing who may bring judicial review claims.[173] It might be thought that the pendulum needs to swing back in the opposite direction somewhat.

In an important recent article, Sam Guy argues that judicial review has seen the advent of 'litigant power' that has expanded the influence, power and effect of judicial review significantly with a consequential 'chilling effect on infrastructure delivery' and 'overcaution amongst administrators and industry'.[174] He draws particular attention to the impact on the 'High-Speed (HS2) railway project', but his arguments have much wider salience.[175] In particular, he notes recent calls for reform by think tanks such as UKDayOne and Britain Remade in relation to judicial review applications.

UKDayOne have argued that the ability to bring judicial review applications against NSIPs should be narrowed from those with a legitimate interest to those with a 'direct and substantial interest' in order to reduce the volume of claims by pressure groups rather than individuals.[176] They also argue that a greater 'chance of success' threshold should be imposed.[177] This point is picked up by Sam Guy, who cites a 1994 case that identified a 'higher threshold' than the normal one of 'arguable', specifically 'that a case should be "strong; that is to say, is likely to succeed" if granted permission.[178]

On similar lines, Britain Remade have argued for restrictions on the application of Aarhus-based cost protection caps, in particular where applicants are backed with crowd funding, have other means or have history of losses in similar litigation.[179] This particular proposal would risk falling foul of international law in the form of the Aarhus convention, a stance that has been expressly ruled out by the Attorney-General Lord Hermer on more than one occasion.[180] The Prime Minister has expressed himself in explicit terms on the necessity of compliance with international law as well.[181]

Guy also points to the recent review by Lord Banner, commissioned by the previous government, but adopted and endorsed by the current administration. Lord Banner has suggested that the current 'three bites of the cherry' for judicial review could be reduced to two for Nationally Significant Infrastructure Projects ('NSIP') applications, all of which will be heard at oral hearing without a paper stage.[182] In her written statement announcing these proposals, the then Solicitor General, Sarah Sackman, also said the government would bring forward primary legislation including a measure that will prevent any appeal where a High Court judge certifies an application as being 'Totally Without Merit'.[183] She also announced plans to 'formally designate NSIP judicial reviews as significant planning court claims; and work with the judiciary to introduce target timescales for NSIP judicial reviews in the Court of Appeal and in the Supreme Court'.

The Prime Minister announced the Planning and Infrastructure Bill, currently wending its way through Parliament, in January 2025 and singled out in particular various 'blockers' who he blamed for the delays incurred by NSIPs in previous years and arguing instead that he wanted to

173. *ibid*, 345.

174. Sam Guy, 'Putting the Brakes on Infrastructure? Judicial Review Challenges to HS2 and the Critique of 'Litigant Power', *Oxford Journal of Legal Studies* (2025) Vol XX, 1, 5.

175. *ibid*, 2.

176. https://britishprogress.org/briefings/reforming-judicial-review-to-get-britain-building.

177. *ibid*.

178. Sam Guy, https://ukconstitutionallaw.org/2025/01/28/sam-guy-the-governments-plan-to-reform-infrastructure-judicial-review/. *Mass Energy Limited v Birmingham City Council* [1994] Env LR 298, 308, per Lord Justice Glidewell.

179. Britain Remade, n 140, above, 32.

180. Rt Hon Lord Hermer KC, 'The Rule of Law in an Age of Populism' (Bingham Centre for the Rule of Law 15 October 2024) https://www.biicl.org/documents/12532_bingham_lecture_2024.pdf. https://www.bbc.co.uk/news/articles/c3354d5j8jzo. https://www.gov.uk/government/speeches/attorney-general-speech-the-rule-of-law-powering-growth, 19 September 2025.

181. https://www.gov.uk/government/speeches/pm-speech-to-the-interpol-general-assembly-4-november-2024.

182. https://www.gov.uk/government/publications/independent-review-into-legal-challenges-against-nationally-significant-infrastructure-projects, 4. https://questions-statements.parliament.uk/written-statements/detail/2025-01-23/hcws385.

183. *ibid*.

'take the brakes off Britain'.[184] The Prime Minister specifically mentioned attempts to block the Sizewell C project, by which he can only have been referring to Together Against Sizewell C, who brought the case in relation to potable water discussed above.[185] This month, the Times reported that Steve Reed, the new Secretary of State for housing, promised to 'bulldoze through the barriers that have strangled growth for decades' in an attempt to take 'the fight directly to the blockers' so that the country could 'build baby build'.[186] The Chancellor, Rachel Reeves, concurred, saying that the 'outdated planning system has been gummed up by burdensome bureaucracy and held to ransom by blockers for too long….we are serious about cutting red tape to get Britain building again'.[187]

Many of the proposals for reform listed in this section from Lord Banner and others are thoughtful and intelligent. They have been strongly opposed by others. A representative of Friends of the Earth explicitly invoked rule of law norms, arguing that 'no one is above the law, not even the government' and 'if ministers don't want to be challenged in the courts, they should act within the law'.[188] These claims, made in all seriousness, illustrate the sheer extent of the challenge faced by those seeking to drive through major infrastructure projects in the UK. What is striking, perhaps, is how mild, even minor, some of the proposed changes are. Reducing the number of 'bites of the cherry' by one, or slightly restricting the rules governing who can bring a claim, or preventing claims from being appealed that are certified as totally without merit are not radical. Indeed, they are reminiscent of the sound of a string quartet as an iceberg looms menacingly into view. Much more radical ideas are necessary, to which we now turn.

184. https://www.theguardian.com/politics/2025/jan/23/legal-challenges-to-infrastructure-projects-to-be-blocked-in-push-for-growth

185. *TASC v SZCL* above n 114,

186. https://www.thetimes.com/uk/politics/article/labour-reeves-reed-planning-overhaul-vpf888kc5, 13 October 2025.

187. *ibid*.

188. https://www.theguardian.com/politics/2025/jan/23/legal-challenges-to-infrastructure-projects-to-be-blocked-in-push-for-growth

The Solutions: Two Proposed Regulatory Reforms

Solution 1: Regulatory reform 1 – Hybrid Acts

Summary

- The Planning Act 2008 was intended to streamline approvals for Nationally Significant Infrastructure Projects (NSIPs), but in practice it has failed — projects remain slow, costly, and vulnerable to judicial review because decisions by ministers are subject to judicial review.
- Historically, many large infrastructure projects such as 19th Century railways have been authorised through Private Acts of Parliament, enabling compulsory land acquisition while remaining immune from judicial review due to the doctrine of parliamentary sovereignty.
- Hybrid Bills (Public bills with added Private bill elements) combine ministerial sponsorship with public petition rights and have been used for projects like HS2. They allow quasi-judicial hearings before MPs and public participation and result in an Act of Parliament whose provisions are insulated from judicial review.
- Legal precedent from *Pickin v British Railways Board* confirms that courts cannot invalidate provisions in any Act, including Private or Hybrid Acts, making this route uniquely resistant to post-approval litigation.
- Analysts Jack Pannell and Patrick McAlary highlight several advantages of Hybrid Bills:
  - Legitimacy: Parliament itself balances national and private interests.
  - Flexibility: Projects can be amended during scrutiny to address local concerns.
  - Judicial immunity: Acts of Parliament are not subject to judicial review.
  - Smaller, site-specific projects (like nuclear plants) are especially suitable, with limited petitioners and clear boundaries.

