

From Fragmentation to Fleet: A European Blueprint for Coordinated SMR Deployment

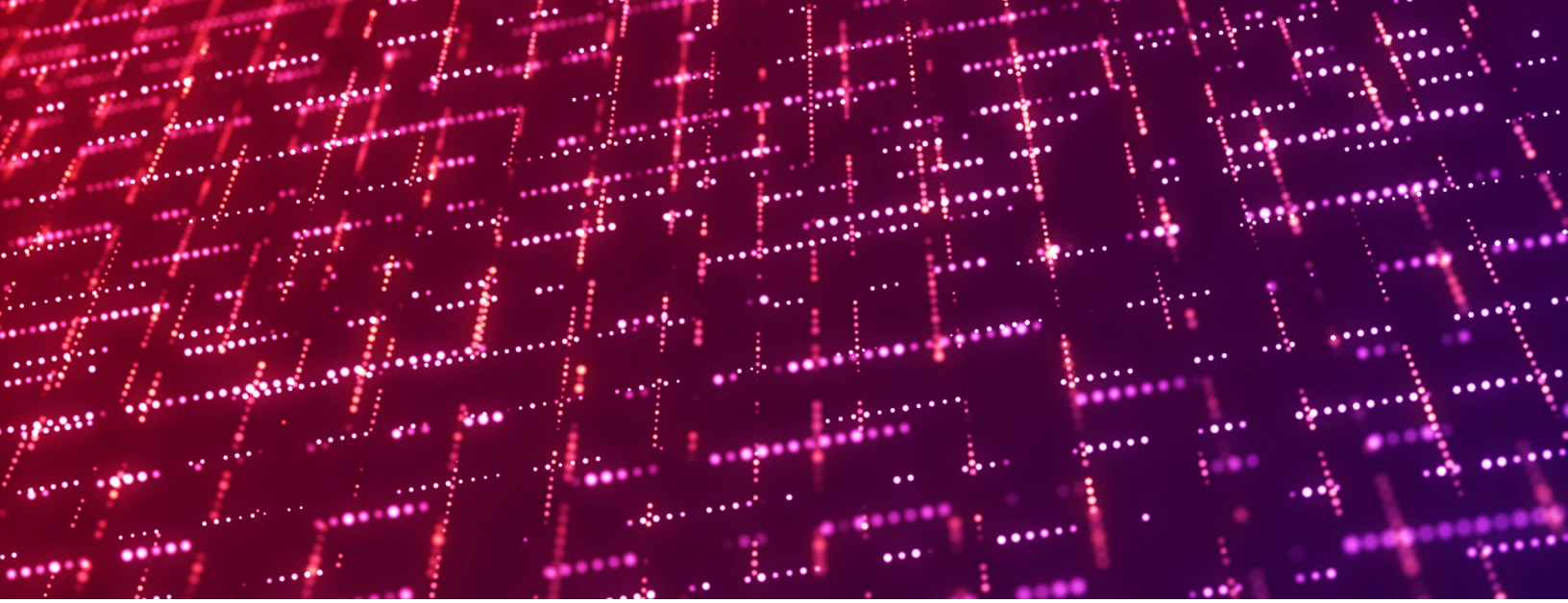
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CLEAN AIR TASK FORCE

Disclaimer

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Executive Summary

Three conditions for Europe's first SMR fleet

Built separately, Small Modular Reactors (SMRs) stay expensive: every country pays first-of-a-kind costs and competes unproductively for skilled workers and resources. Built together as a cross-border fleet of the European Union – one design, repeated across several countries – the EU lowers the cost early. Three conditions make that possible:

1. **Coordination.** A small group of EU Member States (2-4) and utilities should pool their orders into a single orderbook built around one standard design, and commit to building it repeatedly. A fleet of 5–8 gigawatts electrical (GWe), or about 12–20 units at 400 megawatts electrical (MWe) each, even across different sites, already captures most of the learning and savings theoretically available for a larger fleet.
2. **Sharing.** Those countries and utilities should use the same supply chain to deliver every SMR in the fleet, at least for the first 5–8 GWe. Project owners should coordinate schedules, so that critical suppliers and skilled workers carry their experience from site to site. The first fleet should draw on qualified suppliers across EU Member States from the outset, rather than waiting for separate national supply chains to develop sequentially in each country. Companies in different EU Member States already have the expertise in components, systems or services that can be mobilised wherever the SMRs are built.
3. **Localisation.** As the orderbook expands, participation can broaden and additional national suppliers can be qualified, increasing national industrial involvement without duplicating complete EU supply chains or changing the standardised design.

The role of policymakers in enabling an SMR programme

Early SMR units carry the greatest first-of-a-kind costs and uncertainty, which the market will likely not resolve on its own. Policy actions are needed at three levels:

1. **National level (single country).** The cost of capital, meaning the return that lenders and shareholders require, is one of the two largest drivers of the levelised cost of electricity (LCOE), together with the plant's overnight capital cost. Policy tools such as regulated asset base (RAB) models, debt guarantees, low-interest loans, contracts for difference (CfDs) and power purchase agreements (PPAs) can reduce financing risk and the cost of capital, lowering LCOE by tens of euros per megawatt-hour in the modelled cases.
2. **Multinational level (group of countries).** Policymakers should create the conditions for long-term collaboration. For instance, countries deploying the same design should align technical requirements where law permits and share regulatory evidence, so regulators reuse work instead of repeating it. Because the lack of regulatory coordination is a critical bottleneck for European fleet deployment, existing cooperation on SMRs (e.g., EURATOM/ENSREG) should be strengthened, potentially including dedicated support for national safety authorities participating in joint reviews and cross-border licensing cooperation. Joint early reviews are already under way and should be expanded, resourced and encouraged where they help regulators reuse relevant technical evidence.
3. **EU level.** While EU Member States retain the right to determine their own energy mix, the EU should put in place an enabling policy framework that empowers them to pursue shared objectives, including decarbonisation, energy security and industrial competitiveness. Accordingly, EU policy should support Member States that wish to pursue SMR deployment in a coordinated manner. Relevant financial instruments might be guarantees covering completion of construction and repayment of debt and public co-investment alongside private capital, including through the European Investment Bank (EIB). Their purpose is to mobilise cross-border private investment by absorbing risks that private investors, or single countries, cannot carry alone.

This study, conducted by Politecnico di Milano for Clean Air Task Force, was designed to compare fragmented national projects with multi-country, coordinated, standardised deployment of SMRs in terms of the levelised cost of electricity (LCOE).

The report's central conclusion is that the EU can capture a substantial part of the economic and industrial value of SMRs if a suitable size of the programme (e.g., the first 5–8 GWe) is organised as a coordinated fleet, rather than as a succession of independent projects.

The focus of the study is the EU as a whole, with France, Czech Republic, Sweden and Poland selected as four national case studies representing different nuclear programme pathways (see Table ES1): "continuity" in France, where nuclear power is already well established; "renewal" in Czech Republic and Sweden, where new reactors would follow a long pause in construction; and "first build" in Poland, where a nuclear power programme is being developed for the first time.

The EU-wide simulations extend from a single SMR unit to 51.2 GWe. For the quantitative analysis, the study leverages INCAS (Integrated model for the Competitiveness Assessment of Small and medium-sized reactors). The country analysis uses low, medium, and high deployment trends and alternative cost assumptions. It compares each country's financing arrangements with one common "supported" package applied identically to all four. The qualitative analysis includes public data and 20 semi-structured interviews involving 21 participants based in eight European countries. The interviews complement inputs from publicly available literature and reinforce the quantitative findings.

What the EU-wide modelling shows

The LCOE is the average cost of building and operating a power plant per unit of electricity produced over its whole life, measured in euros per megawatt-hour (€/MWh). EU-wide analysis identifies two dominant drivers of LCOE:

1. The cost of financing, and particularly the cost of equity, meaning the return shareholders require for putting capital at risk.
2. The overnight construction cost (OCC), meaning what the plant would cost to build if it could be built instantly, excluding financing charges but including engineering, labour, materials, equipment and site works.

Cost of equity and financing

A nuclear plant has very high upfront capital spending or expenditure (CAPEX) and low operating and fuel costs (OPEX) thereafter. **The final cost of its electricity therefore depends far more on the cost of capital than on fuel or operating costs. In other words, much of a nuclear plant's lifetime cost is committed before it sells a single unit of electricity.** At least in the EU and USA, the recent experience with nuclear new builds (large reactors) is that considerable delays and overruns are common. Therefore, construction, market, and other risks are priced into the cost of capital, increasing financing costs, and therefore the LCOE. The cost of equity, i.e., the return shareholders require to invest their own capital in a project, reflects the risks investors believe they undertake: construction delays, licensing uncertainty, exposure to wholesale electricity price volatility, and the possibility that a first-of-a-kind plant does not perform as designed.

In this EU-level analysis, holding the cost of debt at 4% and raising the real cost of equity from 6% to 12% takes LCOE from about € 74 to about € 106/MWh. This is equal to a 42% increase for the same reactor, the same number of units and the same construction programme. **Reducing or reallocating these risks is therefore essential to reduce the required return on equity and, in turn, LCOE.**

The financial instruments available to policymakers differ in which risk they mitigate. A Regulated Asset Base (RAB) model, state or EU guarantees, and very low-cost public or state-backed debt can reduce construction and financing risk by lowering the amount and cost of capital exposed during the build phase. By contrast, CfDs and long-term industrial PPAs primarily reduce market-price risk by providing greater certainty over future revenues. Capacity markets address a different risk by remunerating availability rather than electricity output.

Overnight construction cost

EU-wide modelling with INCAS[1] shows that repeated deployment lowers LCOE through two mechanisms. The first one is learning: each successive unit is cheaper because the whole supply chain, people and organisations alike, gains experience. The decline is steepest over the first few units/gigawatts and then flattens. The second is co-siting: several units on one site share fixed and semi-fixed costs.

The INCAS analytical model shows that an orderbook of 5 to 8 GWe built around the same standardised design already captures roughly half to two-thirds of the learning savings available in a total fleet of 50 GWe or more, depending on reactor size and site layout. The interviews point in the same direction: several experts associated meaningful industrial learning with a run of about 8–10 units of a single reactor design, or roughly 2.5 to 4.5 GWe depending on the size of unit chosen. A large share of the savings therefore materialises at a scale that a group of countries can reach together.

Co-siting, meaning building several units on the same site, is the second part of the scale effect. **Raising a site from 400 to 800 MWe of capacity reduces modelled LCOE by roughly 2–8 €/MWh; raising it from 400 to 1,600 MWe saves about 6–12 €/MWh.** The savings come from costs such as grid connection, security and emergency planning that are largely fixed and can therefore be shared across units.

The size of the individual reactor also matters. Economy of scale at the plant level means that a single 100 MWe SMR costs about 20 €/MWh more than a single 400 MWe SMR. At fleet level, that gap narrows to about 6 €/MWh, because for the same total installed capacity smaller units are built in larger numbers and therefore accumulate more learning with each project build.

[1] INCAS (Integrated model for the Competitiveness Assessment of SMRs) is a proprietary bottom-up discounted-cash-flow model developed at Politecnico di Milano to assess the economic competitiveness and financial performance of small and medium-sized reactors. It explicitly models construction schedules, learning, co-siting, financing and multi-unit deployment. A full description is provided in Appendix of the report.

What the four country cases show

In the second stage, analysis was conducted at the individual country level. The four countries were chosen as they cover different scenarios: an established fleet and a mature supply chain (France); fleets due for renewal after a long gap in construction (Czech Republic and Sweden); and a country with no operating nuclear power reactor (Poland). The scenarios below are constructed test cases built on common modelling assumptions. They are not assessments of the programmes those countries are pursuing, and the figures should not be read as project offers.

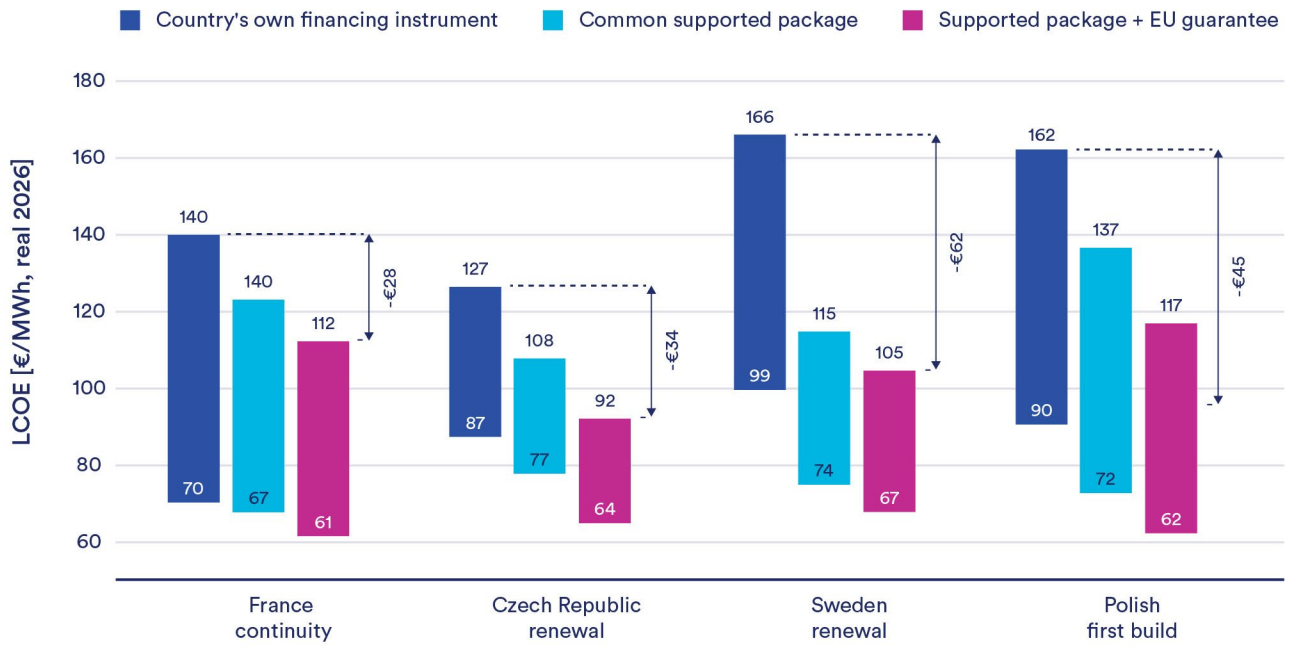
Table ES1: Quantitative summary of the country scenarios and their results

Each LCOE range spans the low, medium and high deployment pathways and the optimistic and conservative cost cases, so the low end of every range is the high-deployment optimistic scenario, and the high end is the low-deployment conservative one. All runs use a generic 400 MWe unit, a 90% load factor, a 60-year operating life and a construction schedule of 7 years for the first unit, 6 years for units 2 to 6 and 4.5 years thereafter. Fuel-cycle costs are 9–12 €/MWh and decommissioning is 2 €/MWh in every country. The figures are scenario outputs in real 2026 euros, not project offers, and are not directly comparable between countries.

Country and case	SMR capacity modelled low / medium / high pathway	Overnight cost optimistic / conservative (€/kWe)	Domestic financing options modelled LCOE (€/MWh)	Common supported package, no EU guarantee LCOE (€/MWh)	Supported package + EU guarantee LCOE (€/MWh)
France – continuity	New capacity: 0.4 / 2.4 / 7.2 GWe (1 / 6 / 18 units) SMRs also replacing retiring large reactors: 6.0 / 15.2 / 27.2 GWe (15 / 38 / 68 units)	8,965 / 10,758	Exeltium-inspired prepaid industrial contract; EPR2-inspired package 69.8 – 140.4	67.1 – 123.1	61.0 – 112.4
Czech Republic – renewal	2.0 / 3.2 / 4.8 GWe (5 / 8 / 12 units)	8,069 / 9,862	Merchant; Dukovany-inspired state loan with long-term PPA 86.7 – 126.7	77.1 – 108.3	64.5 – 92.4
Sweden – renewal	New capacity: 1.6 / 3.2 / 4.4 GWe (4 / 8 / 11 units) SMRs also replacing retiring large reactors: 3.2 / 6.8 / 11.6 GWe (8 / 17 / 29 units)	8,965 / 10,758	Merchant; state loan with 40-year CfD 98.8 – 166.4	74.3 – 115.2	67.1 – 104.7
Poland – first build	1.2 / 4.0 / 7.2 GWe (3 / 10 / 18 units)	8,069 / 13,448	State loan with CfD 90.0 – 162.5	72.1 – 136.7	61.6 – 117.1

Figure ES1: Whole-fleet LCOE ranges across all low, medium and high deployment trends and both optimistic and conservative cost cases, in real 2026 €/MWh

These are not medium-trend/optimistic-case point estimates; the arrows compare the domestic and EU-guaranteed package upper endpoints.



Read together, the four cases reinforce the EU-level result.

- France shows the cost of treating a first SMR as an isolated demonstrator: its low new-capacity case carries the full first-of-a-kind penalty, and additional units bring LCOE down.
- Czech Republic shows what happens once a programme has five or more units: moving from low to high deployment then changes LCOE by only about 1.6-4.2 €/MWh, while moving from a merchant (market-exposed) structure to the EU-guaranteed supported case is worth roughly 27.3-34.4 €/MWh.
- Sweden is the clearest demonstration of the impact of financing: the financing structure alone is worth 47-63 €/MWh across scenarios.
- Poland combines the largest opportunity to displace fossil generation with substantial modelled deployment potential: the modelled 1.2, 4.0 and 7.2 GWe pathways all improve with scale, but construction-cost uncertainty remains wide, and it is the guarantee that brings five of the six cases below the assumed 115 €/MWh CfD strike price (the reference price in the support contract).

The value of the fleet approach emerges from treating national programmes as part of a broader, coordinated, cross-country deployment, where the scale effects described above can be combined with national financing arrangements and EU-level support.

Supply chain, workforce and licensing – qualitative assessment

Interviewees emphasised how the EU retains a substantial but uneven nuclear industrial base, led by France's extensive Framatome and Orano ecosystem and complemented by significant manufacturing capabilities in Italy, particularly in forgings, valves, pumps and specialised equipment, as well as nuclear-industrial capabilities in Czech Republic (heavy manufacturing) and other EU countries. However, this industrial depth does not necessarily imply sufficient capacity to deliver several gigawatts of simultaneous SMR new builds on a repeatable schedule. Several interviewees also noted they could not point to a European Engineering Procurement and Construction[2] company with a proven track record of delivering on time and on budget.

