A Brief History of Civil Nuclear Energy in the UK

Policy Exchange

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Published by
Policy Exchange, 1 Old Queen Street, Westminster, London SW1H 9JA

www.policyexchange.org.uk

ISBN: 978-1-917201-55-1

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Introduction

The civil nuclear industry in the UK has been primarily characterised by an inconsistent rate of reactor construction caused by overwhelming regulatory burdens, which have made nuclear energy an economically challenging option by raising the time and cost of construction. A declining number of reactors resulting from disproportionate regulation has led to embedded inefficiencies in reactor technology, a gradual decline in British technological leadership and a greater vulnerability to the global energy market. Regulatory reform should be understood as easing the pathway for investment and construction, not as diminishing nuclear safety in any meaningful way. Periods of sustained nuclear construction have consistently aligned with insecurity regarding energy supply, industrial capacity and Britain's place in the world. These circumstances are all too familiar following the Russian invasion of Ukraine, deindustrialisation and rising global instability not just to the UK, but across the Western world. The UK's relative vulnerability in addressing these issues in a large part derives from neglect of its nuclear industry. The only answer to these challenges is the regulatory reform that would facilitate consistent nuclear construction ensuring secure, cheap and clean energy while resurrecting the regional productivity of the most deprived regions and attracting investment in cutting-edge technologies. This paper will trace the nuclear sector's history establishing how it became so enfeebled and the importance of its revival.

Civil nuclear energy has its roots in the military applications of plutonium production following the discontinuation of Anglo-American nuclear cooperation and Britain's post-imperial insecurity. This led to the construction of Magnox reactors for civil and military use alongside the first advanced gas-cooled reactors (AGRs). The 1964 'Second Nuclear Power Programme' promised further expansion but was blighted by poor delivery and the shift toward more stringent regulation, slowing the construction necessary to phase out these somewhat flawed reactors and sustained construction. This was followed by the partial delivery of the 1970 programme and the emergence of anti-nuclear environmental groups.

The second period of nuclear history was defined by privatisation and the failure to repeat the established model of building and repeating. Thatcher's interest in nuclear energy, as means to ensure autarky and diminish the strength of the coal unions, promised enlargement after a period of stagnation. Instead, the rate of reactor construction declined significantly as the 'dash for gas' in the North Sea provided an alternative source of cheap energy. The now comparatively high MWh cost of nuclear shifted attention away from expansion, which combined with the introduction of further regulation following the Chernobyl meltdown spelt stagnation. Cumulatively, focus on privatisation, ready supply of gas and further regulation meant the Government was not taking a view on new construction. This would leave the nuclear industry in a position of weakness rivalled only by our present circumstances.

By 2003 the 'Our Energy Future'[1] white paper deemed nuclear energy an economically unviable option. The Government's position toward nuclear energy only began to shift in 2006 with climate change achieving an increasingly prominent position in national and international discourse alongside renewed energy insecurity. For a new generation of nuclear construction to occur in a liberalised market Britain had to become an attractive investment prospect through regulatory and financing reforms. While progress was made on financing reform, it meant little without overhauling the overregulation which still hinders the nuclear industry today. Governments in this period slowly began to pay increasing attention to the key hurdles to a successful nuclear market but did remarkably little to remove them.

If we are to learn anything from the history of the British nuclear industry it is that future governments must ensure a consistent rate of construction through regulatory change. The gradual accumulation of rules in tandem with oscillating interest has driven up the costs of construction and diminished the ability for nuclear to address the most pressing issues of today. Continuing the peaks and troughs of the last 80 years will only damage the ability of nuclear energy's immense potential to improve British security, economic dynamism and environmental commitments.

1. 'Our Energy Future – Creating a Low Carbon Economy', Department of Trade and Industry, Cm 5761, (2003)

The Postwar Period 1945-1979

Ernest Bevin said of Britain's aspirations for a nuclear weapon that 'We've got to have this thing over here whatever it costs [and] we've got to have the bloody Union Jack on top of it.'[2] At the same time Churchill reportedly said 'We must do it. It's the price we pay to sit at the top table.'[3] Regardless of their differences, Bevin and Churchill were in lockstep on the urgent necessity of securing Britain's status as a nuclear power in a period of relative decline. Nuclear power was, therefore, a pressing matter for national security and industrial vitality. The fusion of miliary and civil interests animated the rapid initial expansion of nuclear power through dual-use Magnox reactors. These reactors would be replaced by AGRs, the muddled delivery of which and regulatory weight ingrained lasting costs while diminishing Britain's technological leadership. The first period of nuclear expansion ended with a whimper as fears over safety and environmental impact slowed construction – leaving the UK with a reasonably large but inefficient nuclear industry incumbered by unfavourable popular opinion.

In 1946 the Truman administration passed the Atomic Energy Act (also known as the McMahon Act) which determined how the United States would regulate the nuclear technology it had co-developed with its World War II allies. Combined with its fraying empire and decimated public finances, the McMahon Act prompted a profound insecurity within the UK. Britain needed to ensure its security and standing by becoming a member of the nuclear club. This began with the first research reactor in the UK and Europe, the Harwell Graphite Low Energy Experimental Pile, opened in 1947. In the same year work began on two reactors at Windscale which became operational in 1950 and 1951. The Magnox reactors at Windscale were dual use: capable of producing weapons grade plutonium and energy generation. Following which a further four Magnox reactors were constructed as well as being used in the first nuclear submarines such as HMS Dreadnought. The first fully commercial Magnox reactor was announced in the 1955 white paper 'A Programme of Nuclear Power', outlining three key objectives: to create a market for British designed reactors, foster the growth of a future nuclear export industry, and secure affordable energy supplies by decreasing reliance on coal, which was in short supply.[4] The 1955 white paper makes clear that what had began as primarily a defence application had evolved into an expansive civil energy project. As one Prime Ministerial memo from 1945 notes that Britain was 'naturally interested in the development of atomic energy, both as a means of self-defence, and as a source of industrial power.'[5]

2. Jack, 'Trident: The British Question', *The Guardian*, [https://www.theguardian.com/uk news/2016/feb/11/trident-the-british-question], (2016)
3. Hennessey, *Muddling Through*, (Gollancz, 1996), p.105
4. HM Government, 'A Programme of Nuclear Power', Cm 9389, (1955)
5. Cabinet Office, 'Memorandum of the Prime Minister. International Control of Nuclear Energy', CAB129/4, (1945)

