MYTH BUSTER

NUCLEAR ENERGY IS A DANGEROUS DISTRACTION

March 2024

CAN
CLIMATE ACTION NETWORK
Europe

More than three-quarters of the EU's greenhouse gas emissions stem from our energy consumption, therefore it is vital to stop burning fossil fuels to avert a climate catastrophe. Fortunately, quick, safe, and proven solutions are available and can be rolled out today: Wind and solar energy have become the cheapest source of energy and just within the past year, they grew so fast that newly installed renewables managed to reduce the EU's greenhouse gas emissions from electricity by 19% [1] while saving consumers an estimated €50bn on their energy bills [2].

Yet, there is a strong lobby that hopes to rival the success of renewables: the nuclear industry, fighting for influence and watering down EU climate legislation when it suits their own interests. This development is creating significant tension with proponents of a fully renewable energy system and marks a regressive step in efforts towards a sustainable and just energy transition. While nuclear champions claim that nuclear energy can work hand-in-hand with renewables, it is becoming increasingly clear that nuclear power acts as a significant hurdle to the roll-out of renewables and fossil fuel phase-out.

MYTH 1

The recent nuclear push is not a campaign against renewables

THE FACTS

Nuclear advocates have attempted to lower renewable energy ambition

In the context of the Renewable Energy Directive (RED III) revision, France tested the waters in 2023 by calling for a low-carbon 'weighting' in EU renewables target in order to support a higher EU 2030 renewable energy target of 45%, where so-called 'low carbon' energy sources are taken into account when establishing national renewable energy targets. Though this did not see the light, a concession was won on renewable hydrogen and provisions to facilitate nuclear-produced hydrogen - risking further watering down a renewables-based technology pathway.

The EU Commission launched its proposal for the Net Zero Industry Act (NZIA) in March 2023 as a response to the Inflation Reduction Act (IRA) of the United States. While nuclear was included as a list of technologies that were seen as making a contribution to decarbonisation, the EU Commission President, Ursula von der Leyen, refused to include it in the list of "strategic technologies", which could receive additional support [3]. The list was limited, as to be better targeted, at technologies such as solar, wind, energy storage, heat pumps and grid technologies. Following intense lobbying and political pressure, the final political agreement has led to the inclusion of "nuclear fission energy technologies" as strategic, while this debate allowed the list to become so extensive it practically loses any strategic element.

Pro-nuclear member states have made dirty deals with fossil lobby

During the Electricity Market Design reform, nuclear and fossil fuel promoters in the European Parliament attempted to derail a deal supporting renewables and flexibility. In the Council, due to the focus of the Nuclear Alliance on the Contracts for Difference (supported by some coal dependent countries) the negotiations were delayed by several months and conversations redirected away from renewables, leading to a deal supporting subsidies for existing and new nuclear reactors and a prolongation of subsidies to coal power plants via capacity mechanisms.

The nuclear debate is wasting time and diverting attention

As the nuclear debate aggressively dominates political negotiations, media, and public discourse, it blatantly diverts critical attention from advancing the existing, affordable, sustainable solutions to the energy transition. This overwhelming focus on nuclear power not only overshadows but also poses a risk of derailing the European energy transition, hindering progress towards aligning with the ambitious yet achievable goal of a 100% renewable energy system by 2040.

MYTH 2

New nuclear is an effective solution to align Europe to the Paris Agreement and keep global temperature increase to 1.5°C

THE FACTS

New nuclear construction is too slow

A rapid transition requires the use of existing technologies and solutions which can most quickly be rolled-out such as renewables, primarily solar and wind, energy efficiency, and system flexibility. For years, new nuclear energy projects in Europe have been plagued with delays [4] and, coupled with an untrained workforce, are unable to support the speed of decarbonisation necessary. New nuclear plants typically take 15-20 years for construction, hence failing to address immediate decarbonisation needs to 2030 [5].

