CAN
CLIMATE ACTION NETWORK
Europe

Small Modular Distractors:

Why a European SMR strategy hinders the energy transition

An EU SMR Strategy is a distraction

As demonstrated by the evidence provided below, small modular reactors are not a viable solution to decarbonising our energy system and supporting a transition to net zero. The technology has not been demonstrated at any sort of scale, with great unknowns when it comes to design. As the evidence below details, SMR projects have been shown to be significantly delayed compared to initial estimates, are slower to construct than traditional nuclear, consistently over budget, more expensive than renewables, not economically fit to provide flexibility, not very small, distort funding away from realistic renewable solutions, produce more waste than traditional nuclear, and citizens have little trust in their governments to implement plans fairly. They are also planned under the assumption that the governments would take responsibility and invest in enabling infrastructure such as grids and nuclear storage facilities.

An EU SMR Strategy, as well as national plans to pursue SMRs, risks diverting attention, resources, and political momentum away from the proven solutions needed for a fast, fair, and effective energy transition. While the following recommendations aim to minimise the potential negative impacts of SMR-related initiatives, it is important to underline that only a transition pathway without new nuclear capacity can deliver the speed, cost-effectiveness, and system resilience required for Europe’s decarbonisation.

Recommendations

1. **No EU funding or any state aid approval which violates EU legislation for nuclear, including SMRs:** Every euro given towards new nuclear energy is a euro taken away from more realistic solutions such as renewable energy, energy storage, demand side response, energy efficiency and electrification. Given the history of failures in the SMR industry, it is likely that money spent will not have any results due to project cancellations. State aid for SMRs risks unfairly favouring uneconomic nuclear against renewables and storage, and must not go against public tendering rules.

2. **No money without results:** In the misguided situation where public money is planned to be directed towards new nuclear and SMRs projects, EU countries must avoid mechanisms where a nuclear plant receives profit during construction and before producing electricity (RAB schemes). These schemes put costs directly on household bills and can continue payments even if the project is late or cancelled.

3. **No back door subsidies under guise of “de-risking”:** Contracts for Difference (CfDs) for new nuclear promise to ensure a base profit for generation and caps in the case of higher profits. However, in a future with low electricity wholesale prices due to renewable energy, and a low SMR capacity factor, SMRs will require consistent support via CfDs to remain competitive, acting as a subsidy, distorting competition and putting a strain on national budgets and tax payers.

Recommendations

4. **Project promoters must carry the costs of cancellations, waste, decommissioning, and accidents:** The true cost of new nuclear, including SMRs, must not be hidden on household bills or via tax payers. The cost of waste, decommissioning and accidents, must be placed on the project directly. Artificially lowering the cost of electricity per unit via hidden costs is distortive to the electricity market, and does not allow renewables to fairly compete. In the case of cancellations, countries should have mechanisms in place to clawback any remaining investment.

5. **Countries with new nuclear plans must submit renewable back-up plans:** 10 countries[1] in Europe have expressed desire for new nuclear. Nuclear plans are more likely to be delayed and cancelled than renewable projects. On top of this, betting on a new technology with as of yet unlicensed designs causes more uncertainty. NECPs containing new nuclear energy should include back-up plans to rapidly scale-up renewables, energy efficiency, and electrification in the case of project failure.

6. **SMRs must follow market rules and not distort flexibility:** Renewables will supply 80%-100% of electricity in the 2040s,[2] meaning SMRs will have low capacity factors. Countries might be tempted to promise future subsidies to offset higher costs in providing flexibility by SMRs. This must be avoided, to allow for solutions such as batteries, long duration energy storage, and demand-side response to more cheaply provide flexibility, and to not distort private investment.

1, Bulgaria, Czechia, France, Finland, Hungary, Netherlands, Poland, Romania, Slovenia and Slovakia

2. Between 81% - 87% according to EU Commission analysis, and 100% according to the Paris Agreement Compatible Scenario

Recommendations

7. **SMRs must not hold future grid capacity indefinitely:** Long delays on new nuclear projects and SMRs would mean that new grid capacity could be held unused, paid for by household bills and national budgets without benefit. Deadlines should be set for holding grid capacity, where other technologies can benefit after a set date.

8. **SMR projects must have local community support:** EU citizens have concerns over the safety and environmental risks of SMRs, and want to participate in decision making, however have low trust in their governments to include them. Community approval should be required for both SMR projects and their waste storage solutions, without which no nuclear plan should be approved, before construction can commence.

9. **EU Commission should introduce a non-fossil, non-nuclear EU Flexibility Strategy:** In line with the Electricity Market Design Regulation, the EU Commission should launch an EU Flexibility Strategy, with a focus on energy storage and demand response. Nuclear, including SMRs, is not economically or technically suited toward providing flexibility.

Cost of SMRs is rising, and far higher than renewable alternatives

Projected costs of ongoing small modular reactor designs have skyrocketed, mimicking a trend seen in the building of traditional nuclear reactors. As seen in Figure 1, three champion projects, seen by many as forerunners, have seen dramatic increases. Comparing cost per kW, NuScale has risen by 116%, GE-Hitachi BWRX-300 by 294%[3] and X-Energy by 299%. The more traditional Vogtle 3&4 reactors in the US, which came online in 2023 and 2024 after delays, saw an increase of 122%. Vogtle 3&4 are the most expensive nuclear reactors ever constructed, reaching $38.6 billion together, and SMR designs do not look competitive against even this example. Every SMR design has exceeded costs of traditional nuclear before construction even took place, while most cost increases in industry take place after the start of construction.

