HARNESSING THE POWER OF THE ATOM

By DR THEO ZENOU and THOMAS MUNSON
With a Foreword by SIR GAVIN WILLIAMSON CBE MP

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CENTRE FOR RESILIENT SOCIETY

DEMOCRACY | FREEDOM | HUMAN RIGHTS

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By DR THEO ZENOU and THOMAS MUNSON

"The miraculous inventiveness of man shall not be dedicated to his death, but consecrated to his life."

– President Dwight D. Eisenhower, *Atoms for Peace*, 1953

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About the Centre for Resilient Society

The **Centre for Resilient Society (CRS)** is a citizen-focused, international research centre within the Henry Jackson Society, which seeks to identify, diagnose and propose solutions to threats to the social resilience of liberal Western democracies.

The centre's work includes addressing the twin challenges posed by radicalisation and terrorism. The centre is unique in addressing violent and non-violent extremism. By coupling high-quality, in-depth research with targeted and impactful policy recommendations, it aims to combat the threat of radicalisation and terrorism in our society.

The centre's work also includes broader challenges of democratic resilience – including threats from both foreign interference and domestic issues. This includes the potential harm that various forms of social, cultural and political insecurity, conflict and disengagement can pose to the long-term sustainability of democracies, including the resilience of their institutions, public policy outcomes, citizens' health and wellbeing, and economic growth and prosperity. It also explores the balance between free speech and hate speech, and encourages respectful debate between those of different views, rather than cancellation. Moreover, it underscores how social and political instability can make nations vulnerable to internal and external actors seeking to deepen cleavages, undermine consensus and, ultimately, to weaken democratic functioning.

Contents

Foreword

Bangladesh, Egypt, India, Iran, Turkey. These are just a few of the countries that Russia is currently building nuclear power plants for. With control of 46% of the global uranium enrichment market and over $1bn worth of nuclear-related exports, the Russian bear gnaws at an oversized portion of the global nuclear industry.

Russia's aspirations to dominate nuclear are rivalled only by China. Since 2000, the China National Nuclear Corporation, CNNC, has built 50% of all new nuclear reactors and its exports form a crucial part of China's "Belt and Road" strategy.

And, as energy cannot be created or destroyed but only transformed, China and Russia turn their nuclear power into political power. By providing a reliable source of energy to developing nations, they draw the Global South closer into their orbit and create financial, infrastructural and political dependencies.

But where is the West in all of this?

In the UK, we haven't finished construction of a nuclear power station in almost three decades. The cost of Sizewell C is spiralling, shaking both investor confidence and public trust. Worse still, in the last few weeks, it has been revealed that Ed Miliband wants to bury the UK's stockpile of plutonium underground – and with it, bury Britain's chance of being competitive in the nuclear marketplace.

There is absolutely no reason for Britain, or indeed for the West, to be lagging behind. We have the scientific know-how needed to build reactors, and the innovative spirit needed to pioneer new technologies. We also have the means to finance a pivot towards nuclear, with many big banks pledging to throw their weight behind it.

However, in a world order that is increasingly volatile, fixing our nuclear strategy is not just something we should do, but something we *must* do. A turn towards nuclear would secure our energy supply chains, liberating us from those very dependencies upon which Russia and China's power hinges.

Moreover, by rivalling China and Russia on the nuclear stage, we can show the world that whatever autocracy tries to do, democracy can do better. During the Cold War, America used the power of the atom to demonstrate the power of capitalism – now we must use it to show the power of democracy. By partnering with developing nations to supply their energy, we can show the world that there is an alternative path available to them.

This report sets out a concrete plan of action to achieve this aim. By joining forces and pooling expertise within an umbrella organisation, named *Atoms for Democracy*, Western nations can use nuclear energy to build a cleaner, safer and freer world.

This plan is ambitious, but, as the past decade has shown, so are Russia and China. And if we want to prevent this century marking the decay of democracy, then it's high time we considered the nuclear option.

– The Rt Hon Sir Gavin Williamson CBE MP, former Secretary of State for Defence

Executive Summary

Nuclear power is essential for the UK and the world. It can help tackle climate change, secure energy independence and counter geopolitical rivals.

Nuclear is safe and clean. Decades of misinformation have obscured the truth. Nuclear energy has a strong safety record and is one of the cleanest energy sources available, making it indispensable for achieving net zero.

Renewables are good, but not enough. Wind and solar power cannot meet global energy needs on their own. Nuclear is the reliable, 24/7 solution.

To harness the power of the atom, **the UK Government must fix the UK's nuclear energy strategy by**:

- Pushing back its clean energy target from 2030 to 2040. This will allow nuclear to play a key role in our future energy mix.
- Investing in Small Modular Reactors (SMRs). They are cheaper, faster to build and scalable.
- Simplifying regulations to speed up projects and attract private investment.

The current nuclear-energy marketplace is dominated by Russia and China. They use nuclear exports and know-how to expand their influence. **The West must take back global leadership by**:

- Launching a joint organisation, Atoms for Democracy. This Western-led initiative will rival Russia and China in the nuclear market.
- Partnering with developing nations to provide nuclear energy without the strings attached by autocratic powers.
- Using Western expertise and funding to promote sustainable, democratic energy solutions.

Nuclear energy can be the foundation for a cleaner, safer and freer world.

Introduction

Back in 1953, the future looked bright.

At the United Nations General Assembly, President Eisenhower heralded a new era for humanity: the era of nuclear power.[1]

The energy source would be "a great boon, for the benefit of all", the American president said.[1] Nuclear power was clean and revolutionary. It would not only provide copious amounts of electricity, but also lead to breakthroughs in agriculture and medicine. Eisenhower pledged that the United States would help other countries build nuclear power plants.[3] A year later, he signed the Atomic Energy Act, which spawned the commercial nuclear power industry in the US. Private capital poured in. A uranium rush was underway.[4]

But nuclear mania reached far beyond the Oval Office and American boardrooms. It was blowing the minds of ordinary people everywhere. At the 1958 World Fair in Brussels, 41 million visitors gazed in awe at the Atomium, a giant, glistening structure depicting an iron crystal molecule.[5] It was a shrine to the potential of the atom. Elsewhere in the fair, visitors could tour an "electric house", previewing how nuclear power would bring prosperity to everyone.[6]

The wheel of history was turning. "Generations millenniums hence," declared a science journalist, "may look back upon these years when atomic energy was first put to work in the same spirit in which we now think of the… occasion when man first learned the use of fire."[7]

Fast forward to 2025, and the prophecy has not come true. Nuclear power supplies barely 9% of the world's electricity. By comparison, coal provides 36% and natural gas 22%, according to Our World in Data, a data laboratory based at Oxford University. Even hydropower beats nuclear with 14%.[8]

So what went wrong? Why did nuclear power so badly misfire?

The prevailing narrative is that, after a boom in the 1950s and 1960s, nuclear power was phased out because it is lethal. Headline-grabbing accidents – at the Three Mile Island plant in 1979, at Chernobyl in 1986 and at Fukushima in 2011 – proved how hazardous nuclear power really is.[9] As a result, America and Britain gave up on nuclear power.[10] Germany and Japan closed their nuclear plants, while Italy banned them altogether.[11]

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1 Dwight D. Eisenhower, "'Atoms for Peace' Address Before the General Assembly of the United Nations on Peaceful Uses of Atomic Energy", 8 December 1953, Eisenhower Presidential Library, p.5, https://www.eisenhowerlibrary.gov/sites/default/files/file/atoms_for_peace.pdf.

2 Ibid.

3 Ibid.; Lucy Jane Santos, *Chain Reactions: A Hopeful History of Uranium* (Icon Books, 2024), pp.169-170; Marco Visscher, *The Power of Nuclear: The Rise, Fall and Return of Our Mightiest Energy Source* (Bloomsbury Sigma, 2024), pp.41-42.

4 Santos, *Chain Reactions*, pp.172-173.

5 Ibid., pp.182-183.

6 Ibid., pp.182-183.

7 Ibid., p.162.

8 Hannah Ritchie and Pablo Rosado, "Electricity Mix", Our World in Data, January 2024, https://ourworldindata.org/electricity-mix.

9 Mike Shatzkin and Dietmar Detering, "No, nuclear power is not actually 'dangerous'", *OurEnergyPolicy*, 19 November 2021, https://www.ourenergypolicy.org/no-nuclear-power-is-not-actually-dangerous/.

10 Brad Plumer, "Why America abandoned nuclear power (and what we can learn from South Korea)", *Vox*, 29 February 2016, https://www.vox.com/2016/2/29/11132930/nuclear-power-costs-us-france-korea; Jonathan Leake, "How Britain fell behind in the global race for nuclear power", *The Telegraph*, 21 August 2024, https://www.telegraph.co.uk/business/2024/08/21/how-britain-fell-behind-in-the-global-nuclear-race/.

11 "The nuclear phase-out in Germany", Federal Office for the Safety of Nuclear Waste Management, https://www.base.bund.de/en/nuclear-safety/nuclear-phase-out/nuclear-phase-out_content.html; James Conca, "Shutting Down All Of Japan's Nuclear Plants After Fukushima Was A Bad Idea", *Forbes*, 31 October 2019, https://www.forbes.com/sites/jamesconca/2019/10/31/shutting-down-japans-nuclear-plants-after-fukushima-was-a-bad-idea/; "Italians say no to nuclear energy in referendum", *Reuters*, 13 June 2011, https://www.reuters.com/article/world/italians-say-no-to-nuclear-energy-in-referendum-idUSTRE75C3P0/.

But that was a grave mistake. Nuclear power is safe. In fact, it is safer not only than oil and coal, but also gas, hydropower and wind. And that is including all the nuclear accidents. Despite what many people think, there have been very few deaths linked to nuclear.[12] Estimates put the number at fewer than 100, including both direct and indirect deaths.[13] By contrast, the death toll from oil and gas pipeline accidents surpasses 4,000.[14]

It was not the accidents themselves that put nuclear power on the ropes, but how they were perceived in the public mind. As historian Niall Ferguson has said: "A catastrophe lays bare the societies and states that it strikes. It is a moment of truth, of revelation."[15] What Three Mile Island, Chernobyl and Fukushima revealed is that we love to worry about nuclear power.[16] Popular culture has milked this fear for entertainment.[17]

But climate change has rewritten the script. To reach net zero and avert ecological meltdown, we need nuclear power. The reason: renewables alone cannot produce enough energy to meet the world's needs. But nuclear power can.[18]

Governments worldwide are rushing to build cutting-edge plants.[19] Big banks have pledged to finance the three-fold expansion of nuclear power by 2050.[20] Big Tech behemoths, from Amazon to Microsoft, plan to use it to power Artificial Intelligence (AI) data operations.[21]

It is time, therefore, to reconsider our nuclear energy policies, both at home and abroad. This report does just that.

Organisation of the Report

Part I demystifies nuclear power and explains why it is safe, green and a crucial energy source for AI.

Part II zeroes in on the United Kingdom and gives a low-down of what the UK's current energy landscape is. It argues that nuclear energy is necessary if we want to reach our net zero targets. It also lays a roadmap for what the Government should do to harness the power of the atom.

