REPORT

Debt, Delays, Dependencies

Why Public Banks Should Not Support Nuclear Power

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Content


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Foreword

Claudia Kemfert, Professor of Energy Economics, German Institute for Economic Research

The renewed push for nuclear power is often framed as a pragmatic response to climate change and energy insecurity. In times of geopolitical tension and accelerating climate impacts, the promise of a supposedly “clean”, reliable and scalable technology appears tempting. Yet this narrative does not withstand serious economic, ecological or geopolitical scrutiny. This report makes clear why the growing support for nuclear power, by governments and increasingly also by multilateral financial institutions, is a costly misallocation of scarce public resources.

From an economic perspective, nuclear power has long been a losing proposition. Construction times are measured in decades, costs regularly exceed initial estimates, and financial risks are systematically socialized while potential benefits remain uncertain. New projects across the world illustrate the same pattern: delays, ballooning budgets and dependence on massive public guarantees. In contrast, renewable energy technologies such as wind and solar have become cheaper, faster to deploy and far more flexible. They are already the backbone of least-cost energy systems in many regions, including emerging and developing economies.

Proponents of a nuclear “renaissance” increasingly point to SMRs as a technological breakthrough. However, SMRs are neither commercially available nor economically proven. They face the same unresolved challenges as conventional nuclear power, high costs, safety risks, waste disposal and proliferation concerns, while adding new uncertainties related to standardization, licensing and scalability. Betting public money on technologies that exist largely on paper diverts attention and capital away from solutions that are available here and now.

From a climate perspective, nuclear power is too slow to make a meaningful contribution to emissions reductions in the decisive next decade. The climate crisis demands rapid action. Long planning and construction periods mean that nuclear projects started today will come online far too late to help meet near-term climate targets. Moreover, nuclear power crowds out investment in renewables, grids, storage and efficiency, those very elements that enable resilient, climate-neutral energy systems.

For countries in the Global South, the risks are particularly severe. Nuclear projects often deepen financial dependencies, increase sovereign debt and lock countries into long-term fuel supply and technology relationships. In many cases, these dependencies are geopolitical in nature. The prominent role of state-owned actors such as Rosatom highlights how nuclear cooperation can translate into lasting political leverage and security vulnerabilities, exactly the opposite of what energy sovereignty should mean.

Finally, the unresolved issue of nuclear waste remains a fundamental ethical and environmental challenge. Almost no country has yet demonstrated a fully operational, long-term solution for high-level radioactive waste. Passing these risks and costs on to future generations contradicts the principles of sustainable development that multilateral financial institutions claim to uphold.

Multilateral development banks and international financial institutions play a crucial role in shaping global investment pathways. Their mandate is not only to mobilize capital, but to do so in a way that is economically sound, environmentally responsible and socially just. Supporting nuclear power, including experimental concepts such as SMRs, fails this mandate. Public finance should prioritize energy efficiency, renewable generation, grids, storage and decentralized solutions that strengthen resilience, reduce poverty and deliver climate protection at the lowest cost.

This report provides a timely and well-founded reminder: nuclear power is not a solution to the climate crisis, nor a viable strategy for sustainable development. The future of energy lies in clean, renewable, affordable and democratic systems—and public finance must align accordingly.

> *“The World Bank itself has concluded in its 2024 Off-Grid Solar Market Report that decentralized renewable energy is the fastest and most cost-effective way to lift people out of energy poverty.”*

Editorial

On June 11, 2025, Ajay Banga, President of the World Bank, formally cleared the way for nuclear finance, ending over half a century of de facto exclusion. The World Bank Group, as many other institutions, had apparently yielded to pressure from the second Trump administration. The shift is significant. When the most influential development bank funds nuclear power, it sends a signal to other development banks and the financial markets. On November 24, the Asian Development Bank (ADB) also amended its energy policy to include nuclear power. Others, such as the African Development Bank (AfDB), the Interamerican Development Bank (IDB) and the Asian Infrastructure Investment Bank (AIIB), could follow.

However, by financing nuclear energy, these banks are backing a power source that would never be economically viable on its own. Nuclear power needs public finance, tax breaks and wide-ranging government support, from regulation and permitting to safety and security. At the end of the day, it is taxpayer money enabling private companies’ profits.

To make matters worse, the nuclear industry has long been marred by persistent cost overruns and construction delays. These problems have worsened rather than improved over time. Promises of learnings and design improvements have repeatedly failed to deliver. To add insult to injury, new nuclear power plants produce the most expensive electricity compared to any other alternative. The additional costs are ultimately borne by consumers and taxpayers.

Still, with the World Bank as a trendsetter, the future of nuclear power suddenly seems brighter. Great hopes and expectations hang on small modular reactors (SMRs), touted for their affordability and rapid production times. Although neither selling point has proven true to date, the hype around SMRs persists.

At the same time, nuclear energy creates new dependencies. It leaves consumers reliant on prices dictated by large energy companies. The World Bank itself has concluded in its 2024 Off-Grid Solar Market Report that decentralized renewable energy is the fastest and most cost-effective way to lift people out of energy poverty. Decentralized systems enable local participation and control, are more climate-resilient, and avoid dependence on any one big player.

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Another habitually neglected factor in the purported nuclear renaissance is the inevitable geopolitical dependency. The vast majority of the nuclear export industry is dominated by Russia, which uses nuclear power for geopolitical influence. Moreover, the large infrastructure investments associated with nuclear power plant construction need to be repaid over decades, increasing the country's debt burden without creating much benefit for citizens.

Propping up nuclear energy solely on the basis of "energy access" is overly simplistic. The real questions are how quickly this access can be delivered, how affordable the energy will be for local populations, and whether countries and communities might be pushed into new technological or financial dependencies. Ultimately, people's well-being must take precedence over geopolitical ambitions and special interests.

We can neither afford the time nor the resources to pursue false promises when viable solutions already exist.

Renewable energies are the real answer. They have long demonstrated their economic viability. They are indeed affordable, quick, and do not leave behind copious amounts of toxic waste that is expensive to safekeep and, as of yet, impossible to discard. Anyone who genuinely cares about the public purse and the wellbeing of future generations will steer clear of nuclear power.

There are many solid arguments against this waste of taxpayer money. This report serves as a compilation of science-based theses against the renaissance of nuclear power. In five thematic articles, four renowned scientists and an expert on Russian nuclear policy provide key facts and figures on the topic.

Protests against nuclear power at Hinkley Point Nuclear Power Station in Somerset, England.

Why are nuclear power economics so bad?

Steve Thomas, Professor of Energy Policy, University of Greenwich, London, England

Nuclear power is often portrayed as cheap, but the reality is that it has seldom, if ever, been an economic choice. The promise of cheap power has always been based on the forecast that new reactors would, because of factors such as learning and improved design, have lower costs and faster construction times and would not suffer from the problems that made their predecessors uneconomic.

However, the promises of learning and design improvements have never been achieved. The real expected construction cost of nuclear power has consistently increased over the technology's history, as has the expected time to build the reactors. To make matters worse, cost and time overruns are worsening. So, nuclear power is becoming a riskier investment because of the risk of cost and time overruns.