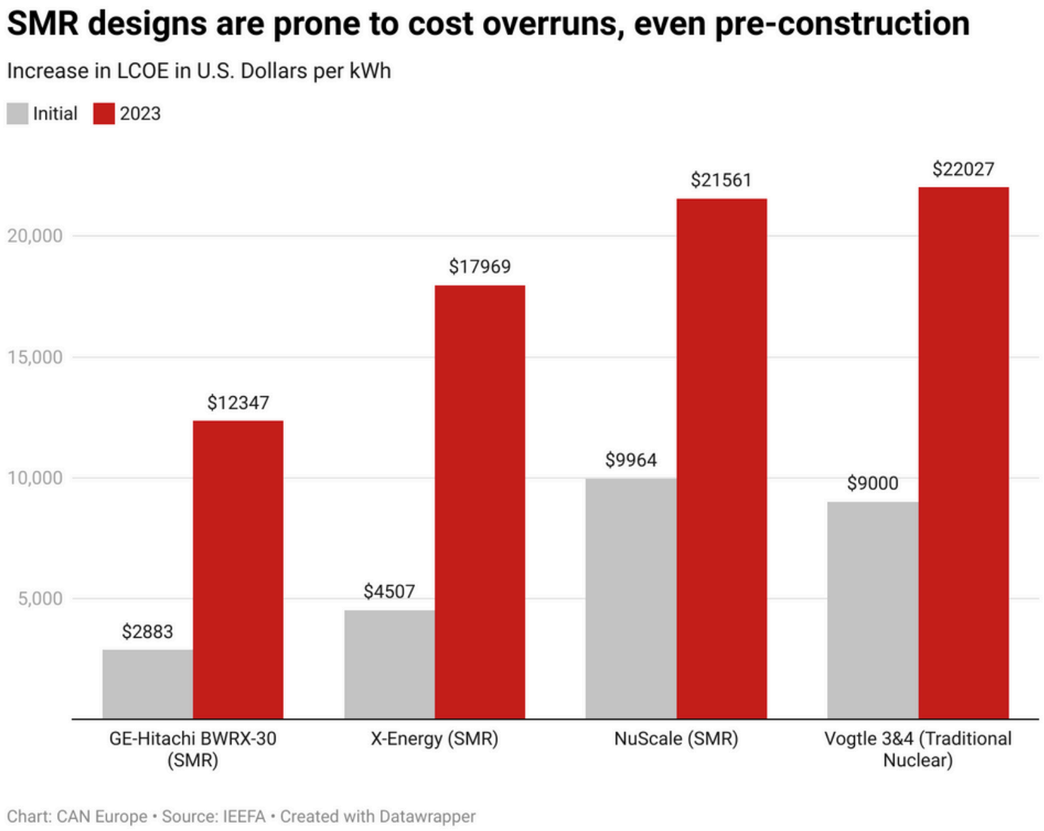


Figure 1 - Cost overruns of SMRs projects against traditional nuclear

3. IEEFA - Small Modular Reactors: Still Too Expensive, Too Slow and Too Risky

SMRs costs skyrocket during construction

Looking at the only 3 SMRs in operation, and the single SMR under construction, price increases are more staggering, demonstrating that high figures forecasted in design stages might be conservative, as shown in Figure 2. In China, the Shidao Bay 1 was 200% more expensive when it came into operation 16 years after its initial announcement, while the two Russian floating small reactors were over 300%. The ongoing development of the CAREM 5 SMR in Argentina has been a disaster with a 600% increase in costs,[4] and has now been cancelled following funding issues.

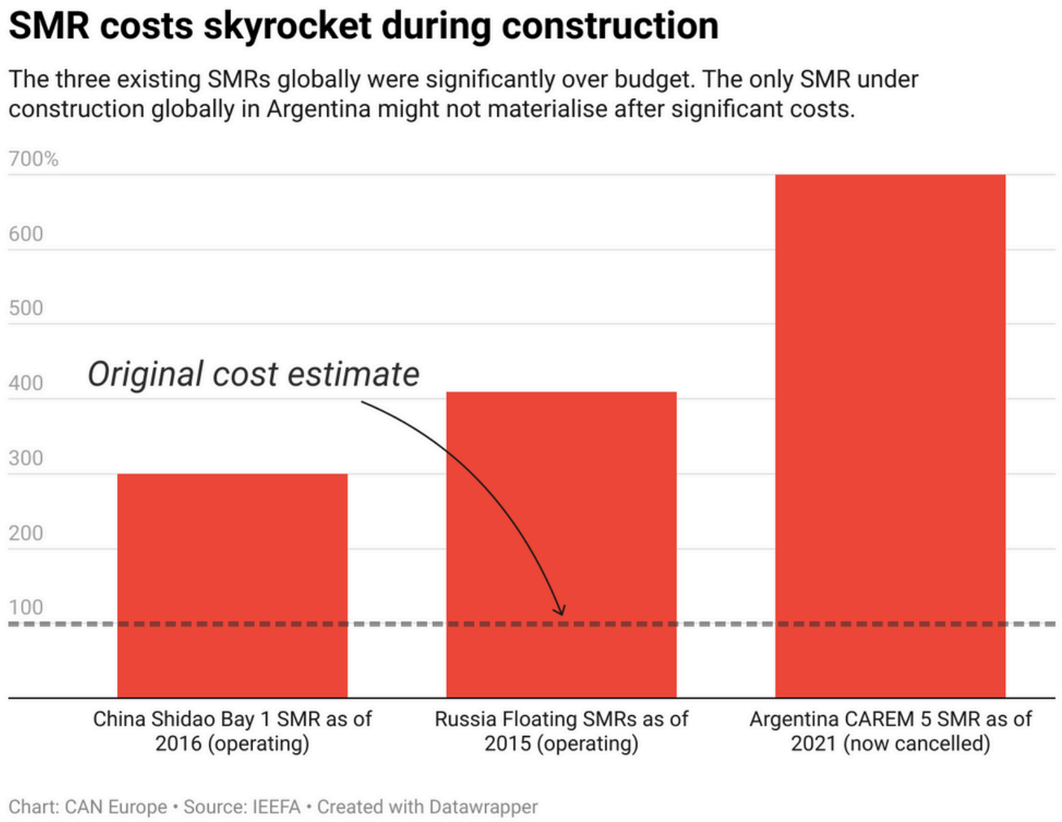


Figure 2 - Cost overruns of SMRs operating and recently under construction

4. IEEFA - Small Modular Reactors: Still Too Expensive, Too Slow and Too Risky

Global nuclear costs rise, as wind and solar gets cheaper

When it comes to costs, Figure 3 shows that nuclear technologies have seen a 47% increase since 2009, whereas wind has made significant cost improvements, and solar has decimated its price.[5] As seen above, SMRs suffer from the same cost overruns as traditional nuclear, and cannot compete with other technologies.