Part III, finally, examines the global nuclear marketplace. It finds that it is dominated by the West's rivals, Russia and China. These two nations export nuclear power plants the world over. In so doing, they extend their sphere of influence and win allies in the Global South. The West cannot stand idly by. It must get its act together. The report ends by calling on democracies to partner in the development of nuclear power.

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12 Hannah Ritchie, "What are the safest and cleanest sources of energy?", Our World in Data, 10 February 2020, https://ourworldindata.org/safest-sources-of-energy; Hannah Ritchie and Pablo Rosado, "Nuclear Energy", Our World in Data, April 2024, https://ourworldindata.org/electricity-mix.

13 Hannah Ritchie, "What was the death toll from Chernobyl and Fukushima?", Our World In Data, 24 July 2017, https://ourworldindata.org/what-was-the-death-toll-from-chernobyl-and-fukushima.

14 M.V. Biezma, et al., "Most fatal oil & gas pipeline accidents through history: A lessons learned approach", *Engineering Failure Analysis*, Volume 110 (2020), https://www.sciencedirect.com/science/article/abs/pii/S1350630719312324.

15 Niall Ferguson, *Doom: The Politics of Catastrophe* (Penguin, 2021), p.5.

16 Santos, *Chain Reactions*, p.202.

17 See, among many others, *The China Syndrome* (1979), *Godzilla* (1998) and *Chernobyl* (2019).

18 Bill Budinger, "Why Renewables Cannot Replace Fossil Fuels", *Democracy: A Journal of Ideas*, 16 February 2024, https://democracyjournal.org/arguments/why-renewables-cannot-replace-fossil-fuels/.

19 Angela Dewan, Ella Nilsen and Lou Robinson, "New-wave reactor technology could kick-start a nuclear renaissance – and the US is banking on it", *CNN*, 26 April 2024, https://edition.cnn.com/2024/02/01/climate/nuclear-small-modular-reactors-us-russia-china-climate-solution-intl/index.html.

20 Paul Day, "Bank backing gives US nuclear new momentum", *Reuters*, 7 October 2024, https://www.reuters.com/business/energy/bank-backing-gives-us-nuclear-new-momentum-2024-10-07/.

21 "Big tech is bringing nuclear power back to life", *The Economist*, 9 October 2024, https://www.economist.com/business/2024/10/09/big-tech-is-bringing-nuclear-power-back-to-life.

A Note to Readers

This report is not a technical or scientific manual. We do not dive into the finer details of nuclear physics or reactor engineering. Nor do we purport to.

Instead, our goal is twofold. First, we aim to demystify nuclear energy for the public.

Second, we want to convince policymakers that nuclear power is the way to go.

We keep jargon to a minimum and stick to the big picture: how nuclear can help solve climate change, power our economy and boost national security.

If you are looking for in-depth physics or mathematical models, you will not find them here. But if you want to understand how nuclear fits into our future, this report offers actionable insight without getting lost in the weeds.

PART I

How to Stop Worrying and Learn to Love Nuclear Energy

1. Why Pop Culture is Wrong... and Nuclear Energy is Safe

Pop culture has distorted our understanding of nuclear energy. For decades now, movies and TV shows have given nuclear energy a bad reputation.

Many people first learned about nuclear power watching *The Simpsons*. America's favourite sitcom, hailed for its cynicism, lampoons nuclear energy. The main character, Homer Simpson, works at the fictitious Springfield Nuclear Power Plant. It is depicted as a dangerous, dysfunctional place, falling short of every health and safety regulation in the book. [22] In one classic episode, released in 1990, nuclear waste ends up all over town, contaminating the local wildlife. Fishes even grow a third eye. [23] The takeaway: nuclear power is unsafe. [24]

But that is a lie. The data tells another story.

Nuclear energy is safe, according to studies. Even taking into account high-profile accidents like Chernobyl and Fukushima, nuclear power is safer not only than oil and coal, but also gas, hydropower and wind. And it is about as safe as solar power. [25] Contrary to popular belief, it has resulted in very few deaths. [26] Geraldine Thomas, a professor of Molecular Pathology at Imperial College, has argued that an unfounded fear of radiation has tarnished the reputation of nuclear energy. This has led to grossly inflated death tolls being ascribed to nuclear accidents. [27]

In recent years, the perception of nuclear energy has gotten better. According to Savanta and Radiant Energy Group, 46% of people in 20 countries now support it while only 28% oppose it. [28] In the UK, the public is broadly supportive of nuclear energy, with three times more people in support than in opposition. [29]

And yet, although nuclear energy is becoming more and more palatable to many, concerns remain. They revolve around nuclear accidents and nuclear waste. Polling data shows that these are the two main reasons why Britons are wary of nuclear. [30] Neither, in fact, should scare us.

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22 "'Simpsons' Spurs Ire of Nuclear Industry", *The Harvard Crimson*, 6 December 1990, https://www.thecrimson.com/article/1990/12/6/simpsons-spurs-ire-of-nuclear-industry/.

23 See "Two Cars in Every Garage and Three Eyes on Every Fish", the fourth episode of the second season of *The Simpsons*, https://www.imdb.com/title/tt0757023/.

24 For a takedown of *The Simpsons* and the way it depicts nuclear energy, see "7 Things The Simpsons Got Wrong About Nuclear", U.S. Department of Energy, 4 April 2018, https://www.energy.gov/ne/articles/7-things-simpsons-got-wrong-about-nuclear.

25 Ritchie, "What are the safest and cleanest sources of energy?".

26 Ritchie and Rosado, "Nuclear Energy".

27 Maxine Myers, "We should have less fear of radiation, says Imperial researcher", Imperial, 26 February 2020, https://www.imperial.ac.uk/news/195618/we-should-have-less-fear-radiation/.

28 "Public Attitudes toward Clean Energy 2023 – Nuclear", Radiant Energy Group, https://www.radiantenergygroup.com/reports/public-attitudes-toward-clean-energy-2023-nuclear.

29 "Over 3X more support for the use of nuclear energy in the UK than its phase out". Nuclear Industry Association, https://www.niauk.org/over-3x-more-support-for-the-use-of-nuclear-energy-in-the-uk-than-its-phase-out/.

30 "DESNZ Public Attitudes Tracker: Energy infrastructure and energy security, Spring 2024, UK", Department for Energy Security & Net Zero, UK Government, 3 July 2024, https://www.gov.uk/government/statistics/desnz-public-attitudes-tracker-spring-2024/desnz-public-attitudes-tracker-energy-infrastructure-and-energy-security-spring-2024-uk#awareness-of-small-modular-reactors.

Nuclear Accidents Are Rare

Contrary to popular belief, the nuclear energy sector is the most regulated of all energy forms and has some of the highest standards of professional conduct. Safety standards are set out globally by the International Atomic Energy Agency (IAEA). As of 15 November 2024, 180 countries are members, including the United Kingdom, France and South Korea. [31] The UK also has its own regulatory body, known as the Office for Nuclear Regulation (ONR). As part of the ONR, UK nuclear power producers adhere to strict safety rules and commit themselves to inspections under the International Convention on Nuclear Safety. [32]

Because the nuclear sector is so highly regulated, staff are highly skilled and vetted. Unsurprisingly, nuclear energy workers in the US earn on average 50% more than their counterparts in other electricity generation sectors. [33] Homer Simpson would never be hired.

Demystifying Nuclear Waste

80% of British people are either "concerned" or "very concerned" about nuclear waste management. [34] Time and again, waste comes up as the main reason why people are opposed to the construction of new plants. The Stop Sizewell C group is campaigning against the construction of the Sizewell C plant on the coast of Suffolk. As they see it, nuclear waste would pose a lasting danger to the coastline. [35] And who could blame them? Isn't nuclear waste toxic? Faced with the prospect of three-eyed fish washing up on the shores, their opposition makes perfect sense.

The truth, however, is altogether different.

Nuclear waste is mostly spent fuel. This means that it has completed its cycle in a reactor. The fuel is in solid form, which makes it easy to contain and store. [36] Other forms of nuclear waste include contaminated protective items such as gloves or machinery. [37]

All nuclear waste is safely stored and disposed of. Low-level waste is compacted or incinerated and then sealed in containers and stored in near-surface facilities. Meanwhile, intermediate and high-level waste is solidified and stored in secure, engineered facilities that contain radioactivity. [38] High-level waste must also cool for decades to reduce its heat and radioactivity. Be in no doubt: the UK's nuclear sector operates under a stringent regulatory framework. Safety measures are not taken lightly. As a result, the industry consistently meets world-class health and safety benchmarks. [39]

Nuclear plants are not ticking bombs. As an example of just how safe they are, the UK Government says that "the annual radiation dose to an adult living beside a new nuclear plant

[31] "List of Member States", International Atomic Energy Agency, https://www.iaea.org/about/governance/list-of-member-states.

[32] "International Convention on Nuclear Safety", Office for Nuclear Regulation, https://www.onr.org.uk/working-with-others/international/international-convention-on-nuclear-safety/.

[33] "5 Workforce Trends in Nuclear Energy", U.S. Department of Energy, 28 August 2024, https://www.energy.gov/ne/articles/5-workforce-trends-nuclear-energy.

[34] "Over 3X more support".

[35] "Homepage", Stop Sizewell C, https://stopsizewellc.org/.

[36] "5 Fast Facts About Spent Nuclear Fuel", U.S. Department of Energy, 3 October 2022, https://www.energy.gov/ne/articles/5-fast-facts-about-spent-nuclear-fuel.

[37] Matthew L. Wald, "The Boring Truth About Nuclear Waste", The Breakthrough Institute, 29 November 2022, https://thebreakthrough.org/issues/energy/the-boring-truth-about-nuclear-waste.

[38] "How do we manage radioactive waste?", UK Radioactive Waste & Materials Inventory, https://ukinventory.nda.gov.uk/information-hub/about-radioactive-waste/how-do-we-manage-radioactive-waste/.

[39] "Nuclear energy: What you need to know", UK Government, 6 April 2022, https://www.gov.uk/government/news/nuclear-energy-what-you-need-to-know.

is much less than taking one trans-Atlantic flight or eating 100g of Brazil nuts – neither of which have heavy radiation." [40]

A final stat to reassure anyone still harbouring fears about nuclear energy. In 18,500 cumulative reactor-years of nuclear power operation, there have only been three major accidents: Three Mile Island, Chernobyl and Fukushima. [41] According to Our World in Data, the confirmed death toll of Chernobyl, taking into account both direct and indirect deaths, is fewer than 100. That of Fukushima is zero. This means that fewer than 100 people have ever perished from nuclear accidents. [42] By comparison, a single oil rig disaster in 1988 left 167 people dead. [43]

As Lucy Jane Santos writes: "In a strange way it is the rarity of nuclear incidents that make them notable." [44]

[40] "Nuclear energy: What you need to know", UK Government, 6 April 2022, https://www.gov.uk/government/news/nuclear-energy-what-you-need-to-know.

[41] "Safety of Nuclear Power Reactors", World Nuclear Association, 23 August 2024, https://world-nuclear.org/information-library/safety-and-security/safety-of-plants/safety-of-nuclear-power-reactors.

[42] Ritchie, "What was the death toll from Chernobyl and Fukushima?".

[43] "7 of the Worst Oil Rig Disasters of All Time", Roberts Markland LLP, 4 July 2021, https://robertsmarkland.com/blog/7-of-the-worst-oil-rig-disasters-of-all-time.