In the past, these competitiveness and risk issues were obscured because electric utilities were monopolies able to choose the generating sources they wanted regardless of the cost. They were able to pass on whatever costs they incurred on to unsuspecting consumers. However, the introduction of competitive electricity markets and more rigorous regulation means that utilities can no longer afford to build power plants that will not be competitive and carry high economic risks.

As a result, governments, unwilling to abandon nuclear technology, have increasingly taken over utilities' old role, choosing technologies, taking equity stakes, providing the finance and imposing power purchase contracts that force consumers to buy the expensive power these reactors produce. Soon, Multilateral Development Banks could take on this role, too. So, the burden of cost and risk falls on taxpayers and electricity consumers.

European and North American nuclear experience in the 21st century

In the Global South, nuclear power development remains extremely limited, with the few ongoing projects largely financed and constructed by Russia, leaving little transparent data on costs or timelines. As a result, this article will rely on evidence from Europe and the United States (US) for its economic viability assessments. However, the cost overruns and delays are structural and will apply equally, if not even more forcefully, in Global South contexts.

Only seven nuclear projects have started construction in Europe and North America this century. Two, Akkuyu in Türkiye and Belarusian in Belarus, are supplied by Russia. The Akkuyu project is late and not complete, with no reliable costs published. The Belarusian project is complete, but also late and with no reliable costs available.

This leaves Olkiluoto 3 (Finland), Flamanville 3 (France) and Hinkley Point C in the United Kingdom (UK) in Europe, all using the Framatome European Pressurised Reactor (EPR), and the Vogtle and Summer projects in the US using the Westinghouse AP1000 technology. The experience with these projects is summarised in the Table below. It must be stressed that this analysis includes all European and North American projects, not just those that went badly wrong.

"The cost overruns and delays are structural and will apply equally in Global South contexts."

Nuclear projects in Europe and North America in the 21st century

Project	Country	Investment decision	Construction start	Forecast completion	Actual completion	Forecast cost	Actual cost
Olkiluoto 3	Finland	December 2003 [1]	August 2005	August 2009	May 2023	EUR 3bn [1]	EUR 11bn [1]
Flamanville 3	France	August 2005 [2]	December 2007	December 2012	2026 [3]	EUR 3.3bn [4]	EUR 13.2bn [5]
Hinkley Pt C 1, 2	UK	October 2016 [6]	December 2018, December 2019	May 2025, November 2025	2031, 2032 [7]	GBP 18bn (2015) [6]	GBP 35bn (2015) [7]
Vogtle 3, 4	US	April 2008 [8]	March 2013, November /13	2016, 2017 [9]	July 2023, April 2024	USD 14bn	>USD 30bn [9]
Summer 2, 3	US	May 2008 [10]	March 2013, November 2013 [11]	2017, 2018 [11]	Abandoned July 2017 [10]	USD 9bn	USD 10bn at abandonment [10]

Notes: Construction start is at pouring of first structural concrete. Completion is at start of commercial operation.
Sources: Construction start and completion dates from PRIS, https://pris.iaea.org/PRIS/home.aspx.

[1] IEEFA, "European Pressurized Reactors: Nuclear power's latest costly and delayed disappointments", 02.02.2023, https://ieefa.org/articles/european-pressurized-reactors-nuclear-powers-latest-costly-and-delayed-disappointments

[2] World Nuclear News, "Construction of Flamanville EPR begins", 04.12.2007, https://www.world-nuclear-news.org/Articles/Construction-of-Flamanville-EPR-begins

[3] Flamanville 3 first supplied power to the grid in December 2024, but by December 2025 was not in commercial operation.

[4] France24, "France's most powerful nuclear reactor comes on stream after 12-year delay", 21.12.2024, https://www.france24.com/en/live-news/20241221-france-s-most-powerful-nuclear-reactor-finally-comes-on-stream

[5] EDF, "Update on the Flamanville EPR", 16.12.2022, https://www.edf.fr/en/the-edf-group/dedicated-sections/journalists/all-press-releases/update-on-the-flamanville-epr-0

[6] EDF, "Final contracts signed for Hinkley Point C" 29.9.2016, https://www.edf.fr/en/the-edf-group/dedicated-sections/journalists/all-press-releases/final-contracts-signed-for-hinkley-point-c

[7] EDF, "Hinkley Point C Update", 23.01.2024, https://www.edf.fr/en/the-edf-group/dedicated-sections/journalists/all-press-releases/hinkley-point-c-update-1

[8] Wikipedia, "Vogtle Electric Generating Plant", https://en.wikipedia.org/wiki/Vogtle_Electric_Generating_Plant

[9] US Energy Information Administration, "Plant Vogtle Unit 4 begins commercial operation", 01.05.2024, https://www.eia.gov/todayinenergy/detail.php?id=61963

[10] Alex Crees, "The failed V.C. Summer nuclear project: A timeline", Choose Energy, 04.12.2018, https://www.chooseenergy.com/news/article/failed-v-c-summer-nuclear-project-timeline/

[11] David Dalton, "Construction Begins At South Carolina's Virgil C Summer-3", NUCNET, 08.11.2013, https://www.nucnet.org/news/construction-begins-at-south-carolina-s-virgil-c-summer-3

“The average outturn cost is 2.7 times the estimated cost.”

The time from project announcement to final investment decision is difficult to quantify but is usually significant. For example, the Hinkley Point project was announced in 2009, seven years before the final investment decision. The mean time from investment decision to construction start is 40 months and appears to be increasing. The actual construction time varies from 10 to 18 years with an average of 13.5 years although this includes the estimate for Hinkley, which is almost certain to be extended. So, if we assume the time from project announcement to investment decision is only four years, the total average project lead-time is more than 20 years. In terms of costs, in the unlikely event that no further cost increases at Hinkley occur, the average outturn cost is 2.7 times the estimated cost.

Westinghouse’s bankruptcy was largely due to them being forced to offer fixed price terms to complete the Summer and Vogtle projects.[12] EDF had to write off Euro 12.9 billion of its investment in Hinkley Point C because it had agreed to absorb any cost increases in the project rather than pass them on to consumers.[13] Areva NP, supplier of the Olkiluoto plant, had to pay substantial compensation to the project owner for the cost overrun, contributing to the need for the French government to restructure the company and take on its liabilities.[14]

This experience demonstrates why no financier, private investor or reactor vendor would be willing to take such risks. Around Europe, the proposed new nuclear projects are based on a strong element of state-ownership, state-provided finance and power purchase agreements that guarantee that all project owners’ costs will be recovered. This is well illustrated by the terms for the UK’s Sizewell C project, with huge incentives and profits for investors and huge risks falling on taxpayers and electricity consumers. Governments aspiring to build new nuclear treat this model as a template for financing new projects.[15]

There is a pervasive narrative, which politicians, decision-makers and commentators accept uncritically, that the problems with nuclear power are down to obstructions caused by inefficient planning and safety regulatory processes. Yet no evidence is offered to support these assertions, for one simple reason: there is none. The problem lies squarely with the technologies and the companies building them.