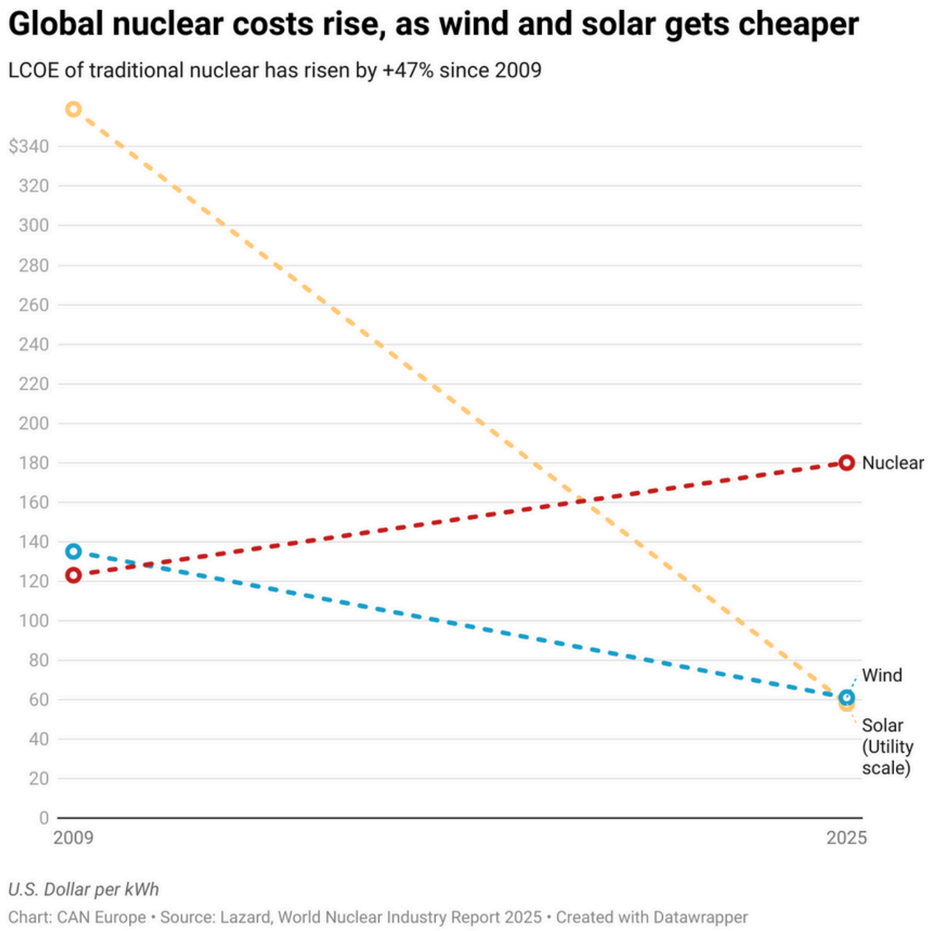


Figure 3 - Change in LCOE of utility solar, wind and nuclear

5. Lazard's Levelized Cost of Energy+ (LCOE+) (2025)

SMRs are not a solution for flexibility

One argument for SMRs has been the alleged potential to work well with renewables, such as wind and solar, to provide flexibility by ramping down when there is ample sun and wind, and ramping up to fill the gap. However, studies have shown that the fewer hours of operation (the capacity factor) the exponentially higher the levelised cost of energy.[6] As vastly cheaper wind, solar, batteries, and demand response play a larger role in our energy systems, SMR operating hours would decrease, putting a financial strain on any project. Alternatively, SMRs could run very high operating hours, pushing cheaper renewable electricity out of the system, and raising energy prices. The EU Commission impact assessment of the proposed 2040 Climate Target of 90% emissions reduction foresees renewables contributing between 81% - 87% of electricity by 2040. At a capacity factor seen in Figure 4 from 20% down to 5% we see a range of LCOE from 405$ per kWh to 804$ per kWh, significantly higher than today's LCOE of 4-hour batteries.