[44] Santos, *Chain Reactions*, p.222.

2. Why the Environmental Movement Is Wrong… and Nuclear Energy Is Green

Nuclear energy pollutes the environment. Or so says the environmental movement.

Greenpeace, the most prominent environmental group on the planet, is adamant that nuclear energy poses "an unacceptable risk to the environment and to humanity". The organisation's stance is unequivocal: "We have to phase out dangerous nuclear power entirely, and do so as soon as possible. Every reactor can fail and put millions at risk." [45]

This is nothing new. For decades, environmentalists have vilified nuclear energy. They have not only depicted it as dangerous, which we have demonstrated is incorrect, but also as dirty. As such, they deny that nuclear has a role to play in combatting climate change and decarbonising the earth. Take another major environment group: America's Sierra Club. "Nuclear is no solution to Climate Change," the Sierra Club argues, "and every dollar spent on nuclear is one less dollar spent on truly safe, affordable and renewable energy sources." [46]

This pernicious narrative must change. The existential threat of global warming demands it. As Bill Gates, the philanthropist and co-founder of Microsoft, has said: "Nuclear is ideal for dealing with climate change, because it is the only carbon-free, scalable energy source that's available 24 hours a day." [47] It is time we recognise nuclear for what it truly is: a boon to the planet that can, alongside renewables, deliver a greener future.

The Greens and Nuclear: A Hate Affair

To understand why the environmental movement is so anti-nuclear, we need to go back to 1979.

That year, a reactor at the Three Mile Island nuclear power plant in Pennsylvania partially melted down. There were no deaths or injuries. No one went on to develop health complications either. [48] The authorities acted swiftly and evacuated the inhabitants in the vicinity of Three Mile Island. But the press ran sensationalist headlines, unwittingly spreading misinformation about the dangers of nuclear. Some highlights: "Terror unleashed", "Nuke cloud spreading", "Life'll never be the same, says nuclear refugee". [49]

Three Mile Island became a lightning rod for the environmental movement in the US, which used it to spread the myth that nuclear was bad for the planet. The "No Nukes" movement, led by well-intentioned artists like Graham Nash and Jackson Browne, staged a huge concert at Madison Square Garden that same year. [50] Anti-nuclear protests soon spread across the US. In 1979, for instance, a whopping 200,000 people showed up in New York's Battery Park. [51] Later, in 1986, when Chernobyl happened, protests emerged in western Europe. And again, in 2011 after Fukushima. [52]

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45 "#Nuclear", Greenpeace, https://www.greenpeace.org/international/tag/nuclear/.

46 "Nuclear Free Future", The Sierra Club, https://www.sierraclub.org/nuclear-free.

47 Bill Gates, "What I learned at work this year", Gates Notes, 29 December 2018, https://www.gatesnotes.com/Year-in-Review-2018.

48 "5 Facts to Know About Three Mile Island", U.S. Department of Energy, 4 May 2022, https://www.energy.gov/ne/articles/5-facts-know-about-three-mile-island.

49 Santos, *Chain Reactions*, pp.203-204.

50 Ibid., p.208; Sara Mansur, "The 'No-Nukes' Concert And The Fallacy Of Opposing Nuclear Power", *Forbes*, 13 September 2011, https://www.forbes.com/sites/energysource/2011/08/17/the-no-nukes-concert-and-the-fallacy-of-opposing-nuclear-power/.

51 Robin Herman, "Nearly 200,000 Rally to Protest Nuclear Energy", *The New York Times*, 24 September 1979, https://www.nytimes.com/1979/09/24/archives/nearly-200000-rally-to-protest-nuclear-energy-gathering-at-the.html.

52 Santos, *Chain Reactions*, pp.208, 217, 220.

The environmental movement's crusade against nuclear has had serious consequences. It has shaped public opinion as well as policy. Nowhere has this been truer – or more detrimental – than in Germany.

In 2002, under pressure from the Green Party, the German Government committed to a nuclear phase-out by 2022. The policy gained renewed momentum in 2011 after Fukushima, prompting Chancellor Angela Merkel to double-down on the shutdown of the country's nuclear plants. [53] By 2023, Germany had closed its last three reactors. [54]

While this move was hailed as a triumph by many environmentalists, it actually damaged the environment. As a consequence of cutting off nuclear, Germany has been forced to rely more on coal and natural gas. [55]

It did not have to be this way. If Germany had invested in nuclear power in 2002, its carbon emissions would have been cut by a further 73% over the last 20 years, according to a recent study by Jan Emblemsvåg, a Norwegian engineering professor. To boot, the German treasury would have also saved more than €300 billion in spending over the same 20-year period. [56]

But that is not all. There have also been adverse effects on the health of the German population since nuclear was replaced by dirty energy sources. According to research by the University of California, Santa Barbara, "the [nuclear] phase-out resulted in more than 1,100 additional deaths per year from increased concentrations of SO_2, NOx, and particulate matter, with the increase in production from hard coal plants making up roughly 80% of the increase in mortality impacts." [57]

It is time, once and for all, to put to bed the myth that nuclear energy is dirty.

Why Nuclear Energy is Green Energy

Nuclear energy is clean. Unlike fossil fuels, which release vast quantities of greenhouse gases during combustion, nuclear power plants produce almost no carbon dioxide during operation. In 2020 alone, thanks to its nuclear plants, the United States avoided over 471 million metric tons of CO_2 emissions, which would amount to taking 100 million cars off the road. [58]

Globally, the data tells the same story. Nuclear energy cuts down carbon emissions. Over the last 50 years, it has prevented the emission of 70 gigatonnes of CO_2. [59] What is more, while nuclear energy generates only 9% of the worldwide electricity output, it accounts for 25% of the world's low-carbon electricity production. [60]

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53 For an overview of the evolution of Germany's nuclear energy policy, see Paul W. Thurner, "Germany: Party System Change and Policy Reversals", in *The Politics of Nuclear Energy Policy*, eds. Wolfgang C. Muller and Paul W. Thurner (Oxford University Press, 2017), pp.157-182.

54 Alex Lawson, "Germany's last three nuclear power stations to shut this weekend", *The Guardian*, 15 April 2023, https://www.theguardian.com/environment/2023/apr/15/germany-last-three-nuclear-power-stations-to-shut-this-weekend.

55 Trevelyan Wing, "Why Germany ditched nuclear before coal – and why it won't go back", *The Conversation*, 23 April 2024, https://theconversation.com/why-germany-ditched-nuclear-before-coal-and-why-it-wont-go-back-228212; Katja Hoyer, "It's Time for Germany to Admit Its Mistake on Nuclear Energy", *Bloomberg*, 2 December 2024, https://www.bloomberg.com/opinion/articles/2024-12-02/germany-needs-nuclear-energy-it-s-time-to-admit-merkel-s-mistake.

56 Jan Emblemsvåg, "What if Germany had invested in nuclear power? A comparison between the German energy policy the last 20 years and an alternative policy of investing in nuclear power", *International Journal of Sustainable Energy*, Volume 43, Issue 1 (2024), https://www.tandfonline.com/doi/full/10.1080/14786451.2024.2355642.

57 "Estimating the cost of Germany's nuclear phaseout", University of California, Santa Barbara, December 2019, https://emlab.ucsb.edu/projects/estimating-cost-germanys-nuclear-phaseout.

58 "3 Reasons Why Nuclear is Clean and Sustainable", U.S. Department of Energy, 31 March 2021, https://www.energy.gov/ne/articles/3-reasons-why-nuclear-clean-and-sustainable.

59 "Nuclear Energy for a Net Zero World", International Atomic Energy Agency, September 2021, p. i, https://www.iaea.org/sites/default/files/21/10/nuclear-energy-for-a-net-zero-world.pdf.

60 "Nuclear Power in the World Today", World Nuclear Association, 6 January 2025, https://world-nuclear.org/information-library/current-and-future-generation/nuclear-power-in-the-world-today.

In addition to its negligible carbon footprint, nuclear power also helps improve air quality. It eliminates pollutants such as sulphur dioxide and nitrogen oxides, which are byproducts of fossil fuel combustion and are noxious to our health.

The transition to nuclear can therefore dramatically reduce health issues caused by air pollution. According to a 2024 study by the US's National Bureau of Economic Research, every new nuclear power plant could save as many as 800,000 life years. [61] By contrast, phasing out nuclear power could lead to more deaths from air pollution. [62] Far from being a threat to humanity, nuclear energy is in fact a life-saver.

Nuclear energy is also sustainable. Nuclear has one seriously overlooked advantage: its high energy density. One uranium pellet, which is the size of a small pill, produces as much energy as a ton of coal, three barrels of oil and 17,000 cubic foot of natural gas, according to the US Department of Energy. [63]

This translates to a minimal land footprint compared to renewables. For instance, a typical nuclear power plant occupies just over one square mile, while a solar farm producing the same output would require 75 times more land and a wind farm 360 times. [64]

Make no mistake: renewables like wind and solar are essential to decarbonisation efforts. But their intermittent nature makes them unreliable.

Wind turbines cannot produce energy during calm conditions. Solar panels, meanwhile, cannot generate electricity at night or when it is overcast. This is exactly where nuclear energy shines. It provides electricity regardless of the weather or time of day. It is, in industry parlance, "a reliable baseload power source".

Nuclear power can also support the production of hydrogen, a clean fuel critical for industries like steelmaking and aviation that are difficult to electrify. By using excess electricity generated during off-peak hours, nuclear plants can help scale hydrogen production, further decarbonising the energy system. [65]

The Greens and Nuclear: A Reconciliation?

Nuclear power is an indispensable ally in the fight against climate change. Its low-carbon footprint, sustainability and reliability make it a vital component of the clean energy mix. Far from being in competition with renewables, nuclear energy complements them.

In recent years, a new generation of environmentalists has begun to recognise this reality. In 2022, Finland's Green Party became the first green party anywhere in the world to officially endorse nuclear power as a "sustainable energy". [66]

Another prominent example is Ia Aanstoot. A Swedish teenage climate activist, she has blasted Greenpeace for its stubborn opposition to nuclear power, asking the group to "drop your old-

61 Ronald Bailey, "Nuclear Energy Prevents Air Pollution and Saves Lives", *Reason*, January 2025, https://reason.com/2024/11/29/nuclear-power-saves-lives.

62 See, for more details, using the US as an example, Lyssa M. Freese, et al., "Nuclear power generation phase-outs redistribute US air quality and climate-related mortality risk", *Nature Energy*, 10 April 2023, https://www.nature.com/articles/s41560-023-01241-8.

63 See chart in "3 Reasons Why Nuclear is Clean and Sustainable".

64 Ibid.

65 "Coupling nuclear and hydrogen-production technologies can enable affordable alternative to fossil fuel", UK National Nuclear Laboratory, 18 September 2024, https://www.nnl.co.uk/2024/09/coupling-nuclear-and-hydrogen-production-technologies-can-enable-affordable-alternative-to-fossil-fuel.