- Recommended reforms include:
  - A Joint Committee of both Houses with a legally qualified chair (ideally a retired judge).
  - More flexible timetabling and robust rules on petitioner admissibility.
  - Appointment of an independent assessor (as in Scotland) to streamline the process.
- Applying hybrid legislation to civil nuclear power could expedite two key areas:
  - Planning and environmental approvals — replacing Development Consent Orders with parliamentary approval, eliminating most judicial review risk.
  - Projects using existing ONR-approved designs — allowing Parliament to authorise construction without re-litigating technical safety issues.

Conclusion:

- Hybrid Bills would deliver constitutional legitimacy, speed, and legal finality while maintaining full Aarhus-compliant consultation through parliamentary petitions.
- In effect, this approach would re-anchor major energy infrastructure decisions in parliamentary sovereignty, mirroring the 19th Century model that enabled the railway revolution - providing both national authority and judicial certainty for urgently needed nuclear expansion.

The Planning Act 2008 created a centralised procedure for NSIPs. The purpose of the NSIP procedure was to smooth the process for major infrastructure projects, speeding it up and rendering it more efficient – but it has manifestly failed. It has failed because even with the centralisation of the decision-making process to the Secretary of State, such decisions are hampered by one major flaw, which is that they are taken by the executive and are thus subject to immediate, costly and slow judicial review proceedings. It was not always so.

Historically, the courts were very reluctant to interfere with decisions that involved matters of national policy with significant strategic implications. Nor is it obvious that judges themselves should be blamed for the current sclerotic reality. Decades of incremental legislation, as well as layers of historic European regulation, and international agreements such as the Aarhus Convention, have hobbled ministers' ability to achieve legitimate policy goals in a timely, efficient and value-for-money basis. But change is possible. The model for that change can be found in our history. It is the one used to allow for the explosion of railway infrastructure in the 19th Century that crisscrossed the nation with a surfeit of rail track, built mostly by private companies seeking to compete to provide lucrative travel services to the public.

English common law is famous for its overriding protection for the

private property rights of ordinary people.[189] Railway tracks crossed hundreds of miles of private land. It became clear in the 19th Century that railway construction would be practically impossible because every project could be held to ransom by a tiny group of individuals who could obstruct works by refusing to allow companies to build across their land. This problem was only soluble due to the central principle of the UK constitution which is the doctrine of parliamentary sovereignty. A core aspect of that doctrine is that Acts of Parliament, of whatever kind, remain inviolate in the courts.

Most Acts are public Acts which means that they start out as Bills proposed in Parliament by a minister, voted through with the support of the governing party and generally opposed by His Majesty's Loyal Opposition and other MPs who are not in office. An important and less well-known type of Act is a Private Act. These Acts are rather different. They are sponsored, at no small cost, by private individuals or corporations and piloted through Parliament on the advice of specialist parliamentary agents who understand the intricacies of parliamentary procedure. They include extra stages that are akin to a public inquiry, where members of the public who are 'directly and specifically affected' by the legislation are accorded the opportunity to make representations to a committee of members of Parliament who are appointed to sit and consider the private Bill as it passes through Parliament.[190]

As the Victorians realised, the solution to the problems of trying to acquire the land on which to build railways was compulsory acquisition of the land needed to build the railways, using Private Acts of Parliament. These are distinct from standard Public Acts with which most people are familiar, as they are initiated by non-MPs. A key further difference is that Private Acts permit affected petitioners to make representations during the passage of the Bill. Operating between the twin poles of Public and Private Acts of Parliament are so-called Hybrid Acts. These are fundamentally Public Acts because they are generally sponsored by a government minister and their department, but they have adopted significant elements of the Private Act procedure. In particular, external petitioners who are affected by the legislation can make representations to the MPs on the committee considering the Bill. This type of Bill is still used to approve railway construction, with a high proportion of modern Hybrid Bills being related to modern construction of projects such as HS2 and others.[191]

The extra procedural elements in a Hybrid Bill are somewhat akin to a planning permission hearing. MPs act in a quasi-judicial capacity and barristers cross examine petitioners, as well as those proposing the schemes, before they vote on the final approved plans. As the provisions of the Act are not comprehensive, there can still in theory be delay caused by judicial review of ancillary aspects of the project, which is why this paper suggests they are only part of the solution. Nonetheless, Hybrid Bills could play an important role in expediting the construction of essential civil nuclear power plants in the short to medium term.

In a recent and heavyweight analysis of the Hybrid Bill process for

189. *Entick v Carrington* (1765), 19 St Tr 1029, 2 Wils KB 274, 95 ER 807.

190. Institute for Government Report, 'Hybrid Bills – Parliament's role in delivering major infrastructure projects', July 2025, Jack Pannell and Patrick McAlary, page 5: https://www.instituteforgovernment.org.uk/publication/hybrid-bill-parliaments-role-major-infrastructure.

191. The latter project was hampered by its enormous geographical reach, which generated multiple ancillary legal claims. Nuclear sites are, by contrast, geographically contained.

the Institute for Government ('IfG'), Jack Pannell and Patrick McAlary set out some of the advantages and disadvantages of the Hybrid Bill process, suggesting a number of useful reforms and improvements that could be made to the process.[192] This paper strongly endorses their suggested amendments to the Standing Orders and the excellent idea of a single Joint Committee drawn from both Houses to sit and consider applications by Petitioners who may be directly and specifically affected by any particular project. This would remove the requirement for there to be a committee in each House to consider the Bill which could otherwise slow down the passage of the Bill.