[1] https://ember-climate.org/insights/research/european-electricity-review-2024/
[2] https://www.iea.org/reports/renewable-energy-market-update-june-2023/how-much-money-are-european-consumers-saving-thanks-to-renewables
[3] Euractiv (2023) Von der Leyen: Nuclear not 'strategic' for EU decarbonisation.
[4] Finnish project Olkiluoto 3 took 18 years to develop, French Flamanville-3 is 16 years into construction and still hitting new delays, and the UK's Hinkley Point C is facing new delays since the project was announced in 2007.
[5] Schneider et al. (2023), The World Nuclear Industry Status Report 2023.
[6] Contexte (2021)

Indicatively, France's six new reactors are estimated by its network operator to enter into use in 2040-2049, much too late to have any meaningful impact on emissions reduction needed already now, with a view to pathways to 2040, and beyond, for a sustainable future [6].

The decision to build the UK's Hinkley Point C nuclear reactor was announced in 2007 with an operational start date of 2017, however it has been delayed several times over, and is now estimated to start in 2031 [7]. In France, the Flamanville project is 16 years into construction and hitting new delays [8], while Finland's Olkiluoto took a full 18 years to come online.

Nuclear power is too expensive

When compared to renewables, the latest analysis from World Nuclear Industry Status Report, using the data from Lazard, determines that the levelized cost of energy (LCOE) for new nuclear plants makes it the most expensive generator, estimated to be nearly four times more expensive than onshore wind, while unsubsidized solar and wind combined with energy storage (to ensure grid balancing) is always cheaper than new nuclear [9].

Recent European projects in Slovakia, the UK, France, and Finland demonstrate the dramatic rising costs. EDF admitted that the costs for the British nuclear facility Hinkley Point C will skyrocket to 53.8 billion euros for the scheduled 3.2 GW power plant, more than twice as much as scheduled in 2015 when the plant was approved [10]. The French project in Flamanville was originally projected to cost 3.3 billion euros when it began construction in 2007, but has since risen to 13.2 billion euros (16.87 billion euros in today's money)[11]. The Finnish Olkiluoto-3 project 1.6GW reactor cost 3 times more than the original forecast price, reaching 11 billion euros [12]. Slovakia's second generation reactors Mochovce 3 and 4 ballooned costs to 6.4 billion euros from an initially estimated 2.8 billion [13]. Slovenia's president announced that a new 1.6GW reactor would cost 11 billion euros, following the Finnish example, demonstrating that these high prices are here to stay [14].

Renewables and energy efficiency are cheaper alternatives

When compared against energy savings, analysis by Hungarian NGO Clean Air Action Group highlights that it is more economically efficient to invest in the renovation of households to save energy than in the construction, operation, and decommissioning of a new nuclear reactor [15]. These findings were confirmed by a separate study by Greenpeace France, that showed that by investing 52 billion euros in a mix of onshore wind infrastructure/photovoltaic panels on large roofs, it would be possible to avoid four times more CO2 emissions than by investing the same amount in the construction of six EPR2 nuclear reactors by 2050, while electricity production triples.

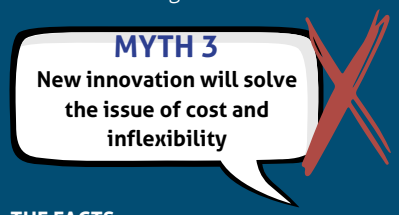
[7] Guardian (2024), Hinkley Point C could be delayed to 2031 and cost up to £35bn, says EDF.
[8] Reuters (2022) EDF announces new delay for Flamanville EPR reactor.
[9] Schneider et al. (2023), The World Nuclear Industry Status Report 2023. Pg 21.
[10] De Standaard (2024).
[11] Reuters (2022).

By investing 85 billion euros of government subsidies in energy savings by 2033, it would be possible to avoid six times more cumulative CO2 emissions by 2050 than with the construction program of six EPR 2 reactors. This would also make it possible to lift almost 12 million people out of energy poverty in a decade [16].

In order to finance new and ongoing projects, the EU has approved State Aid for nuclear, in the case of Hungary, Belgium, and the United Kingdom [17], while national governments seek support schemes. Despite making references to technology-neutrality, this creates an unlevel playing field slanted against renewable energy. Given the significant investment gap to achieve 2030 climate targets [18], and the limited fiscal space of many Member States, investments in nuclear risk diverting precious public resources into projects of poor value-for-money compared to alternatives in a renewables-based system, while reducing the availability of public resources for all other components of the energy transition. Such a choice would equally fail to reduce prices for consumers in the context of the current fossil fuel energy crisis.