Interwoven with the security elements of nuclear was the desire for sovereign control of energy supplies. During and following the war Britain was in a position of profound energy insecurity. By the end of 1945 coal production was at 175 million tonnes, far below the pre-war average of 250 million tonnes.[6] The aging coal mining workforce combined with frequent strikes led to the 1947 fuel crisis during which nationwide electricity shortages led to the closure of factories and severe economic repercussions. In 1951 alone there were '204 instances of electricity supply interruptions caused by excessive peak demand.'[7] These difficulties led Government to pursue diversification through oil, most of which had to be imported creating new vulnerabilities to the actions of foreign actors as exemplified by the nationalisation of Anglo-Iranian Oil by the Iranian government. As Maudling told the Commons 'Since we already spend about £250 million per annum on importing fuel, chiefly oil, and this burden on our balance of payments will continue to grow, the importance of our need to develop nuclear power as a source of energy cannot be in doubt'.[8] The need for energy security at a time of uncertainty regarding Britain's standing in a rapidly evolving geopolitical landscape presents an understandable parallel to our present circumstances. It is no surprise that discussions of supply-chain security and nuclear energy have become so relevant today. Adjoined to energy insecurity was the clear sense of a shared national endeavour toward an urgent goal. In the same speech Maudling proposed accelerating the 1955 programme, urging the adoption of novel technologies to reach increased generation. There was considerable debate on precisely how to get to this target, but there was a clear belief that expansion needed to be achieved at speed.

This created a wave of tremendous enthusiasm on which subsequent expansion rode. As Daily Telegraph proclaimed 'Calder Hall has started a new age' as 'nothing will ever be quite the same again' according to The Economist while The Times described it as 'courageous', 'magic' and that it 'deeply stirs the imagination.'[9] The words of a brave new world were met with action as the nuclear power was expanded to 5000-6000 MW in 1957 in line with the target established in the 1955 white paper.[10] This enthusiasm was given a fresh urgency as the Suez crisis created a fiscal and energy crisis which made oil and gas more expensive to import, leading to the unprecedented introduction of oil rationing. As Baker notes the 'expanded program was a reaction to the consequences of underinvestment in coal mining and imperial misadventure…decision makers saw nuclear power as a solution to problems that they themselves had created.'[11] This galvanised a wave of construction with 26 first generation Magnox reactors being built 11 sites between 1956 and 1971.[12] The goal of creating a nuclear export market set out in the 1955 white paper was also realised with two Magnox reactors being exported to Italy and Japan in 1959.[13] The military and economic insecurity which propelled the first nuclear programme led to its rapid expansion as Magnox reactors were able to provide the plutonium required for nuclear arms and the industrial might required for economic rejuvenation. It was a period of nuclear ambition

6. Hannah, *Electricity Before Nationalisation*, (MacMillan Press, 1979), p.289
7. Shin, 'Energy Shortages and Disruption', Material Cultures of Energy at Birbeck, 2017
8. Hansard, 'Nuclear Power (Revised Programme), 5/3/1957
9. Tweena, 'Nuclear Energy: Rise, Fall and Resurrection', *Centre for International Climate and Environmental Research – Oslo*, (2006), p.15
10. Baker, 'Nuclear Power in Britain: A Series of Successful Failures', *International Review of Public Policy*, vol 5, issue 1, (2023), p.32
11. Ibid, p.32
12. House of Commons Science, Innovation and Technology Committee, 'Delivering Nuclear Power', HC 626, (2023), p.73
13. Baker, 'Nuclear Power in Britain: A Series of Successful Failures', *International Review of Public Policy*, vol 5, issue 1, (2023), p31

and construction that is yet to be repeated.

The second wave of expansion from 1964 was just as ambitious, but unlike the first wave its delivery was plagued with difficulties. The gap between rhetoric and delivery has become a recognisable theme in nuclear policy, particularly in recent decades as pledges to expand have not materialised. In 1964, the Conservative Government unveiled plans for a second program to develop 5,000 MW of generating capacity. The following year, the newly elected Labour Government expanded the initiative to 8,000 MW as part of its push for a 'technological revolution.'[14] This upgrade was necessary because while first generation reactors were designed for research and military use, second generation models were primarily designed for commercial use. This gave second generation reactors improved cost-effectiveness and reliability.[15] This process was defined by significant controversy around the specific reactor design used. The initial clash was between the AEA's Magnox reactor and the American light water reactor design, but by the time the preparations for the second programme started it was between the British AGR and American PWR. The AEA backed the British option while a rising number of critics supported the PWR. Eventually the AEA prevailed probably because of its 'heavy involvement…at every stage', meaning the Central Electricity Generating Board's (CEGB) 'independent' decision judged 'solely on its merits' was likely flawed. [16] Then CEGB chairman Jack Hawkins recalled 'somewhat pretty heavy persuasion'[17] in securing the AGR's primacy over LWRs. This was mirrored by the British Government's attempts to 'aggressively defend Britain's indigenous nuclear industry'[18] as the possibility of exporting technology trumped close study of technological efficacy.

The introduction of AGRs was a mixed bag. The designs, not having gone through a proper inspection, were difficult scale up into full sized commercial units from the small-scale prototype. Meaning that plans had to substantially redesigned throughout the construction process. These delays led to spiralling costs twice the level of original estimates.[19] Meanwhile, each plant had some kind of technical variation from the last because a different consortium was responsible for building each reactor. For example, Dungeness B while ordered in 1965 only started working fully in 1993, and in the process was delivered late and massively over cost. Delivery issues aside it is worth noting that without AGR construction Britain would not have a nuclear industry. Moreover, these reactors far outlasted their initial estimated lifespan with four AGRs still providing energy today.[20] The key issue was regulatory reforms that would facilitate PWRs replacing AGRs or simply greater capacity were not realised.

The most notable regulatory change in this period was found in the Nuclear Installations Act of 1965 which created the National Nuclear Inspectorate (NII), the predecessor to the Office Nuclear Regulation (ONR), responsible for licensing, inspecting and enforcing safety rules. This was followed by The Health and Safety at Work Act 1974 which 'places a duty on employers to ensure, so far as is reasonably practicable, the health, safety and welfare'[21] of employees monitored by the Health and

14. Tweena, 'Nuclear Energy: Rise, Fall and Resurrection', *Centre for International Climate and Environmental Research – Oslo*, (2006), p.10
15. 'Generation II Reactors', Radioactivity.eu.com, [https://radioactivity.eu.com/articles/nuclearenergy/generation_ii_reactors], accessed 9/4/25
16. Hall, *Nuclear Politics: The History of Nuclear Power in Britain*, (Penguin, 1986), p.91
17. Hawkins, 'Evidence to the House of Commons Select Committee on Science and Technology', HC 73-III, (1973)
18. Baker, 'Nuclear Power in Britain: A Series of Successful Failures', *International Review of Public Policy*, vol 5, issue 1, (2023), p.33
19. Tweena, 'Nuclear Energy: Rise, Fall and Resurrection', *Centre for International Climate and Environmental Research – Oslo*, (2006), p.33
20. Heysham 1 and 2, Hartlepool and Torness
21. Office for Nuclear Regulation, 'Licensing Nuclear Instillations', (2021), p.5