Pannell and McAlary set out the advantages of using Hybrid Bills to approve a selection of major infrastructure projects. The first reason is one of legitimacy. As they point out, 'where there is a conflict between a national interest and private interests in relation to large-scale projects', there is a powerful argument that 'Parliament is the correct forum for this to be debated'.[193] This argument is compelling and is particularly true given the historical and continuing role of Parliament as the central debating chamber of the nation where the redress of grievances is paramount. In particular, it is 'better placed to consider trade-offs than other decision-making bodies'.[194]

Secondly, the IfG authors argue that Parliament provides 'real opportunities for petitioner concerns to be addressed' along with 'a significant degree of flexibility with opportunities to amend the proposed project while Parliament is considering the legislation… [which] is particularly useful for large-scale linear infrastructure projects'.[195] In addition, Hybrid Bills allow 'the government to put its weight behind a project and be more directly involved in the consenting process'.[196] The fact that the output is an Act of Parliament itself brings public legitimacy to a project in that it is directly authorised by parliamentarians rather than a secretary of state.

Pannell and McAlary also make a series of insightful detailed reform suggestions for the Hybrid Bill process, some of which have already been mentioned above. These include the idea of appointing as chair of the joint committee that considers such Bills within Parliament, a legally qualified chair, possibly a former judge who is now in the House of Lords. They also argue that the rigid annual November deadline for such Hybrid Bills to be proposed be reformed and that an assessor is appointed to smooth out the processes within Parliament, an idea borrowed from the Scottish Parliament. More controversially, perhaps, but clearly correct, is the idea of taking a more robust approach to the admissibility of petitioners.

Finally, the authors point out that a hybrid process culminating in an Act of Parliament 'provides some protection from judicial review'.[197] They are careful to point out that on major railway infrastructure projects, the Act can only do so much because of the large number of wider areas and communities that are inevitably affected by the projects that cover such large distances. They wisely point out that 'smaller more geographically bounded projects' might engage 'fewer petitioners, which are more

192. IfG report, n 190, above.
193. *ibid*, 20.
194. *ibid*.
195. *ibid*, 18.
196. *ibid*, 7.
197. *ibid*, 18

geographically limited'.[198] This could mean that the Bill takes less time to pass and creates fewer litigation opportunities.

This latter advantage has wider implications in the context of hybrid legislation for nuclear power plants. This is because smaller, geographically limited projects (albeit with some wider effects) may not only attract fewer petitioners during the Bill's passage but may also mean there are fewer people who could be affected and wish to bring legal proceedings subsequently. Far more importantly, however, is the fact that if the proposals in this paper are adopted, relevant hybrid legislation may well provide complete protection from judicial review for nuclear plants. The reason for this lies in a famous railway case decided in 1974, which is taught to every first-year law student.

In *Pickin v British Railway Board*, a claimant argued that a Private Act had been obtained improperly because the sponsor of the Act had failed (possibly deliberately) to notify him of the Bill and give him the opportunity to make his case in Parliament. He was the owner of a sliver of land near to the railway that the Board wished to acquire and the Private Act effectively requisitioned the land from the claimant. The possibility that fraud had been involved led the Court of Appeal to allow an appeal, but the House of Lords resoundingly rejected the claim. Lord Reid made crystal clear that provisions passed by Parliament are inviolate.

> *the idea that a court is entitled to disregard a provision in an Act of Parliament on any ground must seem strange and startling to anyone with any knowledge of the history and law of our constitution…*[199]

Statutes cannot be impugned, Lord Reid made clear, even if it were suggested that officers of Parliament had been 'misled by fraud'.[200] It is clear, then, that statutory provisions are immune from judicial challenge and that applies just as much to Private Acts and Hybrid Acts as it does to ordinary Public Acts of Parliament. The case related to a tightly defined small area of land and there is no reason to suppose that Hybrid Acts that relate to analogously small areas of land will be any less inviolate as was the Act discussed in *Pickin*.

It is worth noting that the recently formed and high-powered Nuclear Regulatory Taskforce contains one member, Mustafa Latif-Aramesh, who is an expert on the internal procedures for these kinds of Bills because he is a parliamentary agent. This means genuine and relevant expertise on this particular issue in the Taskforce, which is welcome. It also contains members who take a robust and forward-looking approach to regulation in general terms, which must supply considerable optimism to those of us seeking to eliminate some of the obstacles facing those trying to expedite the construction of urgently needed civil nuclear power supply.

It is important to differentiate two alternative areas where Hybrid legislation could be used in the context of nuclear power: first, the approval of nuclear power plants themselves; and secondly planning permission generally, particularly development consent orders. The first is considered in more detail in the next section but it is important to be clear

198. *ibid.*, 31-2.

199. *Pickin v British Railways Board* [1974] A.C. 765, 782.

200. *Ibid.*

that this paper is not suggesting that the role of the ONR in approving new or alternative designs for orthodox nuclear power plants should be diminished or removed in relation to Generic Design Assessments for plants using conventional technology. The evident expertise gained by the ONR in recent years has been hard won and their international reputation has been justly earned. It would not be appropriate, not least for lack of expertise, for a joint committee of a hybrid bill to award GDA approval to a particular design that has not secured ONR approval. A different approach may be adopted for designs that already have approval, and this is discussed further below.

The alternative area where hybrid legislation may be useful is in the parallel pathway granting planning permissions in relation to environmental permits and other matters that must be addressed to secure a DCO. In this context, hybrid legislation has the potential to be transformative. As discussed above, there is an ever increasing paper trail that successive projects now generate in vain attempts to pre-empt delays caused by judicial review actions being brought against such projects. If, by contrast, a DCO has been awarded following a procedure within Parliament culminating in a provision of an Act of Parliament, such proceedings could not be brought in the first place. This could have a radical and positive beneficial side effect of causing environmental reports, HRAs and other such matters to be considerably shorter in the first place: they could possibly even run in parallel to the design stages.

It should also be pointed out that the incredibly detailed, comprehensive and weighty DCO that we considered earlier in the context of the Sizewell C development had the depth, length and feel of a major Act of Parliament. It was produced in 11 months by the expert panel discussed earlier. In the IfG report mentioned above, the authors point out that difficulties can be caused by underdeveloped proposals being brought forward in Hybrid Bills. This problem would not be one faced by measures such as the DCO in relation to Sizewell C as the lengthy and detailed example in that case demonstrates. That model should be followed for future proposals where a DCO is developed in advance, in detail, produced by panels of equivalent expertise and excellence.

Some might be concerned that the DCO approved by the Act of Parliament route would be produced without extensive consultation. These concerns would be misplaced. The whole point of the DCO produced by the expert panel would be that it would then go to Parliament as a fully-fledged proposal, along with the accompanying report, and there would then be the chance for those directly and specifically affected to make petitions to Parliament to make their case. This would also, usefully, put the UK entirely in compliance with international obligations under the Aarhus Convention, as was demonstrated in the decision of the Aarhus Convention Compliance Committee in relation to the Crossrail Act 2008.[201] The Committee held that Parliament was acting as 'the "public authority" authorizing a project'.[202]

201. https://unece.org/DAM/env/pp/compliance/C2011-61/Findings/ece.mp.pp.c.1.2013.13.e.pdf.