Fool me once...

If we look back 25 years to claims made about so-called Gen III+ designs (like the Westinghouse AP1000 and the Framatome EPR), these forecast construction times of 5 years or less, at a cost of USD 1,500 per kilowatt (kW) of capacity.[16] As late as 2008, a UK government ‘White Paper’ on nuclear power gave a central cost estimate for a new nuclear power plant of GBP 1,250 per megawatt (MW) so that a station like Hinkley Point C (3,200 MW) could be built for GBP 4 billion. The latest cost estimate in 2025 money is GBP 48 billion and with inflation since 2008 standing at about 67%, the actual cost, if there are no more cost increases, will, in real terms, be more than seven times the government’s 2008 estimate.[17]

Vogtle Nuclear Power Plant. Existing reactors #1 and #2 on the right. The construction site for reactors #3 and #4 on the left.

The outcomes elsewhere were also very different to those promised, as shown in the Table above. Such designs tend to take 10-20 years to build and at a cost perhaps four times the forecast. Yet despite these hopelessly inaccurate claims the nuclear industry made then, governments and Multilateral Development Banks such as the World Bank and the Asian Development Bank seem willing to uncritically accept its new claims today. Central among them: large reactors will be much cheaper because of learning. Given that no new large reactor designs have been brought to market in the past 20 years, it is hard to see why the outcome with new projects using these designs should be any different.

SMRs are also on everyone's lips. SMRs are regularly reported to be quicker, easier and cheaper to build than large reactors; all assertions yet to be backed by evidence. By December 2025, construction had yet to start on any commercial SMR. So, costs, construction times and operating performance are simply marketing claims, which on past experience should not be believed.

Can nuclear save the planet?

There is a perception that climate change is moving faster, and an increased awareness that we are facing a climate emergency. In that context, how is it sensible to rely on an option that typically takes 20 years from project inception to power generation, is vastly more expensive to begin with and gets even more expensive compared to the alternatives which are quicker, less risky and increasingly cheaper? Nuclear power is an option we cannot afford.

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[12] Tom Hals and Emily Flitter, "How two cutting edge U.S. nuclear projects bankrupted Westinghouse", Reuters, 02.05.2017, https://www.reuters.com/article/world/how-two-cutting-edge-us-nuclear-projects-bankrupted-westinghouse-idUSKBN17Y0C7/

[13] EDF, "2023 Annual Results", 02.04.2024, https://www.edf.fr/sites/groupe/files/2024-04/annual-results-edf-2023-presentation-2024-04-02.pdf

[14] World Nuclear News, "New NP resurrects Framatome name", 04.01.2018, https://www.world-nuclear-news.org/Articles/New-NP-resurrects-Framatome-name

[15] Stephen Thomas, "Sizewell C—the last of its kind", Policy Brief, 2025, https://policybrief.org/briefs/sizewell-c-the-last-of-its-kind/

[16] Stephen Thomas, "The Economics of Nuclear Power", Heinrich-Böll-Stiftung, 2005, https://www.nirs.org/wp-content/uploads/ch20/publications/nip5_thomas.pdf

[17] Department for Business Enterprise & Regulatory Reform, "Meeting the Energy Challenge—A White Paper on Nuclear Power", 2008, https://assets.publishing.service.gov.uk/media/5a7490ace5274a44083b7b15/7296.pdf , p. 61

Techno-economic challenges of the nuclear back-end

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Producing electricity from nuclear power plants necessitates the implementation and upkeep of a complex infrastructure system, from the "front-end" of the nuclear supply chain, i.e., uranium mining, enrichment, and fuel production, over the power plant itself, to decommissioning, waste management, and reprocessing, i.e., the so-called "back-end". However, in economic assessments, the costs of the nuclear back-end are often excluded or discounted away—even though they are both substantial and subject to uncertainty. Despite the limited data available for independent assessment, experience to date indicates that back-end costs are often vastly higher than expected.

Decommissioning

As of July 2025, 218 reactors with total capacity of 110 gigawatts (GW) have been closed, but only 23 reactors have completed their technical decommissioning. Only nine sites have been cleared as "greenfield", meaning they are cleared for non-industrial uses. Most other locations still house interim waste storage facilities or other infrastructure.[18] Consequently, global experience in nuclear decommissioning is limited. Projects can take many decades and are characterized by complexity, uncertainty, specificity, delays, and, in many cases, cost increases.[19] Because there are only a handful of completed projects, cost assessments are based on ex-ante calculations and rely on assumptions. Drawing from the expectations and provisions of German, Italian, and Lithuanian operators, one can calculate the expected costs to decommissioning high-capacity commercial reactors as, respectively, USD 6.82, 14.05, and 15.71 per megawatt hour (MWh) which is significantly higher than the official estimates by the International Atomic Energy Agency (IAEA) of USD 0.01 to 0.4 per MWh.[20]

The organization of decommissioning funds depends on individual state regulation. In some cases, operators must ensure sufficient funds via internal provisions (e.g., France and West German utilities), while other decommissioning projects are funded by the state (e.g., the UK's Magnox fleet), external funds (e.g., some reactors in the US or in Switzerland), or via a combination of guarantees and IOUs (e.g., in some cases in the US). Ensuring that sufficient funds are available for these long-term liabilities is subject to

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[18] Mycle Schneider, Julie Hazemann, Phred Dvorak, et al., "World Nuclear Industry Status Report 2025", Mycle Schneider Consulting, https://www.worldnuclearreport.org/World-Nuclear-Industry-Status-Report-2025

[19] Alexander Wimmers and Christian von Hirschhausen, "Organizational Models for the Decommissioning of Nuclear Power Plants: Lessons from the United Kingdom and the United States", Utilities Policy, vol. 91, 2024, https://doi.org/10.1016/j.jup.2024.101843

[20] Doug Koplow, "Uncovering Hidden Nuclear Subsidies and Other Forms of State Support", Nuclear Power—Technology, Geopolitics, and Economics, Springer, 2026, pp. 321-354, https://doi.org/10.1007/978-3-031-99894-2_12

“At the end of 2025, there was not a single country in the world operating a final repository for highly radioactive waste, also referred to as ‘high-level waste’.”

ongoing research. In some cases, insufficient funds result in decommissioning projects’ extension by several decades (by being placed into a state of long-term enclosure) to allow for (external) funds to accumulate.[21]

Waste management

Nuclear waste management comprises the interim and final storage of all types of radioactive waste generated during the operation and decommissioning of a nuclear plant. In some cases, this can include reprocessing activities that shall be explicitly excluded in this report due to most countries (apart from France) opting against these processes, mostly for cost reasons.[22]

At the end of 2025, there was not a single country in the world operating a final repository for highly radioactive waste, also referred to as “high-level waste.” The Finnish project is close to completion, having begun test operations in 2025. Most countries are still the process of siting suitable locations (e.g., Germany, Bulgaria, Lithuania, the UK, or Japan), have selected a potential site (e.g., Switzerland), are planning underground research laboratories (e.g., Russia or Hungary), or are in the process of licensing their potential repositories (e.g., China, Canada, Sweden, or France). Several countries have postponed final decisions on whether to pursue national efforts for a final repository for high-level waste (e.g., the Netherlands or Slovakia) or have decided to de-facto end these efforts (e.g., the US).[23]

The lack of empirical data on completed waste management projects makes reliable cost estimations challenging. From past experience and the very long-term processes associated with the siting of suitable repositories across different countries for low-, intermediate- and high-level wastes alike, we can be certain that current cost estimates will be exceeded once these large-scale infrastructure projects are completed. Projects for low- and intermediate-level waste disposal demonstrate this, for example. As of today, most repository projects are characterized by substantial delays. In the US, siting a final repository for civilian spent fuel has de facto failed and has not been pursued in earnest since 2016. The German site selection project for high-level waste is decades behind schedule.