Safety Executive (HSE). These pieces of legislation laid the groundwork for the 'as low as reasonably practicable' (ALARP) principle's dominance of nuclear regulation. While ALARP was not explicitly named in the 1965 Act, the concept and associated thinking 'is fundamental and applies to all activities within the scope of the HSWA and NIA 1965'[22] meaning it was embedded from the outset. The problem with ALARP is that when any jump in productivity occurs it becomes an opportunity to make it as safe as possible, rather than as safe as it needs to be. This massively extends the amount of planning required and raises the costs without any tangible safety benefit. While ALARP has a positive function in assuring those concerned that systems are becoming progressively safer, these two changes to regulation rose the MWh cost of nuclear construction from £10-30 (in 2020 prices) found in the initial Magnox reactors to £40-70 for the AGRs. This created the first major hurdle to nuclear construction and the first significant nuclear slowdown.[23]

It is no surprise, therefore, that the third wave of nuclear construction from 1970 stalled. Little was achieved between 1970-1979. The 1974 programme set the underwhelming of target 'not more than 4,000 MW over the next four years.'[24] Low ambitions were accompanied by the Flowers Report two years later which recommended halting nuclear expansion. Hesitance was deepened by the meltdown of the Three Mile Island plant in 1979 and public sentiment toward nuclear energy worsened with the Flowers Report's other recommendation that a nuclear fuel reprocessing plant be created at Windscale. The Daily Mirror's response that the UK had become the 'World's Nuclear Dustbin'[25] reflected popular concerns.

It was against this rising tide of public fear and Government reluctance that Tony Benn became Minister for Energy. Benn remained committed to the third nuclear programme but repeated the same mistakes of the second programme. The GEC, AEA and civil servants all favoured PWRs and yet Benn pursued AGRs on safety grounds with a view to potentially reviewing PWRs another time. Thus, the 'AGR cul-de-sac'[26] was embedded in the structure of British nuclear energy. High costs and flawed designs exacerbated by public fears facilitated the decline in the attractiveness of nuclear power, making its rejuvenation substantially more difficult. It is in this diminished position that the British nuclear industry entered the Thatcher ministry. Nuclear energy had declined from pioneering a brave new world for the purpose of maintaining Britain's position at the top-table of global powers and industrial strength to systematically inefficient, costly and unpopular.

22. Ibid, p.5
23. Hansard, 'Nuclear Power And The Environment', *House of Lords*, 22/12/1976
24. Ministry of Energy, 'Nuclear Reactor Systems for Electricity Generation', Cm 5695, (1974)
25. Williams, *The Nuclear Power Decisions: British Policies 1953-78*, (Croom Helm, 1980), p.289
26. Davis, *The British Nuclear Industry: Status and Prospects*, (Hurst & Company, 2009), p.7

Privatisation and The Dash for Gas 1979-2003

The gradual decline in reactor construction and efficiency throughout the postwar period appeared to end with renewed interest under Thatcher. Her particular concern with the strength of the unions and general interest in establishing greater British self-reliance led to the reemergence of the nuclear issue. Despite this, the greater availability of gas and oil from the North Sea undermined the sustained expansion necessary to sustaining a healthy nuclear industry. Instead of expansion, this period was dominated by energy privatisation and the dash for gas diminishing the interest in, and affordability of, nuclear construction. The result being a failure to repeat the established pattern of construction, leaving Britain with an acute nuclear shortfall.

Up until privatisation nuclear energy was dominated by the consortia, the collection of companies responsible for plant construction under contract from the Generating Board based on designs by the AEA. Initially the British model of consortia was seen to be effective in the first nuclear programme as each group could construct complete 'turnkey' stations. The bidding for these contracts, however, effectively excluded those outside of the consortia. Simultaneously, the AEA was both 'advisor' to the electricity authorities and the consortia undermining its ability to impartially award contracts. It became increasingly apparent that the consortia model was not working. Reduced construction brought the number of consortia to three by 1960 and to one by the end of the decade.[27] The collapse of the consortia model was a major reason for the failures of the nuclear sector during the 1960s and 70s. Following this, the National Nuclear Corporation, a mixed public-private organisation, was established in 1973 with 85% private ownership.[28] Despite the efforts of previous Conservative Governments to liberalise nationalised energy, this was the situation into which the Thatcher ministry entered.

Following their election victory the new Government announced its intent to expand nuclear power to meet predicted demand, asserting that the 'electricity supply industry has advised that even on cautious assumptions it would need to order at least one new nuclear power station a year in the decade from 1982.'[29] The appetite for nuclear power was spurred on by the strong unions which had brought the country to a halt during the 'Winter of Discontent.' As the minutes of a meeting of the Economic Strategic Committee note 'a nuclear program would have the advantage of removing a substantial portion of electricity production from

27. Young, 'Atomic Energy: From "Public" to "Private" Power', *Annales Historiques de L'Electricite*, vol 1, (2003), p.140
28. Ibid, p.140
29. Baker, 'Nuclear Power in Britain: A Series of Successful Failures', *International Review of Public Policy*, vol 5, issue 1, (2023), p.34

the dangers of disruption by industrial action by coal miners.'[30] Fears of industrial action dovetailed with the oil shocks of 1974-34 and in 1979 to render nuclear power 'One of the Prime Minister's particular obsessions.'[31]

Renewed nuclear enthusiasm was accompanied by growing appetite for liberalising the electricity market. Lawson's 1982 speech outlined renewed optimism that a market-oriented approach could achieve greater efficiency and reduced costs. Speaking to the British Institute of Energy Economics he said the role of the Government was not to plan energy: 'Our task is rather to set a framework which will ensure that the market operates with a minimum of distortion and energy is produced and consumed efficiently.'[32] The Government announced its intention to privatise the electricity sector in the 1988 White Paper.[33] Nuclear plants were exempted from the initial round of privatisation in 1989 and stayed in state control under the Nuclear Electric company until the 1995 'Prospects for Nuclear Power in the UK' review. It found no 'reasons why the electricity market should not of its own accord provide an appropriate level of diversity' and 'no evidence to support the view the new nuclear build is needed in the near future.'[34] It also found that building new stations would not be commercially attractive. Meaning that the Government's focus would turn exclusively to privatisation. Having won 1997 election, the new Labour Government continued the process of privatisation; the new Energy Minister John Battle stressed the Government's 'commitment to competition.'[35]