202. *Ibid*, [54].

Solution 2: Regulatory reform – Nuclear Appeal Tribunal

Summary — Nuclear Appeal Tribunal and the use of Ouster Clauses

- Hybrid or Private Acts can streamline nuclear approvals but even with the ONR's Generic Design Assessment (GDA) and parliamentary consent, projects like Sizewell C still face delays from judicial review.
- The paper proposes a Nuclear Appeal Tribunal (NAT) — a dedicated, expert tribunal to handle all nuclear-related planning, permitting, and operational disputes at pace and without the possibility of judicial review.
- Recent case law developments now make this possible: courts have accepted that tribunals with properly drafted "ouster clauses" can in theory be made effectively immune from judicial review, provided they are judicial in nature and meet detailed linguistic clarity requirements.
- Political context:
  - Government reforms aim to shorten or limit judicial reviews but excluding review of ministerial (executive) decisions risks constitutional conflict.
  - The NAT proposal sidesteps this by being a judicial tribunal, satisfying rule of law principles while ensuring finality.
- Design of the NAT:
  - Jurisdiction over all nuclear construction, permitting, and operational matters not settled by primary legislation.
  - Strict standing: only those directly affected may apply; no pressure groups.
  - Appeals limited to points of law to the Upper Tribunal, with 1–2 month decision deadlines and no further appeal.
  - Annual operating cost minimal compared to financing costs (≈£13 m/day interest on a £46 bn project like Hinkley C).
- Strategic advantage: combining parliamentary authorisation (Hybrid Acts) with a non-reviewable specialist tribunal would eliminate most judicial delay, restore investor confidence, and accelerate delivery of urgently needed nuclear capacity.
- In short: a constitutionally robust, judicially insulated NAT, supported by parliamentary approval routes, could transform the UK's ability to build nuclear power plants quickly while preserving fairness, legality, and international compliance.

The use of Hybrid Acts will not be sufficient on its own to expedite the construction of civil nuclear power in the short to medium term at the requisite speed. Further measures will be essential. This is because even

if legislation is passed that grants a DCO and other aspects critical to such projects, there will inevitably be further attempts to challenge ancillary and unavoidable parts of the project that are not covered in the Hybrid Act. The example of the problems caused to the Sizewell C project by measures to remove mud from the site is illustrative – Britain Remade cite this example as just one of the '160 overlapping permits' that are and will be required before SZC is completed.[203] Analogous problems could well occur even for a nuclear plant that has a DCO granted by a Hybrid Act.

The second regulatory reform proposed by this paper, therefore, is the creation of a Nuclear Appeal Tribunal ('NAT') which would have jurisdiction in relation to all aspects of the construction of nuclear power plants. The purpose of creating the NAT is to take advantage of recent advances in case law that are of critical importance in the context of judicial review proceedings, but which do not yet seem to be widely known amongst decision makers in Westminster. The short version is that it has now been accepted by the courts that it is possible to create supervisory tribunals to regulate important areas of national life without, critically, those new tribunals being judicially reviewed themselves, as long as they are judicial in nature.

This innovation has now been accepted at Court of Appeal level in relation to a narrow rule in relation to refusals of appeal in some contexts - but this narrow example could in theory be broadened. The Rubicon has been crossed. Proof of concept has been achieved. The mechanism to achieve this protection from ongoing judicial review is an important type of statutory provision called an 'ouster clause'. It will be argued here that the putative Nuclear Appeal Tribunal with the jurisdiction to deal with the construction of civil nuclear power stations should be able to avoid many of the delays normally caused by lengthy judicial review proceedings in the ordinary courts.[204]

It is important to acknowledge that serious attempts have been and continue to be made to try to reduce the delays caused by judicial review of major infrastructure projects in recent years. In addition to the reform suggested by Lord Banner and discussed earlier, there have been innovations in the Planning Court to try to speed up the process of judicial review. A good example of the partial success of some of these measures is the timings in relation to the appeals in relation to the SZC case discussed earlier. The delays in that case were not caused by dilatory production of judgments. On the contrary, the length of time between the hearing and the publication of the decisions, at all levels, were exemplary in their brevity. The problem was the lengthy periods before the hearings took place – many months at a time. The problem, then, is not that the country lacks the intellectual judicial firepower to address, consider and dispatch unmeritorious challenges. The problem is the absence of a dedicated panel of expert judges available to deal with these matters, alongside appropriate lay members sitting with the judges who possess relevant industry expertise.

While what is proposed in this paper will come with costs, those costs

203. Britain Remade, n 140, 4.

204. The author has previously published on these issues elsewhere: see 'Ouster clauses, separation of powers and the intention of parliament: from *Anisminic* to *Privacy International*' [2018] *Public Law* 570, cited by Lord Carnwath in *Privacy International*. See also, 'Third generation ouster clauses', *Public Law* (forthcoming, 2026).

are trivial when compared with the sums involved in these mega-projects. HPC is mooted to cost £46bn, for which the cost of capital at a conservative 10%, amounts to close to £5bn per year, which is £13m *per day*. The total *annual* budget for the NAT, with associated support staff, buildings and all ancillary costs, would struggle to amount to the interest cost incurred in one day for one mega-project. At a purely strategic level, the absence of a dedicated full-time tribunal that does nothing other than consider, at pace, any potential legal claims that could possibly be made is difficult to understand. It is essential that whatever judicial or other resource is needed such that there are zero delays caused by waiting for a hearing should be supplied as soon as possible.

The case for a dedicated and well-resourced tribunal to consider any legal matters relating to the construction of nuclear power plants is therefore apodictic, on cost savings grounds alone. This paper goes much further, however. It is important to be clear that our international obligations under the Aarhus Convention will have been completely satisfied by the quasi-judicial proceedings already completed within Parliament in the passing of any hybrid of private legislation granting a DCO and other permits for any particular project. There is therefore considerable scope to strictly determine who may bring an action to the NAT in relation to any particular project. It is suggested that the restrictions should be fairly severe – being limited to individuals directly and personally affected, and excluding pressure groups and other such bodies.