These delays have implications for the future costs that will have to be borne by future generations. Like decommissioning, waste management is funded in different ways in different countries. A prime example of (likely) insufficient funding provision is the German case. Here, funding responsibilities were delegated to an external fund that must ensure sufficient funding for most German waste management activities. However, the initial endowment was based on an outdated study of an obsolete repository design which assumes overly optimistic inflation rates and no delays in the site selection process. One can expect that if the current regulatory and process designs remain, future taxpayers will end up bearing the additional costs when the fund dries up.[24 25]

However, the German case is comparatively simple because waste volumes will not increase in the coming decades due to the closure of the country’s commercial power plants. The Finnish and French projects, arguably the most advanced in the world, are only licensed for the expected waste volumes of their currently operational fleets with currently licensed lifetimes. If plants operate longer, or new plants are built, new approval processes will have to be conducted and, potentially, new sites will have to be identified.

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[21] Rebekka Bärenbold, Muhammad Maladoh Bah, Rebecca Lordan-Perret, et al., “Decommissioning of Commercial Nuclear Power Plants: Insights from a Multiple-Case Study”, Renewable and Sustainable Energy Reviews, vol. 201, 2024, https://doi.org/10.1016/j.rser.2024.114621

[22] Manon Besnard, Marcos Buser, Ian Fairlie, et al., “The World Nuclear Waste Report—Focus Europe“, 2019, https://worldnuclearwastereport.org/wp-content/themes/wnwr_theme/content/World_Nuclear_Waste_Report_2019_Focus_Europe.pdf

[23] Jochen Ahlswede, Jan Graefje, and Hendrik Schopmans, “Disposal of High-Level Nuclear Waste: Global Status and German Experience with the Unresolved Liability of Nuclear Energy”, Nuclear Power—Technology, Geopolitics, and Economics, Springer, 2026, pp. 447-481, https://doi.org/10.1007/978-3-031-99894-2_16

[24] Mahdi Awawda and Alexander Wimmers, “Delays and Deferrals in Nuclear Waste Disposal: A Stochastic Analysis of Funding Shortfalls of Germany’s Waste Fund KENFO”, arXiv preprint, 2025, https://doi.org/10.48550/ARXIV.2412.16126

Delays in final repository provision have implications for the safety and security of interim waste storage sites. In some cases, waste containers might have to be replaced due to aging, or be relocated to centralized facilities for inspection, necessitating sufficiently dimensioned infrastructure, like hot cells, and suitable transportation measures. Furthermore, the long-term processes necessitate knowledge management and detailed documentation over many decades, for which highly skilled personnel must be trained.[26][27]

So-called new reactor concepts, including light-water SMRs and non-light water reactor concepts are in early development stages. [18] Most concepts are based on existing technologies and will produce similar wastes; albeit with lower burn-up and therefore more waste per generated unit of energy. New types of waste generated in non-light water reactors would require additional specialized waste handling infrastructure.[28] The implementation of "waste recycling" breeder reactors poses additional questions related to safety, security, technology development, and cost – and would require even more specialized infrastructure.[29]

Conclusion

As of today, reliably calculating the costs of the nuclear back-end is an impossible task given the lack of empirical evidence. Experience so far, however, shows that ex-ante calculations are likely to underestimate the costs for future generations who will face the long-term challenges of decommissioning and waste management. The nuclear sector is prone to underestimating costs and there is no reason to believe that complex infrastructure projects like final waste repositories will be the exception to the rule. Consequently, the implications of investing into new nuclear power plants must be considered beyond the investment decision of the plant itself—without discounting away future costs. These implications include the provision of sufficient funds with back-stops, long-term and reliable regulation to ensure safe and secure storage of radioactive wastes, and suitable plans to deal with the nuclear back-end both today and many decades from now.

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[25] Alexander Wimmers and Lukas Vorwerk, "Finanzierungsfragen vertagen? Ergebnisse eines Workshops zur Sicherstellung der langfristigen Finanzierung der kerntechnischen Entsorgung", International Journal for Nuclear Power vol. 70, 2025, pp. 76-80, https://www.yumpu.com/en/document/view/70713952/atw-international-journal-for-nuclear-power-052025

[26] Marissa Z. Bell and Allison Macfarlane, "'Fixing' the Nuclear Waste Problem? The New Political Economy of Spent Fuel Management in the United States", Energy Research & Social Science 91, 2022, https://doi.org/10.1016/j.erss.2022.102728

[27] Konrad Ott, Klaus-Jürgen Röhlig, Fabian Präger, and Christian von Hirschhausen, "Für mehr Tempo in der Endlagerung hochradioaktiver Abfälle", Forschungsjournal Soziale Bewegungen Plus 37 (4), 2024, https://forschungsjournal.de/fjsb/wp-content/uploads/fjsb-plus_2024-4_ott.pdf

[28] Lindsay M. Krall, Allison M. Macfarlane, and Rodney C. Ewing, "Nuclear Waste from Small Modular Reactors", Proceedings of the National Academy of Sciences 119 (23), 2022, https://doi.org/10.1073/pnas.2111833119

[29] Matthias Englert, Christoph Pistner, Yannick Vogt, and Friederike Frieß, "Scenario Analysis for Partitioning and Transmutation (P&T) in a Phase-out Scenario", International Nuclear Risk Assessment Group, 2026, https://www.inrag.org/wp-content/uploads/2026/03/inrag_put_publication_V2.pdf

Rafael Mariano Grossi, IAEA Director-General and Ajay Banga, President World Bank Group, sign an agreement that promotes nuclear power in developing countries

Small modular nuclear reactors are neither environmentally nor economically sustainable

M. V. Ramana, Professor at the School of Public Policy and Global Affairs, University of British Columbia, Vancouver, Canada

In July 2025, World Bank Group President Ajay Banga and IAEA Director General Rafael Mariano Grossi signed a partnership agreement that envisions the Bank promoting nuclear power to developing countries.[30] The accompanying announcement listed accelerating "the development of small modular reactors" or SMRs as a key area of cooperation between the two institutions.

Such announcements about SMRs are ubiquitous. The first term, "small", refers to the relatively low amounts of electricity these reactors are designed to produce—less than 300 MW—when compared to the typically 1000 MW of the current nuclear reactor fleet. "Modular" refers primarily to the practice of assembling the reactor from various modules, in keeping with the trend across multiple industries.