The workforce, which includes welders, electricians, civil trades, quality assurance specialists and experienced project managers, emerged as equally critical. France's nuclear industry association estimates that some 100,000 full-time equivalents must be recruited over the next decade for the domestic nuclear programme alone, with about half replacing retirees rather than adding capacity.[3] Czech interviewees described losing specific manufacturing capabilities during the long gap in new construction. At the same time, Swedish respondents highlighted the absence of a deep apprenticeship pipeline for nuclear-qualified trades. Poland's own national analysis reaches the same diagnosis, adding that certifying a supplier to nuclear standards takes two to four years and costs more than most small and medium-sized firms can carry without support.[4] The experience of Olkiluoto 3 in Finland was cited as a warning that importing labour from neighbouring countries cannot be scaled indefinitely if several programmes peak at the same time. **In the first wave of SMR deployment, common training, cross-border certification and deliberate sequencing of projects can turn a scarce European workforce into a shared fleet resource, rather than forcing Member States to compete for the same people at the same moment.**

Thirdly, licensing can remain national while technical assessments are reused across borders. Participating countries can agree on the reference design early, use joint early reviews and regulatory "shadowing", in which one regulator observes another's assessment, and reuse those assessments so national regulators avoid costly, lengthy repetition. The Rolls-Royce SMR cooperation involving the United Kingdom, Czech Republic and Sweden, and the earlier multi-regulator review of Nuward, show that this can work while legal responsibility remains national. Polish analysis similarly calls for more joint safety assessment of first-of-a-kind designs and greater use of common European technical standards where safety rules allow. The objective is a repeatable licensing pathway around a common design. Existing cooperation among European regulators, including through the work of the European Nuclear Safety Regulators Group (ENSREG) on SMRs, should therefore be strengthened and supported at EU level, including through dedicated resources for national regulators participating in joint reviews and cross-border regulatory cooperation.

Conclusions

The quantitative and qualitative evidence converge on an "economy of multiples": the first unit proves the design, an early cross-border fleet creates the economics and the delivery capability, and a mature fleet creates the basis for broader localisation. If EU Member States do not work together in implementing a joint SMR deployment strategy, they risk paying first-of-a-kind costs repeatedly and competing for the same scarce suppliers and workforce. If a small group of willing countries first coordinates the orderbook, design and licensing pathway, financing, supply chain and workforce, it can create the momentum needed for a cost-effective, at-scale and timely deployment of SMRs in the EU.

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[2] The engineering, procurement and construction organisation that takes responsibility for delivering a whole plant, as a structural gap that no single country is likely to close on its own

[3] Groupement des industriels français de l'énergie nucléaire (GIFEN), MATCH report, 2025, which also projects a total of about 300,000 full-time equivalents in the sector by 2035.

[4] Horyzont Atomowy (2026), section 4.2, which identifies an acute shortage of certified welders, fitters and non-destructive-testing operators as a systemic constraint, and notes that nuclear supplier certification (ISO 19443, ASME NQA-1) takes two to four years.

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SECTION 1

Introduction

Nuclear power remains a cornerstone of Europe's low-carbon electricity system, providing around 23% of EU electricity generation in 2024 across twelve member states.[5] Energy security has returned to the top of the European policy agenda following international geopolitical tensions, decarbonisation commitments under the EU's net-zero targets, and rising electricity demand from widespread electrification and new users (e.g., data centres). In this context, the European Commission Strategy for Small Modular Reactors (SMRs), adopted in March 2026, estimates that 17–53 GW of EU SMR capacity is plausible by 2050.[6,7] A growing number of SMR projects are moving from feasibility studies to firm site selections, licensing applications and early contracts. Yet Europe's SMR ambitions remain, for now, a set of largely uncoordinated national efforts. Countries differ sharply in their starting conditions, industrial capability, financing models and regulatory maturity. This report aims to provide evidence on the extent to which a fleet approach that is coordinated and standardised across countries would provide cost savings benefits compared with each country building its own programme independently. This report combines primary data from interviews with stakeholders across Europe with quantitative analysis and publicly available data to achieve three core objectives.

1. To investigate country-level orderbooks under different scenarios. Four countries are examined as representative case studies: France (a continuity case, with an existing large-reactor fleet and a mature but re-orienting supply chain), Sweden and the Czech Republic (the so-called "renewal cases", reactivating dormant capability after a long gap in new construction), and Poland (a first-build case, with no operating nuclear power reactor).
2. To assess the potential benefits of large-scale, European-level standardised deployment. This would account for wider co-siting and learning effects, at both technology and site level, on the Levelised Cost Of Electricity (LCOE), as well as the standardisation, industrial, regulatory and workforce conditions under which those benefits could plausibly be realised.
3. To develop recommendations for policymakers, industry and financial institutions, addressing the conditions under which an SMR fleet and the related European supply chain pipeline would develop.

Taken together, these objectives are intended to move the conversation about European SMR deployment beyond aspiration and towards an evidence-based assessment of what a credible, investable pathway to a European nuclear fleet would require. Policymakers are the primary audience for this assessment: most of the choices that determine whether such a pathway materialises – orderbook aggregation, licensing reuse and financing design – sit with the European Commission and Member State governments rather than with industry alone.

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5 Eurostat. Nuclear Energy Statistics. Statistics Explained (2025). https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Nuclear_energy_statistics

6 Compass Lexecon. Pathways to 2050: The Role of Nuclear in a Low-Carbon Europe. Report for nucleareurope (2024). https://www.nucleareurope.eu/downloads/compass-lexecon-report-on-pathways-to-2050/

7 European Commission. Small Modular Reactors. https://energy.ec.europa.eu/topics/nuclear-energy/small-modular-reactors_en (accessed August 2026).

Methodologically, for each country, the study draws on two complementary sources of evidence: publicly available data (national energy statistics, government and regulator publications, company and vendor disclosures, etc.) and semi-structured interviews with relevant European stakeholders.

The characteristics identified as positively or negatively affecting SMR deployment, at both the country level and across Europe as a whole, were derived from the interview data using the Gioia methodology. This methodology is a systematic, widely used approach to qualitative research designed to bring analytical rigour.[8] At first, interview-centric "first-order concepts" were coded directly from interview transcripts, staying close to the interviewees' own language and meaning; these were then grouped into researcher-interpreted "second-order themes," and finally distilled into a smaller number of overarching "aggregate dimensions". The analysis was hybrid rather than purely inductive or purely deductive: the categories developed during coding were not "fixed," so unexpected themes and country-specific findings could emerge from the data. This focused on the following topics: national starting conditions, electricity demand, regulatory readiness, government support, project financing and bankability, supply-chain and workforce capability, public acceptance, and European coordination. This process progressed both within each country case and across the four-country sample, producing the country-level and cross-country data structures that underpin the qualitative findings presented in this report.

Ultimately, these two sources (literature and interviews) also feed a quantitative analysis, built using the INCAS techno-economic discounted cash flow model.[9] Country-level simulations compare financing arrangements within each deployment scenario. A separate EU-wide analysis quantifies how fleet size and co-siting affect the modelled levelised cost of electricity. Taken together with the interviews, these analyses identify potential benefits and enabling conditions for coordinated deployment; they do not isolate every cross-border governance effect in a single matched counterfactual.

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[8] Gioia, D. A., Corley, K. G. & Hamilton, A. L. Seeking Qualitative Rigor in Inductive Research: Notes on the Gioia Methodology. Organizational Research Methods 16, 15–31 (2013). https://doi.org/10.1177/1094428112452151; Gioia, D. A. A Systematic Methodology for Doing Qualitative Research. Journal of Applied Behavioral Science 57, 20–29 (2021). https://doi.org/10.1177/0021886320982715; Magnani, G. & Gioia, D. A. Using the Gioia Methodology in International Business and Entrepreneurship Research. International Business Review 32, 102097 (2023). https://doi.org/10.1016/j.ibusrev.2022.102097

[9] S. Boarin et al., INCAS Manual V2.0-b0, 2012 https://ia903104.us.archive.org/11/items/manualzilla-id-6881012/6881012.pdf

SECTION 2

Case studies: single country

2.1 Introduction

This part covers four countries: France, Czech Republic, Sweden and Poland. They are not a representative sample of the EU, but together they span the starting positions an SMR programme must work from. France is the continuity case: the largest fleet in Europe, with 57 power reactors supplying 67% of national generation, with a committed large-reactor renewal (EPR2). As such, SMRs are treated mainly as additional capacity and as an export product. Czech Republic and Sweden are renewal cases: both operate ageing fleets that will reach the end of their assumed operating life within the study horizon; both have already selected an SMR technology to renew that capacity, with Czech Republic also using SMRs to repower coal sites. Poland is the first-build case: no operating nuclear power reactor today, and a large-reactor and an SMR programme starting in parallel. Each single-country case study is organised in the same four parts:

- **Brief introduction:** population, GDP and natural resources; the existing fleet and the announced new-build programmes; the utilities and the regulator.
- **Orderbook:** electricity production and consumption, the expected demand and nuclear generation trends, the large-reactor and SMR capacity announced or proposed, and district heat.
- **Supply chain readiness:** the industrial base available to deliver that capacity. An overview of the national programmes, the structure of the manufacturing and contracting tiers, and the country-specific constraints on fuel and enrichment, workforce, regulatory capacity, financing. Public sources are complemented by interview evidence.
- **Financial assessment:** the quantitative part. Low, medium and high deployment trends; the optimistic and conservative cost pairs applied to Overnight Capital Cost (OCC) and Operation and Maintenance (O&M) cost; the financing and funding options available in the country plus the common “supported” option; and the resulting LCOE.

Three concepts recur across the country and EU-level analysis: demand (whether enough orders are aggregated to reach fleet scale), technology concentration (whether that demand converges on a limited number of designs rather than dispersing across many), and supply-chain depth (whether the industrial base, i.e., manufacturing, workforce, licensing capacity, can actually deliver the resulting pipeline). Each case study and the cross-country synthesis return to these three dimensions. The simulations are based on INCAS, a discounted cash flow model, described in the Appendix.

2.1.1 Common assumptions

The following assumptions are held identical across the four countries, so that any difference in the results is attributable to national conditions rather than to modelling choices.

- **Real terms.** All cash flows, rates and prices are in real terms. The reason is that the assets modelled operate for 60 years and carry debt for up to 40, and a nominal model over that horizon would embed an uncertain inflation forecast. Working in real terms also makes four countries with different inflation directly comparable, and it allows the LCOE to be read against a real strike price without further adjustment. Nominal rates are converted using the exact Fisher relation (see the modelling convention in the Appendix).
- **Tax.** The corporate tax rate is set to zero in all runs. This isolates the financing and cost effects from four different national tax regimes, which would otherwise move the results for reasons unrelated to the SMR programmes.
- **Currency.** All monetary values are in 2026 EUR. Source amounts are converted using the exchange rates in the modelling convention in the Appendix.
- **Unit capacity.** The SMR unit is 400 MWe in every country and every trend. Some countries have expressed interest in differently sized units; where that is the case, the announced capacity is approximated using a whole number of generic 400 MWe units; the country scenarios disclose the resulting capacity and any departure from the announced figure.

- **Load factor and operating life.** The load factor is assumed at 90% in every country and trend, and it is also used for demand comparisons and avoided emissions calculation. Similarly, a 60-year operating life is assumed for both existing and new units. This sets which existing reactors retire within the study horizon and therefore how much capacity the replacement programmes (under different deployment trends) must cover.
- **Construction schedule.** The first unit of a national programme takes 7 years to be built. Units 2-6 take 6 years, and every unit after the 6th takes 4.5 years. Construction of each unit starts 2 years after the previous one at the same site. Construction of the first unit at a second site starts once the first unit at the preceding site is complete; where a programme (for implementing a specific deployment trend) uses more than two sites, later sites may run in parallel.
- **Deployment trends.** Each country has a low, medium and high trend, built from published energy programmes, fleet data, and interview outcomes. France and Sweden are divided into two parts, because in both countries the choice between replacing retiring large reactors with large reactors or with SMRs changes the scale of deployment: the new-capacity trends (low, medium, and high), in which SMRs supply only additional new capacity, and the replacement trends (low, medium, and high), in which SMRs also take over part of the retiring capacity.
- **Cost pairs.** An optimistic and conservative value is applied to the OCC and to the O&M cost. Fuel cycle costs are escalated between the two, while D&D costs are held equal in both. The derivation of the country's values is reported in the technology costing part of the Appendix.
- **Scenario.** A scenario is one full simulated combination of a deployment trend, a cost pair, and a financing option.
- **Reporting the results.** Every results part reports the LCOE against two benchmarks: the national wholesale average price for the reference year, and/or the strike price assumed in the financing options. Moreover, the LCOE results are followed by the estimation of the avoided emissions against fossil fuel production.

2.1.2 Financing options

Most inputs are national: deployment trends from published energy programmes and fleet data, costs from the technology literature, and financing terms from the financial structures of the plants in operation and of the projects proposed in each country. Where possible they are cross-checked against the supply chain part, which reflects interview evidence on industrial capacity, schedules and cost drivers. Each country is then simulated under the financing options that exist or are proposed domestically, plus one option common to all four. The domestic options differ in number and nature because they reflect what each country has done or proposed. The common option is called "supported" because each of its components is a public support instrument already used or proposed elsewhere in the EU. Table 1 summarises the mechanisms identified across the four countries; not all of them are simulated.

Table 1: Possible financial mechanisms, at country/project level, for supporting the construction of nuclear power plants, with * denoting proposed projects

Mechanism	Country	Applied to nuclear	Impact on financing	Impact on funding
Concessional state loan	CZ, FR	Dukovany 5, approved 2024*; EPR2*	Cost of debt near zero during construction; 98:2 gearing; 30 to 40 years	The state balance sheet supplies the capital. No revenue stream is created
State guarantee on debt	PL	Approved 2025*	Cost of debt compressed towards the sovereign yield, but not to zero	Private lenders supply the capital against a state promise
Direct state equity	PL, FR, CZ	State-owned utilities throughout; 30% state share in Poland*	Lowers the cost of equity only where it changes the risk borne by the residual equity	The state budget supplies part of the equity
Two-way CfD	FR, PL, SE	EPR2*; Poland*; Swedish enabling law, 2025*	Removes price risk	Secures the revenue stream for the contract term at the strike price
Long-term PPA with a state off-taker	CZ	Dukovany, 40 years, state purchaser resells at least 70% of output on organised markets*	Revenue certainty equivalent to a CfD	Secures the revenue stream through a state-owned buyer
Mankala, cost-price cooperative	SE	Proposed*	Equity return near zero by design; debt raised on shareholder covenants	Shareholders commit to take the output at cost, which secures the revenue
Prepaid industrial contract	FR	Exeltium	Demand-side prepayment, not project debt	Consumers advance the capital against future deliveries

Public support towards a nuclear project (e.g., a subsidised loan, a state guarantee, an equity injection, or a Contract for Difference, CfD) may constitute state aid: it must be notified to the European Commission and cannot be granted before approval (article 108).[10] Since the 2024 electricity market reform, where a Member State grants direct price support to a new nuclear investment, that support must take the form of a two-way CfD or an equivalent scheme (article 19d). For qualifying direct price-support schemes for new generation, the EU electricity-market-design rules require two-way CfDs or equivalent schemes for contracts concluded from 17 July 2027.[11]

Three consequences follow. First, from that date, qualifying direct price support must use a two-way CfD or an equivalent scheme with the same effects; this does not prohibit commercial power purchase agreements or other forms of support outside that provision. Second, strike price and duration are not free variables, since aid is limited to the minimum necessary to close the project's funding gap and the contract length must be proportionate to the investment. Third, the notification and approval process adds timeline uncertainty and is itself a project risk, since neither the duration nor the outcome of a Commission state-aid review is guaranteed in advance.

[10] European Union. Consolidated Version of the Treaty on the Functioning of the European Union. Official Journal of the European Union (2016). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:12016E/TXT

[11] European Union. Regulation (EU) 2024/1747. Official Journal of the European Union (2024). https://eur-lex.europa.eu/eli/reg/2024/1747/oj

An earlier nuclear state-aid precedent, Hinkley Point C, took about ten months to clear its formal investigation (opened December 2013, approved October 2014[12] and then remained under legal challenge until the Court of Justice's final ruling in September 2020.[13] The EU is also a potential source of support, but the instruments currently in place reach research, innovation, manufacturing supply chain, and fuel-cycle capacity rather than construction-phase debt for a fleet. The supported option below is therefore a bounding case: it prices an EU credit instrument that does not yet exist in the form modelled.

2.2 The "supported" financial option

The national financing options are each built on what that country has already done in the past or proposed. The supported option applies one identical financing package to all four countries. OCC, schedule, learning rate, load factor, operating and fuel costs, and the deployment trends are held equal to the corresponding national financing option, so the difference between the two runs measures the financing contribution alone. The option exists for two reasons:

- **To compare.** The national options are not comparable one with another. They differ in gearing from 60:40 to 98:2, in tenor from 30 to 40 years, and in whether a merchant structure exists in the country. A national result therefore mixes the effect of national conditions with the effect of the instrument that country happens to have adopted. Holding the financing package identical across the four countries separates the two effects and leaves the sovereign borrowing basis as the only financing variable that differs.
- **To benchmark.** The supported option sets a lower bound on what financing can contribute, so that the remaining distance to a viable LCOE is attributable to construction cost, schedule and fleet size rather than to the cost of capital.

The "supported" option is built from separable components and it is further described in the Appendix:

- **EU completion-and-payment guarantee** covering 80% of senior debt. The remaining 20% is priced at the national sovereign yield, which is what leaves any residual difference between the four countries. The 80% coverage level is calibrated against the Polish state guarantee approved in 2025, which covers 100% of the debt; 80% is used to keep a residual national basis in the pricing.
- **Euro-denominated senior debt** priced off the EU/EIB (European Investment Bank) benchmark of 0.56% real, plus a credit margin of 0.75%, with a repayment period of 40 years from commercial operation.
- **Two-way indexed** CfD at a strike price stated for each country.
- **Patient public equity tranche** taking half the equity at 3.0% over the cost of debt, against 5.8% for the private half, giving a blended equity premium of 4.4% common to the four countries. A common equity premium is used rather than four country-specific ones so that the equity leg does not reintroduce the cross-country differences this option is designed to remove. The patient public equity tranche is mapped to the state equity participations in Poland and Czech Republic.
- **Conditionality:** a single design licensed in at least two Member States and a committed multi-country SMR orderbook. The package applies to a fleet, not to a single site/plant.
- The package includes **no capital grant and no cover for cost overruns**, which remain with the project. It is the same whether SMRs are deployed as new capacity or as replacements for retiring large reactors, so the deployment variants in France and Sweden change the scale of EU exposure but not the rates.