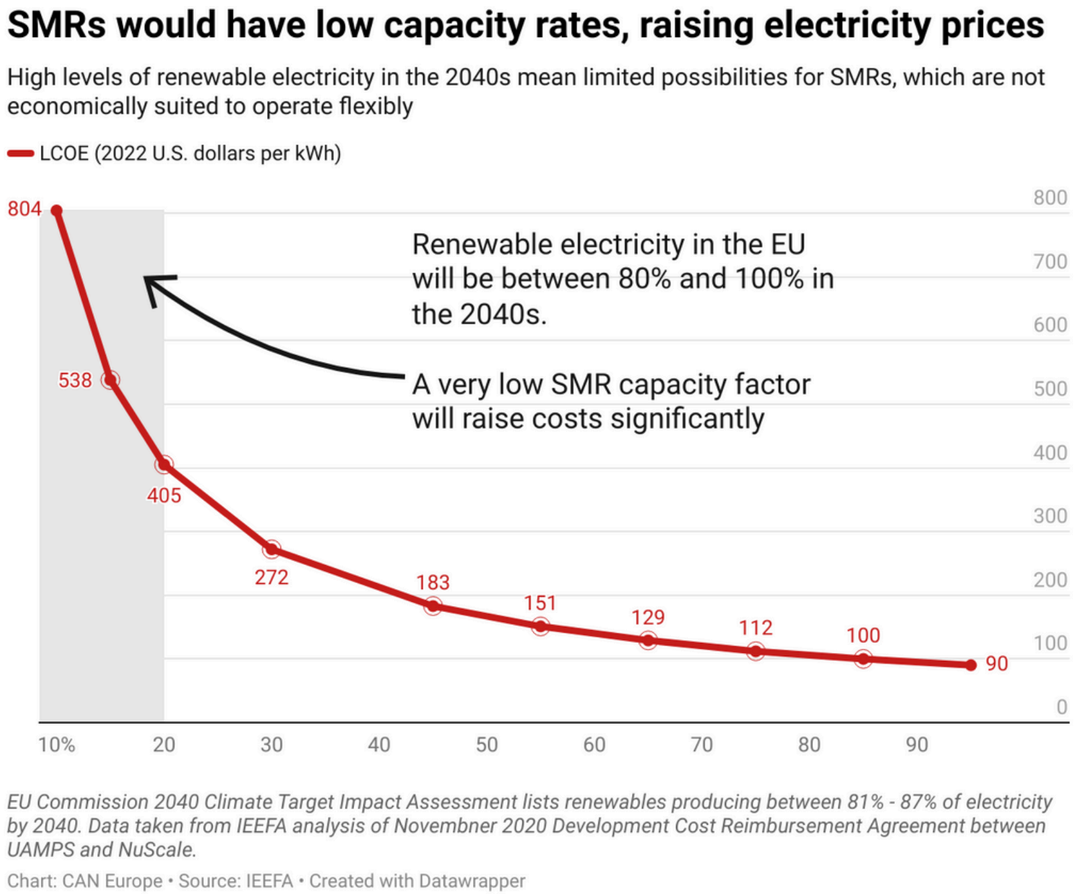


Figure 4 - Change in SMR LCOE by capacity factor

6. IEEFA - Small Modular Reactors: Still Too Expensive, Too Slow and Too Risky

Case Study: France

France has aimed to make its aging nuclear fleet more flexible, to ramp down to allow for lower-cost renewable power and to better meet a varied demand. However, one report has found a correlation between a high use of flexibility requiring more technical maintenance and high corrosion issues.

Analysis by analytics firm Kpler shows that France's most modulated of its 1.5GW nuclear reactors, Civaux 2, has been the one hit by corrosion issues, requiring technical maintenance. Another unit, Cattenom 3, at a size of 1.3GW, was the most modulated unit in the entire country, and has also faced corrosion issues, identified in 2022. Seven out of the 14 most-modulated reactors in 2024 were "more prone to stress corrosion cracking than other 900MW models".[7]

The French Nuward SMR design seeks to be a Pressure Water Reactor (PWR), which is the same basis of all of France's reactors.

7. Montel News (2025) - Corrosion-hit Civaux most modulated 1.5 GW French unit – study

Investing in nuclear can raise household bills

The promise of cheaper nuclear power from SMRs is not so straightforward. Evidence above shows that price rises are more than likely, however SMR cost can fall directly on household bills, without any benefit.

Case Study: United Kingdom 

A new levy introduced in the UK to pay for the ongoing construction of new nuclear reactor Hinkley Point C could add thousands of pounds to the bills of energy users, hitting charities and small businesses particularly hard. For most charities, an increase in costs of between £100 and £240 a year can be expected, but some may experience an increase of £2500.[8] In this case, the cost of new nuclear power is being put on the backs of the most vulnerable, who depend on the services that these charities provide, and removes any incentive to switch over from gas-based heating towards electrification. Small businesses, pubs, and restaurants are footing the bill during difficult economic circumstances, meaning likely price rises for consumers, without a single unit of electricity being produced. Hinkley Point C is many years delayed and over budget - this new levy incentivises further delays, as costs can always be recovered, burdening the public, communities, and small enterprises.

In total, consumers will pay £2 billion annually to cover the development of Hinkley Point C and Sizewell C.[9]

8. Guardian (2025) UK small businesses and charities say nuclear levy could add thousands to bills
9. Guardian (2025) UK energy bill payers will hand £2bn a year to EDF for new power stations

Case Study: Vogtle 3 and 4, US

To finance the Vogtle 3 and 4 nuclear reactors in Georgia, US, the state introduced the Nuclear Construction Cost Recovery mechanism, which allowed Georgia Power to recover the costs of constructing the nuclear power plants, during the construction phase, by placing costs onto household bills. This began in 2011, even though the plants only came online in 2023 and 2024, meaning households experienced higher electricity costs without any new power.

When the project construction time nearly doubled from 7.7 years to 13.3 years, and initial cost projections overran, consumers were left paying. This gave project developers an incentive to profit from delay. Between 2011 and 2020, $3.5 billion was added to household bills. If replicated in Europe, this policy would be at odds with our aims to lower energy prices, incentivise electrification, and tackle energy poverty, while distorting the market and disadvantaging renewable alternatives.[10]

10. Ratepayer Robbery (2021) — The True Cost of Plant Vogtle

SMR projects are significantly delayed, like traditional nuclear

Of the few SMRs in existence, a similar trend of delays in the nuclear industry can be seen in Figure 5. The Shibao Bay SMR in China took three times the initial construction estimate, totaling 12 years, higher than already very delayed traditional nuclear projects in the country. Data on how the Shibao Bay SMR is operating, such as operating hours, maintenance timings and cost, is unknown, as no public data is available. The two Russian small reactors were over four times delayed. Looking at recent delays in France, Finland, and the United Kingdom with traditional nuclear reactors, and the tendency for SMRs to be even more delayed, these solutions may only be available in the 2040s if construction began today, which no project is anywhere near in Europe.[11] Some SMR projects are heavily delayed even before any construction has begun, as in the case of the Estonian SMR project by Fermi Energy, who have already pushed back their grid connection year from 2031 to 2035, which is a poor sign as future delays are likely during development, based on historical analysis of nuclear power.