Privatisation was an important step in optimising the electricity market, but it became a problem for continued construction as it absorbed Government's attention. Privatisation was, therefore, a positive step for how the nuclear industry was run but not for the overall health of the sector as demonstrated by the slow pace of building during the period. One PWR was ordered for Sizewell B, but its approval was delayed for two years by a public inquiry between 1983-1985. The inquiry was caused by objections from the Suffolk County Council, Suffolk Coastal District Council and others across environmental, economic and safety issues. Given the ongoing Sizewell C inquiry, the 1983-1985 session demonstrates the difficulty of aligning acceptable risk with public approval. Such prolonged disagreement raises the time taken to build and the accompanying cost, further diminishing the financial viability of nuclear. Further PWR expansion was planned at Hinkley Point C, Wylfa B and Sizewell C. While approval was granted for Hinkley Point C, the Government ceased building following the Chernobyl meltdown. A review of nuclear policy was undertaken until 1994 and all construction ceased. In 1995 the new private sector body Nuclear Electric decided that more nuclear power plants were not viable. Between 1983-1995 a total of five plants were opened, followed by a distinct absence of further construction.[36] Four of these plants are expected to shut by 2028.[37]

The failure to replicate the established pattern of repeated construction because government attention was focussed on privatisation became imbricated with the dash for gas. The liberalisation of the gas market

30. Cabinet Office, 'Minutes from the 13th Meeting of Ministerial Committee on Economic Strategy', CAB 34/4337, (1979)
31. Tweena, 'Nuclear Energy: Rise, Fall and Resurrection', *Centre for International Climate and Environmental Research – Oslo*, (2006), p.12
32. Pearson and Watson, 'UK Energy Policy 1980-2010', Parliamentary Group for Energy Studies, (2012), p.7
33. Department of Energy, 'Privatising Electricity White Paper', 1988
34. Pearson and Watson, 'UK Energy Policy 1980-2010', Parliamentary Group for Energy Studies, (2012), p.15
35. John Battle, Speech to the Institute for Economic Affairs, London, 4th June 1997
36. House of Commons Science, Innovation and Technology Committee, 'Delivering Nuclear Power', HC 626, (2023), p.18
37. Ibid, p.18

through the Gas Act 1986 and the privatisation of the energy market under the Electricity Act 1989 along with the advent of the combined cycle gas turbine and the discovery of new reserves in the North Sea meant gas became the favoured energy source due to its lower capital costs, rapid deployment time and operational flexibility.[38] Nuclear construction is capital intensive with construction potentially spanning decades while gas plants could be constructed in the space of 2-3 years with greater flexibility, making them ideal to respond to both fresh reserves and a newly competitive electricity market. This created a cyclical effect in which the 'low gas price created a strong incentive for the use of gas in power generation'[39] crowding out nuclear. The decision to allow gas to be burnt at power stations[40] spurred the dash for gas further, and by 1997 the share of electricity generation by gas turbines had increased from nought to 27% and by 1999 the amount of North Sea oil produced reached its peak at 137 million tonnes.

Ultimately it meant that investors were unwilling shoulder the expense of new nuclear construction, not least because of the reduced competitiveness of nuclear in this energy market flooded with cheap gas. Meaning that the MWh cost of nuclear power compared to gas rose greatly, widening the gap between the two significantly. The economics of nuclear energy in a gas dominated market made it a relatively unattractive (albeit more stable in the long term) option, leading to a reconsideration of priorities. It may have been 'a time of nuclear bullishness'[41] in rhetoric, but in practice the Government's focus was firmly set on the dual priorities of privatisation and the dash for gas at the expense of continuing construction. The further consequence of the transition toward gas was that replication of supply of future projects did not occur quickly enough, diminishing the value of consistently building and repeating. Such recurrent benefits can only occur if assets are redeployed rapidly to create economies of scale. Thus, the problem was a decline in the speed of construction embedded the relatively high cost of nuclear construction.

The prospects of renewed construction were worsened by the regulatory response to the Chernobyl meltdown. The NII deepened the ALARP principle through the Layfield Inquiry[42] into safety assessment principles for reactor designs. It introduced a distinction between 'tolerable' and 'acceptable' risk. Tolerable risk 'means that we do not regard it as negligible or something we might ignore, but rather as something we need to keep under review and reduce still further if and as we can.'[43] Whereas acceptable risk means one is willing to accept it largely as it is. This culminated in the 'Probabilistic Safety Analysis' which cemented tolerable risk as the guiding principle of future assessment. This was a clear continuation of the ALARP's requirement for all designs to consistently reduce all risk wherever present. Layfield also recommended that 'the opinion of the public should underlie the evaluation of risk'[44] supported by greater information about nuclear power. Introducing the public into an already risk-averse regulatory framework did not result in a better-informed discourse but another hurdle to building. Together the

38. Helm, *Energy, the State, and the Market: British Energy Policy Since 1979*, (OUP, 2003), p.125
39. Bocse and Gegenbauer, 'UK's Dash for Gas', *Department of War Studies KCL*, (2017), p.10
40. Office of Electricity Regulation, 'Review of Energy Sources for Power Stations', (1998), p.6
41. Saward, 'The Civil Nuclear Network in Britain', in Marsh and Rhodes, *Policy Networks in British Government*, (Clarendon Press: 1992), p.97
42. The Health and Safety Executive, 'The Tolerability of Risk from Nuclear Power Stations', (1988)
43. Ibid, p.2
44. Ibid, p.1

regulatory developments in response to Chernobyl weakened the already fragile position of nuclear.

The combination of market liberalisation, new sources of oil and gas with further regulation created a situation whereby construction fell to unprecedented levels. The consequence being that by 1999 all consumers were able to choose supplier, but a new reactor had not come online for 23 years. The final reactor that came online in 1976, Hinkley Point B, was retired in 2022. The dash for gas, enabled by liberalising the energy market, made nuclear an economically unviable option while also drawing the Government's attention away from continuing construction of new reactors. The chief consequence of which was a long-term nuclear deficit that continues today within which Britain is dependent on long-lasting but somewhat outdated second generation AGRs. Inability to replace reactors and increase capacity became embedded in the structure of the nuclear sector. Simultaneously, it left Britain without a diverse energy mix rendering it vulnerable to exogenous changes in the energy market. While the North Sea reserves are under the exclusive economic zones of friendly actors, the shift toward gas plants during this period has created a structural preference for gas – much of which needed to be imported. This created an imbalanced portfolio dominated by intrinsically volatile gas and oil markets leaving Britain exposed to global instability geopolitical (the Russian invasion of Ukraine) or otherwise (prices during and after the Covid-19 pandemic). When considering the outdated reactors and supply-chain vulnerability embedded during this period, these problems flow downstream of the decline in reactor construction caused by the effects of Government focus being drawn to privatisation and the availability of cheap gas diminishing nuclear's economic viability.