Each country is simulated with and without the EU guarantee, so that its effect is isolated: only the coverage changes between the two runs, from 80% to zero, which produces a parallel shift in both the cost of debt and the cost of equity with no interaction term.

[12] European Commission, "Commission Decision (EU) 2015/658 of 8 October 2014 on the State aid SA.34947 (2013/C) (ex 2013/N) which the United Kingdom is planning to implement for support to the Hinkley Point C nuclear power station," 2014, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015D0658

[13] Court of Justice of the European Union, "Judgment of the Court (Grand Chamber), Republic of Austria v European Commission, Case C-594/18 P," 2020, https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:62018CJ0594

Table 2: Impact of different EU guarantees on financial costs across countries

WACC is the weighted average cost of capital, combining the returns required by lenders and shareholders; D:E is the debt-to-equity financing ratio. Real financing is assumed.

	France	Czech Republic	Sweden	Poland
National real sovereign yield [%]	2.03	3.15	2.15	2.80
Without EU guarantee: cost of debt [%]	2.78	3.90	2.90	3.55
Without EU guarantee: cost of equity [%]	7.18	8.30	7.30	7.95
Without EU guarantee: WACC [%]	3.66	4.78	3.78	4.43
With EU guarantee: cost of debt [%]	1.60	1.83	1.63	1.76
With EU guarantee: cost of equity [%]	6.00	6.23	6.03	6.16
With EU guarantee: WACC [%]	2.48	2.71	2.51	2.64
D:E	80:20	80:20	80:20	80:20
Debt repayment [years]	40	40	40	40

The package puts the cost of debt in a 1.6–1.8% band and the Weighted Average Cost of Capital (WACC) in a 2.48–2.71% band, against costs of debt of 2.6–4.2% and capital structures from 60:40 to 98:2 in the national options. The residual 0.23% of spread between countries is the unguaranteed fifth of the sovereign basis, derived in Appendix E. The scale of the EU guarantee can be estimated. The guarantee is priced per fleet, so its scale depends on how many units the four countries build together. Two capacity paths are reported. The new-capacity path takes the new-capacity trends of France and Sweden; the with-replacement path also takes their replacement trends. The Czech Republic and Poland are the same in both. Values are given as optimistic / conservative, following the two cost pairs.

Table 3: Scale of the EU guarantee: unit counts, capital cost, guaranteed exposure, and provisioning by deployment path

Quantity	New capacity: low	New capacity: medium	New capacity: high	With replacement: low	With replacement: medium	With replacement: high
Units, total	13	32	59	31	73	127
Capacity	5.2 GWe	12.8 GWe	23.6 GWe	12.4 GWe	29.2 GWe	50.8 GWe
Fleet multiplier on First-Of-A-Kind (FOAK) OCC	0.78	0.74	0.71	0.74	0.70	0.68
Capital cost, K	€ 34 / 45 bn	€ 80 / 108 bn	€ 143 / 191 bn	€ 80 / 100 bn	€ 179 / 225 bn	€ 302 / 382 bn
Guaranteed exposure, G	€ 22 / 29 bn	€ 51 / 69 bn	€ 91 / 122 bn	€ 51 / 64 bn	€ 114 / 144 bn	€ 194 / 244 bn
Provisioning at the InvestEU rate	€ 9 / 11 bn	€ 21 / 28 bn	€ 37 / 49 bn	€ 21 / 26 bn	€ 46 / 58 bn	€ 77 / 98 bn

Units are the sum of the four countries' deployment trends. K = Σ (units × 400 MWe × country OCC, Tables 7, 13, 21, 27) × fleet multiplier. G = 64% of K (80% debt, 80% of it covered by the guarantee). Provisioning = 40% of G (InvestEU rate).

Whatever the expected payout on such a guarantee, the binding constraint is the accounting treatment. At the InvestEU provisioning rate of 40% of guaranteed exposure,[14] the guarantee requires € 9–49 bn of cash set aside on the new-capacity path and € 21–98 bn on the with-replacement path, whether it is ever called. Euratom lends rather than guarantees and requires no upfront provisioning, but its lending ceiling of € 4 bn is 7 to 38 times too small on the new-capacity path and 16 to 76 times too small with replacement, and that ceiling is set by Council Decision.[15] The six backstop mechanisms, which of them are modelled here, and the existing EU instruments are described in Appendix E. Under the current InvestEU Regulation, the guarantee cannot support "the decommissioning, operation, adaptation or construction of nuclear power stations"; research and innovation activities are not covered by this exclusion.[16,17] Direct reactor-construction support would require another instrument or legislative change.

[14] European Union. Regulation (EU) 2021/523 Establishing the InvestEU Programme. Official Journal of the European Union (2021). https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021R0523

[15] European Commission. Euratom: The EU as a Borrower. https://commission.europa.eu/strategy-and-policy/eu-budget/eu-borrower-investor-relations/euratom_en

[16] European Union. Regulation (EU) 2021/523 Establishing the InvestEU Programme. Official Journal of the European Union (2021). https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021R0523

[17] European Commission. Strategy for the Development and Deployment of Small Modular Reactors (SMRs) in Europe. COM(2026) 117 final (10 March 2026). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52026DC0117

2.3 FRANCE - "The Continuity case"

2.3.1 Brief introduction

France has a population of approximately 69.1 million (1 January 2026, INSEE)[18] and a GDP of € 2,970 billion (2025, World Bank data).[19] France's main natural resources are coal, iron ore, bauxite, timber, zinc, potash, and extensive fertile agricultural land.[20] France is Europe's nuclear continuity case, with the largest nuclear fleet in Europe,[21] built domestically by Framatome.[22] French reactor authorisations are not granted for a fixed operating duration; continued operation is subject to periodic safety reviews.[23] Electricité de France (EDF)'s Grand Carénage programme funds the periodic safety reviews and component replacement needed to extend operation, and the regulator (ASN at the time of the decision) has progressively cleared reactors to run beyond 40 years, with Tricastin 1 the first unit to do so, in 2023.[24] The government has also asked EDF to study extending operation beyond 60 years.[25] France's 2026-2035 energy programme (PPE3) projects continued growth in both electricity consumption and nuclear output through 2035.[26]

Utility: EDF is 100% French-state owned since the state's € 9.7 billion buyout completed in June 2023; operates the full 57-reactor fleet, delivered the EPR in Flamanville, and is developing both the EPR2 large-reactor programme and the Nuward SMR.[27]

Regulator: Autorité de sûreté nucléaire et de radioprotection (ASNR). Created in 2024 and operational since 1 January 2025, it merges the former safety authority ASN (Autorité de sûreté nucléaire) with the technical support institute IRSN (Institut de Radioprotection et de Sûreté Nucléaire). It is an *autorité administrative indépendante:* part of the State, independent of government and operators, funded from the budget rather than by licensee fees.[28]

2.3.2 Demand orderbook

France is the continuity case, with 57 nuclear power reactors, including Flamanville 3 that achieved first grid connection in December 2024, reached full power in December 2025, and commissioning and start-up testing continued thereafter.[29] The total gross electricity production was 547.5 TWh in 2025,[30] while the net electricity consumption (weather/calendar adjusted) was 451 TWh the same year.[31] These values differ because of imports, exports, and losses. The total French capacity is 155.5 GWe, and 39.5% of it (61.4 GWe excluding Flamanville; with it, 63.0 GWe) is nuclear.[32] Nuclear represents 67% of the total electricity production, 361.7 TWh in 2024.[33]

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18 INSEE. Bilan démographique 2025 (Insee Première n° 2087). 2026. https://www.insee.fr/fr/statistiques/8719824

19 Trading Economics. France GDP. https://tradingeconomics.com/france/gdp

20 Central Intelligence Agency. France. The World Factbook (archived copy). https://user.iiasa.ac.at/~marek/fbook/00/geos/fr.html

21 International Atomic Energy Agency. Country Nuclear Power Profiles: France. (IAEA, 2025). https://cnpp.iaea.org/public/countries/FR/profile/preview

22 World Nuclear Association, *Nuclear Power in France* (2026), https://world-nuclear.org/information-library/country-profiles/countries-a-f/france

23 Autorité de sureté nucléaire et de radioprotection. Annual Report 2021, p. 26. https://regulation-oversight.asnr.fr/annual_report/2021gb/26/

24 ASN. Poursuite de fonctionnement du réacteur 1 de la centrale nucléaire du Tricastin. 2023. https://reglementation-controle.asnr.fr/information/archives-des-actualites/poursuite-de-fonctionnement-du-reacteur-1-de-la-centrale-nucleaire-du-tricastin

25 Élysée. Conseil de politique nucléaire. 2023. https://www.elysee.fr/emmanuel-macron/2023/02/03/conseil-de-politique-nucleaire

26 Ministère de l'Économie et des Finances. Stratégie française pour l'énergie et le climat 2026-2035 (Programmation pluriannuelle de l'énergie, PPE3). (2025). https://www.economie.gouv.fr/files/files/2026/ppe3.pdf?v=1770958215

27 EDF Group. The French State Becomes the Sole Shareholder of EDF Again. https://chile.edf.com/en/news/the-french-state-becomes-the-sole-shareholder-of-edf-again

28 Autorité de sûreté nucléaire et de radioprotection. ASNR. https://www.asnr.fr/

29 International Atomic Energy Agency. Country Nuclear Power Profiles: France. (IAEA, 2025). https://cnpp.iaea.org/public/countries/FR/profile/preview

30 International Atomic Energy Agency. Country Nuclear Power Profiles: France. (IAEA, 2025). https://cnpp.iaea.org/public/countries/FR/profile/preview

31 RTE. Electricity Analysis and Data: Consumption. (2026). https://analysesetdonnees.rte-france.com/en/consumption/consumption-global

32 International Atomic Energy Agency. Country Nuclear Power Profiles: France. (IAEA, 2025). https://cnpp.iaea.org/public/countries/FR/profile/preview

33 International Atomic Energy Agency. Country Nuclear Power Profiles: France. (IAEA, 2025). https://cnpp.iaea.org/public/countries/FR/profile/preview

Table 4: Nuclear Energy demand outlook – France

Demand outlook	Value
Electricity consumption today	451 TWh (weather/calendar adjusted, 2025)
PPE3 consumption projection for 2030	507 TWh (+12%)
PPE3 consumption projection for 2035	534 TWh (+18%)
Nuclear share of generation today	67%
PPE3 nuclear output target for 2035	380–420 TWh

France has expressed interest in both large and small reactors:[34]

- **Large reactors.** In 2022, 6 new reactors were announced by 2050. The possibility of 8 additional reactors is supported by SMR deployment. EDF proposed 3 pairs of EPR2 at Penly, Gravelines, and Bugey. Additional studies regarding Tricastin and Blayais sites. It is also reported that France aims to build 14 EPRs by 2050.[35]
- **Small reactors.** Nuward plant was expected to have 2×170 MWe reactors, but in 2024, EDF stated that it would optimise Nuward design. Now single unit is expected to provide 400 MWe and offer a cogeneration option up to 115 MWth.[36,37]

The 2026-2035 energy programme[38] reports France's electricity consumption trends and nuclear production trends to 2030 and 2035. Electricity consumption is expected to grow to around 507 TWh (+12%) in 2030 and around 534 TWh (+18%) in 2035. Nuclear energy production is expected to be around 380-420 TWh (+5-15%) in the same period.[39] Assuming a 90% capacity factor, this increase would require an additional nuclear capacity of around 2.3 GWe (for 380 TWh) and 7.4 GWe (for 420 TWh). These are separate projections from the expected Nuward and EPR2 deployment, which are supposed to be connected to the grid after 2035.

France's district heating sector is comparatively small relative to Central/Eastern Europe, and France (with Sweden) hosts two-thirds of Europe's district cooling networks. The Paris network (Fraîcheur de Paris) is set to triple in length by 2042.[40]

2.3.3 Supply chain readiness

France's supply chain position reflects its "continuity" starting point: the strongest domestic nuclear manufacturing base in Europe, and a state-owned utility, EDF, developing two build tracks in parallel – a large-reactor renewal (EPR2) and a smaller, export-oriented SMR/AMR one. However, an established supply chain does not automatically guarantee new-build performance.

34 World Nuclear Association. France. World Nuclear Outlook Report (2026). https://world-nuclear.org/our-association/publications/world-nuclear-outlook-report/france---world-nuclear-outlook-report

35 Nuclear Energy Agency. Nuclear Energy Outlook: Global Installed Capacity to 2050 and Beyond. (OECD Publishing, Paris, 2026). https://www.oecd-nea.org/jcms/pl_119893/nuclear-energy-outlook-global-installed-capacity-to-2050-and-beyond?details=true

36 World Nuclear News. French-Italian Industrial Partnership for Nuward SMR Development. (2025). https://world-nuclear-news.org/articles/french-italian-industrial-partnership-for-nuward-development

37 World Nuclear News. EDF to modify Nuward design to aid commercialisation. 2024. https://www.world-nuclear-news.org/articles/edf-to-modify-nuward-design-to-aid-commercialisati

38 Ministère de l'Économie et des Finances. Stratégie française pour l'énergie et le climat 2026-2035 (Programmation pluriannuelle de l'énergie, PPE3). (2025). https://www.economie.gouv.fr/files/files/2026/ppe3.pdf?v=1770958215

39 Ministère de l'Économie et des Finances. Stratégie française pour l'énergie et le climat 2026-2035 (Programmation pluriannuelle de l'énergie, PPE3). (2025). https://www.economie.gouv.fr/files/files/2026/ppe3.pdf?v=1770958215

40 Euroheat & Power. District Heating and Cooling in Europe: The Share of Renewable Energy. (via IIF-IIR). https://iifiir.org/en/news/district-heating-and-cooling-in-europe-the-share-of-renewable-energy

Overview

France's large-reactor programme includes six EPR2 units at Penly, Gravelines and Bugey (≈10GW) and a provisional cost cap of € 72.8 billion (2020 values) and commissioning targeted for 2038-2044.[41] The financing package consists of a subsidised state loan covering at least half of construction costs, a 40-year Contract for Difference, and a state/EDF risk-sharing mechanism.[42] The package was submitted to the European Commission in November 2025, which opened a state-aid investigation in March 2026.[43] Alongside EPR2, the France 2030 plan, launched in October 2021, allocated € 1 billion to the development of innovative nuclear reactors, including € 500 million for the Nuward SMR and € 500 million for new innovative reactor concepts.[44] The programme targeted concepts foresee cogeneration of electricity, heat and/or hydrogen; fuel-cycle closure; waste reduction; improved competitiveness; and safety and security across both fission and fusion. The programme has subsequently supported developers including Jimmy, which is developing a microreactor for industrial heat and received € 40 million of renewed public support as part of an € 80 million financing package in 2026, and Calogena, a Gorgé Group subsidiary developing a small reactor for district heating, which announced nearly € 100 million in funding in 2026, including a € 48 million France 2030 grant.[45,46,47]

On regulatory cooperation, Nuward has been the subject of a Joint Early Review since 2022, led by France's ASNR with the Czech (SÚJB) and Finnish (STUK) regulators; a second phase, completed in December 2025, added Sweden (SSM), Poland (PAA) and the Netherlands (ANVS), bringing the total to six national regulators, with a third phase launched in January 2026.[48]

Interview evidence complements this public information. French interviewees across financial, professional-association, utility backgrounds and independent nuclear experts converge on describing France as a "continuity" case in which SMRs are treated mainly as an export and demonstration product, secondary to the domestic EPR2 construction. The recurring theme in these interviews is that a French SMR must be built and proven at home before it can be sold abroad. On Nuward specifically, interviewees describe it as bringing Italian and Belgian manufacturers into its supply chain, and separately also building industrial ties in Poland, a form of local-content commitment often used to strengthen a vendor's case with a prospective buyer country.

Structure

The core of France's heavy-manufacturing base is Framatome's Le Creusot forge, equipped with 11,300-tonne and 9,000-tonne hydraulic presses and 16 furnaces capable of accommodating components weighing up to 600 tonnes and heating them to temperatures of 1,300°. One interviewee from outside France stressed that, however, even EDF/France (Europe's most capable nuclear industrial base) still might need to source large components from outside Europe.

More broadly, the French nuclear supply chain today comprises around 2,000 companies employing roughly 250,000 people, with the industry association GIFEN (Groupement des Industriels Français de l'Énergie Nucléaire) targeting growth to 300,000 full-time-equivalent professionals by 2035.[49]

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41 World Nuclear News. EDF Estimates EPR2 Programme Costs at €72.8 Billion. (December 2025). https://www.world-nuclear-news.org/articles/edf-estimates-epr2-programme-costs-at-eur728-billion

42 In this report's modelling, the loan is priced off France's 10-year sovereign bond yield (3.87% nominal, 2.03% real, July 2026) and repaid over 40 years, matched to the CfD term (see Appendix).

43 World Nuclear News. EC Launches Investigation into French Nuclear Funding. (March 2026). https://www.world-nuclear-news.org/articles/ec-launches-investigation-into-french-nuclear-funding-plans

44 Nuclear Engineering International. Funding Boost for French SMRs. NEI Magazine (March 2026). https://www.neimagazine.com/news/funding-boost-for-french-smrs/

45 Gouvernement français. La nouvelle stratégie énergétique de la France. info.gouv.fr (May 2026). https://www.info.gouv.fr/actualite/la-nouvelle-strategie-energetique-de-la-france

46 Crédit Mutuel. Jimmy annonce un nouveau tour de table. Communiqué de presse (March 2026). https://www.creditmutuel.fr/fr/alliancefederale/presse/communiques-de-presse/jimmy-annonce-un-nouveau-financement-a-hauteur-de-80m-euros.html

47 Nuclear Engineering International. Funding Boost for French SMRs. NEI Magazine (March 2026). https://www.neimagazine.com/news/funding-boost-for-french-smrs/

48 World Nuclear News. Second Phase of Nuward Review Completed. (December 2025). https://www.world-nuclear-news.org/articles/second-phase-of-nuward-review-completed

49 Société française d'énergie nucléaire. French Nuclear Industry Match Report 2025. SFEN (2025). https://sfeninenglish.org/french-nuclear-industry-match-report-2025/

Interviewed experts explain why this scale of domestic manufacturing has not translated straightforwardly into new-build delivery confidence and identify a structural gap. One explicitly cited Flamanville (alongside the US's V.C. Summer/Vogtle and the UK's Hinkley Point C), which was delivered a decade after the original estimates and with significant cost overruns, as evidence that an established domestic supply chain built to maintain an operating fleet is not equivalent to one able to build new reactors. This is because of different components, different organisational structures, and, importantly, a different Engineering, Procurement, and Construction (EPC) role. The same interviewee's opinion is that Europe, including France, lacks a genuine nuclear systems integrator. The expert proposed a remedy – a dedicated European nuclear EPC entity, potentially a joint venture between a utility such as EDF and a major civil contractor. This was the interviewee's single highest-priority recommendation.