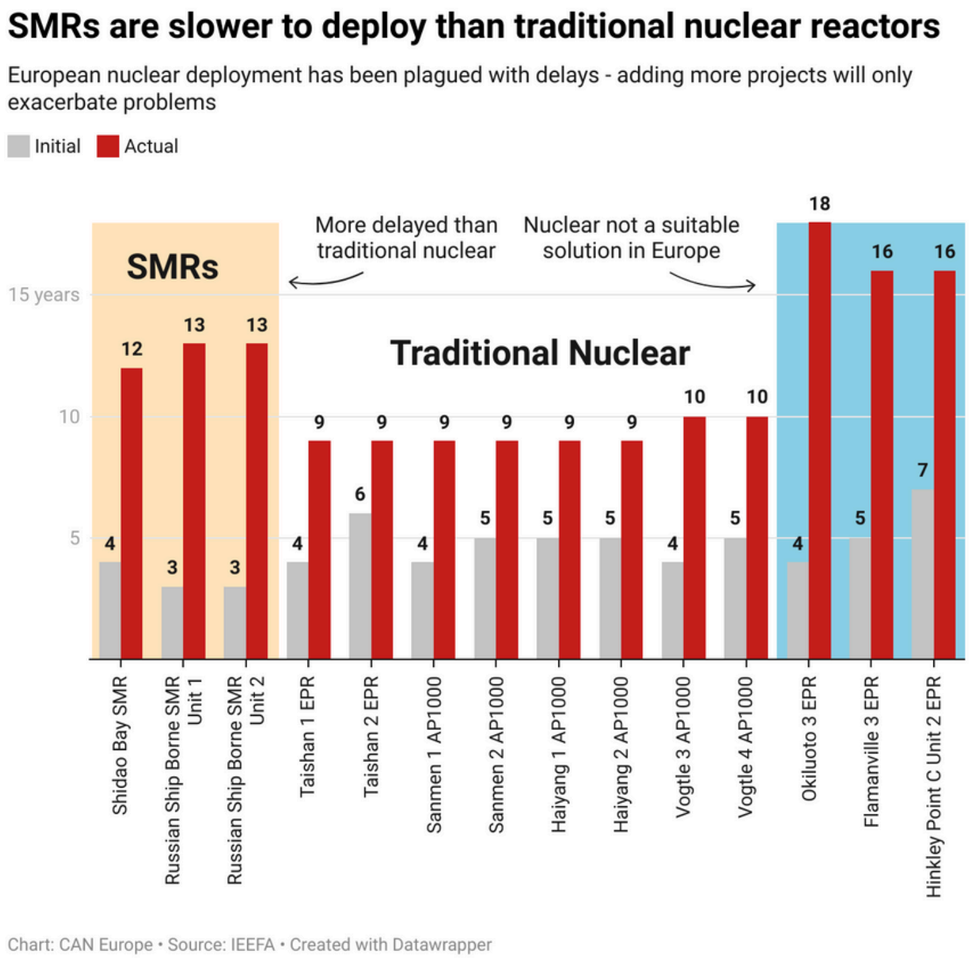


Figure 5 - Delays in SMRs and traditional nuclear

11. IEEFA - Small Modular Reactors: Still Too Expensive, Too Slow and Too Risky

Case Study: France

The French Nuward design has been plagued with technical difficulties, and presents unrealistic timelines for completion. First revealed in 2019, the original design aimed to produce 340MWe of power with the use of two 170MWe units, however these plans were suddenly discarded in early 2025 to produce a design of 400MWe, highlighting difficulties keeping designs “small”. This led to the project suddenly being withdrawn from the United Kingdom’s SMR selection, demonstrating uncertainty and the risk of relying on this technology.[12] Despite a drastic change in approach, Nuward somehow aims for a “conceptual design” by 2026, and a “basic design” by 2029, and would work on a “detailed design” from 2030. History shows a great tendency for SMR designs to reach significant delays, with later stages of planning having the highest technical difficulties due to deepening complexity. These timelines for designs speak nothing of actually prototyping, testing, and the deployment of the first design. Beyond this, any hope of making this system modular, and ramping up manufacturing would take several more years.[13]

12. World Nuclear News - EDF Simplifies Nuward SMR Design
13. World Nuclear Industry Report (2025)

SMR plans distort financing away from existing renewable technologies

Case Study: United Kingdom

The United Kingdom announced Great British Energy as a publicly owned vehicle for investing in renewable energy, with a budget of £8.3 billion. This was championed as a method to bring to market solar and wind, which is fast to deploy and able to provide low cost power. However, following the announcement to develop small modular reactors, over £2.5 billion was siphoned from Great British Energy to cover the costs. As seen in Figure 6, over 30% of the financing promised toward proven renewable technology solutions, suddenly reallocated towards unproven nuclear designs, with no demonstrated prototypes, to an industry with a history of budget overruns, delays, and environmental damage. This example highlights a larger trend within Europe, as public and private money is artificially distorted away from economically sound solutions such as wind, solar, and batteries, towards nuclear.[14]