Ouster clauses

The current government is looking carefully at changes to the planning system, not least through the Planning and Infrastructure Bill. As we saw earlier, Lord Banner has suggested a reduction in the number of attempts to bring a claim from three to two 'bites of the cherry[205]'. UKDayOne have suggested that the time limit for bringing a claim be reduced from the current limit of 6 weeks to 28 days.[206]

The current Chancellor of the Exchequer, Rachel Reeves, is reported to have argued that judicial review should be limited such that only one claim can be brought per project alongside some allegedly choice asides about 'bats, newts and spiders'.[207] The Prime Minister himself is reported to have asked Lord Banner 'to remove the ability for environmental groups to delay projects such as Heathrow's third runway with judicial reviews'.[208] With the greatest of respect to those who are clearly experiencing considerable frustration within the government and assorted think tanks commenting on these issues, these measures will not be sufficient.

Lord Offord of Garvel, on behalf of the Conservative party, has suggested amendments to the current Planning Bill. The provisions they are seeking to insert purport to exempt new nuclear power stations from the HRA and environmental impact assessments.[209] Even more interestingly, Lord Offord's amendments seek to exclude judicial review for a decision by the Secretary of State to grant a development consent order for 'a nuclear power station and any associated infrastructure under the Planning Act 2008',

205. The three bites are: a decision on the papers, an oral hearing and an appeal.

206. https://britishprogress.org/briefings/reforming-judicial-review-to-get-britain-building.

207. https://www.theguardian.com/politics/2025/sep/27/starmer-asks-conservative-peer-write-planning-bill-block-judicial-reviews.

208. *ibid.*

209. https://bills.parliament.uk/publications/62300/documents/6944. https://watt-logic.com/2025/07/20/nuclear-regulation-pragmatism-not-paralysis/. https://www.theguardian.com/politics/2025/nov/09/developers-met-ministers-dozens-of-times-over-planning-bill-while-ecologists-were-shut-out.

further specifically mentioning the environment and habitat regulations.[210] The wording of the exclusion is novel, requiring that 'no court or tribunal may entertain' a judicial review claim or other appeal against such a decision and that the exclusion should apply 'notwithstanding' any rule of domestic or international law.[211] These proposed Conservative amendments do not follow the successful proof of concept displayed by the 2022 legislation and thus there must be a question mark over whether they will be effective.

Ouster clauses are designed to exclude the courts from engaging in judicial review of relevant bodies or particular categories of decisions made by them.[212] They have long been the source of considerable tension between Parliament and the courts. The reason is simple. On the one hand, the rule of law requires that bodies, especially the executive, be monitored by the courts to ensure that they stay strictly within their legal powers. On the other hand, the orthodox view of the sovereignty of Parliament as the supreme principle of the constitution means that, if Parliament mandates that a body or government minister shall not be judicially reviewed, that direction should be obeyed by the courts. Parliament may make or unmake any law whatever. Thus, two core constitutional principles are at loggerheads.

The longstanding solution adopted by the courts since a seminal case in 1964 called *Anisminic* was to impose a requirement that Parliament make its intentions clear beyond any possible doubt before the courts would accept that it had genuinely intended to remove the body in question from their jurisdiction.[213] In practice, up until 2022 none of the ouster clauses actually passed were found by the courts to have achieved the requisite level of clarity. Judges therefore deemed them not to have displayed the requisite intention to exclude judicial review. This first generation of ouster clauses were therefore ineffective.[214]

The issue flared up again in the late 2010s in a case called *Privacy International*, which concerned a specialist Tribunal, the Investigatory Powers Tribunal ('IPT'), established as the sole judicial body to which complaints of unlawful conduct by the security and intelligence services could be brought. Parliament had tried to protect decisions of the IPT from judicial review in the ordinary courts by using an ouster drafted in stronger terms than that considered in *Anisminic*. Parliament had deliberately beefed up the ouster clause in response to the previous caselaw. This stronger, second-generation ouster clause persuaded a unanimous Court of Appeal in a judgment written by Lord Justice Sales (as he then was)[215] which found the ouster effective. This would have rendered the IPT immune from judicial review.

The Supreme Court took a different view,[216] overturning the Court of Appeal judgment a by 4-3 ruling, allowing an appeal from the Court of Appeal. Lord Carnwath for the majority held that the wording of this second-generation clause was still not clear enough to be certain that Parliament genuinely intended to exclude judicial review of the IPT. He insisted that particular wording was essential to demonstrate the requisite

210. *ibid*.

211. *ibid*.

212. Ouster clauses are also known as privative clauses.

213. *Anisminic Ltd v Foreign Compensation Commission* [1969] 2 AC 147.

214. Any attempt to explain those machinations would rapidly confuse the overwhelming majority of possible readers of this paper.

215. *R (Privacy International) v Investigatory Powers Tribunal* [2017] EWCA Civ 1868.

216. *R (Privacy International) v Investigatory Powers Tribunal* [2020] A.C. 491.

level of clarity. Importantly, he drew a sharp distinction between ouster clauses that attempted to exclude judicial review over executive decisions and those seeking to exclude review of decisions made by judicial bodies.[217] He made clear that the courts would be somewhat less concerned about ouster clauses protecting *judicial* bodies from review. This is because tribunals like the IPT themselves provide a judicial check on executive power (in this case exercised by the security and intelligence services), thus arguably satisfying the demands of rule of law.

Lord Wilson, in dissent, argued that the entire line of authority since *Anisminic* was problematic and would have restored the apparently plain meaning of ouster clauses in general, removing the jurisdiction of the ordinary courts where Parliament intended to do so. Lords Sumption and Reed also dissented, on the basis that given the IPT is a judicial body, the extra wording in the ouster clause made Parliament's intention sufficiently clear - as the Court of Appeal had held.

Subsequent events moved fairly rapidly. Parliament passed Acts containing provisions that were significantly more robust than the second-generation ouster clauses and related to judicial bodies. The resultant pudding was put to proof in a couple of critically important cases called *Oceana* and *LA Albania* which unequivocally held that the third-generation ouster clauses were effective in ousting the jurisdiction of the courts over one category of decisions made by the Upper Tribunal.[218] It must be mentioned that these clauses left an extremely narrow set of circumstances where judicial review could conceivably still be brought, but it is clear that the basic principle has now been established.

For our purposes, therefore, it is now crystal clear that tightly drafted ouster clauses can now protect judicial tribunals from further judicial review. The Conservative amendments discussed earlier do not follow this pattern, and therefore there is a risk they may not succeed. This is for at least two major reasons. First, they seek to exclude judicial review of executive decisions, a principle that has not been conceded by the courts and could precipitate a serious constitutional crisis. Secondly, they appear unlikely to meet the requirements of linguistic clarity demonstrated by recent legislation and now accepted in *Oceana* and *LA Albania*.[219]

These recent and critically important innovations therefore open the door to a potential solution to the long delays created by the judicial review queue for nuclear plant projects, with all the chilling effect on investment decisions that such delays cause. The solution, then, is to create a specialised Nuclear Appeal Tribunal that can be protected from judicial review and granted significant powers and jurisdiction to deal with any and all matters relating to the construction, supervision and ongoing monitoring not just of the planning and permitting stages, but also the continued operation of civil nuclear power plants that fall within its aegis.