66 "Finland's Green Party supports nuclear power", *Nuclear Engineering International*, 26 May 2022, https://www.neimagazine.com/news/finlands-green-party-supports-nuclear-power-9727725/.

fashioned and unscientific opposition to nuclear power, and join us in the fight against fossil fuels instead". [67] Aanstoot added:

> "Greenpeace is stuck in the past fighting clean, carbon-free nuclear energy while the world is literally burning. We need to be using all the tools available to address climate change and nuclear is one of them. I'm tired of having to fight my fellow environmentalists about this when we should be fighting fossil fuels together." [68]

Aanstoot is right. The good news is that she is far from alone. Many other young climate activists, such as Zion Lights and Isabelle Boameke, are sharing pro-nuclear advocacy on social media to great effect. [69]

Far from breaking with the environmental movement, this new generation is actually renewing with the movement's forgotten pro-nuclear tradition. Back in the 1950s, when nuclear energy was starting to spread, it had the support of environmentalists. Even the Sierra Club was all in on it.

"[Nuclear power] is one of the chief long-term hopes for conservation," said William Siri, the Sierra Club's president, who predicted that we would one day "look back from the clean comfortable world driven by nuclear energy and wonder what all the fuss was about." Alas, that day has not yet arrived. But it should. As Siri put it: "The rest of the universe runs on nuclear energy, why not us." [70]

Indeed, why not us.

67 Helena Horton, "Young climate activist tells Greenpeace to drop 'old-fashioned' anti-nuclear stance", *The Guardian*, 29 August 2023, https://www.theguardian.com/environment/2023/aug/29/young-climate-activist-tells-greenpeace-to-drop-old-fashioned-anti-nuclear-stance.

68 Ibid.

69 See the documentary "Nuclear Now" (2022), which includes interviews with Boameke and showcases her work.

70 Santos, *Chain Reactions*, pp.192-193.

3. Why the Naysayers Are Wrong… and Nuclear Energy Will Power the Future

"Most policy makers formed their views on AI before it became clear just how great the energy demands of the larger models were going to be. The fact is that either we pursue less power-hungry AI models or we find new sources of energy to power them."

– The Viscount Camrose, former Minister for AI and Intellectual Property, speaking to HJS

Detractors like to say that nuclear power is a "relic of the past". They maintain that the transition to renewables alone can sustain the energy demands of the future. [71]

The future tells a different story.

Our world is rocked by rapid technological advancements. Chief among them is artificial intelligence (AI). AI is emerging as the beating heart of the global economy, powering everything from natural language processing to predictive algorithms. [72]

But AI needs power. A lot of power. AI data centres cannot function without gargantuan energy supplies. And that is putting it mildly.

In 2023, AI data centres used 4.5 gigawatts of electricity, or 8% of all data centre energy usage. This is enough power to light up 450 million LED bulbs. [73] And the curtain has just been raised. By 2028, AI data centre energy usage is expected to quadruple. [74] By 2050, which is only a quarter of a century away, it could well use as much electricity as the United States currently uses, according to the consultancy Wood Mackenzie. [75] And that is without taking into account all the data centres which do not use AI but are nonetheless essential to our economy. Deloitte projects that energy usage in global data centres will double by 2030. [76]

The future will be energy-intensive, and renewables simply cannot provide enough energy. Although they are indispensable, they are insufficient and too unreliable. [77] AI operations cannot afford the unpredictability of windless days or cloudy weather. Any lag or malfunctioning would disrupt essential services and result in considerable economic losses.

And so nuclear energy enters the conversation. With its scalability and reliability, it is the ideal energy source for AI.

Big Tech is Going Big on Nuclear

Tech giants are recognising nuclear power's powerful potential.

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71 See, amongst others, Richard Anderson, "Nuclear power: Energy of the future or relic of the past?", *BBC News*, 27 February 2015, https://www.bbc.co.uk/news/business-30919045.

72 "Sizing the prize", PwC, 2017, https://www.pwc.com/gx/en/issues/artificial-intelligence/publications/artificial-intelligence-study.html.

73 "How Much Power is 1 Gigawatt?", U.S. Department of Energy, 21 August 2024, https://www.energy.gov/eere/articles/how-much-power-1-gigawatt.

74 See "Artificial intelligence power consumption and share of total data center consumption worldwide in 2023, with forecasts to 2028", Statista, https://www.statista.com/statistics/1536969/ai-electricity-consumption-worldwide/.

75 Cosmo Sanderson, "AI data centres 'could need more power than whole of US' by 2050", *Recharge*, 29 October 2024, https://www.rechargenews.com/energy-transition/ai-data-centres-could-need-more-power-than-whole-of-us-by-2050/2-1-1731092.

76 Karthik Ramachandran, et al., "As generative AI asks for more power, data centers seek more reliable, cleaner energy solutions", Deloitte Center for Technology Media & Telecommunications, 19 November 2024, https://www2.deloitte.com/us/en/insights/industry/technology/technology-media-and-telecom-predictions/2025/genai-power-consumption-creates-need-for-more-sustainable-data-centers.html.

77 Ben Payton, "Power mad: AI's massive energy demand risks causing major environmental headaches", *Reuters*, 4 December 2023, https://www.reuters.com/sustainability/climate-energy/power-mad-ais-massive-energy-demand-risks-causing-major-environmental-headaches-2023-12-04/.

In 2024, Microsoft partnered with Constellation Energy to re-open the Three Mile Island plant. The goal: "to provide the company with a clean source of energy as power-hungry data centres for artificial intelligence expand." [78] As Constellation CEO Joe Dominguez put it, re-opening Three Mile Island, the site of the most famous nuclear accident in US history, is a "powerful symbol of the rebirth of nuclear power as a clean and reliable energy resource." [79]

Amazon is following suit. [80] The famous online retailer is also the single largest global provider of cloud data and web services, and plans to use nuclear energy extensively in the years to come. "Nuclear is a safe source of carbon-free energy that can help power our operations and meet the growing demands of our customers, while helping us progress toward our Climate Pledge commitment to be net-zero carbon across our operations by 2040," said Matt Garman, CEO of Amazon Web Services. [81]

Meta also wants to leverage nuclear energy for its AI-driven infrastructure. In 2024, the social media firm outlined its collaboration with nuclear innovators to accelerate the adoption of advanced reactors. [82] Meta emphasised that nuclear offers unparalleled scalability, which is essential as AI innovation continues to drive energy consumption higher. [83]

The rationale behind these investments is clear. Nuclear has three advantages for tech companies.

- **The first, and most obvious, is that it delivers electricity day in, day out.**
  Large data centres, especially hyperscale facilities, can demand up to 150 megawatts of power – comparable to the consumption of a city. [84] A typical nuclear power plant, which generates 1,000 megawatts, could thus power several data centres. [85] By contrast, while renewables can contribute to a data centre's energy mix, relying on them exclusively would necessitate substantial energy storage solutions to ensure uninterrupted operation. [86] In other words, they do not generate enough power enough of the time.

- **The second advantage of nuclear is that it is scalable.**
  Small modular reactors (SMRs) can be deployed close to data centres, thus reducing transmission losses and improving efficiency, according to the data centre operator CyrusOne. [87] The modular nature of SMRs allows companies to scale their energy production in line with their activities. [88]

78 Natalie Sherman, "Microsoft chooses infamous nuclear site for AI power", *BBC News*, 20 September 2024, https://www.bbc.co.uk/news/articles/cx25v2d7zexo.

79 Ibid.

80 "Amazon signs agreements for innovative nuclear energy projects to address growing energy demands", Amazon, 16 October 2024, https://www.aboutamazon.com/news/sustainability/amazon-nuclear-small-modular-reactor-net-carbon-zero.

81 Ibid.

82 Justine Calma, "Meta turns to nuclear energy for its AI ambitions", *The Verge*, 4 December 2024, https://www.theverge.com/2024/12/4/24313011/meta-ai-data-center-nuclear-energy.

83 "Accelerating the Next Wave of Nuclear to Power AI Innovation", Meta, 3 December 2024, https://sustainability.atmeta.com/blog/2024/12/03/accelerating-the-next-wave-of-nuclear-to-power-ai-innovation/.

84 Phill Powell and Ian Smalley, "What is a hyperscale data center?", IBM, 21 March 2024, https://www.ibm.com/topics/hyperscale-data-center; Justin Etheredge, "Fun Friday: How Much Solar Power Would It Actually Take to Power a Hyperscale Data Center", *Simple Thread*, 9 February 2024, https://www.simplethread.com/fun-friday-how-much-solar-power-would-it-actually-take-to-power-a-hyperscale-data-center.

85 "What is nuclear waste, and what do we do with it?", World Nuclear Association, https://world-nuclear.org/nuclear-essentials/what-is-nuclear-waste-and-what-do-we-do-with-it.

86 Christopher Tozzi, "Why You Can't Power Your Data Center Only With Renewables – But Should Try Anyway", *Data Center Knowledge*, 6 April 2023, https://www.datacenterknowledge.com/cooling/why-you-can-t-power-your-data-center-only-with-renewables-but-should-try-anyway.

87 "The future of data centers: Embracing nuclear power and small modular reactors", CyrusOne, 18 October 2024, https://www.cyrusone.com/resources/blogs/embracing-nuclear-power-and-small-modular-reactors.

88 Ibid.

- **The third advantage is that nuclear energy is carbon-free.**
  This helps companies meet sustainability goals. In the current market, a company's environmental, social and governance (ESG) record is increasingly important to consumers. For instance, in the United Kingdom, a third of consumers say that they look for "brands with strong sustainable credentials". [89] Investors, especially large institutional funds, also monitor a company's ESG score. [90]

Nucleonomics

Anti-nuclear activists usually say that nuclear energy is too onerous. While it is true that constructing plants requires significant upfront investment, it is well worth the money. They are cheaper to run, once they are built, than renewables or fossil fuel facilities. [91] But that is not all. SMR technology is advancing fast and driving down cost. Some SMR designs are projected to be cost-competitive with natural gas by the end of the 2020s. [92]

Nuclear power also benefits the economy. Take, for example, the United States. It has only 54 power plants. And yet in 2022, the US nuclear industry generated $63 billion and employed nearly half a million people. [93] And those are quality jobs. Nuclear jobs are the best-paid jobs in the electric power production sector, according to written testimony to the US Senate from Amy Roma, a lawyer and founding member of the Nuclear Energy and National Security Coalition at the Atlantic Council. [94]

Last but not least, the nuclear sector is a hub of innovation. From thorium reactors to advanced waste recycling technologies, tomorrow's plants will keep improving. [95] Short of humanity suddenly discovering a bountiful, carbon-free and reliable energy source, nuclear will power the future. It will drive entrepreneurship and innovation across all sectors of the economy. Who knows what extraordinary breakthroughs it will make possible.

89 Talal Rafi, "Why sustainability is crucial for corporate strategy", World Economic Forum, 9 June 2022, https://www.weforum.org/stories/2022/06/why-sustainability-is-crucial-for-corporate-strategy/.

90 Alexander Gelfand, "Big Investors Say They Use ESG to Reduce Risk (But Mostly Focus on the E and G)", Stanford Business, 2 May 2024, https://www.gsb.stanford.edu/insights/big-investors-say-they-use-esg-reduce-risk-mostly-focus-e-g.

91 "Economics of Nuclear Power", World Nuclear Association, 29 September 2023, https://world-nuclear.org/information-library/economic-aspects/economics-of-nuclear-power.

92 "The Economics of Small Modular Reactors", SMR Start, March 2021, https://www.nei.org/CorporateSite/media/filefolder/advanced/SMR-Start-Economic-Analysis-2021-(APPROVED-2021-03-22).pdf.