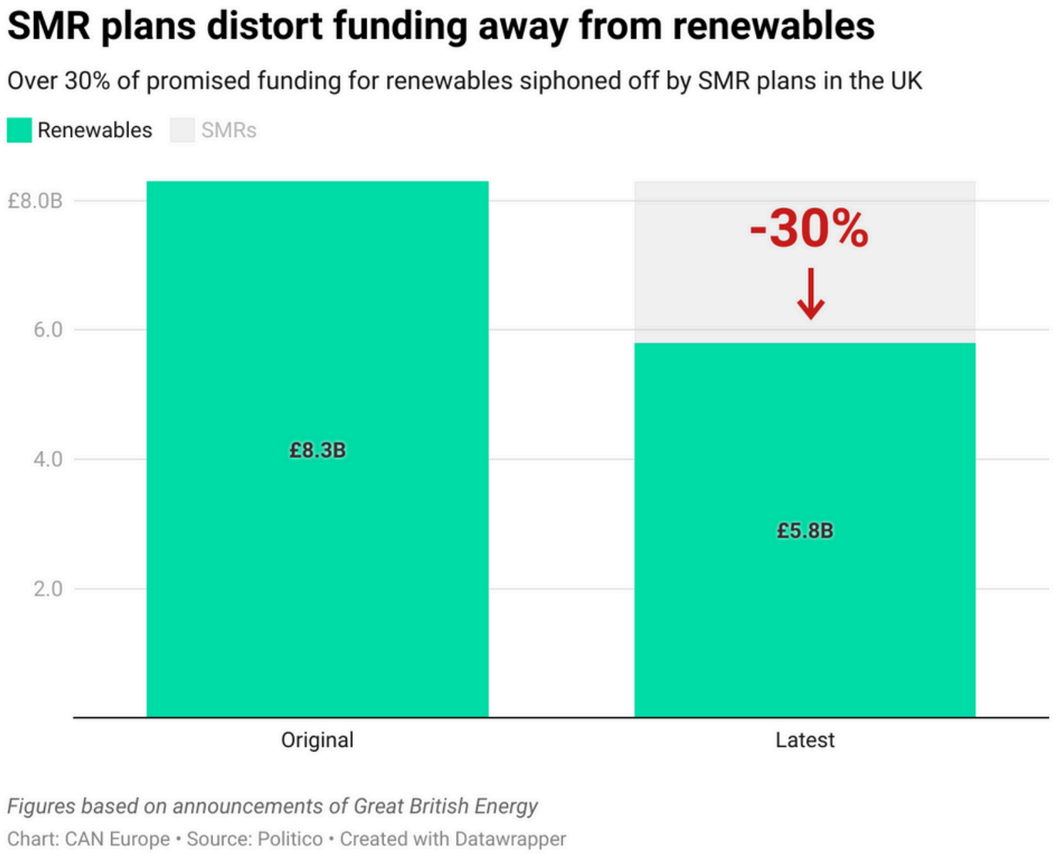


Figure 6 - Change in UK budget allocation to SMRs from renewables

14. Politico (2025) - GB Energy budget raided to pay for mini nuclear reactors

SMR projects are not small

The EU Commission defines SMRs as having a “maximum output of 300 Megawatt electric (MWe)”, compared to traditional nuclear plants having around a 1000 MWe in size. The promise of having smaller, yet modular, designs is that this can lead to price savings in construction. However, there is a tendency for nuclear projects to increase in size in order to benefit from economies of scale, where larger plants have lower capacity and operational costs for kWh. As seen in Figure 7, two European SMR designs, France’s Nuward and UK’s have both increased in size since the original announcement, and are both above the EU Commission’s definition of SMR. These announcements come at the beginning of the design process, with the possibility for size increases later on.[15]

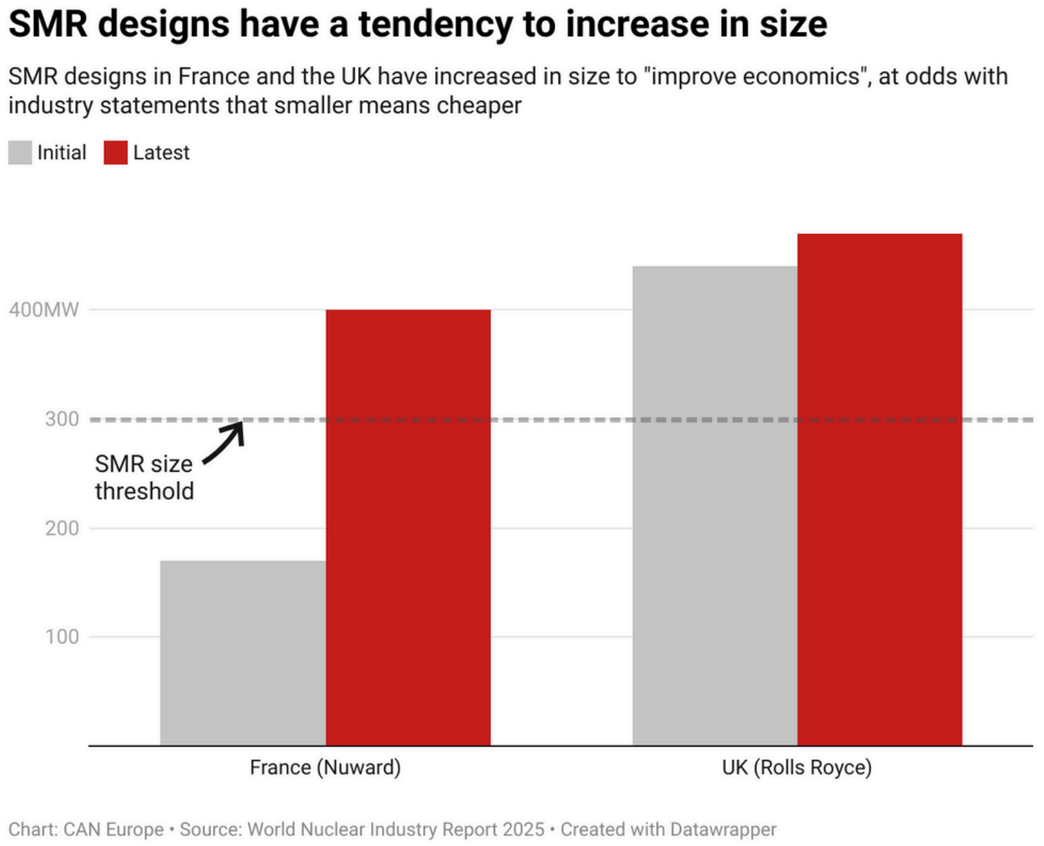


Figure 7 - Change in size of SMR designs in Europe

15. World Nuclear Industry Report (2025)

SMRs would create more radioactive waste, not less

The promise of lower nuclear waste from SMRs is unfounded. One study looked into 3 SMR designs (Figure 8), and found they would have a higher production of nuclear waste, with 5 times the levels of spent nuclear fuel, and 30 and 35 times production of long-lived low-and-intermediate waste and short-lived low-and-intermediate waste respectively.