The Environment and the Return of Nuclear? 2003-2025

At the turn of the millennium interest in nuclear construction was at its nadir. Focus was entirely on the process of privatisation and new reactors were completely out the picture. Falling interest and usage seemed to spell the end of nuclear power in the UK. The Government's priority continued to be optimising liberalisation until interest turned to climate change. It was only with environmental concerns that nuclear energy reemerged as a notable interest. As the question of how to encourage building and investment within liberalised market arose successive Governments sought to improve regulation and financing legislation. Recognising the necessity of reappraising the regulation and financing was a step in the right direction but left much to be desired – particularly in regulation.

Between 2003-2006 the Government published several White Papers illustrative of its shifting position. From the first declaring that 'its current economics make it an unattractive option'[45] to the 2006 paper's argument that 'nuclear has a role to play in the future UK generating mix alongside other low carbon generation options.'[46] The Blair Government's energy policy was in flux until his 2005 speech where he said 'The issue back on the agenda with vengeance is energy policy' because 'Energy supply is under threat. Climate change is producing a sense of urgency.'[47] Out of this dual concern the 2006 White Paper was produced encouraging nuclear expansion. Blackouts across North America and Europe in 2003, a spike in the price of uranium and most importantly the UK's return to net electricity importer from exporter had sizeable psychological impact in highlighting energy insecurity. The 2008 Climate Change Act cemented the importance of these concerns and gave nuclear energy an important but not central role in the response.

To meet climate targets and ensure energy security while sustaining commitments to a liberalised energy market required a construction boom through the private sector. For this reason, attention turned to making sure regulation was not excessive and financing available. The gradual accumulation of regulatory constraints built-up over the preceding 50 years were not addressed and were in some cases worsened. As demonstrated by the MWh cost price rising to around £90 for the PWRs.[48] The first regulatory barrier added in this period was the 1998 Aarhus Convention[49] which ensured the public's right to request and receive environmental information without needing to state an interest. It also requires the public to be involved early in the environmental decision-making process so that

45. 'Our Energy Future – Creating a Low Carbon Economy', Department of Trade and Industry, Cm 5761, (2003)
46. Department of Trade and Industry, 'The Energy Challenge Energy Review Report 2006', Cm6887, (2006)
47. Tony Blair, Speech to the Confederation of British Industry, (2005)
48. Hansard, 'Reactors (Costs)', *House of Commons*, 19/3/1980
49. United Nations Economic Commission for Europe, 'Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters', (1998)

public input is genuinely considered in the final decision. These steps provide clear avenues to delay decisions, but most importantly Article 9 enshrines the public's right to challenge any process that does not provide this information. The Aarhus Convention contributed towards a legal-regulatory framework that is designed to provide as many junctures as possible to delay or prevent construction.

The next major step was the Energy Act,[50] which established the ONR as an autonomous regulator operating alongside the International Atomic Energy Agency (IAEA) which sets safety standards globally. The ONR was now the single authority with a broad remit over nuclear safety, security, and construction oversight whose role required it to scrutinise construction methods and designs through the Generic Design Assessment. These assessments were lengthier than ever with the proposed Bradwell B reactor entering the generic design assessment (GDA) in 2017 and was only completed in 2022. The issue here was not establishing a single body responsible for regulation but the gradual creep of ever-widening regulations and the zeal with which they were pursued. As the ONR's assessment of its own organisational culture notes a 'focus on reputation can lead to disproportionate risk aversion, reducing ONR's ability to respond to challenge, change and innovation.'[51] Therefore, in addressing over-regulation the answer should not be bureaucratic reorganisation, there is little wrong with a single regulatory body, instead the problem is the execution of its function.

The further challenge has been in planning regulation as demonstrated through comparison with South Korea which is subject to the same IAEA planning rules and yet the average time taken to build a plant is under five years, which is three times faster than the world average.[52] This has had no effect on South Korea's safety record. As the IAEA noted in 2024, South Korea 'demonstrates a high level of nuclear safety through its independent regulatory body and mature regulatory systems, promoting a strong safety culture.'[53] In the US the average time taken to construct a reactor was 6.3 years[54] and in France it typically takes 9-10 years.[55] Neither of which have received criticism from the IAEA on safety grounds. This planning system makes the UK one of the most expensive place to build a nuclear reactor in the world.[56] Hinkley Point C will cost £128.09MWh[57], six times more per megawatt than its South Korean equivalent, and despite France using many of the same reactor designs as the UK they are built for almost half per megawatt than in Britain.[58]

There have been a handful of insignificant steps intended to address these problems. The Localism Act of 2011 created the Planning Inspectorate, responsible for the development consent order needed for nationally significant infrastructure status. This was intended to ease planning permission but was ultimately a reflection of coalition divided on nuclear issues and uninterested in pressing the issue. The Liberal Democrats did not want any further nuclear expansion with Energy Secretary Chris Huhne calling it a 'tried, tested and failed technology.'[59] Meanwhile, the Conservatives supported replacement if it was not publicly subsidised.

50. UK Government, 'Energy Act 2013', c.32, (2013)
51. ONR, 'In-depth assessment of ONR's organisational culture published', (2023), [https://onr.org.uk/news/all-news/2023/12/in-depth-assessment-of-onrs-organisational-culture-published/#:~:text=Its%20enabling%20approach%20to%20regulation,lead%20to%20perfectionism%20and-%20overworking.], accessed 13/4/25
52. Zenou and Munson, 'Harnessing the Power of the Atom', *The Henry Jackson Society*, (2025), p.21
53. IAEA,' IAEA Mission Reviews Republic of Korea's Regulatory Framework for Nuclear Safety', (2024), [https://www.iaea.org/newscenter/pressreleases/iaea-mission-reviews-republic-of-koreas-regulatoryframework-for-nuclear-safety], accessed 1/4/24
54. Ritchie, 'How long does it take to build a nuclear reactor?', *Sustainability by the Numbers*
55. Ibid
56. Dumiriu, 'Why Britain is Building the World's Most Expensive Nuclear Plant', *The Spectator*, (2024)
57. Evans, 'New nuclear power in UK would be the world's most costly, says report', *Carbon Brief*, (2015), [https://www.carbonbrief.org/new-nuclear-power-in-uk-would-be-the-worlds-most-costly-says-report/#:~:text=A%20Department%20for%20Energy%20and,falling%20costs%20through%20the%-202020s.], accessed 12/4/2025
58. 'Nuclear Manifesto', *Britain Remade*
59. Hunhe, 'Tried Tested and Failed', *The Guardian*, (2006)

Hesitance was deepened by the Fukushima disaster in 2011 which led to widespread nuclear pollution in the surrounding area and displaced around 164,000 residents.[60] Regulatory reform under the coalition while carving out the potential for streamlined regulation, was static because it was marshalled by sceptics.