Advocates of SMRs claim that these two features will make nuclear power more viable. While announcing the partnership, Banga wrote: "we must help countries deliver reliable, affordable power. That's why we're embracing nuclear energy as part of the solution—and reembracing it as part of the mix the World Bank Group can offer developing countries to achieve their ambitions".

The term reembracing should remind us of the World Bank's earlier foray into nuclear power, most notably in Italy in the 1950s.[31] That 150 MW project was not a success, producing less than 40% of the amount of

> *"SMRs are expensive and risky. It is best not to invest in them."*

[30] World Bank Group, „World Bank Group, IAEA Formalize Partnership to Collaborate on Nuclear Energy for Development", 26.06.2025, https://www.worldbank.org/en/news/press-release/2025/06/26/world-bank-group-iaea-formalize-partnership-to-collaborate-on-nuclear-energy-for-development

[31] World Bank Group, "Senn Nuclear Power Plant Project for Italy", World Bank Group Archives Exhibit Series, 2016, https://documents1.worldbank.org/curated/en/721841468195566999/pdf/104699-WP-PUBLIC-2008-09-Senn-Nuclear-Power-Plant-for-Italy.pdf

"Electricity from SMRs will be more expensive than power from large nuclear plants, rendering them commercially unviable."

The World Bank funded the Garigliano Nuclear Power Plant in Italy in the 1950s; however, it produced less than 40% of the electricity it was designed to generate.

electricity it was designed to generate, and the Bank stayed away from nuclear power since then.[32] The Italian reactor was not an exception: small reactors in other countries were failures too, primarily due to their poor economics.[33]

The economic challenge

The problem for SMRs is that when the cost of building them is weighted by their power output, they turn out to be more, not less, expensive than large reactors. Larger reactors are cheaper on a per MW basis because their material costs and work requirements increase more slowly than generation capacity. The cost estimate per MW for the now canceled VOYGR project involving six NuScale SMR reactors was around 250% more than the initial per MW cost for the 2,200 MW Vogtle project that was commissioned in 2023 and 2024.[34, 35] Electricity from SMRs will be more expensive than power from large nuclear plants, rendering them commercially unviable.

A recent authoritative estimate of the cost of electricity from SMRs from Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) showed that SMRs are by far the most expensive way to generate power.[36] CSIRO's estimate for the levelized cost of energy for an SMR project starting to deliver power in 2030 was between AUD 328 and 619 (between USD 214 and 404); electricity from renewable sources of power, solar photovoltaics (PV) and onshore wind, were just a fraction of this estimate. Even taking into account the variability of wind and solar power, CSIRO estimated the overall cost of renewables to be AUD 90 to 131 (USD 59 to 85) even when variable resources constitute 90% of the electricity supply.

The high cost of nuclear power is the reason nuclear energy has been declining in importance as a source of power globally. The fraction of the world's electricity supplied by nuclear reactors has declined from a maximum of 17.5% in 1996 to a mere 9% in 2024.[18] In contrast, the share of modern renewables, excluding hydropower, rose globally from under 1% to over 17% in the same period.

Risks associated with small modular nuclear reactors

Because SMRs also rely on nuclear fission, they will contain radioactive materials in their cores, and this raises the same risks as large reactors. Because the underlying technology is complex with unexpected failure modes, all nuclear plants, including SMRs, can undergo accidents leading to large amounts of fission products being expelled from these reactors and radioactive materials contaminating large tracts of land, exposing people to radiation.[37] Although smaller

> *“Radioactive waste generation is inextricably linked to producing nuclear energy, no matter what kind of reactor is used.”*

reactors have a lower inventory of radioactive materials and less energy is available for release during an accident, even a small reactor that generates as little as 10 MW of electricity can undergo accidents resulting in significant radiation doses to members of the public.

When multiple SMRs are built at a single site, perhaps to lower costs by taking advantage of common infrastructure elements, the combined radioactive inventories might become comparable to the inventory of a large reactor. Co-locating reactors also increases the risk of an accident at one unit inducing accidents at other reactors or making it harder to take preventive actions on site. At Japan’s Fukushima Daiichi plant, explosions at one reactor damaged the spent fuel pool in a co-located reactor. Radiation leaks from one unit made it difficult for emergency workers to approach the other units.

Building SMRs also necessarily means increased production of radioactive waste due to the underlying nuclear fission process. Radioactive waste generation is inextricably linked to producing nuclear energy, no matter what kind of reactor is used. Despite decades of well-funded research, there is no demonstrated way of safely managing these wastes because of a combination of social and technical problems.[38]

Finally, SMRs can also contribute to nuclear weapons proliferation. Plutonium is created in all nuclear power plants that use uranium fuel. Practically any mixture of plutonium isotopes could be used for making weapons.[39] The institutional and personnel factors linking nuclear energy with the technology to make nuclear weapons are also accentuated by SMRs.[40]

The time factor

Another reason to stay away from SMRs is the urgency of the climate crisis. SMRs take a long time to build. Russia’s KLT-40S, which is based on the design of reactors used in the nuclear-powered icebreakers operated by Russia for decades, took 13 years from the start of construction to generating electricity, instead of the expected 3 years.[41] China’s Shidao Bay reactors took more than twice the promised “50 months” and their power output has been reduced by 25%.[42]

Thus, SMR construction timelines are similar to those of large nuclear plants. Nuclear reactors that were connected to the grid over the last three years (2022–2024) took 10.8 years on average to be built; all were delayed.[18] Such long periods are incompatible with the rapid emissions reductions recommended by climate scientists.[43]

Given the high costs of SMRs, or nuclear energy more generally, investing this money in renewables and associated technologies will save far more carbon dioxide and do so faster.

To summarize, SMRs are expensive and risky. It is best not to invest in them.

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IAEA mission visits Fukushima Daiichi nuclear power plant. Climate-related extreme weather events make nuclear accidents such as the Fukushima nuclear accident more likely.

New nuclear: Too late and too costly for the climate and energy crises

Dr. Paul Dorfman, Bennett Scholar, Bennett Institute, University of Sussex, UK

Greenland, the planet's thermostat [44], lost 105 billion tonnes of ice last year [45], with sea ice the lowest in the 47-year satellite record [46]. The climate crisis is here and the choices we make now will determine the success or failure of our climate actions. Cost is key, but time is the most critical variable—and it is running out.[47]

New nuclear projects in Europe are running years behind schedule and vastly over budget.[48] The former Chair of the US Nuclear Regulatory Commission concludes there is not enough time for nuclear innovation to make a realistic impact on the climate crisis.[49] Furthermore, the Intergovernmental Panel on Climate Change (IPCC) reported that renewables are now 10 times more effective at cutting carbon dioxide (CO_2) emissions than new nuclear.[50] The world has passed the point of no return,[51] and the direction of travel seems clear[52]: Renewables are the lowest-cost, quickest technologies for climate mitigation and new power generation worldwide,[53] and they are here to stay.