Not only would waste be higher, its production and temporary storage would be more decentralised, and therefore would require more security and is at greater risk of theft, terrorism and acts of war.[16]

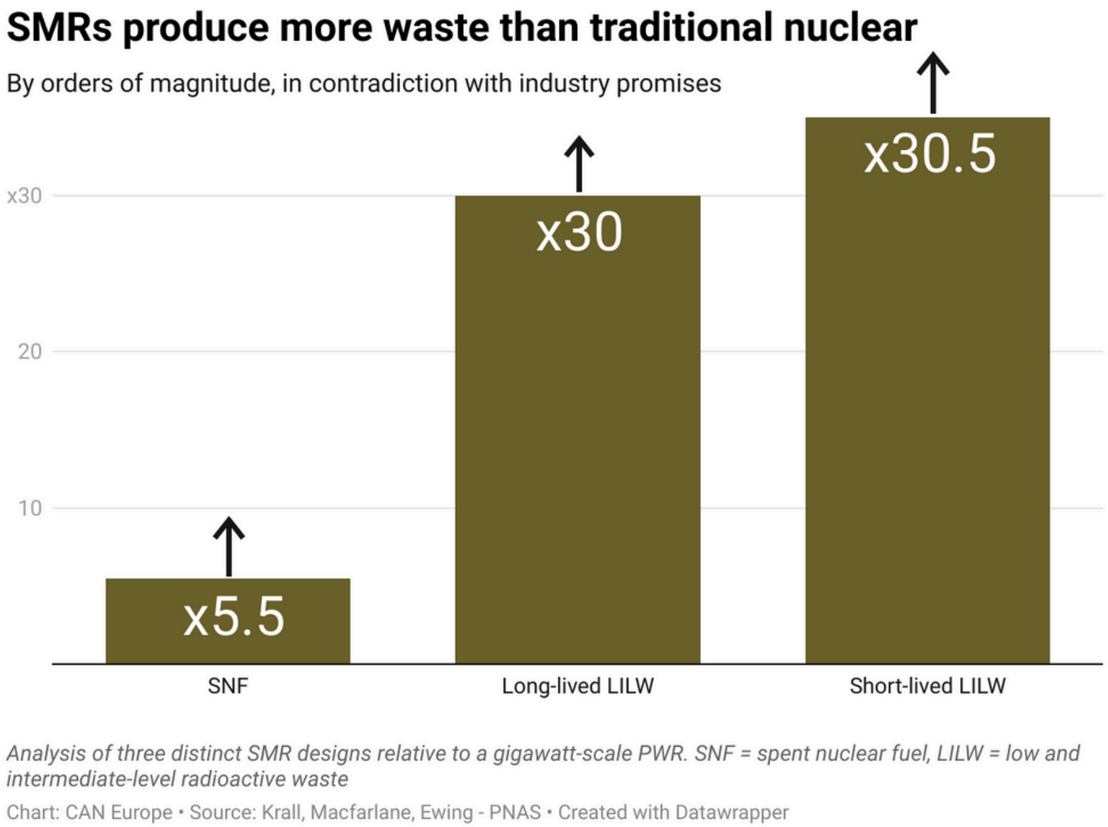


Figure 8 - Increase in nuclear waste produced by SMR compared to traditional nuclear

16. Lindsay M. Krall, Allison M. Macfarlane, Rodney C. Ewing (2022) - Nuclear waste from small modular reactors)

Citizens have concerns about SMR safety and environmental risk, and want more public participation

The majority of citizens polled in Belgium, Spain and Czechia according to the EU Project ECOSENS[17] would find it unacceptable to have an SMR built within 10km of their home (Figure 9), and believe SMRs pose safety risks and have a higher environmental risk than renewables (Figure 10).