Nuclear power includes many additional hidden costs

The costs would be even larger if accounting for "unpaid externalities" borne by taxpayers and the public at large, from nuclear accident risks that are impossible to insure against by private actors [19]. The costs of decommissioning of a nuclear power plant, which can cost 1-1.5 billion euros per 1000 MW [20], are often borne by the public as these costs are poorly taken into account when planning a new nuclear installation [21]. The cost associated with storing radioactive waste for hundreds of thousands of years is also often undervalued [22], alongside costs associated with radioactive leaks from plants or storage facilities, as demonstrated by the radioactive leaks in the UK Sellafield site, causing tension with Ireland and Norway [23]. To lower costs, attempted lowering of safety and environmental standards can be expected, posing risks to communities, nature, and society at large, also as a burden to future generations.



THE FACTS

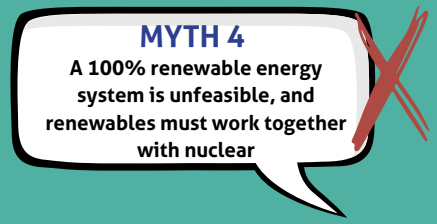
Small Modular Reactors are not coming to save us

Argued to be more flexible, decentralised, smaller, and cheaper than existing nuclear designs, countries are wasting public resources in favour of non-existent Small Modular Reactor (SMRs), riddled with the same limitations as their predecessors [24], and presenting poor value-for-money compared to existing alternatives. The focus on SMRs risks delaying the development of renewable energy technologies already available at the moment, and thereby prolonging the usage of fossil fuels [25] [26] [27].

Burdened by the same high capital costs, SMRs would have to run near constantly to reduce losses, thereby further congesting the grid and making them useless in providing back-up power needed for peak hours against renewables and energy storage.

Small Modular Reactors are untested

Only few SMRs in China and Russia are currently in operation [28]. Since the technology has not been tested yet at commercial scale, claims that the industry is making about their supposedly faster construction and lower costs are therefore purely speculative at this stage [29]. An SMR project that was planned in the US state of Utah, was terminated in November 2023 as local authorities that were meant to buy the electricity pulled out due to rising costs [30]. The same company that failed with this project intends to build SMRs in Romania, Kazakhstan, Poland and Ukraine.



Studies demonstrate that 100% renewable by 2040 is feasible and favourable:

The Paris Agreement Compatible (PAC) scenario [31], developed by civil society and experts, emphasises renewables-based electrification and energy demand reduction, calling for determined and heightened attention to enable a 100% renewables-based EU energy system by 2040, and foresees no need for nuclear power in Europe. A fully renewables-based energy system even functions in times of low wind and at night, when the sun is not shining. The solution to still provide the required amount of power needed during these times is a combination of flexibility (such as energy storage) and demand-side measures [32]. The myth of the need for nuclear baseload has been debunked for years. The energy system can be reliably and safely managed with 100% renewables and system flexibility [33].

[12] AP News (2023).
[13] Slovak Spectator (2023).
[14] Euractiv (2023).
[15] Levegő Munkacsoport (2023).
[16] Greenpeace (2023).
[17] EU Commission (2017), EU Commission (2017), EU Commission (2014).
[18] CAN Europe (2022).
[19] Schneider et al. (2023), The World Nuclear Industry Status Report 2023. Pg. 382.
[20] Diletta Colette Invernizzi, Giorgio Locatelli, Anne Velenturf, Peter ED. Love, Phil Purnell, Naomi J. Brookes, Developing policies for the end-of-life of energy infrastructure: Coming to terms with the challenges of decommissioning
[21] Schneider et al. (2023), The World Nuclear Industry Status Report 2023. Pg. 368.
[22] Schneider et al. (2023), The World Nuclear Industry Status Report 2023. From Pg. 376.
[23] Guardian (2023).

Nuclear power production is not reliable: Nuclear power units across Europe have been proven as unreliable in providing power when needed [34]. Future climatic conditions, such as heatwaves, droughts, flooding and rising sea-levels only increase the likelihood of future nuclear power plant disconnections and pose further security risks. In 2022, on average French nuclear reactors had 152 days with zero-production. Over half of the French nuclear reactor fleet was not available during at least one-third of the year, one-third was not available for more than half of the year, and 98% of the year 10 reactors or more did not provide any power for at least part of the day.