It is worth recalling that there is ample evidence that properly funded, organised and expert judges are perfectly capable of determining even complex judicial review proceedings in a timely manner. This can be clearly seen not only in the time scales between the hearing and judgment

217. *ibid*, [39]-[40].

218. Namely, decisions to refuse leave to appeal itself from lower tribunals. *R (Oceana) v Upper Tribunal (Immigration and Asylum Chamber)* [2023] EWHC 791 (Admin). *R (LA(Albania)) v The Upper Tribunal* [2023] EWCA Civ 1337

219. *ibid.*

discussed earlier in relation to the SZC judicial review, but also in earlier cases concerning nuclear matters. In the *Greenpeace* case, a judicial review was brought to challenge the nuclear waste disposal policy of British Nuclear Fuels which had responsibility at the time.[220] The authorisation was made on 25 August 1993. The substantive hearing was held on 14 September 1993, and the judgment was handed down on 29 September 1993. It was not appealed. Key for our purposes is the sheer speed at which the proceedings were conducted. That can and should be replicated by the appointment of dedicated, legally expert, tribunal members whose annual costs and support mechanism would pay for themselves in a matter of days, in interest savings alone. For the want of a penny, a nuclear kingdom is in danger of being lost.

There remains the possibility of time-consuming appeals of decisions made by the NAT to the next level, called the Upper Tribunal. This could also be very carefully constrained and confined to appeals on strict points of law, with a deadline of one or two months at most for judgment to be delivered. There would be no further appeal. Again, the resourcing to make this happen would be trivial compared to the cost savings and the commensurate building of confidence in potential investors that they will not be hampered by long delays waiting for cases to be adjudicated.

It will be recalled that the purpose of the use of hybrid and private legislation is to pre-empt the possibility of litigation in relation to swathes of the subsequent decision-making process in approving and permitting nuclear power plant designs that have achieved GDA from the ONR. The purpose of the NAT would be to sweep up any ancillary elements of the process that were not dealt with in the primary legislation that granted the DCO or other permitting necessary to complete construction. The NAT would have the jurisdiction, and the power, to grant local planning permissions, permits and all related matters – removing those issues from the purview of local councils, the Environment Agency, the Health and Safety Executive and the like. The ONR's role in permitting and approving the stages of construction would fall within the NAT's jurisdiction.

Putting together the use of private/hybrid legislation and the establishment of the NAT should very significantly cut the delays endemic in the current system, expediting the completion of new nuclear power plants. Both these reforms should be pursued in order to address the urgent problem of the medium-term electricity supply crunch facing the country.

220.R v H.M. Inspectorate of Pollution and Ministry of Agriculture, Fisheries and Food [1994] 2 C.M.L.R. 548

Solution 3: Expediting the granting of Generic Design Assessment approvals

Summary — Rebalancing Nuclear Regulation: restoring dynamic oversight

- Current proposals focus on post-GDA procedure — i.e., planning and permitting after ONR approval. Unlike large linear projects (e.g., HS2), nuclear plants are geographically contained, making them ideal for hybrid legislation and NAT jurisdiction.
- This section asks whether these reforms could also extend upstream to the Generic Design Assessment (GDA) stage — a controversial but crucial question given mounting regulatory delays and costs.
- Drawing on Jack Devanney's analysis, early nuclear regulation (1950s–60s) balanced industry pragmatism and safety oversight through a "tug of war" model that was both dynamic and effective.
- Over time, this balance eroded under the ALARP ("As Low As Reasonably Practicable") and Best Available Practice doctrines, creating a one-way ratchet of cost and complexity detached from realistic safety gains.
- The ONR's incentive structure reinforces this imbalance:
  - It acts as both prosecutor and judge, with no incentive to consider cost or delay.
  - Safety maximisation brings institutional credit; leniency brings reputational risk.
  - Constructors therefore rarely challenge requirements (e.g., Wylfa's "filter" fiasco) to preserve working relations.
- The paper proposes separating these roles:
  - ONR remains as prosecutor; it continues to enforce and propose safety measures.
  - Nuclear Appeal Tribunal (NAT) becomes adjudicator – it independently weighs safety vs cost, based on evidence and proportionality.
- The NAT would:
  - Hear rapid cost–benefit challenges to ONR requirements without stigma.
  - Evaluate scientific disputes (e.g., Linear No Threshold theory) with expert witnesses.
  - Replace rigid safety ratios (10:1 / 2:1) with nuanced, evidence-based analysis that factors in societal and environmental trade-offs.
- Chaired by a High Court judge and staffed by nuclear and engineering experts, the NAT would restore the creative tension between extreme safety measures and efficiency lost in modern

regulation.

- The outcome: a dynamic, fair, and rapid oversight model preserving the ONR's safety authority while enabling cost-effective, timely construction of urgently needed civil nuclear power plants.

This section has thus far focused only on the non-specialist issues relating to development consent orders and other permitting that become relevant after a GDA has been granted by the ONR. Unlike many other large scale infrastructure projects, especially high-speed rail, nuclear power plants are geographically limited. This means that they are far more suitable for hybrid legislation as the legal issues can genuinely be isolated, and jurisdiction can be conferred on the NAT for all related matters, without straying too far into the jurisdictions of local councils, other relevant public bodies and private citizens in the process. In that sense, civil nuclear power plants form the paradigm case for the innovations suggested in this paper in relation to the use of private/hybrid legislation and specialised tribunals that are effectively immune from further judicial review.

Some may wonder whether the ideas in this paper could be extended to other situations: two in particular. First, it might be wondered whether hybrid legislation and specialised tribunals could be used for other infrastructure projects. That is outside the scope of this paper. Secondly, it might be wondered whether the private/hybrid legislation and tribunal process could be used to expedite the granting of Generic Design Assessments as well. This is much more controversial, but the possibility must be considered carefully and the arguments on both sides are important.

This section builds on the arguments canvassed earlier in relation to controversial principles of nuclear regulation, in particular the Linear No Threshold theory ('LNT'), the 'As Low As Reasonably Practicable ('ALARP') principle and the absolutist versus dynamic approach to regulation. As ever, the contribution of Jack Devanney is seminal. In his work, he explains the history of nuclear regulation in the early years – and in particular the 1960s – when civil nuclear power was in its infancy.