17. ECOSENS (2025) - Public attitudes towards small modular reactors

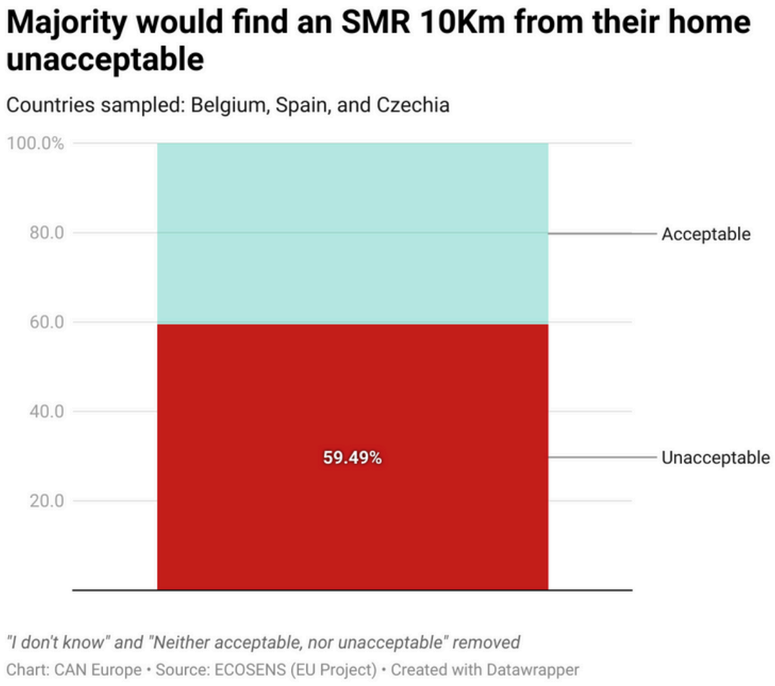


Figure 9 - Majority of citizens would be against living near a SMR

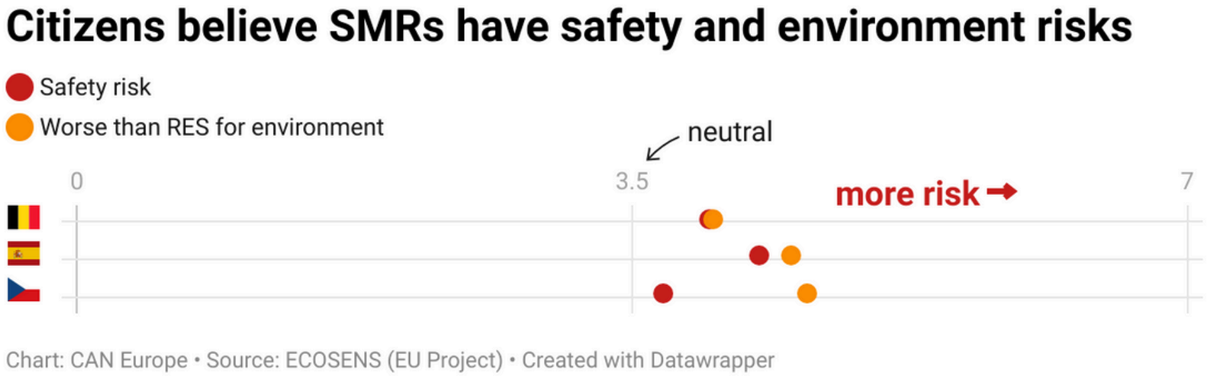
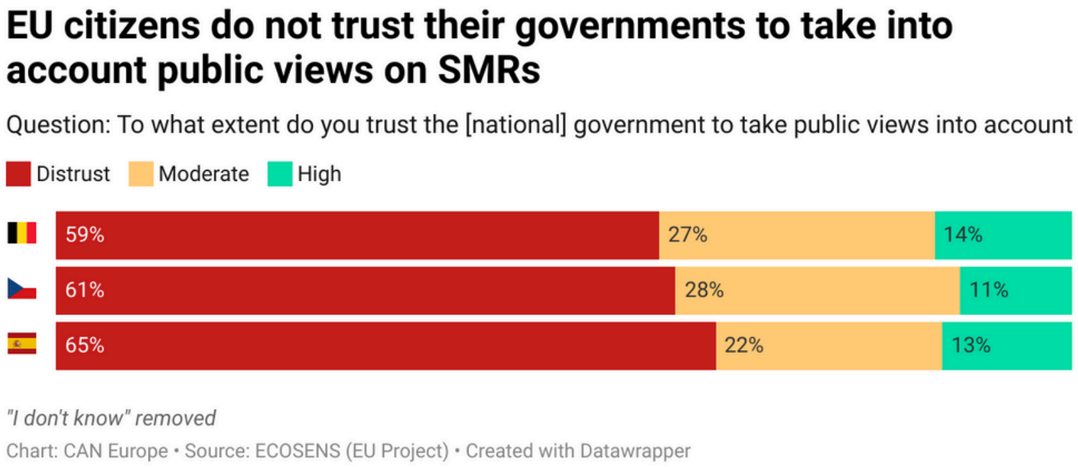


Figure 10 - Majority of citizens believe SMRs pose safety and environmental risks

Citizens in the same countries do not trust their governments to take into account public views of SMRs (Figure 11), with an overwhelming majority wanting to be involved in decision making. (Figure 12) An essential part of the energy transition is having a greater role for citizens in the planning of the energy system, and the increase in democratic practices. National SMR strategies risk standing in the way of a just energy transition.



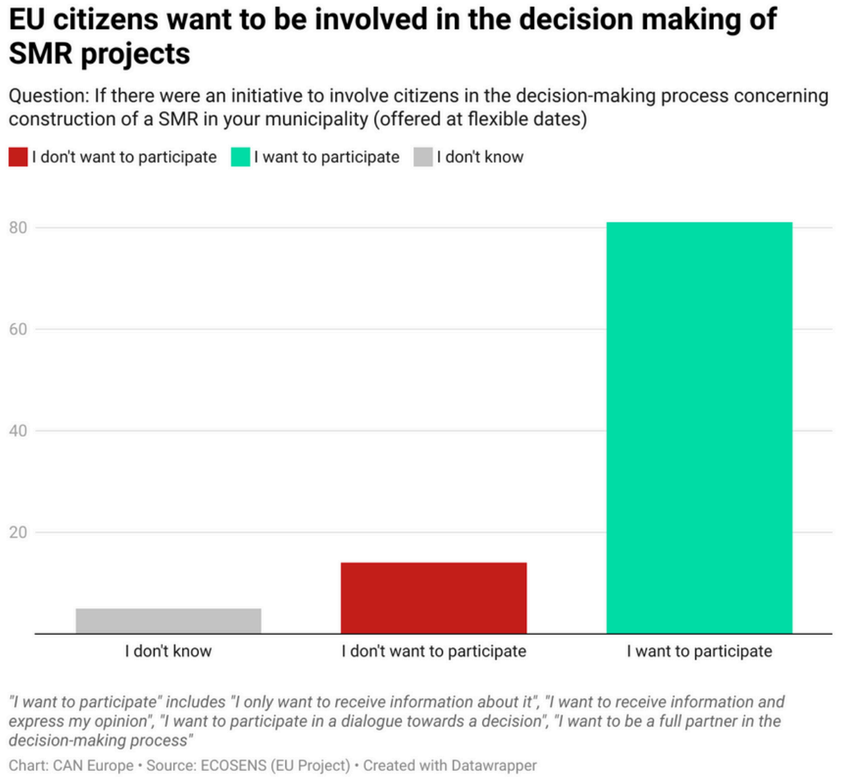


Figure 11 - Majority of citizens have concerns over public participation for the development of SMRs

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