Moreover, experts expect SMR modularisation to shift complexity from on-site construction to off-site module assembly – an area where Europe currently has limited organisational capability, particularly in the nuclear sector. Interviewees hold differing views on this shift: some see it as a straightforward improvement, while others are more cautious, pointing to the complexity it introduces at the module-assembly stage.

On the French supply chain self-sufficiency, one interviewee explained that while France has identified more than 2,000 companies across its nuclear supply chain (amongst which a considerable percentage export goods and services), the lower tiers depend strongly on French neighbouring countries. The interviewee explained that specialised machine tools come "mostly from Italy", with Germany also cited as a source of components. Additionally, Nuward is also open to sourcing components in other countries, such as Italy and Belgium.

Notably, one interviewee described the industry's increasing use of Early Work Agreements (EWAs) as helpful. EWAs are established in early stages of the project, ahead of formal/large-scale procurement, and are cases where multiple potential suppliers are paid to work with the developer on construction plans and technical specifications before an order is placed. The interviewee cited this as the approach also used in the UK to adapt the civil-works construction method for a new site, noting that it helps build relationships and trust with suppliers.

Fuel enrichment and workforce

The interviewees also highlighted two more key factors related to the supply chain readiness of the country: fuel enrichment – i.e., the process of increasing the concentration of fissile uranium-235 to the level needed for reactor fuel – and the workforce needed for new build. Enrichment requires large, capital-intensive facilities that only a small number of countries operate: France is one of them.

Orano operates the Georges Besse II (GB-II) plant at Tricastin, which performs fuel enrichment and reached its full design capacity of 7.5 million Separative Working Units (SWU)[50] per year in 2016; in October 2023 Orano's board approved a roughly € 1.7 billion project to expand capacity by more than 30%, backed by a € 400 million European Investment Bank loan signed in March 2025, with initial production expected from 2028 and full commissioning by 2030.[51] On the topic of enrichment, French and Italian interviewees independently flagged enrichment capacity as an acute, geopolitically sensitive bottleneck, reporting that a joint EU-UK enrichment initiative remains several years from delivering meaningful capacity.

On workforce, GIFEN's 2025 MATCH report puts the sector's recruitment need at 100,000 full-time-equivalent roles over the next ten years, to reach a total of 300,000 FTEs by 2035 (implying that, against a current base of roughly 250,000, about half of the 100,000 recruits replace retiring staff rather than add capacity), with the fastest-growing demand in boilermaking (+140%) and civil engineering (+220%) rather than nuclear engineering itself.[52] Also, on the topic of workforce, an independent expert interviewee mentioned a considerably larger France-specific figure (roughly 200,000 people needed over 10 years, around 20,000 per year) than GIFEN's published, 10-year figure (roughly 10,000/year). The interviewee's figure might possibly reflect a broader definition (e.g., including adjacent sectors) than GIFEN's focus. Separately, two interviewees offered skills-gap considerations consistent with GIFEN's data: established-fleet countries such as France are seen as retaining deep specialist nuclear expertise while lacking more general industrial/conventional experience.

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50 The standard unit for measuring uranium enrichment capacity.

51 World Nuclear News. EU Funding for French Enrichment Plant Expansion. (March 2025). https://www.world-nuclear-news.org/articles/eu-funding-for-french-enrichment-plant-expansion

52 Société française d'énergie nucléaire. French Nuclear Industry Match Report 2025. SFEN (2025). https://sfeninenglish.org/french-nuclear-industry-match-report-2025/

2.3.4 Financial assessment

This part describes the nuclear scenarios simulated for France and the rationale behind them. Each scenario is a combination of 3 elements:

1. Nuclear Deployment Trends
   (How many SMRs are deployed over time).
2. Costing and Economics Values
   (Life cycle cost, Electricity Price).
3. Financing and Funding Options
   (how capital is raised and remunerated).

Nuclear Deployment Trends

Assuming the operating life of large reactors in France is capped at 60 years and a time horizon of 2050, all reactors connected to the grid before 1990 should be replaced in principle by 2050. 11 of the current 57 reactors were connected to the grid after 1990, for a total of 15.5 GWe.[53] France's deployment trends are then divided into two parts: in the first part, it is assumed that today's large reactor capacity will be replaced by large reactors by 2050, with SMRs only providing additional capacity; in the second part, SMRs could also replace the current large reactor fleet at the end of their operating life. In this way, six deployment trends emerge for France: three when SMRs are deployed only as new capacity, and three when SMRs act also as a replacement of large reactors.

Table 5: SMR deployment trends as new capacity – France

Site name	Nuclear capacity as of today	Deployment trends – SMRs as new capacity								
		Low			Medium			High		
		Existing reactors	New large reactors	New SMR capacity	Existing reactors	New large reactors	New SMR capacity	Existing reactors	New large reactors	New SMR capacity
Penly	2.8 GWe	2.8	0	0.4 SMR	2.8	0	3×0.4 SMRs	2.8	0	3×0.4 SMRs
Bugey	3.6 GWe	0	3.6	0	0	3.6	3×0.4 SMRs	0	3.6	3×0.4 SMRs
Gravelines	5.5 GWe	0	5.5	0	0	5.5	0	0	5.5	4×0.4 SMRs
Tricastin	3.6 GWe	0	3.6	0	0	3.6	0	0	3.6	4×0.4 SMRs
Blayais	3.6 GWe	0	3.6	0	0	3.6	0	0	3.6	4×0.4 SMRs
Other sites	42.3 GWe	12.7	29.6	0	12.7	29.6	0	12.7	29.6	0
Total nuclear capacity	61.4 GWe	61.8 GWe (15.5 GWe existing capacity, 46.3 GWe new capacity including 400 MWe new SMR)			63.8 GWe (15.5 GWe existing capacity, 48.3 GWe new capacity including 2.4 GWe new SMR)			68.6 GWe (15.5 GWe existing capacity, 53.1 GWe new capacity including 7.2 GWe new SMR)		
		1 SMR only, as demonstrator of the technology			Lower end of nuclear production trends (5%) achieved through SMRs			Higher end of nuclear production trends (15%) achieved through SMRs		

[53] International Atomic Energy Agency. Country Nuclear Power Profiles: France. (IAEA, 2025). https://cnpp.iaea.org/public/countries/FR/profile/preview

SMRs as new capacity

In these trends, the current large-reactor fleet will be replaced by large reactors by 2050 (assuming capacity is maintained), with SMRs also providing additional capacity. Three deployment trends are assumed, with illustrative SMR deployment siting, given the possible deployment support of SMRs:[54]

- **New capacity low trend.** Only a first 400 MWe unit is built on an existing site, assumed Penly, replicating Nuward deployment.[55]
- **New capacity medium trend.** Given the nuclear energy production trends[56] and the required additional capacity, this is assumed to derive from SMRs. For the medium scenario, 2.3 GWe of additional SMR capacity are considered (lower end of the 5-15% range).[57] These are achieved by the deployment of six 400 MWe SMRs (total of 2.4 GWe) in two sites, Penly and Bugey. This trend considers the deployment of three reactors on each site.
- **New capacity high trend.** In this trend, the higher end of new nuclear energy production,[58] is achieved through SMRs. The expected 7.4 GWe increase in capacity is achieved by deploying 18 SMRs of 400 MWe each (total 7.2 GWe capacity). The deployment in Penly and Bugey remains as in the medium trend. The additional reactors are deployed at Gravelines (4 units), Tricastin (4 units), and Blayais (4 units).

The deployment schedules follow the rules reported in the assumptions and are detailed in the Appendix.

54 World Nuclear Association. France. World Nuclear Outlook Report (2026). https://world-nuclear.org/our-association/publications/world-nuclear-outlook-report/france---world-nuclear-outlook-report

55 World Nuclear News. French-Italian Industrial Partnership for Nuward SMR Development. (2025). https://world-nuclear-news.org/articles/french-italian-industrial-partnership-for-nuward-development

56 Ministère de l'Économie et des Finances. Stratégie française pour l'énergie et le climat 2026-2035 (Programmation pluriannuelle de l'énergie, PPE3). (2025). https://www.economie.gouv.fr/files/files/2026/ppe3.pdf?v=1770958215

57 Ministère de l'Économie et des Finances. Stratégie française pour l'énergie et le climat 2026-2035 (Programmation pluriannuelle de l'énergie, PPE3). (2025). https://www.economie.gouv.fr/files/files/2026/ppe3.pdf?v=1770958215

58 Ministère de l'Économie et des Finances. Stratégie française pour l'énergie et le climat 2026-2035 (Programmation pluriannuelle de l'énergie, PPE3). (2025). https://www.economie.gouv.fr/files/files/2026/ppe3.pdf?v=1770958215

Table 6: SMR deployment trends as replacement of large reactors – France

Site name	Nuclear capacity as today	Deployment trend – SMRs as replacement of large reactors								
		Low			Medium			High		
		Existing reactors	New large reactors	New SMR capacity	Existing reactors	New large reactors	New SMR capacity	Existing reactors	New large reactors	New SMR capacity
Penly	2.8 GWe	2.8	0	0	2.8	0	3×0.4 SMRs	2.8	0	3×0.4 SMRs
Bugey	3.6 GWe	0	3.6	0	0	0	12×0.4 SMRs	0	0	12×0.4 SMRs
Gravelines	5.5 GWe	0	0	15×0.4 SMRs	0	0	14×0.4 SMRs	0	0	18×0.4 SMRs
Tricastin	3.6 GWe	0	3.6	0	0	0	9×0.4 SMRs	0	0	13×0.4 SMRs
Blayais	3.6 GWe	0	3.6	0	0	3.6	0	0	0	13×0.4 SMRs
Chinon-B	3.6 GWe	0	3.6	0	0	3.6	0	0	0	9×0.4 SMRs
Other sites	38.7 GWe	12.7	26.0	0	12.7	26.0	0	12.7	26.0	0
Total nuclear capacity	61.4 GWe	61.9 GWe (15.5 GWe existing capacity, 46.4 GWe new capacity including 6.0 GWe new SMR)			63.9 GWe (15.5 GWe existing capacity, 48.4 GWe new capacity including 15.2 GWe new SMR)			68.7 GWe (15.5 GWe existing capacity, 53.2 GWe new capacity including 27.2 GWe new SMR)		
		Around 10% of the current large reactor capacity is replaced by SMRs			Around 20% of the current large reactor capacity is replaced by SMRs			Around 30% of the current large reactor capacity is replaced by SMRs		

SMRs as replacement of large reactors

In these trends, the current fleet is partially replaced by SMRs at the end of the operating life, the new capacity will be covered by SMRs as well as presented in the previous trends. As per the previous trends, the deployment assumes illustrative sites:

- **Replacement low trend.** It is assumed that around 10% (or 6.1 GWe) of the current large reactor capacity is replaced by SMRs. This is achieved by considering the Gravelines site, and with the deployment of 15×0.4 GWe SMRs (6.0 GWe total) to replace the current large reactors. In this trend, the demonstrator discussed in the previous part is considered as new capacity in the Gravelines site.
- **Replacement medium trend.** It is assumed that around 20% (or 12.3 GWe) of the current large reactor capacity is replaced by SMRs. This is achieved with the replacement of the Gravelines, Bugey, and Tricastin sites' capacity. Bugey capacity is replaced with 9×0.4 GWe SMRs (plus the three SMRs considered additional capacity in the previous part, reaching a total of 12). Gravelines capacity is replaced with 14×0.4 GWe SMRs (5.6 GWe total). Tricastin capacity is replaced with 9×0.4 GWe SMRs (3.6 GWe total). Moreover, as in the previous part, the deployment of 3×0.4 GWe SMRs in Penly is considered as additional capacity.
- **Replacement high trend.** It is assumed that around 30% (or 18.4 GWe) of the current large reactor capacity is replaced by SMRs. This is achieved with the replacement of the Gravelines, Bugey, Tricastin, Blayais, and Chinon-B sites capacity. Bugey capacity is replaced with 9×0.4 GWe SMRs (plus the three SMRs considered additional capacity in the previous part, reaching a total of 12 as in the medium trend). Gravelines capacity is replaced with 14×0.4 GWe SMRs plus 4 additional units as increased capacity (as in the previous part), reaching a total of 18 units. Tricastin and Blayais capacity is replaced with 9×0.4 GWe SMRs each, plus 4 additional units as increased capacity each (as in the previous part), reaching a total of 13 units. Chinon-B capacity is replaced with 9×0.4 GWe SMRs. Moreover, as in the previous part, the deployment of 3×0.4 GWe SMRs in Penly is considered as additional capacity.

The full deployment schedules are detailed in the Appendix.

Costing and economic values

The OCC of a nuclear plant is largely country-specific, varying because of construction know-how and delays, but also because of labour costs, supply chain maturity, commodity and equipment prices, and regulations. The OCC for a 400 MWe SMR in France is estimated in two ways, reported in the Appendix.

O&M costs could be, in general, considered 15-30 €/MWh.[59,60] These values are maintained for France's simulations. Fuel-cycle costs are € 9/MWh in the optimistic case and € 12/MWh in the conservative case. Decommissioning costs are held at € 2/MWh in both.

Table 7: OCC input assumptions, optimistic and conservative – France

Input	Optimistic value	Conservative value	Reference
OCC [€/kWe]	8,965	10,758	See Appendix
O&M [€/MWh]	15	30	See Appendix
Fuel cycle [€/MWh]	9	12	Based on[61,62]
D&D [€/MWh]	2		Based on[63]

Refer to footnotes below for the citations used in the table.

59 Idaho National Laboratory. Nuclear Energy Cost Report. (INL, Idaho Falls, ID, 2026). https://inldigitallibrary.inl.gov/content/uploads/50/2026/04/Sort_107010.pdf

60 Office of Scientific and Technical Information. Economic and Market Assessment of Small Modular Reactors. (US Department of Energy). https://www.osti.gov/biblio/1167545/

61 Idaho National Laboratory. Nuclear Energy Cost Report. (INL, Idaho Falls, ID, 2026). https://inldigitallibrary.inl.gov/content/uploads/50/2026/04/Sort_107010.pdf

62 MIT Center for Advanced Nuclear Energy Systems. Total Cost Projection of the Next AP1000. (MIT CANES, Cambridge, MA, 2024). https://canes.mit.edu/media/2024-total-cost-projection-of-next-ap1000

63 Idaho National Laboratory. Nuclear Energy Cost Report. (INL, Idaho Falls, ID, 2026). https://inldigitallibrary.inl.gov/content/uploads/50/2026/04/Sort_107010.pdf

Moreover, the simulations require additional France's data. In particular:

- Electricity price (2025 average): € 62.91/MWh[64]
- Inflation (June 2026): 1.8%[65]
- 10-year government bond yield (July 2026): 3.87% nominal,[66] around 2.03% real.

Financing and funding options

Financial information is retrieved from past and proposed projects in France. Table 8 reports the financial data of the French fleet and the proposed 6 EPR2 reactors. Besides the D:E reported in Table 8, it is also possible to find that the Exeltium webpage mentions a debt ratio of 80-90%.[67]

Table 8: Financial structure of past and proposed nuclear projects – France

Plant	Size	Status	Financial structure	D:E	Cost of debt	Cost of equity	Electricity price
Fleet of 57 reactors	Between 900 and 1600 MWe	Operating, connected to the grid between 1978 (Bugey's PWRs) and 2024 (Flamanville-3)	Debt and equity from state ownership (EDF)	[68] reports value of 42–56% for debt ratio	4.25% by the Commission de Regulation de l'Energie (CRE) and 5.1% declared by EDF[69]	Pre-tax 14% by CRE and 13.5% by EDF[70]	Not reported
EPR2 (6 reactors)	6 EPR2 (1,670 MWe)	Proposed, first concrete expected in 2028	Subsidised construction loan (30 years) + 40 years CfD[71] capped at € 100/ MWh (2024 €)[72]	60% of the expected construction cost[73]	0% during construction, 1% over FR borrowing cost during operation (minimum 2%)[74]	n/a	Strike price € 100/MWh[75]

Refer to footnotes below for the citations used in the table.