> *"Up until the late 1960s, AEC regulation was a tug of war. Attempts to impose regulatory costs were not only strongly resisted by the industry which was in life or death competition with coal and oil, but the AEC was caught between its promotional function and its regulatory function. But the result was a balance, and the plants that were built under that balance have a pretty good safety record. No member of the public has been harmed in some 50 years of operation."*[221]

The only reason nuclear power survived this period is because it is 'inherently safe, inherently cheap and inherently renewable'.[222] Devanney rightly points to the loss of this dynamic relationship between the constructors and the regulator as forming a turning point in the

221. Devanney n 2, 269.
222. *ibid*, 257.

development of the nuclear regulatory regime in the USA and elsewhere. Gradually, the philosophy changed, turning from a 'tug of war' into one of obeisance to the ALARP principle, to the enormous detriment of cost competitiveness and viability of civil nuclear power. The dreaded 'Best Available Practice' model causes a ratchet of ever more esoteric ideas to be spread across regulators around the world, imposing measures far beyond the safety levels achieved by previous designs that have worked safely and effectively for decades. This is what led, inexorably, to the imposition of filters on Hitachi, and may have contributed to the disaster of their withdrawal from the Wylfa site and the UK in general in 2019.

It remains an astonishing fact that nuclear power in the early years was competitive with coal at a time when the latter was extraordinarily cheap. The question now is whether the steady expansion in regulatory requirements means that the pendulum has now swung too far the other way and whether there is any way to balance the essential safety elements in the provision of civil nuclear power against the need to construct cheaper, faster and more efficiently to meet the urgent need for new baseload nuclear power provision. If such a solution can be found, it could be transformative precisely because it could restore the dynamic relationship between the regulator and the constructor that has been lost for so many decades, without compromising on the baseline safety requirements.

The solution suggested in this paper starts by recognising that the ONR and other regulators are performing two distinct roles which should be disaggregated. The two roles are prosecutor and judge in relation to nuclear regulatory requirements. On the one hand, the ONR is rightly motivated to implement best available practice, gleaned from parallel experience gained by regulators across the world, and with the sole object of maximising the safety measures that constructors of nuclear power plants are required to adopt. The motivation of the ONR is predicated on the simple fact that there is no motivation for them to be lenient precisely because their incentives are radically skewed in favour of safety rather than cost. This is because the responsibility rests with the ONR if anything were to go wrong. By contrast, they have no incentive at all to save any costs. The strong reputation of the ONR, built up over years, is based entirely on their close adherence to international and regional standards without regard to costs.

The obvious problem is that the ONR is not just the prosecutor (in a sense), it is also the judge. Constructors are of course entitled to push back against decisions of the ONR which they view as being too onerous, but it is difficult to see what the point would be since the final decision rests with the ONR in any event, and we have already seen that their incentive structure is weighted heavily towards safety and not cost or efficiency. This is why the debacle over the filters at Wylfa occurred. It also perhaps goes some way to explain why the ONR could publish a news release that comes across as half-amused at the idea that their judgement could be questioned by the constructor. Perhaps unsurprisingly, constructors may instead prioritise the preservation of a solid working relationship with

the regulator rather than push back against what they might legitimately argue are measures, even if expressed in terms of overall goals rather than specific requirements, that they would otherwise resist.

It is a long-standing principle of English common law that having the same person be the prosecutor and the judge is a basic breach of natural justice with serious and harmful effects on good decision-making. It is suggested, therefore, that the ONR should be confined to its role as setting goals and standards rather than adjudicating on whether they are appropriate in the wider context. The role of independent adjudicator should be passed to the new nuclear appeal tribunal. The NAT should be specifically tasked to weigh up costs of any mooted safety measures against any claimed improvement in safety. Constructors should be welcome to bring actions, dealt with extremely swiftly, challenging the ONR to justify regulatory requirements on a straightforward cost-benefit analysis. There should be no stigma attached to such actions, least of all that the constructor is somehow insufficiently committed to appropriate safety measures.

The NAT should be encouraged to weigh up the latest scientific evidence on matters such as Linear No Threshold theory and hear evidence from different parties on such matters. The longstanding ratios of 10:1 for safety critical issues and 2:1 for non-safety critical issues should be abandoned in favour of a serious analysis that takes into account the long terms costs to society of expensive and long delays in the provision of nuclear generated electricity, not least if the alternative is (like Germany) fossil fuel based, with all the attendant direct air pollution from coal fired stations, for example. The NAT should engage in active case management, attempting to reach rapid and effective conclusions to disputes and should constantly bear in mind the overriding objective of balancing safety considerations against the need to get plants built safely and rapidly.

The ONR would and should maintain its hard-won reputation for rigour in the application of nuclear safety protocols, absolved of final responsibility in favour of a tribunal chaired by a High Court judge, who is by definition sufficiently robust to make the necessary balancing calls essential to maintain safety but also efficiency. In this way, the long-lost dynamic process that used to characterise nuclear regulation could be formally revived such that the creative tension between regulator and constructor could be managed within the crucible of a rapidly acting tribunal with the power to resolve differences in approach fairly and reasonably.

Outcomes: Future Potential Pathways

If implemented, these proposals could presage the beginning of a genuine golden age of civil nuclear power in the UK. It is worth considering a number of potential pathways that could expedite the development of nuclear power plants in the short to medium term.

First, the existing approved design that underpins HPC and SZC could be rolled out to future sites. In stark contrast to the tortuous processes that led to extended delays in approval and permitting of the sites at HPC and SZC, a prompt report by a panel of experts could be completed within 6-12 months including a DCO that could form the basis of hybrid legislation. Such legislation could then be put through Parliament, with government support, and with the opportunity for petitioners who are directly and specifically interested to make representations in line with international law and in particular the Aarhus Convention. All permits and approvals would be granted by Parliament following that process, ideally on a far shorter timescale than currently.

Following approval, construction could commence, subject to any claims made at the NAT. Such claims would be dealt with swiftly by the NAT, with extremely restricted appeals on points of law to the Upper Tribunal from which there would be no appeal. The financing of such projects, in the light of these expedited timetables, would be likely to be considerably more transparent and the interest costs would be substantially lower both because of the shortened timeframes but also because the expedited process would reduce investor risk – a potential double benefit.

A second pathway could relate to the mooted Small Modular Reactors, in particular the Rolls Royce model that is currently completing the GDA process with the ONR. Ideally, approval would be achieved by 2026/7. Other SMRs may also go through the approval process independently. If and when Rolls Royce secure GDA approval, they could also pursue hybrid legislation, again with government support, with a view to securing all relevant DCO and other approvals fairly quickly, subject to the petitions that would no doubt be brought by interested parties. As a smaller scale project, one would hope that the process could be as quick, if not quicker, than the rollout of the next round of EDF designed reactors after HPC and SZC.