93 For more details on the economic advantages of nuclear power, see Theo Zenou, "Go nuclear, Trump", *The Boston Globe*, 4 December 2024, https://www.bostonglobe.com/2024/12/04/opinion/trump-administration-invest-nuclear-energy/.

94 Amy C. Roma, "Written Testimony of Amy C. Roma", Senate Committee Energy and Natural Resources, U.S. Senate, 25 March 2021, p. 10, https://www.energy.senate.gov/services/files/20BF3ACC-F6F4-4D7C-90C9-933DACA1D253.

95 Artem Vlasov, "Thorium's Long-Term Potential in Nuclear Energy", International Atomic Energy Agency, 13 March 2023, https://www.iaea.org/newscenter/news/thoriums-long-term-potential-in-nuclear-energy-new-iaea-analysis; "Advanced Nuclear Technologies", UK Government, 6 December 2024, https://www.gov.uk/government/publications/advanced-nuclear-technologies/advanced-nuclear-technologies.

PART II

How the UK Can Use Nuclear Energy to Build a Clean Economy

1. How the UK Uses Nuclear Energy Today

In 2023, nuclear was the third energy source in the UK with 14%. The country's electricity generation was:

- Wind: 30%
- Gas: 26%
- Nuclear: 14%
- Imports (which includes energy generated by fossil fuels): 14%
- Biomass: 7%
- Solar: 5%
- Hydro: 2%
- Coal: 1%
- Storage: 1% [96]

The UK operates nine nuclear reactors across the country. [97] As of 2023, these facilities are staffed by more than 77,000 employees, which marks the highest employment level in the sector in two decades. [98] Yet, despite the substantial infrastructure and workforce, nuclear power does not even account for one-fifth of the UK's electricity supply. [99]

It could all have been so different. The UK's nuclear journey began with the establishment of the world's first civil nuclear programme in 1954. [100] However, the sector experienced periods of stagnation as the public and successive governments turned their back on nuclear. Notably, the 1976 Flowers report recommended halting large-scale nuclear expansion until safe containment methods for radioactive waste were demonstrated. It was, as we have seen, a reflection of the times. [101]

But that was then. What about now? Why is the UK not going big on nuclear energy? There are two reasons holding nuclear back. Put simply, there has been too little investment and too much regulation.

96 "Britain's Electricity Explained: 2024 Review", National Energy System Operator, 7 January 2025, https://www.neso.energy/news/britains-electricity-explained-2024-review.

97 "Nuclear Power in the World Today", World Nuclear Association, 4 December 2024, https://world-nuclear.org/information-library/current-and-future-generation/nuclear-power-in-the-world-today.

98 "UK nuclear workforce at highest for 20 years, says NIA", *World Nuclear News*, 12 September 2023, https://www.world-nuclear-news.org/Articles/UK-nuclear-workforce-at-highest-for-20-years%2C-says.

99 Compare this to France, which relies considerably more on nuclear power. See "Nuclear Power in France", World Nuclear Association, 10 January 2025, https://world-nuclear.org/information-library/country-profiles/countries-a-f/france.

100 "1954: New authority for atomic energy", *BBC News*, 12 February 1954, http://news.bbc.co.uk/onthisday/hi/dates/stories/february/12/newsid_2540000/2540781.stm.

101 "ONR-NGO groups – Written evidence (RSK0096)", House of Commons Committees, 13 January 2021, https://committees.parliament.uk/writtenevidence/24899/html/.

Too Little Investment

The markets have long been lukewarm towards nuclear. The high capital costs associated with constructing new power plants have deterred them. Cost overruns and delays on existing projects have only added to investors' apprehensions. The Hinkley Point C project, for example, has faced substantial delays and budget escalations. It was first announced in 2005 and was meant to be operational before 2020. Yet it is still under construction today, more than 20 years later. [102] This has only reinforced market scepticism. [103]

Additionally, the absence of "compelling returns" has made it challenging to attract private investment. For this reason, investors have long asked the UK Government for more favourable financial incentives before committing capital to nuclear projects. [104]

Indeed, nuclear energy does not currently benefit from the same green financing vehicles that renewables do. This makes it harder still to raise funds. [105] But the UK can take a leaf out of Canada's book. In 2023, the Canadian Government made the decision to update its Green Bond Framework to include nuclear projects. It was the first sovereign borrower to do so and raised $2 billion in the process. [106]

Too Much Regulation

The UK's regulatory framework for nuclear energy is extremely intricate. This leads to protracted approval processes for new projects. The Wylfa Newydd Nuclear Power Station project exemplifies these challenges. Despite initial progress, the project was suspended due to funding disputes and planning delays. [107] It is a perfect example of how regulatory hurdles block the expansion of nuclear power in the UK.

It is important to realise that the heavy regulatory burden in the UK has nothing to do with safety. It is possible to build nuclear power plants quickly while respecting every safety regulation. Take, for instance, the case of South Korea. The average time taken to build a plant there is under five years, or three times faster than the world average. [108] At the same time, South Korea is hailed globally for its stringent safety record. In 2024, the International Atomic Energy Agency said that it "demonstrates a high level of nuclear safety through its independent regulatory body and mature regulatory systems, promoting a strong safety culture." [109]

The same needs to happen in the UK.

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[102] Luc Torres, "Hinkley Point C timeline: all the key moments", *The Guardian*, 28 July 2016, https://www.theguardian.com/environment/2016/jul/28/hinkley-point-c-timeline-all-the-key-moments.

[103] Josephine Cumbo, George Parker and Rachel Millard, "Pension funds need 'compelling' returns from UK nuclear projects to invest", *Financial Times*, 18 May 2024, https://www.ft.com/content/70cd278f-8ef5-4904-9535-305fe1095768/.

[104] Ibid.

[105] "UK Green Financing: Allocation Report", HM Treasury, UK Government, October 2024, https://assets.publishing.service.gov.uk/media/6717ae60e319b91ef09e383a/HMT-UK_Green_Financing_Allocation_Report_2024_Accessible.pdf.

[106] "Canada to re-open 10-year green bond", Department of Finance Canada, Government of Canada, 8 October 2024, https://www.canada.ca/en/department-finance/news/2024/10/canada-to-re-open-10-year-green-bond.html; "Canada Raises $2 Billion in Green Bond Reopening, First to Include Nuclear Energy Expenditures", *ESG News*, 14 October 2024, https://esgnews.com/canada-raises-2-billion-in-green-bond-reopening-first-to-include-nuclear-energy-expenditures/.

[107] Chris Johnston, "Hitachi weighs pulling out of Welsh nuclear power plant", *The Telegraph*, 11 January 2019, https://www.telegraph.co.uk/business/2019/01/11/hitachi-set-walk-away-wylfa-nuclear-power-plant/.

[108] Jhoo Dong-chan, "South Korea is second-fastest nuclear plant-building country", *South China Morning Post*, 12 October 2016, https://www.scmp.com/news/asia/article/2027347/south-korea-second-fastest-nuclear-plant-building-country?module=perpetual_scroll_0&pgtype=article.

[109] "IAEA Mission Reviews Republic of Korea's Regulatory Framework for Nuclear Safety", International Atomic Energy Agency, 22 November 2024, https://www.iaea.org/newscenter/pressreleases/iaea-mission-reviews-republic-of-koreas-regulatory-framework-for-nuclear-safety.

2. How the UK Should Use Nuclear Energy in the Future

On 13 December 2024, the UK Government unveiled its Plan for Change. It sets out a roadmap for how the UK can transition to clean power by 2030. [110]

According to the Government, "Clean Power means that by 2030, Great Britain will generate enough clean power to meet our total annual electricity demand, backed up by unabated gas supply to be used only when essential." [111] This would entail replacing the nearly 40% of electricity currently generated through gas, coal and imported fossils fuels.

The Government recognises that this is an incredibly ambitious target. Not only is the expected cost around £200 billion, but it will also entail restructuring our energy infrastructure. [112]

The Scale of the Challenge

The Government does not provide an explicit breakdown of what proportions of clean energy will come from renewables and nuclear power. It assumes that the UK electricity consumption will double by 2050. If this demand is met entirely through clean energy produced in the UK, then 44% of our current energy sources would need to be replaced. At current consumption levels, this means replacing 138.4 TWh, or 276.8 TWh, by 2050.

To put it into perspective: if we were to replace our fossil energy sources with wind power, we would need to build an extra 23,000 onshore turbines, dwarfing our current number of 9,100. [113] Alternatively, if we were to instead use solar power to decarbonise, we would need 43 million solar panel systems (4kW). This would cover an area equivalent to 121,000 football pitches, or more than the entire Greater Manchester area. And those comparisons only apply to the present. Demand is inevitably going to skyrocket between now and 2050.

The Government intends to rely on a combination of renewables and nuclear energy to achieve its clean energy targets. However, given the 2030 deadline, it is unlikely that new nuclear infrastructure could be built in time to make a significant impact. This suggests the Government envisions renewables playing the dominant role. While renewables are essential to meeting the UK's long-term energy needs, an overreliance on them would undermine the reliability of supply. The consequence would be bad for the planet: it would require the use of gas reserves.

Meeting these ambitious targets will require a radical nationwide infrastructure-building programme. Recognising this, the Government's 2030 roadmap highlights the need for substantial planning reform. It says: "Our current planning systems across Great Britain are not working at the pace required to meet our target for clean power by 2030." [114] As a consequence, Angela Rayner, the Secretary of State for Housing, Communities and Local Government, has outlined plans to unify local authorities and devolve powers to mayors. This strategy aims to speed up large infrastructure projects, like nuclear power plants, that have historically been stalled by local bureaucracy. [115]

110 "Government sets out plan for new era of clean electricity", UK Government, 13 December 2024, https://www.gov.uk/government/news/government-sets-out-plan-for-new-era-of-clean-electricity.

111 "Clean Power 2030 Action Plan", UK Government, December 2024, p. 25, https://assets.publishing.service.gov.uk/media/675bfaa4cfbf84c3b2bcf986/clean-power-2030-action-plan.pdf.

112 Ibid., p.9.

113 "UK wind energy database", Renewable UK, https://www.renewableuk.com/energypulse/ukwed.

114 "Clean Power 2030 Action Plan", UK Government, p.50.

115 "'Devolution Revolution' forges ahead with more powers for Mayors," UK Government, 16 December 2024, https://www.gov.uk/government/news/devolution-revolution-forges-ahead-with-more-powers-for-mayors.

The Government's Vision for Nuclear

The Government has been clear. Nuclear power will play an "essential" role in our future energy mix since it is a reliable source of baseload, low-carbon electricity. It will help us reach net zero by 2050. [116]

The Government has committed to streamlining the regulatory processes that have hampered the pace of nuclear infrastructure development. Simplified approval pathways would reduce delays and boost investor confidence. This would thus enable the UK to build more advanced power plants quicker.