64 Ember. European Wholesale Electricity Price Data. https://ember-energy.org/data/european-wholesale-electricity-price-data/

65 Trading Economics. Inflation Rate: Europe. https://tradingeconomics.com/country-list/inflation-rate?continent=europe

66 Trading Economics. France 10-Year Government Bond Yield. https://tradingeconomics.com/france/government-bond-yield

67 Exeltium. Le projet. https://www.exeltium.com/le-projet

68 Commission de régulation de l'énergie. Évaluation des coûts complets de production de l'électricité au moyen des centrales électronucléaires historiques pour la période 2026-2028. (CRE, Paris, 2025). https://www.cre.fr/fileadmin/Documents/Rapports_et_etudes/2025/Rapport_CRE_Couts_du_nucleaire.pdf

69 Commission de régulation de l'énergie. Évaluation des coûts complets de production de l'électricité au moyen des centrales électronucléaires historiques pour la période 2026-2028. (CRE, Paris, 2025). https://www.cre.fr/fileadmin/Documents/Rapports_et_etudes/2025/Rapport_CRE_Couts_du_nucleaire.pdf

70 Commission de régulation de l'énergie. Évaluation des coûts complets de production de l'électricité au moyen des centrales électronucléaires historiques pour la période 2026-2028. (CRE, Paris, 2025). https://www.cre.fr/fileadmin/Documents/Rapports_et_etudes/2025/Rapport_CRE_Couts_du_nucleaire.pdf

71 Information Technology and Innovation Foundation. Lessons from France's Nuclear Program. ITIF (2 September 2025). https://itif.org/publications/2025/09/02/lessons-from-frances-nuclear-program/

72 World Nuclear News. EDF May Get State Loan for Six New Reactors. (2025). https://www.world-nuclear-news.org/articles/edf-may-get-state-loan-for-six-new-reactors

73 European Commission. Commission Opens Formal State Aid Assessment of French Support to New Nuclear Programme. Press release (2026). https://ec.europa.eu/commission/presscorner/detail/en/ip_26_744

74 Information Technology and Innovation Foundation. Lessons from France's Nuclear Program. ITIF (2 September 2025). https://itif.org/publications/2025/09/02/lessons-from-frances-nuclear-program/

75 World Nuclear News. EDF May Get State Loan for Six New Reactors. (2025). https://www.world-nuclear-news.org/articles/edf-may-get-state-loan-for-six-new-reactors

It is likely that, for France, the deployment of SMRs would follow the already established financial process for large reactors. However, the deployment scenario expected for the six EPR2 reactors is also considered:

- **Exeltium-inspired option.** Based on the D:E values, it is selected a D:E of 85:15, as reported by the Exeltium webpage.[76] A cost of debt of 4.5% is between the CRE estimate and the EDF value and, similarly, a cost of equity of 14% is close to the two values. In real values, the cost of debt is set to 2.6% and the cost of equity to 12.0%. Given the proposed strike price for the EPR2 reactors, it is assumed an electricity price of € 105/MWh (from[77] adjusted to 2026 euros) and a debt repayment period of 30 years.
- **EPR2-inspired option.** A D:E ratio of 60:40, with a debt repayment period of 30 years, is selected.[78] The cost of debt is set to zero during construction and 3.0% during operation (1% over government yield).[79] The electricity price is set to the CfD strike price of € 105/MWh (from[80] adjusted to 2026 euros). The cost of equity is not reported for the EPR2 reactors and 10% is assumed.
- **Supported option.** See assumptions and Appendix for the full derivation:
  - **No EU guarantee.** The gearing ratio is set at 80:20 and repaid over 40 years. Electricity is sold under a CfD set to € 105/MWh (as in non-supported options). The cost of debt is the French real yield (2.03%) plus a credit margin of 0.75%, or 2.78% real. The cost of equity is built as a spread over the cost of debt. The spread is 4.4%, common to the four countries, see Appendix for the full derivation: the average of a private tranche requiring 5.8% (taking half the equity) and a public tranche requiring 3.0% (taking the remaining half of equity), i.e., the average of these two values is 4.4%. The cost of equity is therefore 2.78% + 4.4% = 7.18% (real).
  - **With EU guarantee.** In this option, an EU guarantee covers 80% of the senior debt, so the debt is priced at the 0.56% (real) EU benchmark, while the remaining 20% is priced at the French government yield (2.03%). This results in a cost of debt of 0.8*0.56% + 0.2*2.03% = 0.85% Considering a credit margin of 0.75%, the cost of debt becomes 1.60% (real). The cost of equity is computed considering a premium of 4.4% as above, reaching a value of 6.00% (real). The CfD strike price, the gearing, and the debt repayment period are maintained at € 105/MWh, 80:20, and 40 years, respectively.

76 Exeltium. Le projet. https://www.exeltium.com/le-projet

77 World Nuclear News. EDF May Get State Loan for Six New Reactors. (2025). https://www.world-nuclear-news.org/articles/edf-may-get-state-loan-for-six-new-reactors

78 European Commission. Commission Opens Formal State Aid Assessment of French Support to New Nuclear Programme. Press release (2026). https://ec.europa.eu/commission/presscorner/detail/en/ip_26_744

79 Information Technology and Innovation Foundation. Lessons from France's Nuclear Program. ITIF (2 September 2025). https://itif.org/publications/2025/09/02/lessons-from-frances-nuclear-program/

80 World Nuclear News. EDF May Get State Loan for Six New Reactors. (2025). https://www.world-nuclear-news.org/articles/edf-may-get-state-loan-for-six-new-reactors

Results

The following are the scenario results in terms of LCOE.

Table 9: LCOE simulation results by deployment trend – France

Values are whole fleet levelised electricity costs in €/MWh, expressed in real 2026 money.

		Deployment trends					
		Low		Medium		High	
		Optimistic	Conservative	Optimistic	Conservative	Optimistic	Conservative
SMRs as new capacity	Exeltium-inspired	92.56	123.86	83.91	113.51	77.51	105.82
	EPR2-inspired	106.34	140.40	100.10	132.93	99.35	132.02
	Supported – no EU guarantee	91.95	123.13	82.21	111.45	75.10	102.90
	Supported – EU guarantee	82.99	112.39	74.38	102.06	68.11	94.53
SMRs as replacement	Exeltium-inspired	76.40	104.48	72.07	99.28	69.78	96.54
	EPR2-inspired	99.65	132.39	94.70	126.42	93.76	125.31
	Supported – no EU guarantee	73.88	101.45	69.99	96.78	67.12	93.35
	Supported – EU guarantee	66.79	92.94	63.66	89.20	60.96	85.95

The French options are simulated at a strike price of € 105/MWh,[81] against a 2025 wholesale average of € 62.91/MWh.[82] In particular:

- **Exeltium-inspired option.** It fails the wholesale value everywhere but is below the strike test in nine cells of twelve: it is above the strike price in the conservative cases of the "new capacity" deployment trends, the ones with the least amount of SMR units deployed;
- **EPR2-inspired option.** The most expensive of the four, 13–34% above the Exeltium-inspired option despite carrying a subsidised state loan, and the only option that fails the strike test under optimistic costs in one cell. The cause is the capital structure: at 60:40, equity funds 40% of the asset, and an assumed 10% real cost of equity outweighs the zero-cost debt during construction;
- **Supported option without EU guarantee.** Only 1–4% below the Exeltium-inspired option. The gain is small because France already borrows cheaply: on a national basis the supported cost of debt is 2.78% real against 2.6% for the Exeltium structure, and the lower cost of equity, 7.18% against 12.0%, is partly offset by the reduction in gearing from 85:15 to 80:20;
- **Supported option with EU guarantee.** 9–13% below the Exeltium-inspired option and a further € 6–11/MWh below the same option on a national basis. It passes the strike test in eleven cells of twelve and is the only option to clear the wholesale average in any cell, at € 60.96/MWh in the high replacement trend under optimistic costs.

[81] World Nuclear News. EDF May Get State Loan for Six New Reactors. (2025). https://www.world-nuclear-news.org/articles/edf-may-get-state-loan-for-six-new-reactors

[82] Ember. European Wholesale Electricity Price Data. https://ember-energy.org/data/european-wholesale-electricity-price-data/

Read against the strike price, 35 of the 48 French configurations have an LCOE below the assumed strike price, however, read against the wholesale average, one is below as well. The difference between those two counts illustrates sensitivity to the revenue benchmark: it is not a stand-alone valuation of a CfD, and it is worth restating that the € 105/MWh strike is itself a policy choice.

The four levers can be ranked by the LCOE spread they generate:

- Moving from optimistic to conservative life-cycle costs is worth € 25–34/MWh and is the most consistent lever.
- Moving between financing options is worth € 23–39/MWh, but the top of that range is set entirely by the EPR2-inspired option: among the other three the spread is € 8–12/MWh.
- Moving from the new-capacity family to the replacement family is worth € 5–22/MWh, the effect being largest in the low trends.
- Moving from the low to the high trend is worth € 6–20/MWh within the new-capacity family and € 6–8/MWh within the replacement family.

Deployment therefore matters considerably in France because of the number of units. The French low new-capacity trend is a single demonstrator: it carries the full First-Of-A-Kind (FOAK) cost with no learning and no co-siting. **Once a trend contains enough units for the fleet effect to be realised, the marginal value of adding more decreases rapidly, and the difference between** 38 and 68 u**nits in the replacement family is worth only € 2–4/MWh.**

On France's own figures, adding an EU guarantee to the common supported package narrows the LCOE band by a further € 10.74/MWh at the top of the range, a gain from financing coordination, not from a different reactor, from € 123.13 to € 112.39/MWh. The full change from the highest domestic-financing result, € 140.40/MWh, is € 28.01/MWh. The avoided emissions are estimated with the method reported in the Appendix. In 2024, the French energy-industry total was 31.2 $MtCO_2eq$.[83]

In the new-capacity trends, the SMRs cover the growth in nuclear output projected by PPE3,[84] so gas is a plausible alternative. In the replacement family the SMRs substitute for retiring large reactors, and the fossil counterfactual applies only if that capacity would otherwise be replaced by gas or coal. The medium and high replacement figures exceed total French energy-industry emissions by a factor of two to six, which means they cannot be interpreted as displacement of the current domestic fossil fleet: France does not have, and under PPE3 does not plan, a fossil fleet of that size. Those figures are therefore a measure of the low-carbon generation preserved rather than of emissions displaced.

Table 10: Avoided emissions by deployment trend – France

Trend	Units	Output [TWh/year]	SMR emissions [$ktCO_2eq$/year]	Avoided vs gas [$MtCO_2eq$/year]	Avoided vs coal [$MtCO_2eq$/year]
New capacity, low	1	3.2	38	1.5	2.5
New capacity, medium	6	18.9	227	9.0	15.3
New capacity, high	18	56.8	681	27.1	45.9
Replacement, low	15	47.3	568	22.6	38.2
Replacement, medium	38	119.8	1,438	57.3	96.8
Replacement, high	68	214.4	2,573	102.5	173.3

[83] Citepa. Rapport Secten, édition 2026. (Citepa, 2026). https://www.citepa.org/le-rapport-secten-edition-2026-est-en-ligne/

[84] Ministère de l'Économie et des Finances. Stratégie française pour l'énergie et le climat 2026-2035 (Programmation pluriannuelle de l'énergie, PPE3). (2025). https://www.economie.gouv.fr/files/files/2026/ppe3.pdf?v=1770958215

2.4 CZECH REPUBLIC - "The Renewal case"

2.4.1 Brief introduction

Czech Republic has a population of 10.9 million (2025)[85] and a GDP of € 346.53 billion (2025, World Bank data). GDP grew 2.5% in 2025.[86] Czech Republic's main natural resources are hard coal, brown coal (lignite), kaolin, clay, graphite and timber.[87] Nuclear power is a central component of Czech Republic's electricity system and its long-term energy strategy. The country currently operates six PWRs at two sites,[88] built to Soviet VVER designs by Škoda Praha.[89] Czech Republic is expanding this base to reduce coal dependence and meet climate targets. Two APR-1000 units are proposed at Dukovany, with an option for two more at Temelín.[90]

Czech Republic has selected the Rolls-Royce SMR (470 MWe) as its SMR technology of choice, with Temelín and Tušimice as its lead sites, the latter a coal plant due for decommissioning.[91] Additional coal-repowering sites have been identified as potential future nuclear locations.[92] Government statements on the future nuclear share have grown progressively more ambitious over time.[93]

Utility: ČEZ is the main utility, 70% owned by the Czech state via the Ministry of Finance, while the remaining 30% is held by institutional and retail investors on the Prague and Warsaw stock exchanges. It is a vertically integrated group operating Dukovany and Temelín alongside coal, renewables, distribution, and retail businesses; leading both the Dukovany 5/6 large-reactor project and the Rolls-Royce SMR programme.[94,95]

Regulator: State Office for Nuclear Safety (Státní úřad pro jadernou bezpečnost, SÚJB), established in 1993 and acting under the Atomic Act (Act No. 263/2016 Coll.), is a central administrative authority that reports directly to the Government. Its Chairperson is appointed and recalled by the Government, and it is separate from the operators it licenses. SÚJB's remit covers nuclear safety and security, radiation protection and monitoring, emergency preparedness, physical protection and non-proliferation, and the authorisation of nuclear installations and radioactive waste management. It maintains resident site inspectors at Dukovany and Temelín.[96]

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85 World Bank. Population, Total: Czechia. World Bank Open Data. https://data.worldbank.org/indicator/SP.POP.TOTL?locations=CZ

86 Trading Economics. Czech Republic GDP. https://tradingeconomics.com/czech-republic/gdp

87 Central Intelligence Agency. Czechia. The World Factbook (archived copy). https://user.iiasa.ac.at/~marek/fbook/00/geos/ez.html

88 International Atomic Energy Agency. Country Nuclear Power Profiles: Czech Republic. (IAEA, 2025). https://cnpp.iaea.org/public/countries/CZ/profile/preview

89 World Nuclear Association, *Nuclear Power in the Czech Republic* (2026), https://world-nuclear.org/information-library/country-profiles/countries-a-f/czech-republic

90 World Nuclear News. ČEZ Selects Amentum to Support SMR Programme. (2025). https://www.world-nuclear-news.org/articles/cez-selects-amentum-to-support-smr-programme

91 World Nuclear News. ČEZ Selects Amentum to Support SMR Programme. (2025). https://www.world-nuclear-news.org/articles/cez-selects-amentum-to-support-smr-programme

92 World Nuclear News. ČEZ Selects Amentum to Support SMR Programme. (2025). https://www.world-nuclear-news.org/articles/cez-selects-amentum-to-support-smr-programme

93 World Nuclear Association. Nuclear Power in the Czech Republic. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-a-f/czech-republic

94 ČEZ Group. Annual Reports. ČEZ Investor Relations. https://www.cez.cz/en/investors/financial-reports/annual-reports

95 Erste Group. Research Report SR445291. Erste Group Research. https://www.erstegroup.com/en/research/report/en/SR445291

96 State Office for Nuclear Safety. Introduction. SÚJB. https://sujb.gov.cz/en/about-sujb/introduction

2.4.2 Demand orderbook

Czech Republic has 6 large PWRs: 4xVVER-440 (Dukovany site, in operation since 1985 and 1987, currently delivering 479 MWe each due to upgrades) and 2xVVER-1000 (Temelín site, in operation since 2000 and 2002, delivering 1,028 MWe each).[97] Czech Republic had gross electricity production of 73.9 TWh in 2024 and net consumption of 59.2 TWh in the same year.[98] These values differ because of imports, exports, and losses. Nuclear represents 20% of installed capacity (3,972 MWe; the Czech Republic's total capacity is 19.9 GWe) and 41% of net electricity production (28.1 TWh).[99]

Table 11: Nuclear energy demand outlook – Czech Republic

Demand outlook	Value
Electricity consumption today	59.2 TWh (net, 2024)
ENTSO-E consumption estimate for 2035 – low	73 TWh (+23.3%)
ENTSO-E consumption estimate for 2035 – best	83 TWh (+40.2%)
Nuclear share of generation today	41%
Policy target for nuclear share	68% by 2040

Czech Republic has expressed interest in both large and small reactors:[100]

- **Large reactors.** Proposed 2xAPR-1000 (1,055 MWe each) of new capacity at Dukovany (Dukovany 5 and 6), with an option for 2 additional units at Temelín site (Temelín 3 and 4).[101]
- **SMRs.** The technology of choice is the Rolls-Royce SMR (470 MWe). Czech Republic has set a 2050 policy target of up to 3 GWe (not yet a committed order) at the Temelín site and at coal power plant sites that are due for decommissioning, including Tusimice. ENTSO-E assessment provides electricity consumption trends to 2035 (predicted in 2024):[102]
- Slower growth to 73 TWh (+23.3% from 2024 data).
- Best estimate of 83 TWh (+40.2% from 2024 data).

Regarding nuclear energy trends, ref.[103] reports the following: in 2011 it was stated that nuclear would increase from 13.9 to 18.9 GWe to reach 60% of Czech Republic power; in 2012 it was assumed that at least 50% of Czech Republic's power would be generated from nuclear power, for a total of 55.2 TWh per year; in 2015, an increase in nuclear capacity of 2.5 GWe by 2035, with share raising from 35% to 46-58% in 2040. Moreover, in a 2019 speech, it was reported that the nuclear share of electricity could increase to 40% by 2040, while in 2025, it was stated that the share of nuclear generation would rise to 68% by 2040.[104]

District heating supplies around 40% of heat demand, among the highest shares in Central/Eastern Europe.[105] In 2022, the government introduced subsidy programmes to cover district-heating utilities' operating costs during the energy price crisis.[106]

97 International Atomic Energy Agency. Country Nuclear Power Profiles: Czech Republic. (IAEA, 2025). https://cnpp.iaea.org/public/countries/CZ/profile/preview

98 Czech Statistical Office. Energy. ČSÚ (2025). https://csu.gov.cz/energy?pocet=10&start=0&skupiny=39&razeni=-datumVydani

99 International Atomic Energy Agency. Country Nuclear Power Profiles: Czech Republic. (IAEA, 2025). https://cnpp.iaea.org/public/countries/CZ/profile/preview

100 World Nuclear News. ČEZ Selects Amentum to Support SMR Programme. (2025). https://www.world-nuclear-news.org/articles/cez-selects-amentum-to-support-smr-programme

101 Nuclear Energy Agency. Nuclear Energy Outlook: Global Installed Capacity to 2050 and Beyond. (OECD Publishing, Paris, 2026). https://www.oecd-nea.org/jcms/pl_119893/nuclear-energy-outlook-global-installed-capacity-to-2050-and-beyond?details=true

102 ENTSO-E. European Resource Adequacy Assessment 2025, Annex 6: Country Comments. (ENTSO-E, Brussels, 2025). https://eepublicdownloads.blob.core.windows.net/public-cdn-container/clean-documents/sdc-documents/ERAA/ERAA_2025_Annex6_CountryComments_ENTSOEProposal_Dec2025.pdf

103 World Nuclear Association. Nuclear Power in the Czech Republic. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-a-f/czech-republic

104 World Nuclear Association. Nuclear Power in the Czech Republic. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-a-f/czech-republic

105 Euroheat & Power. District Heating and Cooling in Europe: The Share of Renewable Energy. (via IIF-IIR). https://iifiir.org/en/news/district-heating-and-cooling-in-europe-the-share-of-renewable-energy

106 International Energy Agency. District Heating. IEA. https://www.iea.org/energy-system/buildings/district-heating

2.4.3 Supply chain readiness

Czech Republic's supply chain position reflects its "renewal" starting point: an operating fleet and an established regulator, but 25+ years without a new-build project, now being reactivated through a single vertically integrated actor, ČEZ, that is simultaneously customer, industrial owner and vendor-equity investor.