Nuclear power blocks renewables integration into the electricity grid: The inflexibility of nuclear [35],caused by technical limitations, safety requirements and economic factors, prevents the feed-in of renewable electricity into the grid, causing grid congestion and curtailment. Nuclear's dominance over grid capacity can block the connection of new renewable energy projects [36], where even announced and then abandoned plans for a new nuclear unit can delay renewable projects connection, allowing for continued fossil fuel usage. Grid structures designed for large-scale, centralised nuclear power, make it more challenging, time-consuming and costly to introduce small-scale distributed renewable power [37].

An example can be found in Romania where Cernavodă 3 and 4 reactors have reserved grid capacity for years, blocking new renewable energy projects in the Dobrogea region, the most wind-intensive region in the country. Delayed grid investments, due to uncertainty of new nuclear units, have also meant that capacity bottlenecks exist today for renewables online.
In the Netherlands, the only current nuclear power station, Borssele is competing for landing space for off-shore electricity [38].

Post-Fukushima, renewables were blocked from connecting to the grid in Japan as the government considered restarting the reactors, despite public opposition to nuclear restarts and support for renewables [39]. Rather than taking the opportunity to invest in grids and integrate renewables twenty years ago, Japan still heavily relies on fossil fuels today.

[24] Clean Technica (2023). The Nuclear Fallacy: Why Small Modular Reactors Can't Compete With Renewable Energy
[25] Institute for Energy Economics and Financial Analysis, David Schlissel, Small Modular Reactors – Too Untested, Too Expensive, Too Risky and Too Uncertain (2022).
[26] Jim Green, Small modular nuclear reactors: a history of failure (2024).
[27] Argentina started the construction of a prototype SMR 25-MWe PWR, CAREM-25 (Central Argentina de Elementos Modulares—a pressurised-water SMR) reactor near the Atucha site in February 2014 (World Nuclear Energy Status Report 2022). It is still not completed and operating and currently operation is scheduled for 2027. Even with the current lower cost estimate of US$520 million, the per unit cost of the project is around US$17,000/kW, roughly twice the cost estimate of the most expensive Generation-III reactors.

MYTH 5

Nuclear energy supports the EU's plans for energy autonomy

Nuclear power means continued reliance on Russia and imports: Nuclear power units equally fail to pass an "energy security" test, and run counter to the RepowerEU target of enhancing Europe's autonomy [40], given that more than 40% of the EU's Uranium is imported from Russia and no EU country is currently mining uranium within its own borders [41] [42]. Though Kazakhstan is seen as an alternative, its uranium industry is directly tied to Rosatom, Russia's state atomic energy company. While import bans have been placed on Russian coal and liquified natural gas, and Russian oil and natural gas have been targeted, this has not been the case for uranium.

MYTH 6

Nuclear energy is safe

Severe nuclear accidents remain possible, and climate change is adding new risks: Nuclear technology inherently carries the risk of severe nuclear accidents with the release of large amounts of radioactivity as shown by catastrophic accidents in Fukushima or Chornobyl. Extreme and more frequent weather events due to climate change create unprecedented risks through storms or flooding that are not captured in planning standards for nuclear plants based on historic frequencies and severeness [43]. Extreme weather events may also indirectly affect nuclear plants, such as breaking dams above nuclear plants or longer disconnection from electricity grids after storms. Cyber attacks, military aggression e.g. Russia's occupation of the Zaporizhzhia Nuclear Power Plant, and terrorist attacks, e.g. via drone attacks, could also lead to severe accidents of nuclear plants.

Nuclear waste remains a risk worldwide: Nuclear waste is a risk to the health of all living creatures, including humans, for thousands of years after its use in energy production. Management of any future storage facility would still be at risk of natural disasters and decisions of future generations, whereas currently without any long-term solutions risks are increasingly shifting to interim storage which were not planned for the current supply and length of storage [44].