The UK's nuclear industry is still notably overregulated but recent developments show promising signs that reform is being taken more seriously. The 2020 'Ten Point Plan for a Green Industrial Revolution' directly addresses the need to pursue large-scale nuclear expansion, part of which is investing £40 million into developing regulatory frameworks.[61] The Nationally Significant Infrastructure Projects (NSIP) reform plan in 2023 sought to align planning permission with other nationally significant infrastructure projects.[62] Meaning that reactors could be fast-tracked through NSIP status, moving to an outcomes based environment assessment and placing greater onus on the pre-application stage. These were all positive steps, but the most progress has been made in the past year. The ONR and the Environment Agency have developed a pathway for early regulatory engagement[63] to make the process for GDA quicker when it arrives. This should also assist in streamlining of environmental regulation to make it proportionate on safety and risk in addition to greater international alignment allowing minimal changes in regulatory approval if technology is moved to another country. Most recently the Government has established The Nuclear Regulatory Taskforce which while in its nascent stages possesses a wide investigative remit across the suitability of the existing regulatory framework, the scope and capacity of regulatory bodies, the culture and processes within the nuclear sector and support for innovation and the deployment of new nuclear.[64] If the rhetoric of 'Government rips up rules to fire-up nuclear power'[65] is actualised, then the dial may be finally moving on the regulatory reform, but this is decades too late.

These regulatory burdens increase the level of investment needed and the time taken to build. While nuclear power plants have low running costs and long lifetimes, they have high upfront cost spread over an extended period which in turn drives up the MWh cost. MWh cost calculations convey the price of one megawatt-hour of electricity which is composed of capital costs (construction, financing, licensing and infrastructure), operating costs, fuel costs and decommissioning. The accumulation of regulations across these fields has driven up the MWh cost of nuclear energy for investors. Expensive extended construction presents significant frontloaded costs, creating an outweighed impact on the competitiveness of nuclear. Upfront capital expenditure cannot be reduced without regulatory overhaul, but successive Governments have attempted to make investment more appealing by underwriting capital costs and mitigating risk. In many cases pre-liberalisation construction passed the cost on to electricity consumers through regulated tariffs 'minimising the risk to lenders, investors and operators of exposure to price fluctuation.'[66] This was appropriate in contexts where utilities were integrated monopolies

60. Do, 'Fukushima Nuclear Disaster Displacement', *International Journal of Disaster Risk Reduction*, vol 33, (2019), p.236
61. HM Government, 'The Ten Point Plan for a Green Industrial Revolution', (2020), p.12
62. Department for Levelling Up, Housing and Communities, 'Nationally Significant Infrastructure: action plan for reforms to the planning process', (2023)
63. Office for Nuclear Regulation, Environment Agency and Natural Resources Wales, 'New Nuclear Power Plants: Early Engagement for Regulatory Pathways', (2024)
64. UK Government, 'Nuclear Regulatory Taskforce', (2025)
65. UK Government, 'Government Rips Up Rules to Fire-Up Nuclear Power', (2025)
66. Orayeva, Financing and Managing Nuclear Energy Risks: The UK model', *IAEA Bulletin*, (2017), p.15

bringing together generation, transmission and sale under significant Government intervention. The liberalising of the electricity market spelt price and revenue uncertainty, diminishing the appetite of lenders and investors for this type of long-term project. The aim of Government policy, therefore, has been to reduce risk by minimising revenue volatility.

The strongest effort to mitigate the risks of revenue volatility is found in the contracts for difference (CfD) model introduced under the 2013 Energy Act. CfDs contain a ratepayer-backed guaranteed price for low-carbon electricity generation. With Hinkley Point C its owners will be paid the difference between the 'strike price' – the electricity price which reflects the cost of investing in nuclear – and the 'reference price' which is the average price for electricity within the UK market. This means that if the market price of electricity falls below the agreed strike price, the Government pays the difference. If the inverse occurs, the generator pays the difference to the consumer. CfDs operate in tandem with the carbon floor price which is intended to guide the market toward feed-in tariffs or strike price level from low-carbon methods. The Energy Act also established a final investment decision process which facilitates early investment in low-carbon projects, helping prevent delays in energy infrastructure development. These measures were important steps in stabilising financial returns from low-carbon generation and mitigating the risks contained in high capital expenditure.

The regulated asset base (RAB) model established in the Nuclear Financing Act allowed the RAB model to be extended to nuclear projects, as it had been in other major infrastructure projects. Under the RAB model an economic regulator is allowed to levy a charge on consumers, the money from which goes toward funding construction costs of new infrastructure. The 'RAB model would reduce the overall cost of a project by reducing financing over the construction period, compared to a model in which the cost of construction was financed exclusively from the return provided by operating the plant in the future.'[67] This model's ability to raise revenue throughout construction has been the saving grace of the elongated Hinkley Point C saga. The Roadmap to 2050 provided further important financial support through the inclusion of nuclear in the Green Taxonomy. The UK Green Taxonomy provides a classification system for environmentally sustainable activities providing the market with reliable information concerning sustainability to the market 'driving an increase in financing for activities that support the transition to net zero.'[68] This reclassification is an important step to providing nuclear energy the same investment incentives as other sources of low-carbon energy.

CfDs and the RAB model are important steps toward making nuclear construction financing viable, but too much time was spent debating the perfect model of financing when the obvious answer that was always going to be (and eventually was) reached was a mix of private and state capital. So, these were positive moves to facilitating a hospitable investment environment but getting to this position of state support for private capital over the lengthy building process took too long to realise.

67. House of Commons Science, Innovation and Technology Committee, 'Delivering Nuclear Power', HC 626, (2023), p.70
68. Department for Energy Security and Net Zero, 'Civil Nuclear: Roadmap to 2050', Cp 1009, (2024), p.42

These measures are certainly something to build on but are a testament to decades of lost progress in technological leadership. Without construction through investment Britain's ability to innovate and to build strong domestic industrial capacity has been significantly diminished. By creating the circumstances conducive to investment in regulation and financing, the industrial and innovative capacity will follow – the UK just needs to create the groundwork. Lost progress, therefore, is not just a matter of electricity generation, but our ability to grow expertise and create further investment.