Overview

ČEZ, the majority state-owned Czech utility, holds an approximate 20% equity stake in Rolls-Royce SMR as part of a strategic partnership to deploy up to 3GW of SMR electricity in the Czech Republic.[107] The Czech nuclear programme is also currently under direct EC scrutiny: in December 2025, the EC opened an in-depth state-aid investigation into Czech Republic's proposed public support package for two new units at Dukovany,[108] building on an earlier, narrower approval for a single Dukovany unit in April 2024.[109] Alongside the state loan[110] and CfD, the Dukovany support package includes a mechanism intended to protect the project company against future policy changes or unforeseen events. More than one interviewee pointed to this risk, citing two European precedents: Italy's Montalto di Castro plant, roughly 75–80% complete when Italy's 1987 referendum halted construction, and Austria's Zwentendorf plant, fully built and fuel-loaded but never operated after a 1978 referendum. In both cases, a policy decision rather than a technical or safety failure ended the project. Also, interviewees raised concerns regarding the exclusion of nuclear from funds such as the Just Transition Fund, *"which aims to support the people, economies and environment of territories that face serious socioeconomic challenges stemming from the shift towards a climate-neutral European Union"*.[111]

Interviewees also point out that, since ČEZ already owns and operates both its nuclear sites and the coal plants earmarked for SMR conversion, the supply chain does not need to mobilise around land acquisition and greenfield licensing (for sites already hosting nuclear power plants), as a newcomer country would. This head start is reinforced on the regulatory side: according to one interviewee, Czech authorities are also "shadowing" the UK's Generic Design Assessment process for the Rolls-Royce SMR, so design-certification work already underway in Britain can be leveraged rather than repeated from scratch. Experts also describe the situation in the Czech Republic as an example of a cross-border fleet already emerging, one that could link Czech Republic to the UK and Sweden through cross-border regulatory shadowing, sharing of learnings, and shared allocation of components and manufacturing capacity across projects.

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[107] Rolls-Royce SMR. Rolls-Royce SMR and ČEZ Group Partnership. Press release (October 2024). https://www.rolls-royce.com/media/press-releases/2024/29-10-2024-rolls-royce-smr-and-cez-group-partner-to-deploy-smrs-in-uk-and-czechia.aspx

[108] European Commission. Commission Opens In-Depth Investigation into Czech Support for Dukovany. Press release (2025). https://ec.europa.eu/commission/presscorner/detail/en/ip_25_3139

[109] European Commission. Commission Approves Czech State Aid for Dukovany. Press release (2024). https://ec.europa.eu/commission/presscorner/detail/en/ip_24_2366

[110] Euronews, April 2026. Austria has separately pursued legal challenges against EU state aid for Dukovany, https://www.euronews.com/my-europe/2026/04/30/czechia-a-small-country-with-big-nuclear-energy-ambitions

[111] European Union. The Just Transition Fund. EUR-Lex (2024). https://eur-lex.europa.eu/EN/legal-content/summary/the-just-transition-fund.html

Structure

The domestic industrial backbone of the Czech programme is Škoda JS, the Pilsen-based manufacturer that has produced or delivered components for 21 complete VVER-440 and three VVER-1000 reactors over six decades, including Dukovany's own four units,[112] and which today employs around 1,100 people and generates roughly CZK 3.5-4 billion (approx. € 144-€ 165 million) in annual sales, close to half of it from exports.[113] Notably for the study's wider geopolitical-alignment theme, Škoda JS was until 2022 majority-controlled by the Russian engineering group OMZ (linked to Gazprombank). So, Škoda JS was "at risk of sanctions",[114] a risk that ČEZ resolved by taking full ownership that year.[115] Škoda JS has since been fully owned by ČEZ and has been selected, alongside South Korea's Doosan Enerbility, as one of two dual-source suppliers of Rolls-Royce SMR's nuclear-island components, for reactor pressure vessels, vessel heads, pressurisers and other heavy forgings, explicitly to improve delivery resilience.[116]

Interview evidence qualifies how ready-made this capability is, adding nuance to publicly available information. According to one interviewee, Temelín was almost entirely domestically fabricated when commissioned around 2000-01, but that more than 25 years without new construction since then means some capability must now be rebuilt rather than simply reactivated. The same interviewee explicitly distinguished between capabilities that survived the gap, such as Škoda's pressure-vessel and dry-cask manufacturing, from ones that did not such as steam-generator production, which one interviewee described as no longer active at former producer Vítkovice.[117]

Workforce and training

The interviewees also highlighted two more key factors related to the supply chain readiness of the country: the workforce and training-related challenges. The scale of workforce mobilisation already under way is visible in public figures: the new Dukovany unit alone is expected to require up to 700 operating staff once commissioned, across largely technical professions, on top of the separate design, construction and commissioning project team.[118] Interview evidence explains why this scale of training investment is necessary and where the residual risk sits. Indeed, more than one interviewee describes the workforce constraint as structural rather than a simple training-volume problem: shortages in skilled trades (welders, boilermakers, civil-works crews) are seen as at least as critical as the shortage of nuclear engineers and specialists. Separately, one expert identified construction-phase disruption, including transport and the use of temporary or foreign labour, as the main possible source of local friction, even in communities that show little underlying opposition to nuclear itself since they already live near an operating plant. This suggests workforce mobility, not technology acceptance, is the more immediate local-relations issue for Czech Republic specifically. This framing is more precise than the general public-acceptance findings discussed in other parts of the report. Concerning the Rolls-Royce fleet linkage, some interviewees view it as a way to collaborate across borders. For Czech Republic, this could be the practical route to reach the roughly 8-10-unit scale that interviewees (also from other countries) associate with genuine cost learning.

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112 Škoda JS. Company Profile. https://www.skoda-js.cz/en/company-profile/

113 ČEZ Group. ČEZ Finally Takes Over Škoda JS, a Major Czech Company. Press release (2022). https://www.cez.cz/en/media/press-releases/cez-finally-takes-over-skoda-js-a-major-czech-company-primarily-operating-in-nuclear-servicing-and-engineering-167450

114 ČEZ Group. ČEZ Will Acquire Škoda JS, a Major Czech Company. ČEZ (2022). https://www.cez.cz/en/investors/inside-information/cez-will-acquire-skoda-js-a-major-czech-company-dedicated-mainly-to-nuclear-servicing-and-engineering-159811

115 ČEZ Group. ČEZ Will Acquire Škoda JS, a Major Czech Company. ČEZ (2022). https://www.cez.cz/en/investors/inside-information/cez-will-acquire-skoda-js-a-major-czech-company-dedicated-mainly-to-nuclear-servicing-and-engineering-159811

116 World Nuclear News. Škoda JS and Doosan Enerbility Get Key Rolls-Royce SMR Work. (2026). https://www.world-nuclear-news.org/articles/skoda-js-doosan-enerbility-get-key-rolls-royce-smr-work

117 This is an interviewee claim broadly consistent with, though not independently confirmed by, Vítkovice Heavy Machinery's heavy-engineering bankruptcy in 2020 (PBJ, 2020).

118 ČEZ Group. The Dukovany II Power Plant: Employment. ČEZ. https://www.cez.cz/en/nuclear-new-build/the-dukovany-ii-power-plant/region/employment

2.4.4 Financial assessment

This part describes the nuclear scenarios simulated for the Czech Republic and the rationale behind them. Each scenario is a combination of 3 elements:

1. Nuclear Deployment Trends (How many SMRs are deployed over time).
2. Costing and economics Values (Life cycle cost, Electricity Price).
3. Financing and Funding Options (how capital is raised and remunerated).

Table 12: SMR deployment trends – Czech Republic

Site name	Nuclear capacity as today	Deployment trends					
		Low		Medium		High	
		Existing reactors	New capacity	Existing reactors	New capacity	Existing reactors	New capacity
Dukovany	1.9 GWe	0	5×0.4 GWe SMRs	0	5×0.4 GWe SMRs	0	5×0.4 GWe SMRs
Temelín	2.1 GWe	2.1 GWe	0	2.1 GWe	3×0.4 GWe SMRs	2.1 GWe	3×0.4 GWe SMRs
Tušimice (coal)	0 GWe	0	0	0	0	0	2×0.4 GWe SMRs
Coal site 2	0 GWe	0	0	0	0	0	2×0.4 GWe SMRs
Total nuclear capacity	4.0 GWe	4.1 GWe (2.1 GWe existing, 2 GWe new SMR capacity)		5.3 GWe (2.1 GWe existing, 3.2 GWe new SMR capacity)		6.9 GWe (2.1 GWe existing, 4.8 GWe new SMR capacity)	
		SMRs in one site, preserving capacity (replacement of the large reactors) and electricity consumption		Replacement capacity in Dukovany and new SMRs capacity in Temelín. Slower electricity consumption trend and nuclear generation increasing to 50%		Replacement capacity in Dukovany, new SMRs capacity in Temelín, and two coal sites replaced by nuclear SMR capacity. Best estimate for electricity consumption trend and nuclear generation increasing to 60%	

Nuclear Deployment Trends

Three SMR deployment trends are assumed based on electricity consumption trends and Czech Republic's interest in SMRs. It is also assumed that the operating life of the large reactors present in Czech Republic is capped at 60 years:

- **Low deployment trend.** Electricity demand remains constant, and nuclear electricity share remains close to 40%.[119] New SMRs replace the Dukovany nuclear plant, which is nearing 40 years of operating life and will surpass the 60 years if a 2050 time horizon is considered. This trend implements 5×400 MWe SMRs for a total of 2.0 GWe, close to the 1.9 GWe currently in operation.
- **Medium deployment trend.** Electricity demand increases by 23.3% to 73 TWh.[120] Nuclear generation reaches close to 50%:[121] from 28.1 TWh to 36.5 TWh per year. This is +8.4 TWh or +1.1 GWe of new SMR capacity (assuming a 90% load factor) above the replacement of the Dukovany nuclear plant in the low trend. This is implemented by adding 3×400 MWe SMRs to the Temelín site[122] for a total of 1.2 GWe of new nuclear capacity. The Temelín reactors existing today were connected to the grid in the early 2000s,[123] thus, it is assumed they will still be operating in the considered time horizon.
- **High deployment trend.** Electricity demand increases by 40.2% to 83 TWh.[124] Nuclear generation reaches close to 60%[125] (58-68% are reported as highest values; 60% is selected because it maintains the 10% increase reported between the previous two trends): from 28.1 TWh to 49.8 TWh per year. This is +21.7 TWh or +2.8 GWe of new SMR capacity (assuming a 90% load factor) above the replacement of the Dukovany nuclear plant of the low trend. This is implemented by considering the same additional capacity in the Temelín site as in the medium trend and an additional 1.6 GWe of SMR capacity deployed in two coal sites (Tušimice and a generic one),[126] with 2×400 MWe SMRs each.

The full deployment schedules are reported in the Appendix.

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119 International Atomic Energy Agency. Country Nuclear Power Profiles: Czech Republic. (IAEA, 2025). https://cnpp.iaea.org/public/countries/CZ/profile/preview

120 ENTSO-E. European Resource Adequacy Assessment 2025, Annex 6: Country Comments. (ENTSO-E, Brussels, 2025). https://eepublicdownloads.blob.core.windows.net/public-cdn-container/clean-documents/sdc-documents/ERAA/ERAA_2025_Annex6_CountryComments_ENTSOEProposal_Dec2025.pdf

121 World Nuclear Association. Nuclear Power in the Czech Republic. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-a-f/czech-republic

122 World Nuclear News. ČEZ Selects Amentum to Support SMR Programme. (2025). https://www.world-nuclear-news.org/articles/cez-selects-amentum-to-support-smr-programme

123 World Nuclear News. ČEZ Selects Amentum to Support SMR Programme. (2025). https://www.world-nuclear-news.org/articles/cez-selects-amentum-to-support-smr-programme

124 ENTSO-E. European Resource Adequacy Assessment 2025, Annex 6: Country Comments. (ENTSO-E, Brussels, 2025). https://eepublicdownloads.blob.core.windows.net/public-cdn-container/clean-documents/sdc-documents/ERAA/ERAA_2025_Annex6_CountryComments_ENTSOEProposal_Dec2025.pdf

125 World Nuclear Association. Nuclear Power in the Czech Republic. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-a-f/czech-republic

126 World Nuclear News. ČEZ Selects Amentum to Support SMR Programme. (2025). https://www.world-nuclear-news.org/articles/cez-selects-amentum-to-support-smr-programme

Costing and economics values

The OCC of a nuclear plant is largely country-specific. Its value varies because of construction know-how and delays, labour costs, supply chain maturity, commodity and equipment prices, and regulations. The Appendix reports the OCC estimate for a 400 MWe SMR in Czech Republic, as well as the life-cycle costs (O&M, Fuel, D&D).

Moreover:

- Electricity price (2025 average): € 96.70/MWh[127]
- Inflation (June 2026): 1.5%[128]
- 10-year government bond yield (July 2026): 4.70% nominal,[129] around 3.15% real

Table 13: OCC input assumptions, optimistic and conservative – Czech Republic

Input	Optimistic value	Conservative value	Reference
OCC [€/kWe]	8,069	9,862	See Appendix
O&M [€/MWh]	12	24	See Appendix
Fuel cycle [€/MWh]	9	12	Based on[130,131]
D&D [€/MWh]	2		Based on[132]

Refer to footnotes below for the citations used in the table.

127 Ember. European Wholesale Electricity Price Data. https://ember-energy.org/data/european-wholesale-electricity-price-data/

128 Trading Economics. Inflation Rate: Europe. https://tradingeconomics.com/country-list/inflation-rate?continent=europe

129 Trading Economics. Czech Republic 10-Year Government Bond Yield. https://tradingeconomics.com/czech-republic/government-bond-yield

130 Idaho National Laboratory. Nuclear Energy Cost Report. (INL, Idaho Falls, ID, 2026). https://inldigitallibrary.inl.gov/content/uploads/50/2026/04/Sort_107010.pdf

131 MIT Center for Advanced Nuclear Energy Systems. Total Cost Projection of the Next AP1000. (MIT CANES, Cambridge, MA, 2024). https://canes.mit.edu/media/2024-total-cost-projection-of-next-ap1000

132 Idaho National Laboratory. Nuclear Energy Cost Report. (INL, Idaho Falls, ID, 2026). https://inldigitallibrary.inl.gov/content/uploads/50/2026/04/Sort_107010.pdf

Financing and Funding options

The financial inputs are based on the financial information of past or proposed projects in Czech Republic. No financial news on proposed SMRs was found.

Table 14: Financial structure of past and proposed nuclear projects – Czech Republic

Plant	Size	Status	Financial structure	D:E	Cost of debt	Cost of equity	Electricity
Dukovany 1-4	4xVVER-440 (tot. 2040 MWe)	Operating since 1985-87	Predate market-based financing	n/a	n/a	n/a	No CfD or price support is identified. Wholesale market
Temelín 1-2	2xVVER-1000 (tot. 2,160 MWe)	Operating since 2000-2002	Predate market-based financing	n/a	n/a	n/a	No CfD or price support is identified. Wholesale market
Dukovany 5	APR-1000 (up to 1200 MWe)	Approved	State loan (repayment period 30 years after operation start)[133,134] + PPA (40 years)[134]	98:2[136]	0% during construction and 1% over CZ state debt cost during operation at least 2%[137]	n/a	PPA, the state purchaser resells at least 70% of purchased electricity on organised markets[138]

Refer to footnotes below for the citations used in the table.

133 Nuclear Energy Agency. Effective Frameworks and Strategies for Financing Nuclear New Build. NEA No. 7684 (OECD Publishing, Paris, 2024). https://www.oecd-nea.org/upload/docs/application/pdf/2024-09/nea_publication_2_2024-09-18_16-50-13_471.pdf

134 World Nuclear News. EC Examines Czech State Aid for New Dukovany Plant. (2022). https://world-nuclear-news.org/Articles/EC-examines-Czech-state-aid-for-new-Dukovany-plant

135 OECD Nuclear Energy Agency. Effective Frameworks and Strategies for Financing Nuclear New Build. NEA No. 7684 (2024), Czech Republic financing case: the power-purchase agreement lasts 40 years, separately from the 30-year loan. https://www.oecd-nea.org/upload/docs/application/pdf/2024-09/nea_publication_2_2024-09-18_16-50-13_471.pdf

136 Nuclear Energy Agency. Effective Frameworks and Strategies for Financing Nuclear New Build. NEA No. 7684 (OECD Publishing, Paris, 2024). https://www.oecd-nea.org/upload/docs/application/pdf/2024-09/nea_publication_2_2024-09-18_16-50-13_471.pdf

137 Nuclear Energy Agency. Effective Frameworks and Strategies for Financing Nuclear New Build. NEA No. 7684 (OECD Publishing, Paris, 2024). https://www.oecd-nea.org/upload/docs/application/pdf/2024-09/nea_publication_2_2024-09-18_16-50-13_471.pdf

138 Nuclear Energy Agency. Effective Frameworks and Strategies for Financing Nuclear New Build. NEA No. 7684 (OECD Publishing, Paris, 2024). https://www.oecd-nea.org/upload/docs/application/pdf/2024-09/nea_publication_2_2024-09-18_16-50-13_471.pdf

The following financial options are assumed and simulated for the Czech Republic:

- **Merchant options.** Electricity is sold to the wholesale market at a fixed price of € 96.70/MWh. The gearing D:E is fixed at 70:30,[139] with a debt repayment of 30 years; the cost of debt is set to 4.2% (1% over the 10-year government bond yield).[140] The cost of equity must be assumed; its value is set to 10% (real).
- **Dukovany-inspired options.** The D:E is set at 98:2, with a debt repayment period of 30 years.[141] The cost of debt is 0% during construction and 4.2% during operation (real), derived from 3.15% (real) plus 1%.[142] The model uses a fixed sale-price benchmark, not a simulation of the state purchaser's wholesale resale obligation: € 96.70/MWh. The cost of equity is assumed to be 10% (real).
- **Supported option.** See assumptions and Appendix for the full derivation:
  - **Without EU guarantee.** The gearing ratio is raised to 80:20 and repaid over 40 years. Electricity is sold under a CfD set to € 96.70/MWh (equal to the average wholesale price). The cost of debt is the Czech real yield (3.15%) plus a credit margin of 0.75%, or 3.90% real. The cost of equity is built as a spread over the cost of debt. The spread is 4.4%: the average of a private tranche requiring 5.8% and a public tranche requiring 3.0%, each taking half the equity. The cost of equity is therefore 3.9% + 4.4% = 8.3% real.
  - **With EU guarantee.** An EU guarantee covers 80% of the senior debt, so the debt is priced at the 0.56% (real) EU benchmark, while the remaining 20% is priced at the Czech government yield (3.15%). The obtained value is 0.8*0.56% + 0.2*3.15% = 1.08%. Considering a credit margin of 0.75%, the cost of debt becomes 1.83% (real). The cost of equity is computed using a premium of 4.4%, reaching 6.23% (real). The CfD strike price, the gearing, and the debt repayment period are maintained at € 96.70/MWh, 80:20, and 40 years, respectively.

Results

The following are the scenario results in terms of LCOE.

Table 15: LCOE simulation results by deployment trend – Czech Republic

Values are whole fleet levelised electricity costs in €/MWh, expressed in real 2026 money.