The Government has also stated that it will make its final decisions on the roll out of SMRs in the Spring 2025 Spending Review. Traditional nuclear power plants have faced repeated delays and escalating costs. In contrast, SMRs are smaller and designed for modular fabrication. Much of the plant can be constructed in a factory environment and assembled on-site. This reduces construction risk, shortens timelines and lowers overall costs. Rolls-Royce, a leader in SMR technology, estimates that its reactors can be operational within four to seven years at a cost of around £2 billion per unit, which is significantly less than large-scale projects. [117]

SMRs could help grow the UK economy. Rolls-Royce's SMR programme alone could create 40,000 jobs in the UK and generate £52 billion by 2050. [118]

What the Government Should Do

- Abandon the 2030 Clean Power Target and Establish a Realistic Timeline for Nuclear Integration

The Government's 2030 target to achieve 100% clean power is highly ambitious and commendable. But, given the current state of nuclear infrastructure development, it is unrealistic. Large-scale nuclear projects like Hinkley Point C face significant construction delays, while SMRs are still in the developmental phase. It is therefore highly unlikely that the UK could achieve 100% clean energy by 2030. Instead, the Government must push back the target to 2040. This would allow time to build more nuclear plants and phase out fossil fuels. If the UK does not do this, then it will not be able anyway to meet its 2030 target. Renewables cannot scale up at the rate needed.

- Accelerate the Deployment of SMRs

SMRs offer faster construction and lower capital costs. They provide a scalable solution for providing reliable, low-carbon baseload power. The Government should expand investment into SMRs. This would expedite their development and deployment. Funding should go towards further research, supporting regulatory approvals and incentivising private-sector partnerships with companies such as Rolls-Royce. By fast-tracking SMRs, the UK can reduce its dependency on fossil fuels while meeting growing electricity demand. SMRs also represent a more enticing private investment, due to the shorter development times.

That is not to say that the UK can do without large-scale reactors. SMRs alone cannot power a whole grid. They must therefore be paired with large reactors, which deliver stable energy, while SMRs adapt to local needs. Together, they will form a strong, green power system.

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116 Matt Oliver, "Higher bills could fund 'essential' nuclear push", *The Telegraph*, 6 December 2024, https://www.telegraph.co.uk/business/2024/12/06/miliband-plots-tech-led-private-nuclear-power-boom-britain/.

117 Rich Deakin, "Nuclear power: small Is mighty", UK Research and Innovation, 10 February 2023, https://www.ukri.org/blog/voices-nuclear-power-small-is-mighty/.

118 "Small Modular Reactors", Rolls-Royce, https://www.rolls-royce.com/innovation/small-modular-reactors.aspx.

- Include Nuclear Projects in Green Gilt Funds and Green Investment Vehicles

High upfront costs remain a significant barrier to nuclear expansion. The Government should include nuclear energy projects within its Green Gilt framework as well as other green investment vehicles. This would unlock much-needed capital for nuclear development. In 2023, the Canadian Government set a precedent by updating its Green Bond Framework to include certain nuclear projects, successfully raising $2 billion. This decision not only secured critical investment but also sent a symbolic message to Canadians: nuclear energy is green.

In the UK, Green Gilts have already proven an effective tool for financing sustainable projects, raising over £30 billion since their launch in 2021. [119] Including nuclear energy would signal confidence in its role as a low-carbon, reliable source of baseload power, encouraging institutional investors to commit capital to the sector.

[119] "UK Government Green Financing: 2021 to 2023 reports", UK Government, 28 September 2023, https://www.gov.uk/government/publications/uk-government-green-financing.

PART III

How the West Can Use Nuclear Energy to Win Friends and Influence the Global South

1. The Global Nuclear Marketplace: The West Is Losing

The atom was first split in the United Kingdom in 1917. [120] The first nuclear reactor to generate electricity was in the United States in 1951. [121] The first civil nuclear power plant was in the United Kingdom and opened in 1956. None other than Queen Elizabeth II did the honours. "This new power," said Her Majesty, "is harnessed for the first time for the common good of our community." The Lord Privy Seal said it was "epoch-making". [122]

And it was. Yet today, the West is not in pole position anymore. Instead, Russia and China have cornered the global nuclear market. For the past five years, every new nuclear reactor construction project has been started by either Russia or China. [123]

Russia's Dominance

The nucleus of Russia's dominance is the Rosatom State Nuclear Energy Corporation. The state-owned behemoth oversees nearly 45% of all nuclear reactors currently under construction, including in Eastern Europe, the Middle East, North Africa and Asia. As of mid-2024, according to the World Nuclear Industry Status Report, there were 59 nuclear reactors being built the world over. Rosatom is behind 26 of them. [124]

The company is a one-stop shop, delivering "turnkey solutions" that not only include power plant design and construction but also fuel supply, maintenance and upgrades, as well as employee training.[125] The numbers tell a story of unassailable dominance: 70% of global nuclear exports come from Russia – or $200 billion worth of deals. The country also controls 46% of the global uranium enrichment market, which gives it outsized influence over the nuclear supply chain. [126]

Rosatom's terms are often hard to resist for countries looking to purchase nuclear power facilities. According to researcher Seyit A. Colak, "Rosatom offers financing packages with attractive terms, including long-term loans, low interest rates, and flexible repayment plans." [127]

120 "Another Manchester world first from the University that split the atom", The University of Manchester, 26 December 2016, https://www.manchester.ac.uk/about/news/another-manchester-world-first-from-the-university-that-split-the-atom.

121 "EBR-I lights up the history of nuclear energy development", Idaho National Laboratory, 15 May 2019, https://inl.gov/feature-story/ebr-i-lights-up-the-history-of-nuclear-energy-development.

122 "1956: Queen switches on nuclear power", *BBC News*, 17 October 1956, http://news.bbc.co.uk/onthisday/hi/dates/stories/october/17/newsid_3147000/3147145.stm.

123 Mycle Schneider and Antony Froggatt, "The World Nuclear Industry: Status Report 2024", Mycle Schneider Consulting, September 2024, p.19, https://www.worldnuclearreport.org/IMG/pdf/wnisr2024-v2.pdf.

124 Ibid., p.158. See map on p.58 for a visualisation of where Rosatom (i.e. Russia) is building plants.

125 "JSC Atomenergoprom: Annual Report 2023", Rosatom, 2023, p.10, https://report.rosatom.ru/go_eng/atomenergoprom/go_aep_2023/aepk_2023_en.pdf.

126 Paul J. Saunders, "Russia's Global Energy Role: War, Sanctions, and the Energy Transition", *Energy Innovation Reform Project*, April 2024, p.1, https://innovationreform.org/wp-content/uploads/2024/04/2024-04-Russias-Global-Energy-Role-final.pdf.

127 Seyit A. Colak, "Decoding Rosatom's Dominance in the Global Nuclear Industry", *Energy World 360*, 14 October 2023, https://energyworld360.com/rosatoms-global-nuclear-industry-dominance/.

For example, 90% of the cost of Bangladesh's Rooppur nuclear plant is funded by a Russian loan. The loan is repayable over nearly 30 years with a grace period of 10 years. Interest is capped at 4%. [128] In the wake of Russia's full-scale invasion of Ukraine in 2022, Western sanctions targeted the Russian economy. And yet, as the Royal United Services Institute (RUSI) noted, Rosatom emerged unscathed. [129] In the year following the invasion, Russia's nuclear-related exports, including nuclear fuels, exceeded $1 billion. Among them were exports to NATO member states as well as European Union member states. [130]

What can possibly explain this? It is not because these countries are pro-Russian or in the pocket of the Kremlin. Rather, it is a testament to Russia's indispensability when it comes to running nuclear plants. [131] "Russia occupies a major share of the global nuclear energy market," RUSI explains, "with dependencies on Russian nuclear fuel supplies particularly high in Central and Eastern Europe, but also apparent in the US and Western Europe." [132]

But while Russia is in pole position, China is catching up fast.

China's Nuclear Ascendancy

China's equivalent of Rosatom is the China National Nuclear Corporation (CNNC). [133] Think of it as the Pepsi to Russia's Coca-Cola. While the CNNC currently occupies second place behind Rosatom, it is growing fast and could soon catch up with Rosatom. China's nuclear ambitions are staggering – both at home and abroad.

At home, the Chinese Communist Party (CCP) has set a monumental goal for CNNC: to build 150 new reactors over the next decade, or more than the rest of the world has constructed in the past 35 years. [134] As of 2024, every indicator appeared to show that the country would hit its targets, however unrealistic they might sound. [135] China's ambition is underpinned by a $440 billion investment strategy. Nuclear power is at the centre of the country's energy transition plan. The CCP wants to achieve carbon neutrality by 2060. Nuclear can help make it a reality. [136]

Abroad, CNNC exports reactors to countries in Asia, Africa, the Middle East and South America as part of China's "Belt and Road" initiative. Just like Russia does, China also offers attractive financial terms. [137] A startling statistic gives the full measure of China's fast-growing capabilities:

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128 "Rooppur: Bangladesh paying Russia in yuan to sidestep sanctions", *World Nuclear News*, 18 April 2023, https://www.world-nuclear-news.org/Articles/Rooppur-Bangladesh-paying-Russia-in-yuan-to-sidest.

129 Darya Dolzikova, "Atoms for Sale: Developments in Russian Nuclear Energy Exports", *RUSI*, 14 February 2023, p.1, https://static.rusi.org/RUSI-Russian-Exports-final-web_0.pdf.

130 Ibid., pp.1-2.

131 "The world relies on Russia to build its nuclear power plants", *The Economist*, 2 August 2018, https://www.economist.com/europe/2018/08/02/the-world-relies-on-russia-to-build-its-nuclear-power-plants.

132 Dolzikova, "Atoms for Sale", p.6.

133 "Nuclear Organisations in China", World Nuclear Association, 3 December 2024, https://world-nuclear.org/information-library/appendices/nuclear-power-in-china-appendix-1-government-struc.

134 Dan Murtaugh and Xiu Qi Krystal Chia, "China's Climate Goals Hinge on a $440 Billion Nuclear Buildout", *Bloomberg*, 2 November 2021, https://www.bloomberg.com/news/features/2021-11-02/china-climate-goals-hinge-on-440-billion-nuclear-power-plan-to-rival-u-s.

135 Rakshith Shetty, "China Will Generate More Nuclear Power Than Both France and the United States by 2030", *The Diplomat*, 28 August 2024, https://thediplomat.com/2024/08/china-will-generate-more-nuclear-power-than-both-france-and-the-united-states-by-2030/.