Renewable energies are faster and more viable than nuclear

Global data analysis reveals that constructing just one new nuclear power station takes up to 17 years.[54] Nuclear power construction has an average over-run of 64%.[55] In comparison, on average, utility-scale wind and solar take only two to five years from planning phase to operation, and rooftop solar PV projects are down to six months.[40]

At a time when so much looks grim, the renewable revolution offers real hope. In 2025, more power was generated worldwide from renewable energy than from coal.[56] 91% of new renewables are now cheaper than fossil fuels.[57] The United Nations (UN) confirm that renewables have increased their lead over fossil fuels and nuclear via economies of scale, technology innovation, and supply chain rollout.[58, 59]

In 2024, renewables investment totaled USD 2 trillion — more than double that of fossil fuel investment, and vastly more than nuclear, with 582 GW of renewables added to the global energy system.[60] That is 92.5% of all new power capacity added worldwide. The result is, wind and solar worldwide currently generate 70% more electricity than nuclear reactors[61] — whilst each year nuclear adds only as much net global power capacity as renewables add every two days.[62]

Nuclear costs

The average nuclear build has a doubling cost overrun. [55] Whilst the marginal (fuel) costs of renewables are close to zero, nuclear fuel is extremely expensive. All this goes to explain why Lazard's levelized cost of energy for new nuclear plants is GBP 109 per MWh, making it the most expensive energy source[63] — while unsubsidized solar and wind combined with energy storage (to ensure grid balancing) is estimated to be four times cheaper.[64]

> *“The climate crisis is here and the choices we make now will determine the success or failure of our climate actions.”*

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Nuclear is now facing the same challenges as fossil fuels: uncompetitive costs, stranded assets, a legacy of pollution and stiff competition from renewables. Over the past decade, we've seen renewable electricity generation outpace nuclear by a factor of 3. By 2030, this factor is set to increase to between 5 and 7.[65] As Chatham House concludes, renewables hold the key to energy security in the European Union (EU).[66] Indeed, in 2025 wind and solar overtook fossil fuel power generation across the bloc.[67] Solar alone grew by more than 20% in a single year, proving that clean power can scale faster than other technologies.

So, the challenge now is not generation, but how quickly grids, batteries and flexibility can be deployed.[68] With nuclear costs continuing to rise [69] and wind, solar, and battery storage becoming cheaper and more reliable,[70] it seems new nuclear has limited operational need and a poor business case.[71]

Climate impact on nuclear

Sea levels are rising. With more frequent and destructive storms, storm surges and floods, extreme events become the norm and existing flood risk mitigation measures become obsolete.[72] This puts nuclear on the front-line of climate change—and not in a good way.

Globally, 41% of nuclear plants are coastal. Since the climate risks that nuclear faces due to rising sea levels won't be linear, nuclear construction, operation, waste management, and decommissioning will become significantly more expensive. Inland nuclear plants, on the other hand, will face wildfire risks, with episodic flooding alternating with low river-flow and increased water temperature,[73] bringing about profound adverse effects on reactor cooling and discharge.[74]

It is concerning to note that the US Nuclear Regulatory Commission concludes that the majority of their nuclear sites have already experienced flooding hazard beyond their design-base. The US Army War College also reports that nuclear power facilities are at 'high risk' of temporary or permanent closure due to climate threats – with 60% of US nuclear capacity now vulnerable to sea-level rise, severe storms, and cooling water shortages.[75] 61% of US nuclear energy facilities are expected to face water stress by 2030, potentially forcing them to reduce generation or shut down.[76] Meanwhile in the UK, the Institute of Mechanical Engineers finds that coastal nuclear sites will need 'considerable investment' to protect them from rising sea levels, and some would even face 'relocation or abandonment'.[72]

Last but not least, despite being touted as 'green' or 'low-carbon', nuclear avoids only 2-3% of total global greenhouse gas (GHG) emissions annually. If we consider the full nuclear life-cycle (uranium mining, milling, conversion, enrichment, fuel fabrication, transport, construction and dismantling of the nuclear power plant, spent fuel processing and waste storage), nuclear causes significant CO_2 emissions that exacerbate the climate crisis.[77]

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Direction of travel

Solar and wind now lead new electricity generation.[78] Global solar and wind added 793 GW in 2025,[79] with solar meeting 61% of US electricity demand growth in 2025.[80] In the same year wind and solar were the first and second electricity-generating sources in Germany,[81] with the country's share of renewable energy in the electricity grid stable at 55.9%. Importantly, renewable energy surpassed lignite power generation for the first time there.[82] In the UK, the Royal Society concludes that renewables plus long-duration storage are not only feasible but will be cheaper than a system that includes nuclear power.[83] Although solar has delivered the fastest energy transition in history, it is set to be beaten by battery energy storage systems, with a current cumulative global installed capacity of 690 gigawatt hours (GWh) and rising.[84]

Meanwhile, whilst some developing countries have shown an interest in acquiring new nuclear power plants, particularly SMRs, the unfavorable facts remain. Based on available evidence, the Global South's nuclear expectations are very unlikely to be fulfilled.[85] Furthermore, as co-publisher of the 2025 Sustainable Development Goal 7 report, the World Bank itself urged for scaling up financing for decentralized renewable energy as the best way to lift 666 million rural and remote residents out of energy poverty.[86]

> *"The compelling economics of renewables unmask the inadequacy of both fossil and fissile fuels."*

Unlike the nuclear renaissance, the renewable revolution is here and now – on-schedule and cost-effective.[87] It is entirely possible to mitigate climate impact and sustain a reliable power system by expanding renewable energy in all sectors, rapid growth and modernization of the electricity grid, storage technology roll-out, faster interconnection, and using power far more effectively and efficiently via rational energy management.

The compelling economics of renewables unmask the inadequacy of both fossil and fissile fuels.[88] With all key international and national energy organizations and institutes agreeing that renewables will carry the energy transition,[89] the future backbone of the global energy supply system will be renewable, sustainable and cost-effective.[90] Nuclear is already too late and too costly to play any positive role in tackling the climate and energy crises.

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Construction of Akkuyu nuclear power plant in Turkey.

Russia's nuclear supremacy, the limits of China's export ambitions, and the World Bank's policy shift

Vladimir Slivyak, Co-Chairman of the Russian Environmental Group Ecodefense, The Right Livelihood Award Laureate 2021

Since the early 2000s the Russian state corporation Rosatom has become the world's pre-eminent supplier of nuclear reactors, fuel and related services. The World Bank's June 2025 decision to lift its ban on financing nuclear-power projects may likely create an additional support scheme for companies that are actively exporting nuclear reactors.[91] This article analyzes how that policy is likely to amplify Russian influence; contrasts Rosatom with other vendors, especially China's largely domestically-focused nuclear industry; highlights Rosatom's track record of delayed deliveries; outlines its outreach to African and Asian clients; and critically assesses the readiness and cost-competitiveness of SMRs.