[28] https://www.reuters.com/world/china/china-starts-up-worlds-first-fourth-generation-nuclear-reactor-2023-12-06/
[29] Institute for Energy Economics and Financial Analysis, David Schlissel, Small Modular Reactors – Too Untested, Too Expensive, Too Risky and Too Uncertain (2022).
[30] https://www.reuters.com/business/energy/nuscale-power-uamps-agree-terminate-nuclear-project-2023-11-08/
[31] https://www.pac-scenarios.eu/
[32] https://caneurope.org/demand-side-flexibility-blog/
[33] Energy Post (2016). Dispelling the nuclear baseload myth: nothing renewables can't do better

Conclusion

The climate movement has rightly focused its efforts on achieving a fast, fair and full phase out of fossil fuels with remarkable successes, although major fights are still ahead of us. Renewable energy has seen massive growth rates in many European countries and this development is a win for everyone: People as they benefit from lower energy prices, communities where they are part of benefit sharing schemes and the climate due to much reduced greenhouse gas emissions. We therefore conclude and demand:

- Nuclear energy is undermining renewables due to the aforementioned issues and must not be portrayed as an alternative or partner for renewables in the energy transition.
- New nuclear energy in Europe is too slow, and too expensive to meaningfully contribute to the decarbonisation of the energy system by 2040. This pathway is a distraction which only delays fossil fuel phase-out and renewables uptake.
- Small Modular Reactors are an unproven technology and, like conventional nuclear reactor designs, are unable to contribute meaningfully to decarbonisation. If developed, these units would increase the price for electricity, the levels of radioactive waste and risk the proliferation of nuclear materials.
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- CAN Europe calls for a 100% renewable energy system by 2040, and therefore a managed phase-out and decommissioning of Europe's existing nuclear fleet is required by 2040 at the latest to ensure a safe and sustainable future.
- Prolongation must not divert public funds away from renewables and energy efficiency solutions and hinder the integration of renewables in the surrounding area. The prolongation of existing nuclear reactors risks safety as old units are pushed well beyond their original foreseen lifespans.
- Every euro invested in nuclear is a euro not invested in renewables and energy efficiency. For this reason, public finance should remain inaccessible to nuclear, as it should be prioritised on cost-effective, sustainable solutions. This includes the EU's Multiannual Financial Framework and EU funds such as the Just Transition Fund, Modernisation Fund, Innovation Fund, InvestEU, etc, and investments from the European Investment Bank.

[34] World Nuclear Industry Status Report 2023, p. 105
[35] Laka (2022). So how flexible is nuclear power in France now really?
[36] Sovacool, B.K., Schmid, P., Stirling, A. et al. Differences in carbon emissions reduction between countries pursuing renewable electricity versus nuclear power. Nat Energy 5, 928–935 (2020). https://doi.org/10.1038/s41560-020-00696-3
[37] University of Sussex (2020). Two's a crowd: Nuclear and renewables don't mix
[38] Volkskrant (2022)
[39] Reuters (2014). As Japan eyes nuclear restarts, renewables get shut out of grid
[40] European Council on Foreign Relations (2023).

- Renewable energy targets remain an essential tool for the European energy transition, and must be defended against any attempts to water them down through the inclusion of nuclear power. A so-called "low-carbon" directive with "low-carbon" targets would decimate the rate of renewable energy integration, which is already off track, and prevent the EU from aligning with Paris-agreement emissions reduction. Additionally, this opens the backdoor for other false solutions like fossil gas and carbon-capture and storage (CCS).

- Nuclear power and fossil gas should be excluded from the EU taxonomy for sustainable activities.

[41] Uranium Atlas (2020), pg 26.
[42] Analysis of ROSATOM activities (2022). In 2022, TVEL supplied 21 nuclear reactors in the EU with fuel rods. The 14 older pressurised water reactors of the VVER-440 type are completely dependent on TVEL for fuel element production. Two reactors in Finland and several in Western Europe (in Germany, Switzerland, Sweden, the Netherlands and the UK) also purchased fuel elements from Russia. .
[43] Sarah M. Jordaan, Afreen Siddiqi, William Kakenmaster, Alice C. Hill; The Climate Vulnerabilities of Global Nuclear Power. Global Environmental Politics 2019; 19 (4): 3–13. doi: https://doi.org/10.1162/glep_a_00527
[44] World Nuclear Waste Report (2019).