136 Murtaugh and Xiu Qi, "China's Climate Goals".

137 Mark Hibbs, "China Provides Nuclear Reactors to Pakistan", *Jane's Intelligence Review*, Carnegie Endowment for International Peace, 30 December 2013, https://carnegieendowment.org/posts/2013/12/china-provides-nuclear-reactors-to-pakistan; Cameron Brown, "China's Civil Nuclear Strategy and the Risk it Poses for Nuclear Proliferation in Africa", *RUSI*, 4 June 2024, https://rusi.org/networks/uk-poni/nuclear-reactions/chinas-civil-nuclear-strategy-and-risk-it-poses-nuclear-proliferation-africa; "China inks $8 bln nuclear power plant deal in Argentina", *Reuters*, 2 February 2022, https://www.reuters.com/business/energy/china-inks-nuclear-power-plant-deal-with-argentina-2022-02-02/; "China could build 30 'Belt and Road' nuclear reactors by 2030: official", *Reuters*, 20 June 2019, https://www.reuters.com/article/us-china-nuclearpower/china-could-build-30-belt-and-road-nuclear-reactors-by-2030-official-idUSKCN1TL0HZ/.

since 2000, almost 50% of new nuclear reactors have been built by CNNC.[138] It should come as no surprise, then, that the International Atomic Agency has said that China is "the world's fastest expanding nuclear power producer".[139]

China is also distinguishing itself on another front: technological innovation. "China is the de facto world leader in nuclear technology at the moment," said MIT Professor Jacopo Buongiorno.[140] The United States is "as many as 15 years behind China on developing high-tech nuclear power" according to a report by the Information Technology & Innovation Foundation, an American think-tank which cannot be accused of harbouring an anti-American agenda.[141]

China has invested heavily in SMRs. In 2023, it premiered the world's first "fourth-generation nuclear reactor".[142] What is more, the country is also a pioneer in designing thorium-based reactors. In 2021, the Shanghai Institute of Applied Physics unveiled the world's first thorium reactor protype.[143] CNNC will begin building the world's first thorium plant this year in the Gobi Desert. It is scheduled to go live in 2030 and could be a game changer. Unlike uranium-fuelled reactors, thorium-fuelled reactors will not require water. And there is much more thorium than uranium on the planet. To give an order of magnitude, it is estimated that China has enough thorium reserves to generate its own electricity for 20,000 years.[144] (And China is not even in the top 10 of countries with the most thorium, which includes India, Brazil, Australia and the US.)[145]

Nuclear Power: A Vector of Influence for Russia and China

There are consequences to the quasi-monopoly of the global nuclear marketplace exercised by Russia and China. Neither country entered the nuclear energy sector merely to make money. We are talking about the realm of international relations; there is an endgame to everything.

And, in this case, the endgame is more power and a bigger sphere of influence in the world. "Nations wield civil nuclear exports as an instrument of statecraft," argue Nicholas L. Miller and Tristan A. Volpe.[146] This is known as nuclear energy diplomacy, or nuclear diplomacy. "Nuclear-energy diplomacy aims to expand political influence through civil nuclear activity," explain Degang Sun, Haiyan Xu and Yichao Tu.[147]

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138 Roma, "Written Testimony of Amy C. Roma", p.7.

139 Laura Gil, "How China has Become the World's Fastest Expanding Nuclear Power Producer", International Atomic Energy Agency, November 2017, https://www.iaea.org/bulletin/how-china-has-become-the-worlds-fastest-expanding-nuclear-power-producer.

140 Catherine Clifford, "How China became the king of new nuclear power, and how the U.S. is trying to stage a comeback", *CNBC*, 30 August 2023, https://www.cnbc.com/2023/08/30/how-china-became-king-of-new-nuclear-power-how-us-could-catch-up.html.

141 Timothy Gardner, "US as many as 15 years behind China on nuclear power, report says", *Reuters*, 17 June 2024, https://www.reuters.com/business/energy/us-many-15-years-behind-china-nuclear-power-report-says-2024-06-17/.

142 Stephen Ezell, "How Innovative Is China in Nuclear Power?", *ITIF*, 17 June 2024, https://itif.org/publications/2024/06/17/how-innovative-is-china-in-nuclear-power/; Colleen Howe, "China starts up world's first fourth-generation nuclear reactor", *Reuters*, 8 December 2023, https://www.reuters.com/world/china/china-starts-up-worlds-first-fourth-generation-nuclear-reactor-2023-12-06/.

143 "China to build first thorium molten salt NPP in Gobi Desert", *Nuclear Engineering International*, 31 July 2024, https://www.neimagazine.com/news/china-to-build-worlds-first-thorium-molten-salt-npp-in-gobi-desert/.

144 Will Jackson, "China to build first-ever thorium molten salt nuclear power station in Gobi Desert", *ABC News*, 5 September 2024, https://www.abc.net.au/news/2024-09-06/china-building-thorium-nuclear-power-station-gobi/104304468.

145 China ranks number 11. For the full list, see "Thorium", World Nuclear Association, 2 May 2024, https://world-nuclear.org/information-library/current-and-future-generation/thorium.

146 Nicholas L. Miller and Tristan A. Volpe, "The rise of the autocratic nuclear marketplace", *Journal of Strategic Studies*, Volume 46, Issue 6-7 (2023), https://www.tandfonline.com/doi/full/10.1080/01402390.2022.2052725.

147 Degang Sun, Haiyan Xu and Yichao Tu, "In with the New: China's Nuclear-Energy Diplomacy in the Middle East", *Middle East Policy*, Volume 29, Issue 1 (2022), pp.41-60, https://onlinelibrary.wiley.com/doi/abs/10.1111/mepo.12619. For Russia, see also, for instance, Anastasia Stognei, et al., "How Russia is using nuclear power to gain global influence", *Financial Times*, 20 June 2024, https://www.ft.com/content/7110fc18-5a31-4387-9f4c-0cc5753d050a.

Both Russia and China are transparent about what they hope to accomplish with their nuclear diplomacy. Rosatom is a proxy of the Russian state, according to João Paulo Nicolini Gabriel. "Moscow employs Rosatom," he writes, "as a diplomatic tool to garner support within the United Nations to avoid further sanctions." [148] Meanwhile, back in 2016, Chinese state media revealed the country's strategy with CNNC. Nuclear energy, they said, "is not simply an energy source" but also "an important cornerstone of strategic power, a vehicle for civilian-military integration, and a 'China card' to play in the country's international cooperation diplomacy." [149]

Russia and China are laying down their atomic cards in the Global South. The reasons are obvious. Developing nations want to boost their economy and raise their living standards. To do so, they need plentiful, reliable energy sources. If they are to adhere to sustainability goals, then they only have one option: nuclear power.

And if developing nations need nuclear power, then it means that they need Russia or China. At the moment, only Rosatom and CNNC provide the kind of "turnkey services" that they are looking for. But such services do not come without trade-offs: these are not partnerships of equals. After signing with Rosatom or CNNC, developing nations become dependent on them for decades. The reason is simple enough: only these companies can run and maintain their own nuclear infrastructure.

Take, for instance, Bangladesh's Rooppur plant, which is currently being built by Rosatom. It will be the country's first nuclear power plant, providing 10% of its electricity, and will open by 2034. [150] But, as the *Financial Times* reported, Bangladesh will be tied to Russia for decades thereafter. "This is a never-ending relationship that [the Bangladeshi Government] are entering into," explained Professor Ali Riaz. [151]

Or take Uganda's Buyende plant, which will go live in 2031. CNNC is behind it. Make no mistake: it will be a boon not only for Uganda but also for Africa. The continent is currently home to just a single nuclear reactor in South Africa. [152] Buyende is expected to create jobs and drive Uganda's economic growth. [153] But it might come at the expense of Ugandan sovereignty. China is loaning Uganda the funds to finance Buyende as well as several other large infrastructure projects in the country. [154] To put it simply, Uganda is now a Chinese debtor. And, like every loan shark, China will use its sway to ensure that Uganda does its bidding.

Nuclear energy diplomacy works at several levels, according to researchers Kacper Szulecki and Indra Overland. [155] Using Rosatom's international activity as a case study, they have drawn up "a taxonomy of long-term energy dependencies". [156] It can be applied to CNNC's activity too. The orders of dependencies are not only "infrastructural" and "economic" but also "personal"

148 João Paulo Nicolini Gabriel, "Russian Nuclear Diplomacy in the Global South, and How to Respond to It", *IAI Commentaries*, 22 March 2024, p. 1, https://www.iai.it/sites/default/files/iaicom2413.pdf.

149 Mark Hibbs, "The Future of Nuclear Power in China", Carnegie Endowment for International Peace, 2018, p.8, https://carnegie-production-assets.s3.amazonaws.com/static/files/Hibbs_ChinaNuclear_Final.pdf.

150 Stognei, et al., "How Russia is using nuclear power".

151 Ibid.

152 Ximena Vásquez-Maignan, "Africa's quest for universal electricity access and net-zero through small modular reactors", White & Case LLP, 19 December 2023, https://www.whitecase.com/insight-our-thinking/africa-focus-winter-2023-universal-electricity.

153 Ken Mutuku, "Uganda finalizes on its Nuclear Power Plant Project", *The Exchange*, 15 March 2023, https://theexchange.africa/business/uganda-nuclear-power-plant-a-realization-with-first-plant-under-construction/.

154 "China's Influence on Uganda's economy", *Monitor*, 28 October 2024, https://www.monitor.co.ug/uganda/oped/letters/china-s-influence-on-uganda-s-economy-4803872.

155 Kacper Szulecki and Indra Overland, "Russian nuclear energy diplomacy and its implications for energy security in the context of the war in Ukraine", *Nature Energy*, Issue 8 (2023), pp.413-421, https://www.nature.com/articles/s41560-023-01228-5.

156 Ibid., p.413.

and "institutional".[157] In other words, they tether the political class and political institutions of the host country – say Uganda in the case of Buyende – to the foreign power.

Nuclear energy diplomacy has been an incredibly successful strategy for Russia and China. But where is the West in all this?

[157] Szulecki and Overland, "Russian nuclear energy diplomacy", p.417.

2. A Winning Strategy for the West

We must face the truth: the West is losing the race for nuclear power. It matters. A lot. Even nuclear sceptics should care. Put simply, it is an economic and political catastrophe.

The Stakes

By letting Russia and China control the nuclear marketplace, the West is missing out on a hugely lucrative industry. The global demand for nuclear energy is skyrocketing. At COP29, which took place in November 2024, more than 30 nations pledged to triple their nuclear capacity by 2050. Most of them will not be able to do it themselves. [158]

Add to that the soaring demand for electricity the world over, driven by AI, and it is clear that the nuclear market is hot. According to calculations by Third Way and the Energy for Growth Hub, it could amount to a whopping $360 billion a year. [159] As Jeremy Harrell, the Chief Strategy Officer of ClearPath Action and the Chairman of the US Nuclear Industry Council, puts it, nuclear power "is not just a climate imperative, it is an economic opportunity". [160] Can the West really turn its back on this opportunity and let Russia and China run away with it?

But there is another, more important reason why the West cannot afford to lose the race for nuclear power. It has to do with our political goals for the 21st century. As former President Biden has said, the 21st century is already shaping up to be "a battle between the utilities of democracies" in the West and "autocracies" like China and Russia. [161] The whole world is watching. "I predict to you," Biden explained, "your children or grandchildren are going to be doing their doctoral thesis on the issue of who succeeded, autocracy or democracy, because that is what is at stake." He added, "We've got to prove democracy works." [162]

Biden is right. But when it comes to nuclear power, what kind of message are we sending to the Global South? Does the West's lacklustre record prove democracy works? Does it show that democracies can act decisively in harnessing the energy of the future, or does it instead show that we are stuck in the past, powerless to seize the moment?

Autocracies have an "advantage" in the development of nuclear energy, argue Miller and Volpe. Since they can more easily ignore public opinion, anti-nuclear sentiment cannot impede their policy plans, as it has done repeatedly in the West. [163] Furthermore, they can also act unilaterally and use the state to deliver long-term plans. In the words of Miller and Volpe, "Autocratic leaders are more capable of empowering industrial vendors with sovereign resources." [164]

The West cannot let the Global South come to these same conclusions. It would imperil the future of democracy globally. If, as Biden urges us, we must prove that democracy works, then we must prove that democracies can harness the power of the atom – both in our own countries and around the world.