The Present: Opportunities and Challenges

In 2025 expanding Britain's ability to generate nuclear power is an absolute policy imperative. Nuclear lies at the heart of meeting urgent national interest in economic growth, defence and levelling up alongside global environmental responsibilities. Further, its adoption is necessary to address Britain's dependence on imported gas, which has proven as expensive as it is vulnerable to exogenous shocks. The invasion of Ukraine and subsequent embargo sharply exposed the need to reorient the UK's energy portfolio toward nuclear. It is here, at the intersection between prosperity and national security, that nuclear transition's importance is clearest. A nuclear renaissance is not without challenges. Above all it requires largescale regulatory reform to achieve a more consistent rate of construction assisting in realising the objectives for which it was started in defence and industrial dynamism. Moreover, it would improve the economic vitality of the UK's most deprived areas, attract corporate investment and place Britain at the forefront of the next industrial revolution.

At present the UK generates about 15% of its electricity from nuclear energy, placing it ahead of biofuels (12%), solar (4%), hydroelectric (2%), coal (2%) and behind gas (39%) and wind (25%)[69] – a significant drop from of around 25% nuclear generation in late 90s.[70] This should be viewed in the context of the UK being a net importer of electricity, largely importing gas from Norway, Qatar, the USA and until recently Russia.[71] The energy generated by nuclear comes from four AGRs[72] and the PWR Sizewell B. The AGR fleet is aging, all of which are expected to close between 2026-2028. Sizewell C, having been approved in 2012, is expected to come online in the mid-2030s while Hinkley Point C in the early 2030s. Poor rate of construction appears completely out of sync with the ambitions detailed in the Energy Security Strategy[73] to achieve 24GW of nuclear capacity by 2050. This is triple the current nuclear capacity before upcoming plant retirements and double the highest capacity the UK has ever had.[74]

As discussed throughout this paper the underlying challenge for the UK is regulatory reform. The progress made since 2020 has been significant. The NSIP reforms introduced in the Levelling Up and Regeneration Act of 2023 were followed by reform to the planning process by providing 'an upfront…assessment of a design that allows vendors, developers and investors to gain early insight as to the acceptability of designs prior to

69. World Nuclear Association, 'Nuclear Power in the UK', (2024), [https://world-nuclear.org/informationlibrary/country-profiles/countries-t-z/united-kingdom#:~:text=The%20UK%20generates%20about%2015,nuclear%20plants%20is%20under%20construction], accessed 2/4/25
70. Ibid
71. Ibid
72. Heysham 1 and 2, Hartlepool and Torness
73. HM Government, 'British Energy Security Strategy', (2022)
74. House of Commons Science, Innovation and Technology Committee, 'Delivering Nuclear Power', HC 626, (2023), p.60

making significant financial and resource commitments.'[75] The Roadmap to 2050 proposes to use revised NSIP rules to broaden number of possible sites, seeking to dismantle the previous restrictions of only being allowed to build on eight sites. Greater transparency and flexibility in the planning process has been a matter of maximising efficiencies. While beneficial developments, the problems associated with the ONR and its ALARP rules remain. Without changing how we think about safety from as safe as imaginable to as safe as necessary these attempts to streamline regulation will have little effect. Financing reforms leading to a combination of private capital with state support have all been moves toward a more hospitable investment climate, but ones that have come decades too late. Financing arrangements have sought to tinker with a system that needs fundamental change at the regulatory level, making CfDs and the RAB model of limited efficacy.

This is clear in the delivery of both new small modular reactor (SMR) and advanced modular reactor (AMR) technologies. Rolls Royce have developed SMRs which can generate enough energy for one million homes occupying 'around one tenth of the size of a conventional nuclear generation site.'[76] SMRs could act as both bridging the gap in nuclear deficit while larger reactors are built or as part of a dispersed system of generation. Their construction has been stifled by the same issues of 'investment risk, availability of cheaper technologies to generate electricity' because of regulatory barriers.[77] Time, cost and risk brought together through overregulation have also held back the delivery of fourth generation AMRs.

Having been established with the explicitly dual-use intention, nuclear power has returned to the forefront of defence policy. From imperial decline, through oil shocks and to the rise of China and Russia, nuclear energy and defence are tightly imbricated. The most pressing opportunity for nuclear is in addressing Britain's vulnerability to fluctuations in the global energy market exacerbated by Russia's weaponisation of fossil fuels.[78] The immense generative potential of nuclear is an opportunity to insulate ourselves against hostile actors. The problem being that Western actors control a fraction of the nuclear supply chain in the face of growing competition over these resources. For example, Kazakhstan produces around 40% of the global uranium supply, a 'significant proportion of this production is held in joint ventures with Russian and Chinese interests.'[79] This is worsened by the complete supply chain dominance of China and Russia across extraction, enrichment and production as they vertically integrate supply chains from Niger to Canada.

The dominance of hostile states in the nuclear supply chain does not mean the UK should abandon nuclear, rather we must ensure alternative supply and deepen collaboration with partners. Allies such as Canada and Australia produced 13% and 12% of uranium mining in 2020 in addition to possessing the first and third largest reserves.[80] Even as the uranium supply dries up alternative sources such as thorium should be considered considering Australia, the USA and Canada possess sizeable

75. Department for Energy Security and Net Zero, 'Civil Nuclear: Roadmap to 2050', Cp 1009, (2024), p.36
76. House of Commons Science, Innovation and Technology Committee, 'Delivering Nuclear Power', HC 626, (2023), p.39
77. Mignacca, Locatelli and Sainati, 'Deeds not words: Barriers and remedies for Small Modular nuclear Reactors', *Energy*, vol.206, (2020), p.1
78. Clarke, 'The UK Needs to Confront the Weaponisation of the Nuclear Supply Chain', *RUSI*, (2023), [https://www.rusi.org/explore-our-research/publications/commentary/uk-needs-confront-weaponisation-nuclear-supply-chain], accessed 3/4/25
79. Ibid
80. IAEA, 'Uranium 2020 Resources, Production and Demand', (2020), p.139 and 166

reserves.[81] In 2023 alone the UK signed agreements with France[82], the USA[83], Japan and Canada[84] to boost investment into securing the supply chain and construction. These agreements are certainly a step toward the 1955 White Paper's belief that nuclear would allow Britain to 'fulfil our traditional role as an exporter of skill, to the benefit both of ourselves and of the rest of the world.'[85]

The final defence related benefit of nuclear renaissance stands at the overlap with industrial strategy and levelling up. The Integrated Review Refresh outlined how the Government's intention to align civil and military sectors. Dual-purpose nuclear is not limited to enriching plutonium, it describes the transferrable expertise capable of addressing shared challenges, building a skilled workforce and developing new technology. The National Physical Laboratory and UK Research and Innovation play a key role in supporting technological innovation with a range of application from medical radionuclide to space. The continued development of civil-military nuclear engagement presents an immense opportunity that allows the UK to draw on its sizable human capital to regain lost technological leadership.