Rosatom's quantitative lead

Today, Rosatom commands the largest global nuclear infrastructure construction pipeline. According to Russian state corporation itself, it has three VVER-1200/600 units being built in Russia, while 39 reactors—among them six SMRs—are underway in foreign markets.[92] While independent estimates put the number at 27 units under construction [18], Rosatom still remains by far the largest nuclear reactor exporter worldwide. China's CNNC/CGN group is pursuing about 32 projects, but the overwhelming majority of those are domestic; according to the World Nuclear Industry Status Report, the only secured export deal is with Pakistan. Additionally, Russia controls more than 40% of the world's uranium enrichment capacity, supplying almost 80 nuclear reactors in 15 countries.[93] [94]

Technological depth and the "one-stop-shop" advantage

Rosatom's catalogue includes Generation-III+ VVER-1200 reactors, the newer VVER-600 for smaller grids, and a family of SMRs (RITM-200, KLT-40S). All of those are designed for a 60-year operational life. Crucially, Rosatom also owns the upstream fuel chain, so a client can receive a single contract covering design, engineering, procurement, construction (EPC), fuel supply and long-term operation. Competing vendors typically must piece together separate contracts for reactor supply, EPC services and fuel, raising transaction costs and exposing buyers to coordination risk.

The World Bank's nuclear-financing reversal

The World Bank is likely to use its usual development-finance tools—low-interest loans, guarantees that can be combined with regional development-bank financing, and blended-finance structures—to fund nuclear projects. It has also signed a partnership agreement with the IAEA[30]. The Nuclear Lending Framework expressly earmarks funding for SMRs in off-grid locations, a niche that dovetails with Rosatom's modular portfolio. Construction and operation of reactors in such locations will likely result in significant cost increases relative to other energy options (e.g., wind-solar storage) which the World Bank's low interest rates may only partially offset. Moreover, the World Bank's requirement for independent IAEA safety reviews validates Rosatom's designs, allowing the Russian firm to present itself as the "safe" and "affordable" choice.

How multilateral funding reinforces Russian influence

Concessional capital shrinks the upfront barrier, enabling borrowing states to accept Rosatom's turnkey packages without resorting to expensive market financing.

Long-term fuel contracts lock clients into the Russian uranium market for decades, creating a strategic dependency that can be leveraged geopolitically.

Reference projects financed by the World Bank and other financial support such as technical assistance and budget support, serve as examples that other multilateral lenders such as ADB, AfDB, and IDB are likely to replicate, multiplying the volume of Russian-linked contracts.

Safety endorsement from the World Bank effectively endorses Rosatom's technology, marginalizing competitors whose designs are still awaiting generic design assessment.

> *"Russia controls more than 40% of the world's uranium enrichment capacity, supplying almost 80 nuclear reactors in 15 countries."*

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Competitive landscape – why other vendors lag

China (CNNC/CGN). Although China leads in the absolute number of reactors under construction, its only foreign project is in Pakistan. Chinese vendors also lack an integrated fuel-cycle business; they must purchase enriched uranium on the open market, which weakens the "single-supplier" value proposition that many developing-country borrowers prefer.[95]

Western vendors (Westinghouse, EDF/Framatome, KEPCO). Their large-reactor designs (AP1000, EPR-2, APR-1400) have suffered repeated schedule overruns and cost increases. Two AP-1000 reactors at the Vogtle nuclear power plant in the US experienced a delay of seven years and cost overruns, ballooning from an initial USD 14 billion in 2009 to USD 35 billion.[96] Flamanville 3 in France was under construction for 17 years (12 years longer than planned).[97] Its cost was estimated at over Euro 13 billion – about four times its initial estimated cost. The commissioning of two Korean commercial APR1400s (Shin-Kori units 3 and 4) was delayed by 3 and 5 years respectively and the cost increase was eventually about 30%.[98] These track records undermine confidence in their ability to deliver on time—an essential criterion for countries needing rapid capacity addition.

SMR-only players (NuScale, Rolls-Royce, GE Hitachi, TerraPower). Their modular reactors are not yet built and not even under construction, so it's impossible to verify whether declared construction time-scale (24-36 months) is realistic. They have limited experience in full-scale deployment, making them less attractive for large-scale baseload contracts that require a guaranteed fuel pipeline for decades. The projects in each case are already years delayed, even before construction, and there have already been cancellations after years-long delays even before construction ever started.

Taken together, these shortcomings mean that, when multilateral financing lowers the cost of capital, Rosatom's integrated, "one-stop-shop" model will likely outcompete both Chinese and Western rivals for the majority of new projects in developing economies – even though the Russian corporation's projects have suffered similar delays and cost overruns.

Delivery record – promises versus reality

Rosatom's reputation for speed is tempered by a history of delayed completions. In the beginning, following the intergovernmental agreement signed between Russia and Turkey in May 2010, the first unit of the Akkuyu Nuclear Power Plant was scheduled to become operational in 2019.[99] The project faced delays due to supplier issues (sanctions) and contractor changes, shifting the expected first unit operation to 2024, 2025, and now, with 2026 often cited for full, stable operational status.[100] Another Rosatom project, the Paks II nuclear power plant expansion in Hungary, has experienced significant, decade-long delays, with main construction ("first concrete") only beginning in early February 2026.[101] Originally scheduled to come online in 2023, the project now targets completion around 2032 due to permit issues, Western sanctions, and technical hurdles. These examples illustrate that while Rosatom can secure contracts, its ability to meet original deadlines is not guaranteed.

SMRs – the promise and the stumbling blocks

The World Bank's framework highlights SMRs as a rapid-deployment solution for remote or low-demand grids, and Rosatom promotes its RITM-200 and KLT-40S designs as ready for mass production. However, several independent analyses caution that SMRs are not yet ready for large-scale commercial roll-out. The IAEA classifies most SMR designs as "under development" and recommends further prototype testing before serial construction.[102]

Rosatom's own SMR projects have experienced setbacks. The Lomonosov floating nuclear plant construction has taken at least four times as long as originally projected; a little before construction of the ship began in 2007, Rosatom announced that the plant would begin to operate in October 2010. In July 2019, Rosatom announced that it has completed the 70 MW Akademik Lomonosov floating nuclear power plant. The projected cost rose from around USD 232 million to USD 740 million.[103]

Consequently, while the World Bank's SMR earmark creates a market niche, borrowers and financiers must treat SMR deployment as a high-risk, high-cost option.

Expanding Rosatom's outreach in Africa and Asia

Since 2022 Rosatom has intensified diplomatic outreach across the Global South. Formal memoranda of understanding have been signed with Kenya, Ethiopia, Tanzania, Mozambique, Ghana, Nigeria, Vietnam, Indonesia, the Philippines and Bangladesh. In many of these cases the Russian side has offered to conduct feasibility studies, provide financing guarantees and supply both reactors and fuel. Talks with the Democratic Republic of Congo and Mali focus on deploying SMRs to power remote mining operations, while negotiations with Sri Lanka and Myanmar explore VVER-600 units for islands and small grids. The breadth of these engagements demonstrates Rosatom's intention to embed itself in the energy strategies of a wide swath of emerging markets, a process that will be accelerated once World Bank loans become available.