Thirdly, and this may be more challenging, if it can be demonstrated that an efficient and effective approval process now exists in the UK, there may well be interest from USA or manufacturers based elsewhere

to both secure approval or even build further reactors in the UK. This is particularly relevant in the light of recent agreements between the USA and UK for mutual recognition and expedited GDA approval in theory.[223] A mutually beneficial reinforcement process of the evident desire in the USA to accelerate the production of new civil nuclear could create a virtuous circle with approvals and construction in the UK.

Furthermore, South Korean and Japanese expert nuclear power plant construction has consistently demonstrated the ability to build fleets of nuclear power on time and on budget at a fraction of the costs incurred in the UK. If hybrid legislation is demonstrated to be effective, the possibility exists of legislation that grants GDA to existing models built by proven manufacturers for designs approved by trusted regulators in other countries. No doubt the views of the ONR would be given the highest weight in the consideration by the Joint Committee as hybrid legislation passed through Parliament but no less important would be the role of the NAT in limiting the effect of attempts to impose excessive domestic regulations on the construction of such a fleet that would inevitably be in compliance with different, but no doubt reasonable, alternative regulations on health and safety, corridor sizes, filters, diesel engine positions and such like. The NAT would no doubt weigh up the cost of any amendments against any mooted safety benefit argued for by the ONR. Japan has an average 3.8 year build time for their traditional reactors, for example.[224] A further benefit of consistent design is the opportunity to compare operations across the fleet as a whole.

Finally, the hybrid legislation approval model, coupled with a robust independent tribunal, could help to expedite next generation advanced nuclear power generation in the UK, detailed discussion of which is beyond the scope of this paper. Advanced nuclear models have the potential to utilise enormous existing stockpiles of leftover nuclear fuel in the UK to provide cheap or even free electricity in the UK for centuries to come.[225] There are powerful arguments for broadening out the source of potential future nuclear power beyond traditional reactors to include advanced, next generation models that have radical advantages in terms of inherent safety, efficiency and cost, based on laboratory-proven, existing technology.

Existing designs, foreign approved designs and next generation advanced nuclear should be able to provide the essential expansion in nuclear baseload power that is so urgently needed in this country. Thus the reforms suggested in this paper could be put to very practical use in the short to medium term. Companies who wish to build nuclear reactors and wish to use hybrid legislation with government support should be able to so in order to compete to provide electricity to the market. There are a number of different companies who have developed designs that take advantage of the enormous technological improvements in knowledge and design over recent decades. With consistent cross party support, there is genuinely a golden opportunity to establish the UK at the cutting edge of modern dynamic civil nuclear power regulation, pushing back against the

223. https://www.gov.uk/government/news/golden-age-of-nuclear-delivers-uk-us-deal-on-energy-security.

224. https://jackdevanney.substack.com/p/nuclear-power-is-too-slow.

225. https://www.dalton.manchester.ac.uk/managing-uk-plutonium-stockpile/ - Appendix 1. https://www.thesciencecouncil.com/pdfs/PlentifulEnergy.pdf.: Charles Till and Yoon Il Chang, *Plentiful Energy: The story of the Integral Fast Reactor* (2011).

outdated absolutist approach and achieving a balance between appropriate safety measures and successful development that could be transformative for the UK.

Summary and Conclusion

The Government has asserted that civil nuclear power in the UK is entering a 'golden age'.[226] It is incumbent on those who care about the future prosperity of the UK that we treat with appropriate care the regulatory goose that could help lay the nuclear golden egg. The prize could be the advent of genuine domestic energy security and the potential extraordinary benefits of cheap, stable, low carbon long term electricity production through nuclear power. Cheap and abundant energy is possible. The UK is currently in a sprint for wind as we wind down the current fleet of gas-powered electricity generation plants and the existing nuclear fleet. The urgency of our medium-term electricity supply issues, as we transition towards vastly increased demand for electricity, is difficult to understate.

In that context, there is an urgent need to develop more efficient, cheaper and investor-friendly measures that can expedite the provision of civil nuclear power in the UK to provide the essential baseload provision to cover the inevitable slumps in intermittent renewable power generation. This paper has suggested two significant policy changes that could shorten the timescale of permitting and approval of different types of civil nuclear power. The first is a specialised feature of the UK parliamentary system which is the use of hybrid or private Acts to grant the relevant permits and approvals for the construction of future nuclear power plants. This is particularly apt for the EDF model which already has Generic Design Assessment approval from the Office for Nuclear Regulation. Future replicas of the Hinkley Point C and Sizewell C plants could, in theory, have an expedited approval process for the development consent order and ancillary permits that are essential before construction can commence.

The second policy proposal follows from recent case law that makes clear that if Parliament is careful to use particular statutory language, it is now possible to create judicial tribunals that effectively cannot be judicially reviewed. Such a tribunal would raise few if any rule of law concerns because it would itself be judicial in nature. Thus, Parliament is able to create local islands of law. These recent, welcome, innovations mean that it would now be possible to create a Nuclear Appeal Tribunal by statute that could provide an expedited, rapid, and effective method to ensure that judicial review delays to civil nuclear power plant construction could be significantly ameliorated. Furthermore, the jurisdiction of the Tribunal could be extended to include any ancillary planning, permitting or other local or regional legal issues that could form an obstacle to the construction of the plant. Appeals to the Upper Tribunal, and no further, could be strictly limited to narrow points of law, and standing requirements to

226. https://www.gov.uk/government/news/golden-age-of-nuclear-delivers-uk-us-deal-on-energy-security

bring actions could be very narrowly drawn.

These two policy changes, particularly suited to infrastructure projects that are geographically limited, could help to reduce the inordinate costs of civil nuclear power plants, much of it accruing in interest costs as time slips by. These proposals could transform the regulatory environment for the construction of civil nuclear power. In addition, such a legal environment could tempt international expertise to return, and, with government support, innovative constructors of small modular reactors and advanced reactor technology could create genuine competition in the UK as electricity demand ramps up quickly over the coming years. Let a thousand nuclear power plants bloom.

There appears to be broad political consensus for the coming golden age of nuclear as part of a diversified electricity supply mix. There is every chance that the modernisation of the regulatory environment to make it fit for the 21st Century could see the UK lead the world in the modernised and dynamic regulation of large-scale, modular and advanced reactor technology. Perhaps most promising, in the longer term, is the possibility of developing advanced nuclear reactors that could achieve the long-heralded possibility of electricity that is too cheap to meter, a goal with genuinely transformative potential for the future prosperity of the United Kingdom.

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