The economic benefits of nuclear will be felt most in the UK's least economically productive regions. Overall, the civil nuclear sector contributed £6.1 billion toward British GDP employing 64,000 people directly and 211,000 indirectly.[86] In the Northwest it supports £1 in every £49 of economic output and nationally it has a GVA multiplier of 2.6.[87] The Northwest is 'the largest and most connected community of nuclear academics and researchers anywhere in the UK'[88] which in turn produces a vast number of vocational courses, apprenticeships and other expertise building jobs. The levelling up potential of nuclear energy is also found in the decommissioning economy which has emerged in the area. The Nuclear Decommissioning Authority located in Cumbria is responsible for a budget £3 billion and an increasingly lucrative global decommissioning market estimated to be worth £50 billion a year, a number that will rise as a growing number of reactors are being decommissioned across Europe.[89] With nuclear expansion set to reach £930 million in the next 20 years[90] the demand for nuclear expertise and decommissioning can only grow. The opportunities found in nuclear expansion act as catalysts to growth in the poorest areas of the country.

The innovative potential of nuclear is also abundant in artificial intelligence and private sector investment. Sam Altman, CEO of OpenAI, said France had 'created a playbook that other European nations should follow'[91] because of their nuclear-powered energy surplus. AI uses a vast amount of energy, in 2023 alone data centres used the equivalent to 450 million lightbulbs[92]. The average datacentre requires 150 MW of electricity, a typical generation three plant can produce 1000 MW meaning it can reliably power several datacentres at once.[93] Simultaneously its low carbon character allows companies to meet their environmental commitments easily. For Britain to thrive in the next century of technological innovation it must not just grow its economy but attract investment from highly

81. IAEA, 'World Thorium Occurrences, Deposits and Resources', (2019), p.99, 29 and 106
82. Joint Statement of Cooperation in Nuclear Energy
83. The Atlantic Declaration
84. Sapporo 5
85. Baker, 'Nuclear Power in Britain: A Series of Successful Failures', *International Review of Public Policy*, vol.5, issue.1, (2023), p.30
86. Nuclear Industry Association, 'Delivering Value', (2023), p.2
87. Ibid, p.3
88. Department for International Trade, 'Nuclear in the Northern Powerhouse', (2017), p.4
89. Ibid, p.8
90. Ibid, p.10
91. Altman, 'Sam Altman, CEO of OpenAI: "On AI, France has created a playbook that other European nations should follow"', *Le Monde*, (2025), [https://www.lemonde.fr/en/opinion/article/2025/02/09/sam-altman-ceo-of-openai-on-ai-france-has-created-a-playbook-that-other-european-nations-should-follow_6737962_23.html], accessed 4/4/25
92. Zenou and Munson, 'Harnessing the Power of the Atom', *The Henry Jackson Society*, (2025), p.17
93. Ibid, p.18

innovative companies. Nuclear energy is the best way to achieve industrial-commercial innovation.

Conclusion

The British civil nuclear industry is weaker than it ever has been, and the need for its success more urgent than ever. Today we are faced with rising global instability, particularly oil and gas rich regions, threatening our energy security the only answer to which must be a higher degree of self-reliance. Nuclear energy offers the opportunity to secure our energy security, but as our adversaries close-in on the nuclear supply chain action must be taken now in unison with our allies to deepen our investment into nuclear energy itself and its fuel. If we are to secure our interests abroad and endear others to the Western order the UK must put itself in a position to assist with nuclear construction globally.

Attempting to do this without rectifying our own nuclear industry will be an embarrassing irony. Our history of nuclear energy demonstrates that we cannot afford to continue stopping and starting every time we lose the appetite for nuclear. To realise a consistent rate of reactor construction deregulation across planning, the environment and other areas must be the foremost priority of any Government. This, combined with state-supported financing, is the first and most important step toward making nuclear affordable. If the Government is capable of realising cost deflationary deregulation the UK should be able to embark on the wave of construction necessary to end the so-called trilemma[94] of balancing energy security, affordability and sustainability.

The central goal of Government must be committing to creating an environment conducive to investment and keeping a sustained focus on doing so. A sound parallel is with the rapid expansion of the British railway network – another nationally beneficial system of infrastructure driven forward by private investment. The period known as 'railway mania' in the 1840s saw a surge in speculative investments, with over 1,200 railway projects registered in 1845 alone.[95] By 1847 railway capital had risen to over £200 million, reflecting the enormous influx of investment.[96] Such sizeable investment drove rapid construction: between 1820 and 1850, approximately 6,000 miles of railway were opened in Britain.[97] Railway expansion drove down the cost of goods and travel while making it affordable to all. There is no good reason we should not have similar 'nuclear mania.' Continued focus on the reform needed to make nuclear investment affordable will facilitate greater investment, and with that a range of benefits across energy cost, technological innovation and levelling up.

The rhetoric of this and the previous Government demonstrates an increasing engagement with the subject and a growing awareness of the

94. Clark, Speech to The Institute of Directors, (2018)
95. Mesevage and Esteves, 'Private benefits, public vices: Railways and logrolling in the 19th century British Parliament', Centre for Economic Policy Research, (2018), [https://cepr.org/voxeu/columns/private-benefits-public-vices-railways-and-logrolling-19th-century-british-parliament], accessed 17/4/24
96. Glynn, 'The Development of British Railway Accounting: 1800-1911', 'Accounting Information', [https://www.accountingin.com/accounting-historians-journal/volume-11-number-1/the-development-of-british-railway-accounting-1800-1911], accessed 17/4/24
97. Hobsbawm, *Industry and Empire: The Birth of the Industrial Revolution*, (New Press, 1999), p.93

regulatory barriers to growth across energy, defence and industrial strategy portfolios. The UK cannot afford to repeat the pattern of lofty pledges followed by lacklustre delivery at a time of acute shortfall in all these fields. The urgency of early nuclear construction must be resuscitated in the era of 'build baby build.'[98] The first, and most important step, is for the Government to recognise the disappointing history of civil nuclear energy and its principal antagonist: cost inflationary overregulation.

98. Khalil and Morton, '"Build baby build", says PM as he sets out nuclear plan', BBC News, [https://www.bbc.co.uk/news/articles/c805mjxe2y9o], accessed 30/4/25

£10.00
ISBN: 978-1-917201-55-1

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