Authoritarian context, lack of independent oversight, and civil society repression

Freedom House classifies Russia as “Not Free”, while Human Rights Watch call it an authoritarian state that curtails independent monitoring of strategic sectors, including nuclear energy.[104 105] The government tightly controls all information relating to Rosatom’s projects; no independent audit bodies are permitted to verify construction costs, adherence to schedule or safety performance. Scholarly analyses note that no transparent, third-party cost breakdowns exist for Russian reactors, making it impossible for external observers to assess whether the quoted USD 5 to 10 billion per gigawatt figure reflects true expenditures or state subsidies.

Civil society organizations that attempt to monitor environmental or safety issues face harassment, arrests, or forced closure.[106] This environment means that independent safety or security assessments of Rosatom’s projects are effectively absent, raising concerns for borrowing countries that rely on transparent risk evaluation before committing public funds. In addition, many client states lack own mature nuclear regulators, compounding safety concerns.

Additional risks include Western sanctions which target Russian defense-related entities, including parts of Rosatom’s supply chain, including secondary sanction exposure. Many civil society organizations and some donor governments criticize the use of multilateral funds to deepen ties with a state engaged in the Ukraine war. Including human-rights and conflict-of-interest clauses in loan documents can address these objections.

Conclusion

Rosatom’s unrivaled construction pipeline, integrated fuel-cycle control and aggressive outreach to African and Asian governments give it a structural advantage that is likely to be amplified by the World Bank’s newly permissive nuclear-financing policy. Concessional loans reduce the financial barrier that previously limited Russian market penetration, while the Bank’s safety-conditioned framework validates Rosatom’s technology in the eyes of borrowing states.

At the same time, China’s nuclear industry remains predominantly domestically oriented; only a minority of its reactors are built abroad, and the absence of a unified fuel supply business limits its appeal to countries seeking a single-source solution. Western vendors suffer from chronic schedule overruns, while SMR-only firms face unresolved technical and cost hurdles.

Therefore, the World Bank’s change of course could usher in a new era of growing Russian influence over the world’s baseload electricity supply. However, Russia’s authoritarian political system, ongoing war in Ukraine, lack of independent cost and safety assessments, and repression of civil society watchdogs introduce material risks that are simply too great to ignore.

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Conclusion

Protest against the World Bank's decision to lift the ban und nuclear finance in front of the German Bundestag in October 2025.

Ute Koczy & Merete Looft, Urgewald; Vladimir Slivyak, Ecodefense.

The world does not need new nuclear power. Yet institutions like the World Bank, the ADB and other development banks are stubbornly marching towards an economic disaster that creates toxic waste and exacerbates the climate crisis by redirecting scarce resources away from technologies that have long proven themselves cheaper, faster, cleaner and more effective. New reactor models and SMRs will not change this.

This report makes one thing clear: Nuclear energy is not economically viable, neither today nor at any point in the future. It remains significantly more expensive than renewable energy, and no nuclear project has delivered on its original promises on cost or construction time.

To make matters worse, the costs of nuclear waste management and power plant decommissioning are likely to far exceed industry estimates. By investing in nuclear energy, Multilateral Development Banks are saddling future generations with radioactive waste that they will have to manage and pay for – likely for many decades to come. At the time of writing, no final nuclear waste repositories are fully operational, and most such projects are stalling.

The combination of ballooning costs and protracted lead times makes nuclear power unfit to address the climate and the energy crises we face. At the same time, nuclear power plants are increasingly vulnerable to the very impacts of climate change, with potentially disastrous consequences.

Contrary to common claims, nuclear power is not well suited to complement renewable energy sources. Instead, a rapid expansion of grid infrastructure and storage capacity is needed to enable the transition to a fully renewable energy system.

None of these systemic challenges will be solved by new technologies or reactor designs. The core problems are structural and no amount of innovation is liable to circumvent them. In fact, electricity from SMRs will be even more expensive per MWh, and some studies suggest the radioactive waste will be more, too.

This is not development. Instead, investing in nuclear power creates new and lasting dependencies: decades of high debt burden and geopolitical reliance on a small number of nuclear-exporting countries, mainly Russia. The result is predictable: high costs ultimately passed on to consumers and taxpayers. A kiss of death in the development context.

Multilateral Development Banks should stop investing in false hopes, outdated technologies and demonstrably misleading promises. Instead, they should prioritize already proven energy solutions that truly benefit people and the planet.

Abbreviations

ADB	Asian Development Bank
AfDB	African Development Bank
AIIB	Asian Infrastructure Investment Bank
AUD	Australian dollar
bn	billion
CO_2	carbon dioxide
CSIRO	Commonwealth Scientific and Industrial Research
EPC	engineering, procurement, construction
EPR	European Pressurised Reactor
EU	European Union
EUR	Euro
GBP	British pound
IDB	Interamerican Development Bank
IAEA	International Atomic Energy Agency
IOU	"I owe you" (signed document acknowledging a debt)
IPCC	Intergovernmental Panel on Climate Change
GHG	greenhouse gas
GW	gigawatt
GWh	gigawatt hour
kW	kilowatt
MDB	Multilateral Development Banks
MW	megawatt
MWh	megawatt hour
PV	photovoltaics
SMR	small modular reactor
UN	United Nations
UK	United Kingdom
US	United States
USD	US dollar

Alliance Sud | Switzerland

Alyansa Tigil Mina (ATM) | Philippines

Ausgestrahlt | Germany

Bank Climate Advocates | United States

Bankwatch Network | Czech Republic

Beyond Nuclear | United States

Blue Dalian | China

BUND | Germany

Center for Justice Governance and Environmental Action | Kenya

Earthlife Africa | South Africa

Environmental Crisis Group | Russia

Forum Umwelt & Entwicklung | Germany

Fundation para la Defensa del Ambiente (FUNAM) | Argentina

German Affiliate of the International Physicians for the Prevention of Nuclear War (IPPNW) | Germany

GermanWatch | Germany

Growthwatch India | India

International Rivers | United States

Japan Center for a Sustainable Environment and Society (JACSES) | Japan

Jubilee Australia | Australia

NGO Forum on ADB | Philippines

Quest For Growth and Development Foundation | Nigeria

Red Antinuclear de Argentina (RADA) | Argentina

Renevlyn Development Initiative (RDI) | Nigeria

Right Livelihod College (RLC) Córdoba | Argentina

Snow Alliance | China

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Urgewald is an environmental and human rights organization.

It combines in-depth research with public campaigns to expose and cut destructive projects' financial lifeline. Urgewald's databases on coal, oil and gas provide the financial sector with effective divestment and climate protection tools.

More about us: urgewald.org/en

Established in 1989, Ecodefense is one of the oldest environmental groups in Russia. Ecodefense campaigns for the climate, safe energy and the protection of nature. After Russia started the full-scale invasion in Ukraine in 2022, Ecodefense relocated to Europe where they are campaigning for peace and climate issues. The group has won a number of international awards including the Right Livelihood and the Baltic Sea Award. Ecodefense is funded by charitable non-governmental grants. More info: ecodefense.group

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