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158 Theo Leggett, "Is nuclear power gaining new energy?", *BBC News*, 21 November 2024, https://www.bbc.co.uk/news/articles/czr764nr873o.

159 Alan Ahn, et al., "2021 Update: Map of the Global Market for Advanced Nuclear", *Third Way*, 9 November 2021, https://www.thirdway.org/memo/2021-update-map-of-the-global-market-for-advanced-nuclear.

160 Jeremy Harrell, "A Nuclear Energy Solution to Prevent Russian Dominance", *RealClear Energy*, 23 February 2022, https://www.realclearenergy.org/articles/2022/02/23/a_nuclear_energy_solution_to_prevent_russian_dominance_818065.html.

161 Nicole Gaouette, "Biden says US faces battle to 'prove democracy works'", *CNN*, 26 March 2021, https://edition.cnn.com/2021/03/25/politics/biden-autocracies-versus-democracies/index.html.

162 Ibid.

163 Miller and Volpe, "The autocratic nuclear marketplace".

164 Ibid.

And we can. Make no mistake: the West can – and should – succeed in the race for nuclear energy.

We lack neither the scientific expertise nor the industrial capacity. We have cutting-edge companies, from Westinghouse to Rolls-Royce and EDF, that can build and operate nuclear reactors. And we also have innovative start-ups like Oka and Kairos Power.

Nuclear power might be costly, but we also have the money to build out nuclear. In October 2024, big banks including Goldman Sachs, Bank of America and Morgan Stanley pledged to finance the expansion of nuclear power. [165]

What the West lacks, instead, is the vision to imagine an ambitious agenda, the will to make it a reality and the cooperation to see it through. But it does not have to be this way. There is an alternative.

Led by the United States, the West can rally around a common agenda for nuclear energy. There is no time to waste. President Trump must show leadership on this issue. If he does, he would be following in the footsteps of one of his most illustrious predecessors.

Atoms for Peace

At the outset of the Cold War, the United States was the world leader in nuclear energy. As early as 1945, President Truman remarked that "atomic energy may in the future supplement the power that now comes from coal, oil and falling water". [166] But it was his successor, President Eisenhower, who really harnessed the power of the atom.

In 1953, at the United Nations General Assembly, Eisenhower laid out his vision for nuclear energy. It was wildly ambitious. "The United States knows that peaceful power from atomic energy is no dream of the future," he said. "That capability, already proved, is here – now – today." As Eisenhower saw it, nuclear energy "can be developed into a great boon, for the benefit of all mankind". [167]

The President pledged that the US Government was ready to work together with nations wanting to build nuclear power plants. "Any partner of the United States acting in the same good faith," he said, "will find the United States a not unreasonable or ungenerous associate." The programme under which the US entered into partnership with other countries was called Atoms for Peace. Set up under the aegis of the United Nations, it led to the creation of the International Atomic Energy Agency, which exists to this day. [168] Thanks to Atoms for Peace, countries like Pakistan, Turkey, Iran and Israel went on to have nuclear power plants. [169]

Eisenhower was not entirely selfless when he launched Atoms for Peace. That is not to say that he did not genuinely want to share nuclear energy with the world. All evidence shows that he was sincere. But Eisenhower was, of course, also looking to advance American interests. It was the Cold War, and the US was locked in a contest for global supremacy with the Soviet Union. Atoms for Peace was soft power at its finest.

Historian Marco Visscher explains that "with his promise of providing assistance to developing nations, [Eisenhower] wanted to prevent more countries from falling to communism. The aid

[165] Roberto Bocca, "World's biggest banks back nuclear power, and other top energy stories," World Economic Forum, 9 October 2024, https://www.weforum.org/stories/2024/10/worlds-biggest-banks-back-nuclear-power-and-other-top-energy-stories/.

[166] Santos, *Chain Reactions*, p.168.

[167] Eisenhower, "Atoms for Peace".

[168] Ibid., pp.5-7.

[169] Matthew Wills, "Atoms for... Peace?", *JSTOR Daily*, 30 May 2018, https://daily.jstor.org/atoms-for-peace/.

these nations received was to translate into eternal gratitude to their capitalist benefactor." [170] In Visscher's pithy phrase: "While the atomic bomb was developed to win World War II, the nuclear plant was to win the Cold War." [171]

As nuclear energy lost its lustre in the US in the 1970s, so Atoms for Peace lost its appeal. But, more than 70 years later, it is relevant again. The nuclear plant still has a role to play in winning the new Cold War.

Atoms for Democracy

It is time to update Atoms for Peace for the 21st century. It is the best way to counter Russia and China and win back market shares in the nuclear marketplace.

Here is how to proceed in 11 steps:

- **Step 1:** The United States should, once more, create an umbrella organisation dedicated to advancing nuclear energy. For now, as a working name, let us call it Atoms for Democracy.
- **Step 2:** The US should invite democratic nations with technical and industrial capacities – such as the United Kingdom, Japan, France, South Korea and Canada – to join Atoms for Democracy.
- **Step 3:** Private sector companies in democratic nations – such as Westinghouse, GE-Hitachi, EDF, Oka and Kairos Power – should be invited to join Atoms for Democracy.
- **Step 4:** Big Tech companies – such as Google, Meta, Microsoft and Amazon – should be invited to join Atoms for Democracy. They stand to benefit hugely from such an organisation, which would allow them to expand their footprint across the Global South. Besides, they have considerable funds to invest.
- **Step 5:** To work, Atoms for Democracy must have a leader. Members must therefore agree on a chief executive. They must appoint someone with a track record on the international stage. This individual could be a former head of state, a former foreign affairs minister, a former head of an international organisation or a well-known entrepreneur with a passion for nuclear energy. What matters is that they communicate well and have extensive experience with negotiations.
- **Step 6:** The first task for this chief executive is to build synergies between the countries and companies that are part of Atoms for Democracy. The goal, as much as possible, should be to pool resources and increase efficiencies. Public-private partnerships are essential, as are joint ventures. Here, the example of GE-Hitachi, a joint venture between the American General Electric and the Japanese Hitachi, should be emulated.
- **Step 7:** Atoms for Democracy should secure credit lines from both sovereign funds and big banks. Member states should invest in proportion to the size of their economies.
- **Step 8:** Atoms for Democracy should develop a powerful narrative about nuclear energy and democracy. The chief executive must be the one to share it with the international media. They must explain how the democratic world can help the Global

[170] Visscher, *The Power of Nuclear*, p.42.
[171] Ibid.

South meet its energy needs – and how it can do so without coercion unlike Russia and China.

- **Step 9:** Atoms for Democracy should organise a yearly summit to court the Global South. This should be modelled after successful summits like Saudi Arabia's Future Investment Initiative.
- **Step 10:** Atoms for Democracy should bid for contracts to build nuclear power plants in the Global South. With the backing of sovereign states and banks, it will be able to offer favourable financial terms and thus win contracts.
- **Step 11:** Plant after plant, Atoms for Democracy will be able to regain shares of the nuclear marketplace. Because it pools the resources from multiple countries, it will be able to move at a much faster pace than if countries separately tried to rival Russia and China.

This might sound ambitious, pie in the sky even, but we must try. With the right leadership and the willingness to work together, it can happen. Multilateral organisations like NATO and the European Union are a testament to the power of cooperation. "Man can be as big as he wants," said John F. Kennedy, Eisenhower's successor. "No problem of human destiny is beyond human beings. Man's reason and spirit have often solved the seemingly unsolvable – and we believe they can do it again." [172]

The good news is that there are signs that Atoms for Democracy is doable.

Take the US–Africa Nuclear Energy Summit. An annual event first held in 2023, it is organised by the US. The goal: "strengthening Africa's industries through nuclear power". [173] As a result of this push into nuclear diplomacy, the US is now in the planning stages to build a small modular reactor in Ghana. It will double as "a regional centre for the training of nuclear energy personnel". (Construction has not yet started.) [174]

Or take the Sapporo 5 strategic partnership. At the 2023 G7, the US joined forces with Japan, the UK, France and Canada to create a group known as Sapporo 5. [175] "This group is laser-focused on increasing the depth and resilience of the global civil nuclear fuel supply chain free from Russian influence," said the US Department of Energy. [176]

While these initiatives are important, they do not go far enough. If we are serious about rivalling Russia and China, then we need to act like it.

According to the *Financial Times*, "Kathryn Huff, former assistant secretary for nuclear energy at the US Department of Energy, says it is critical for the US and its allies to rebuild a stable nuclear supply chain and re-establish leadership in the global nuclear sector. But it could take a decade for this to happen, she adds." [177]

The best time for the West to back nuclear was decades ago. The second best time is now.

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173 "Agenda", US–Africa Nuclear Energy Summit, August 2024, https://usanes.org/agenda/.

174 Jędrzej Czerep, "U.S. Rivalry with Russia and China over Nuclear Technology in Africa Heating Up", Polish Institute of International Affairs, 10 September 2024, https://www.pism.pl/publications/us-rivalry-with-russia-and-china-over-nuclear-technology-in-africa-heating-up.

175 Stognei, et al., "How Russia is using nuclear power".

176 "Sapporo 5 Leaders Make Significant Progress in Securing a Reliable Nuclear Fuel Supply Chain", U.S. Department of Energy, 18 April 2024, https://www.energy.gov/ne/articles/sapporo-5-leaders-make-significant-progress-securing-reliable-nuclear-fuel-supply-chain.

177 Stognei, et al., "How Russia is using nuclear power".

Conclusion and Policy Recommendations

Nuclear energy is the future. It is key to combatting climate change and winning the new Cold War between democracy and autocracy. Without it, the West faces economic decline and diminished global influence.

- Nuclear power is clean, reliable and critical for achieving net zero. It works alongside renewables to ensure a stable energy supply.
- Russia and China dominate the nuclear market, using it to expand their reach and entangle nations in dependency.
- The West risks losing a $360 billion annual industry – and the geopolitical leverage it provides.

Embracing nuclear power is not just about energy. It's about securing a sustainable, democratic future.

Policy Recommendations

For the UK:

To reach net zero by 2050, the Government must rebuild its nuclear strategy:

1. Delay the clean energy target to 2040. This gives nuclear the time to reshape the energy mix.
2. Fast-track SMRs for their speed, scalability and cost efficiency.
3. Cut regulatory red tape to incentivise private investment and accelerate construction.
4. Include nuclear in the UK's Green Gilt framework and other green investment tools.
5. Follow Canada's example by recognising nuclear as green, unlocking billions in new capital.

For the West:

To reclaim leadership in nuclear energy, the West must take bold, decisive action:

1. Launch Atoms for Democracy, a Western alliance to challenge Russia and China's nuclear dominance.
2. Forge partnerships with developing nations, offering nuclear solutions free from strings and coercion.
3. Deploy public–private collaborations to expand nuclear capacity quickly and strategically.
4. Invest heavily in advanced technologies like thorium reactors and SMRs to stay ahead of competitors.
5. Build regional training hubs to strengthen expertise, particularly in the Global South.

The West is at a crossroads. Falling further behind means ceding control of the future – to autocrats, to polluters, to competitors. Nuclear energy is the way forward.

The West has the tools and talent to lead.

What it needs now is the will.

Title: “HARNESSING THE POWER OF THE ATOM”
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