LCOE [€/MWh]	Deployment trends					
	Low [2.0 GWe]		Medium [3.2 GWe]		High [4.8 GWe]	
	Optimistic	Conservative	Optimistic	Conservative	Optimistic	Conservative
Merchant	95.54	126.66	93.26	123.89	92.63	123.11
Dukovany-inspired loan	88.29	117.80	87.37	116.68	86.73	115.89
Supported – without EU guarantee	80.50	108.29	78.79	106.18	77.10	104.12
Supported – with EU guarantee	67.47	92.36	65.92	90.46	64.48	88.70

[139] MIT Center for Advanced Nuclear Energy Systems. Total Cost Projection of the Next AP1000. (MIT CANES, Cambridge, MA, 2024). https://canes.mit.edu/media/2024-total-cost-projection-of-next-ap1000

[140] MIT Center for Advanced Nuclear Energy Systems. Total Cost Projection of the Next AP1000. (MIT CANES, Cambridge, MA, 2024). https://canes.mit.edu/media/2024-total-cost-projection-of-next-ap1000

[141] Nuclear Energy Agency. Effective Frameworks and Strategies for Financing Nuclear New Build. NEA No. 7684 (OECD Publishing, Paris, 2024). https://www.oecd-nea.org/upload/docs/application/pdf/2024-09/nea_publication_2_2024-09-18_16-50-13_471.pdf

[142] Nuclear Energy Agency. Effective Frameworks and Strategies for Financing Nuclear New Build. NEA No. 7684 (OECD Publishing, Paris, 2024). https://www.oecd-nea.org/upload/docs/application/pdf/2024-09/nea_publication_2_2024-09-18_16-50-13_471.pdf

Recalling the average 2025 electricity price in Czech Republic, € 96.70/MWh:[143]

- **Merchant.** Optimistic costs place the LCOE marginally below the benchmark (1–4%); conservative costs place it 27–31% above;
- **Dukovany-inspired loan.** This option reduces the LCOE by 6–8% relative to merchant. Optimistic scenarios fall 9–10% below the benchmark; conservative scenarios remain 20–22% above it;
- **Supported option without EU guarantee.** The LCOE falls 14–17% below the merchant, reaching values 17–20% below the benchmark in the optimistic scenarios. Conservative scenarios stay 8–12% above it;
- **Supported option with EU guarantee.** The only option clearing the benchmark under both cost assumptions: 30–33% below it under optimistic costs and 4–8% below it under conservative costs.

The three axes of the simulation can be ranked by the LCOE spread they generate. **Moving from merchant to the EU-guaranteed option is worth € 27.3–34.4/MWh; moving from optimistic to conservative life-cycle costs is worth € 24–31/MWh in the opposite direction. Moving from the low to the high deployment trends is worth only € 1.6–4.2/MWh.** Financing options and costing are therefore comparable and dominant levers, while deployment trends are an order of magnitude less important for the LCOE. **The economic case for SMRs in the Czech Republic does not depend on committing to a large fleet given how little impact the size of the deployment trend has.** On the Czech Republic's own figures, adding the EU guarantee to the common supported package reduces the upper endpoint by € 15.93/MWh, from € 108.29 to € 92.36/MWh. The full change from the merchant upper endpoint of € 126.66/MWh is € 34.30/MWh.

A larger fleet nonetheless carries benefits that the LCOE does not capture, e.g., security of supply, production stability, and avoided emissions. Avoided emissions per year are computed by estimating the difference in expected emissions between gas, coal and nuclear, as reported in the Appendix. For reference, energy-industry emissions in 2024 were 31.9 $MtCO_2eq$ in Czech Republic.[144]

In the low trend, the SMRs replace Dukovany, so gas or coal is what would have to fill the gap if the capacity were not rebuilt. In the medium trend, the additional units cover demand growth. In the high trend, four of the twelve units are on former coal sites, but the coal column applies a coal alternative to the whole fleet's output; it is not a calculation of coal generation displaced.

Table 16: Avoided emissions by deployment trend – Czech Republic

Trend	Units	Sites	Output [TWh/year]	SMR emissions [$ktCO_2eq$/year]	Avoided vs gas [$MtCO_2eq$/year]	Avoided vs coal [$MtCO_2eq$/year]
Low	5	Dukovany	15.8	189	7.5	12.7
Medium	8	+ Temelín	25.2	303	12.1	20.4
High	12	+ Tušimice and one further coal site	37.8	454	18.1	30.6

143 Ember. European Wholesale Electricity Price Data. https://ember-energy.org/data/european-wholesale-electricity-price-data/

144 Czech Hydrometeorological Institute. National Inventory Document of the Czech Republic. (Submission to the UNFCCC, 2026). https://unfccc.int/sites/default/files/resource/CZE_NID_2024_2026_April.pdf

2.5 SWEDEN - "The Renewal case"

2.5.1 Brief introduction

Sweden has a population of around 10.6 million (2026)[145] and a GDP of € 540 billion (2024, World Bank data), with a 1.5% increase in 2025.[146] Sweden's main natural resources are iron ore, copper, lead, zinc, silver, timber, hydropower.[147]

Sweden operates six reactors, supplied by ASEA (BWR units) and Westinghouse (PWR units),[148] representing 13.6% of the country's capacity and 29% of total generation.[149] Sweden is now pursuing renewed nuclear expansion after decades without new builds. In 2023, the government announced plans for two new large reactors by 2035, alongside an initial target of ten new reactors overall (a numeric cap since scrapped), and confirmed the availability of state aid loans covering up to 5 GWe of new capacity.[150] On SMRs, a June 2026 supplier selection identified the Rolls-Royce SMR for proposed new capacity at Ringhals, with further light-water SMR interest reported at Valdemarsvik and Nyköping.[151]

Sweden's utilities:

- **Vattenfall:** 100% owned by the Swedish state; majority or plurality owner of the existing nuclear fleet – 70.44% of Ringhals AB and 66% of Forsmarks Kraftgrupp – and lead developer of new SMR capacity at Ringhals.[152,153]
- **Uniper (Sydkraft Nuclear Power):** majority owner (54.5%) of Oskarshamn (OKG); minority co-owner of Ringhals (29.56%) and Forsmark (9.9%).[154]
- **Fortum:** minority co-owner of Oskarshamn (45.5%) and the largest shareholder within Mellansvensk Kraftgrupp's stake in Forsmark.[155] Fortum is 51% owned by the Finnish state and is Finland's own nuclear operator.[156]

Regulator. Swedish Radiation Safety Authority (Strålsäkerhetsmyndigheten, SSM), formed in 2008 through the merger of the Swedish Nuclear Power Inspectorate (SKI) and the Swedish Radiation Protection Authority (SSI). It is a government agency reporting to the Ministry of Climate and Enterprise, with a mandate covering nuclear safety, radiation protection, nuclear security and non-proliferation, and it issues the licences and regulatory conditions under which nuclear facilities are built and operated.[157]

145 Statistics Sweden (SCB). Population statistics. 2026. https://www.scb.se/en/finding-statistics/statistics-by-subject-area/population-and-living-conditions/population-composition-and-development/population-statistics/

146 Trading Economics. Sweden GDP. https://tradingeconomics.com/sweden/gdp

147 Geological Survey of Sweden. Mineral Resources. SGU. https://www.sgu.se/en/mineral-resources/

148 World Nuclear Association, *Nuclear Power in Sweden (2026)*, https://world-nuclear.org/information-library/country-profiles/countries-o-s/sweden

149 International Atomic Energy Agency. Country Nuclear Power Profiles: Sweden. (IAEA, 2025). https://cnpp.iaea.org/public/countries/SE/profile/preview

150 World Nuclear Association. Nuclear Power in Sweden. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-o-s/sweden

151 World Nuclear Association. Nuclear Power in Sweden. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-o-s/sweden

152 Vattenfall. About Us. https://group.vattenfall.com/about-us

153 Vattenfall. Forsmark and Ringhals Nuclear Power Plants Lifetime Extension. Press release (2024). https://group.vattenfall.com/press-and-media/pressreleases/2024/forsmark-and-ringhals-nuclear-power-plants-aim-for-80-years-of-operation-of-existing-reactors

154 Uniper. Nuclear Power in Sweden. https://www.uniper.energy/sweden/power-supply-delivers/nuclear-power-sweden

155 Fortum. Owners of Oskarshamn Nuclear Power Plant to Investigate New Capacity. Press release (2024). https://www.fortum.com/en/media/2024/09/owners-oskarshamn-nuclear-power-plant-sweden-investigate-lifetime-extension

156 World Nuclear Association, Nuclear Power in Finland (2026), https://world-nuclear.org/information-library/country-profiles/countries-a-f/finland

157 Swedish Radiation Safety Authority. About the Authority. SSM. https://www.stralsakerhetsmyndigheten.se/en/about-the-authority/

2.5.2 Demand orderbook

Sweden has 6 reactors, 4 BWR and 2 PWR, in 3 sites, all connected to the grid between 1980 and 1985.[158] In 2023, the gross electricity production was 163 TWh while the net consumption was 131.5 TWh.[159] However, the values reported for 2024 are 172 TWh and 123 TWh, respectively.[160] These values differ because of imports, exports, and losses. Sweden has 7.0 GWe of net nuclear capacity, which is 13.6% of the total (51.3 GWe) installed. In 2024, they produced 29% of the total electricity generation, around 49.4 TWh.[161]

Table 17: Nuclear energy demand outlook – Sweden

Demand outlook	Value
Electricity consumption today	123 TWh (net, 2024)
Consumption projection for 2035	up to 250 TWh
Nuclear share of generation today	29%
Policy target (capacity, no official % target)	2 new large reactors by 2035; up to 5 GWe state-aid-backed capacity

Sweden expressed interest regarding both large and small reactors:

- **Large reactors.** In 2023, the government announced its plans to construct two large reactors by 2035 and the equivalent of 10 new reactors, including SMRs. The limit to 10 reactors was later scrapped and the proposed capacity has been expressed in capacity rather than units.[162] The government could also provide state aid loans for up to 5 GWe of capacity.[163,164]
- **Small reactors.** In 2025, Vattenfall's project company Videberg Kraft applied for 1.5 GWe of new SMR capacity at Ringhals; the board selected the Rolls-Royce SMR (3×470 MWe) as supplier in June 2026, for a total of 1,410 MWe.[165] Additional interest in light water SMR is reported for two sites:[166] Valdemarsvik, for 4-6 BWRX-300 units (1.2-1.8 GWe); and 2-4 reactors in Nyköping for a total of 0.6-1.4 GWe. The Ringhals selection is not a final investment decision. The private BWRX-300 project discussed below concerns alternative locations (Nyköping or Valdemarsvik).

Electricity consumption trend for Sweden is expected to increase up to 250 TWh in 2035[167] mainly due to transports and industry, effectively doubling 2024 consumption. Sweden has one of Europe's most decarbonised district-heating sectors, with renewables share around 66% and biomass/geothermal supplying over 70% of urban district heat;[168] the country has a national target for a fossil-free heating sector by 2030 and a carbon-positive sector by 2045.[169]

158 World Nuclear Association. Nuclear Power in Sweden. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-o-s/sweden

159 International Atomic Energy Agency. Country Nuclear Power Profiles: Sweden. (IAEA, 2025). https://cnpp.iaea.org/public/countries/SE/profile/preview

160 World Nuclear Association. Nuclear Power in Sweden. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-o-s/sweden

161 International Atomic Energy Agency. Country Nuclear Power Profiles: Sweden. (IAEA, 2025). https://cnpp.iaea.org/public/countries/SE/profile/preview

162 World Nuclear Association. Nuclear Power in Sweden. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-o-s/sweden

163 World Nuclear Association. Nuclear Power in Sweden. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-o-s/sweden

164 Nuclear Energy Agency. Nuclear Energy Outlook: Global Installed Capacity to 2050 and Beyond. (OECD Publishing, Paris, 2026). https://www.oecd-nea.org/jcms/pl_119893/nuclear-energy-outlook-global-installed-capacity-to-2050-and-beyond?details=true

165 World Nuclear Association. Nuclear Power in Sweden. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-o-s/sweden

166 World Nuclear Association. Nuclear Power in Sweden. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-o-s/sweden

167 SKGS. The Swedish Industry's Demand for Electricity up to 2035. (SKGS, 2024). https://skgs.org/app/uploads/sites/2/2024/09/Swedish-Industries-Electricty-Demand-SKGS-2024.pdf

168 Market Data Forecast. Europe District Heating Market. https://www.marketdataforecast.com/market-reports/europe-district-heating-market

169 Fossil free Sweden. Roadmap for fossil free competitiveness. https://fossilfrittsverige.se/wp-content/uploads/2020/10/roadmap_for_fossil_free_competitiveness_klar.pdf

2.5.3 Supply chain readiness

Sweden's supply chain position reflects its "renewal" starting point: six operating reactors built in the 1970s-80s and a newly enacted framework for state financial support and risk sharing, and modified licensing approaches. It can also boast a formal industrial consortium of major electricity consumers co-investing directly in a nuclear project alongside the state and the incumbent utility, Vattenfall,[170] while other alliances and consortia are emerging for other projects, as discussed below.

Overview

Sweden's State Aid framework for new nuclear, i.e., government loans plus a 40-year two-way Contract for Difference, entered into force on 1 August 2025, currently capped at approximately 5,000 MWe, with lending expected to total around SEK 220 billion (≈Euros 19.84bn) over 12 years.[171] In December 2025, Vattenfall's project company Videberg Kraft submitted the first application under this framework, covering a choice of either five GE Vernova-Hitachi BWRX-300 units or three Rolls-Royce SMR units (≈1,500 MWe) at Ringhals.[172] The project progressed through 2025 without a final supplier selection, for which Videberg Kraft's board selected Rolls-Royce SMR in June 2026. The board cited several factors: Rolls-Royce SMR's pressurised water reactor design uses the same underlying technology as Ringhals' existing reactors, its established local subcontractor network is concentrated in the surrounding region, and its integration into the broader European Rolls-Royce SMR programme (alongside the UK and Czech Republic) was seen as reducing delivery risk through a standardised, repeatable design.[173] Alongside this large, state-linked project, a second application track has emerged from smaller private developers.

In the first half of 2026, Blykalla applied for State Aid for a six-unit, 55 MWe-per-unit lead-cooled SMR plant at Norrsundet.[174] Later in 2026, Blykalla submitted a second State Aid application for up to eight lead-cooled units (approximately 440 MWe combined) at Untra.[175] Separately, Fortum's project company NuCore Energi applied for State Aid for a new nuclear plant of 1,200–3,400 MWe (technology to be selected) at the Ävrö site in Oskarshamn municipality.[176] Moreover, a separate private track is converging on the BWRX-300: on 3 September 2026 Studsvik selected GE Vernova Hitachi Nuclear Energy and Samsung C&T as partners for an initial four-unit BWRX-300 project (≈1,200 MWe) at either its licensed Nyköping site or Målma in Valdemarsvik, with a first unit targeted for the mid-2030s.[177] Sweden's emerging fleet therefore spans two light-water designs: Rolls-Royce's PWR on the state-backed Ringhals track and GE Vernova Hitachi's BWR on the private-developer track.

The ownership of the Ringhals project is also evolving: in November 2025 the industrial consortium Industrikraft i Sverige AB (formed in June 2024 by ABB, Alfa Laval, Boliden, Hitachi Energy, Höganäs, SSAB, Saab, Stora Enso and Volvo Group) agreed to take a 20% stake in Videberg Kraft for SEK 400 million (≈Euros 36m); in April 2026 the Swedish government separately proposed acquiring a 60% state stake in the same project company, with an initial SEK 1.8 billion injection and up to SEK 34.3 billion

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170 Industrikraft. An Initiative by Leading Swedish Industrial Companies. https://www.industrikraft.se/en (accessed 27 August 2026)

171 Government Offices of Sweden. How the Support Model for Financing New Nuclear Power Is Designed. (May 2025). https://www.government.se/government-policy/nuclear-financing/how-the-support-model-for-financing-new-nuclear-energy-works/

172 World Nuclear News. Sweden Gets First Application for State Aid for New Nuclear. (December 2025). https://www.world-nuclear-news.org/articles/sweden-gets-first-application-for-state-aid-for-new-nuclear

173 World Nuclear News. Swedish New Nuclear Project Selects Rolls-Royce SMRs. (15 June 2026). https://www.world-nuclear-news.org/articles/swedish-new-nuclear-project-selects-rolls-royce-smrs

174 World Nuclear News, "Blykalla Applies for State Aid for SMR Plant," June 2026, https://www.world-nuclear-news.org/articles/blykalla-applies-for-state-aid-for-smr-plant

175 Blykalla, "Blykalla Submits Application for Second Advanced Nuclear Reactor Park in Sweden, with up to 440 MW of Capacity," press release, August 25, 2026, https://www.blykalla.com/post/blykalla-submits-application-for-second-advanced-nuclear-reactor-park-in-sweden-with-up-to-440-mw-of-capacity

176 Fortum, "Fortum-Owned Project Company NuCore Energi AB Initiates Discussions on the Framework for New Nuclear in Sweden," press release, August 27, 2026, https://www.fortum.com/media/2026/08/fortum-owned-project-company-nucore-energi-ab-initiates-discussions-framework-new-nuclear-sweden

177 Studsvik AB, "Studsvik, GE Vernova Hitachi and Samsung C&T Commit to Advancing 1.2 GW Nuclear Power Project in Sweden," press release, 3 September 2026, https://investors.studsvik.com/en/press-releases?page=/en/press/studsvik-ge-vernova-hitachi-and-samsung-ct-commit-advancing-12-gw-nuclear-power-project

during construction.[178] By late June 2026 this proposal had been finalised: the state, Vattenfall and Industrikraft concluded a shareholders' agreement setting the state's stake at 60%, with Vattenfall's and Industrikraft's holdings reduced to 20% each; the formal transfer of shares to the state is expected in the second half of 2027, pending a State Aid decision from the European Commission.[179]

Interviewees also explained that Sweden is running two licensing tracks in parallel. One interviewee described how Vattenfall, as the state-owned first mover, chose to use the established, traditional licensing route (i.e., a full technical assessment of final design drawings, followed by a government and municipal siting decision) because it has confidence the project would clear it; conversely, privately-led developers opted for a newer process built around early government approval of the site itself, closer to a UK-style Generic Design Assessment, because it offers earlier investment certainty before committing to detailed design work. The same government expert named the licensing routes and the financing model as "the two most important instruments" the current government has created. On the other hand, the interviewee highlights his disappointment with the European Union's lack of funding support, while seeing more promise in cross-border regulatory cooperation over the coming decade. This gap is echoed at EU level: in its opinion adopted in July 2026, the European Economic and Social Committee itself called for the EU to launch a financing roadmap for SMRs sharing risk between private investors and the public sector, an indication that concrete EU-level financial support has yet to materialise.[180]
Based on the interviewees' description, the two Swedish licensing routes can be compared as follows:

Table 18: Comparison of the traditional and early-approval licensing routes – Sweden

Dimension	Traditional licensing route	Newer early-approval licensing route
Typical user	Vattenfall / state-owned first mover	Privately led nuclear developers
Basic logic	Detailed technical design is assessed before the main siting decision	Government provides earlier approval of the site/ project concept before full detailed design
Siting decision	Government and municipality decide after the detailed technical assessment	Site acceptability is addressed earlier, before major detailed-design expenditure
Up-front developer expenditure	Higher, because significant engineering must be completed before key approvals	Lower before the initial political/regulatory decision
Design maturity required	High: final or near-final design drawings are assessed	Lower at the initial approval stage
Investment certainty	Arrives later	Arrives earlier
Regulatory philosophy	Demonstrate that a mature, specific plant design meets requirements	Establish early acceptability, then progressively mature and assess the detailed design
Similar international model	Conventional project-specific nuclear licensing	Described by interviewees as closer to the UK Generic Design Assessment approach
Main advantage	Provides a comprehensive assessment of a well-developed design and may suit an experienced, well-capitalised developer confident of approval	Gives developers an earlier "go/no-go" signal and therefore improves bankability and investment confidence
Main disadvantage	Requires substantial design expenditure before regulatory and political certainty is achieved	More regulatory stages/interfaces may be required later as the design is developed and approved in detail
Policy significance	Part of the existing licensing framework	Presented by the government interviewee as one of the key instruments for enabling new nuclear investment, alongside the financing model

178 World Nuclear Association. Nuclear Power in Sweden. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-o-s/sweden

179 Government Offices of Sweden. Sweden Takes Next Major Step Towards New Nuclear Power. Press release (26 June 2026). https://www.government.se/press-releases/2026/06/sweden-takes-next-major-step-towards-new-nuclear-power/

180 European Economic and Social Committee. Small Modular Reactors. Opinion, adopted 15 July 2026. https://www.eesc.europa.eu/en/our-work/opinions-information-reports/opinions/small-modular-reactors

The central distinction is therefore one of sequencing and risk allocation. The traditional route asks the developer to mature the plant design substantially before receiving the key governmental and municipal decisions. The "newer route" seeks to move an important element of political and siting certainty forward in time, allowing developers to obtain greater confidence in the project before committing to the full cost of detailed engineering. This also explains the difference between Vattenfall and private developers described in the interviews: a state-owned, experienced utility may be better able to absorb the development risk associated with the traditional route, whereas privately financed projects place greater value on an early regulatory or governmental decision that can reduce sunk-cost exposure before major capital commitments are made.[181] On the cross-border Rolls-Royce SMR fleet spanning Sweden, the UK, and Czech Republic, two experts independently explained that deliberate sequencing is a coordination mechanism that also allows at least some of the workforce to move from one project to the next and share learnings.

Structure

Industrikraft's structure consists of major industrial energy consumers co-investing directly in project equity, providing early-stage development capital alongside the state and Vattenfall, rather than simply signing offtake agreements.[182] One interviewee explained that energy-intensive industry co-investing directly in a nuclear plant is common practice in Finland (see the Mankala model) but has never happened in Sweden.

Concerning the back-end infrastructure (incl. decommissioning and waste management), Sweden's existing infrastructure is already extensive, specifically sized for the current fleet and currently under construction.[183] SKB (the Swedish Nuclear Fuel and Waste Management Company) received government permission in January 2022 to build a final geological repository for spent fuel at Forsmark, designed to hold 12,000 tons of spent fuel in around 6,000 copper canisters under its KBS-3 method, with construction now under way, and disposal expected to begin in the late 2030s;[184] the repository is explicitly sized to the waste arising from Sweden's existing reactor programme,[185] and SKB has separately confirmed the scale of the underlying construction project and its multi-decade delivery timeline.[186]

Interview evidence adds a structural detail the public record does not state explicitly and identifies this as a distinctive theme within the wider study. According to one interviewee, Sweden's existing waste repository system – operated by SKB (Swedish Nuclear Fuel and Waste Management Co.),[187] which is owned solely by the incumbent nuclear power utilities – is formally mandated only to handle the waste and spent fuel produced by the existing reactor fleet, and Sweden has kept new-build waste and spent fuel separate from SKB.

The interviewee also explained that where Sweden's current spent-fuel storage is centralised at a single site, a new-build pathway could instead be modular and distributed across multiple locations. Notably, two Swedish experts were the only interviewees across the dataset to raise decommissioning and waste management as a live consideration for the new SMR build-out, without being prompted by the interviewer.

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181 A note: Videbergkraft moving to a majority state-owned model in 2027 (state will have 60%), with Vattenfall a minority owner (20%) along with Industrikraft (20%).

182 Industrikraft. An Initiative by Leading Swedish Industrial Companies. https://www.industrikraft.se/en (accessed 27 August 2026).

183 Vattenfall. One of the World's First Final Repositories. Vattenfall Newsroom (2025). https://group.vattenfall.com/press-and-media/newsroom/2025/one-of-the-worlds-first-final-repositories-for-spent-nuclear-fuel-is-being-built-in-forsmark/

184 Government Offices of Sweden. Final Disposal of Spent Nuclear Fuel. (January 2022). https://www.government.se/articles/2022/01/final-disposal-of-spent-nuclear-fuel/

185 Vattenfall. One of the World's First Final Repositories. Vattenfall Newsroom (2025). https://group.vattenfall.com/press-and-media/newsroom/2025/one-of-the-worlds-first-final-repositories-for-spent-nuclear-fuel-is-being-built-in-forsmark/

186 Svensk Kärnbränslehantering. The Conditions for SKB's Biggest Construction Project: The Final Repository. SKB (2024). https://skb.com/nyhet/the-conditions-for-skbs-biggest-construction-project-the-final-repository-for-spent-nuclear-fuel-are-now-being-established/

187 As Sweden's 8th report to the Joint Convention states: "The four utilities operating nuclear power reactors in Sweden have formed a special company, the Swedish Nuclear Fuel and Waste Management Co. (SKB), to assist them in executing their responsibilities regarding all handling, transportation and storage of spent fuel and radioactive waste outside the nuclear power plants." Sweden in fact operates two distinct facilities at Forsmark - one for short-lived operational waste, and a deep geological repository under construction for spent fuel – though the interviewee did not distinguish between the two, and it is not clear from the interview which, or both, they referred to.

This suggests that there is a genuinely under-discussed dimension of Europe's SMR orderbook rather than one already resolved. Recent peer-reviewed research on SMR deployment reinforces this point, noting that, unlike gigawatt-scale reactors, SMRs can generate a larger volume of low- and intermediate-level waste per unit of energy produced, requiring correspondingly greater effort in waste management and disposal.[188]

Regulatory capacity, workforce, and financing

On regulatory capacity, Sweden's 2026 budget allocated SEK 161 million (approx. € 14.67 million) specifically to strengthen the permitting capability of the agencies and courts involved in nuclear licensing, including the Swedish Radiation Safety Authority (SSM), and the government plans to establish a dedicated new environmental permitting authority from July 2027 to accelerate approvals.[189] However, interviewees identify workforce, not licensing capacity, as the more binding constraint on the industrial side. One interviewee, for example, described Sweden as lacking an apprenticeship system comparable to Germany's or the UK's, leaving an unclear pipeline of new entrants for craft trades such as (nuclear) welding, fitting and electrical work. This expertise is also required in the non-nuclear industry, so competition will come from the road, rail, housing, and urban-renewal construction too. One interviewee drew a direct precedent from Finland's Olkiluoto 3, whose construction relied on a large, imported labour force, predominantly Polish, to cover a shortfall Finland could not meet domestically, and questioned how scalable that solution would be if several European countries build nuclear plants simultaneously. This mirrors another interviewee account of the FOAK financing "chicken-and-egg" problem: suppliers are reluctant to expand capacity ahead of firm orders, and orders are hard to place without confidence the supply ecosystem can deliver.

On financing-instrument choice specifically – and noting that there are several financial support mechanisms deployed for new nuclear in Sweden: state loans, the two-way CfD, and a risk sharing approach – one expert argued that the CfD/Regulated Asset Base (RAB) debate is essentially about the electricity-selling mechanism and does not straightforwardly apply outside it. Notably, the production of electricity (and heat) can have two main routes: produced for the electricity market (more common) or produced specifically for a specific end user.

A separate interviewee offered a more tentative, personal view that RAB could prove "easier to make work" politically than a CfD, given it spreads cost through a small, upfront bill increase rather than a delayed price-hedging mechanism, though this was explicitly framed as a personal impression rather than an institutional position. This however, is not the preferred route for Sweden, due to concerns about public and political resistance associated with charging consumers now for something that will not produce power for many years to come.

An alternative route is that the electricity (and/or heat) is produced directly for an industry for a single factory or industrial complex, without going to the general electricity market. In this case, it could instead use a direct PPA that redistributes market risks between the utility and the industrial consumers. In this scenario, the long-term PPA itself provides the price stability that a CfD would otherwise supply, so the CfD/RAB choice discussed above becomes less relevant. A PPA is not, however, mechanically equivalent to a CfD in risk allocation or construction-period support, so financing the build phase still requires separate instruments.

2.5.4 Financial assessment

This part describes the nuclear scenarios simulated for Sweden and the rationale behind them. Each scenario is a combination of 3 elements:

1. Nuclear Deployment Trends
   (How many SMRs are deployed over time).
2. Costing and economics Values
   (Life cycle cost, Electricity Price).
3. Financing and Funding Options
   (how capital is raised and remunerated).

Nuclear Deployment Trends

Assuming the operating life of large reactors in Sweden is capped at 60 years, the full fleet should be replaced by about 2045. Sweden's deployment trends are then divided into two parts: in the first, it is assumed that today's large reactor capacity will be replaced by large reactors by 2045, with SMRs only providing additional capacity; in the second, SMRs could also replace the current large reactor fleet at the end of their operating life.

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188 Larbanois, A. et al. Towards the Integration of Small Modular Reactors in Industrial Hubs: A Multi-Dimensional Discussion. Energy Research & Social Science 139, 104859 (2026). https://doi.org/10.1016/j.erss.2026.104859

189 NucNet. Sweden Proposes €19.9 Billion Framework to Finance New Nuclear Plants. (September 2025). https://www.nucnet.org/news/sweden-proposes-eur19-9-billion-framework-to-finance-new-nuclear-plant-projects-9-1-2025

Table 19: SMR deployment trends as new capacity – Sweden

Site name	Nuclear capacity as today	Deployment trends – SMRs as new capacity					
		Low		Medium		High	
		New large reactors	New SMRs	New large reactors	New SMRs	New large reactors	New SMRs
Ringhals	2.2 GWe	2.2	4×0.4 SMRs	2.2	4×0.4 SMRs	2.2	4×0.4 SMRs
Valdemarsvik	0 GWe	0	0	0	4×0.4 SMRs	0	4×0.4 SMRs
Nyköping	0 GWe	0	0	0	0	0	3×0.4 SMRs
Other sites	4.8 GWe	4.8	0	4.8	0	4.8	0
Total nuclear capacity	7.0 GWe	8.6 GWe (new capacity, large and small reactors)		10.2 GWe (new capacity, large and small reactors)		11.4 GWe (new capacity, large and small reactors)	
		Deployment of only the confirmed decision in Ringhals site		Confirmed SMR deployment in Ringhals and new SMRs to reach the midpoint of the capacity for which the government would provide state loans		Confirmed SMR deployment in Ringhals and new SMRs to reach the higher end of the capacity for which the government would provide state loans	

SMRs as new capacity

In these trends, the current nuclear fleet of large reactors at the end of their operational life will be replaced by large reactors (assuming the capacity is maintained), with SMRs only representing additional capacity. Given the explicit interest in deploying SMRs in three different sites, the following trends are considered:

- **New capacity low trend.** Deployment limited to the Ringhals site.[190] Given the expected 1,410 MWe of total power, it is assumed that 4×400 MWe SMRs are built on this site for a total of 1.6 GWe.
- **New capacity medium trend.** Deployment in Ringhals (as in the low trend) and Valdemarsvik sites.[191] In the latter, it is assumed that a 1.6 GWe deployment in the 4×400 MWe form. A total of 3.2 GWe of new SMR capacity is reached. This value is close to a two large reactor equivalent, at the midpoint of the capacity for which the government would provide state loans, and at the lower bound of the possible new SMR capacity.[192]
- **New capacity high trend.** Deployment in Ringhals, Valdemarsvik (as in the medium trend), and Nyköping (hypothetical assumption, not announced capacity).[193] The deployment is 3×400 MWe for a total of 1.2 GWe of new capacity in the site. The total new SMR capacity is 4.4 GWe, at the higher end of both the capacity for which the government would provide state loans and the expected new SMR capacity. [194]

The full schedules are reported in the Appendix.

190 World Nuclear Association. Nuclear Power in Sweden. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-o-s/sweden

191 World Nuclear Association. Nuclear Power in Sweden. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-o-s/sweden

192 World Nuclear Association. Nuclear Power in Sweden. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-o-s/sweden

193 World Nuclear Association. Nuclear Power in Sweden. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-o-s/sweden

194 World Nuclear Association. Nuclear Power in Sweden. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-o-s/sweden

Table 20: SMR deployment trends as replacement of large reactors – Sweden

Site name	Nuclear capacity as today	Deployment trends – SMRs as replacement of large reactors					
		Low		Medium		High	
		New large reactors	New SMRs	New large reactors	New SMRs	New large reactors	New SMRs
Ringhals	2.2 GWe	2.2	4×0.4 SMRs	0	9×0.4 SMRs	0	9×0.4 SMRs
Valdemarsvik	0 GWe	0	0	0	4×0.4 SMRs	0	4×0.4 SMRs
Nyköping	0 GWe	0	0	0	0	0	3×0.4 SMRs
Oskarshamn	1.4 GWe	0	4×0.4 SMRs	0	4×0.4 SMRs	0	4×0.4 SMRs
Forsmark	3.4 GWe	3.4	0	3.4	0	0	9×0.4 SMRs
Total nuclear capacity	7.0 GWe	8.8 GWe (new capacity, large and small reactors)		10.2 GWe (new capacity, large and small reactors)		11.6 GWe (only new SMR capacity)	
		Around 20% of the existing large reactor capacity is replaced by SMRs		Around 50% of the existing large reactor capacity is replaced by SMRs		The full existing large reactor fleet capacity is replaced by SMRs	

SMRs as replacements of large reactors

In these trends, the current fleet is replaced by SMRs at the end of the operating life, the new capacity will be covered by SMRs as well as presented in the "new capacity" scenarios:

- **Replacement low trends.** It is assumed that 20% of the current fleet is replaced by SMRs, corresponding to 1.4 GWe. Given the size similarity with the Oskarshamn site, it is assumed that 4×400 MWe SMRs are deployed at this site, replacing the current capacity, in addition to the extra capacity reported in the “new capacity” low trend.
- **Replacement medium trends.** The replacement is assumed at 50%, i.e., half of the current large reactor capacity is replaced by SMRs in 2045. Ringhals and Oskarshamn account for 3.6 GWe total today (around 50%). It is assumed the replacement happens at these sites: Oskarshamn sees the deployment of 4×400 MWe SMRs; Ringhals sees the deployment of 5×400 MWe SMRs to cover the current capacity as well as the addition of 4×400 MWe SMRs as additional capacity (as in the "new capacity” medium trend) for a total of 9 reactors. New SMRs are also deployed in Valdemarsvik as in the "new capacity” medium trend.
- **Replacement high trends.** The full large reactor fleet is assumed to be replaced by SMRs. The deployment is the same as the previous trend, but it also includes Forsmark site: its 3.4 GWe are assumed to be replaced by 9×400 MWe SMRs, 3.6 GWe in total. New SMRs are also deployed in Nyköping as in the "new capacity” high trend.

The full schedules are reported in the Appendix.

Table 21: OCC input assumptions, optimistic and conservative – Sweden

Input	Optimistic value	Conservative value	Reference
OCC [€/kWe]	8,965	10,758	See Appendix
O&M [€/MWh]	16	31	See Appendix
Fuel cycle [€/MWh]	9	12	Based on[195,196]
D&D [€/MWh]	2		Based on[197]

Refer to footnotes below for the citations used in the table.

Costing and economics

The OCC of a nuclear plant is largely country-specific and varies because of construction know-how and delays, as well as labour costs, supply chain maturity, commodity and equipment prices, and regulations. The determination of the OCC and O&M cost for a 400 MWe SMR in Sweden are reported in the Appendix. Fuel cycle costs are based on public data. The same is done for D&D costs, that are also maintained equal between the conservative and optimistic scenarios.

Moreover, the simulations require additional Swedish data. In particular:

- Electricity price (2025 average): € 42.51/MWh.[198]
- Inflation (June 2026): 0.7%.[199]
- 10-year government bond yield (July 2026): 2.87% nominal,[200] around 2.15% real.

[195] Idaho National Laboratory. Nuclear Energy Cost Report. (INL, Idaho Falls, ID, 2026). https://inldigitallibrary.inl.gov/content/uploads/50/2026/04/Sort_107010.pdf

[196] MIT Center for Advanced Nuclear Energy Systems. Total Cost Projection of the Next AP1000. (MIT CANES, Cambridge, MA, 2024). https://canes.mit.edu/media/2024-total-cost-projection-of-next-ap1000

[197] Idaho National Laboratory. Nuclear Energy Cost Report. (INL, Idaho Falls, ID, 2026). https://inldigitallibrary.inl.gov/content/uploads/50/2026/04/Sort_107010.pdf

[198] Ember. European Wholesale Electricity Price Data. https://ember-energy.org/data/european-wholesale-electricity-price-data/

[199] Trading Economics. Inflation Rate: Europe. https://tradingeconomics.com/country-list/inflation-rate?continent=europe

[200] Trading Economics. Sweden 10-Year Government Bond Yield. https://tradingeconomics.com/sweden/government-bond-yield

Financing and funding

The financial inputs are retrieved from past and proposed nuclear projects in Sweden.

Table 22: Financial structure of past and proposed nuclear projects – Sweden

Plant	Size	Status	Financial structure	D:E	Cost of debt	Cost of equity	Electricity price
Ringhals 3-4	2×1,100 MWe (tot. 2,190 MWe)	Operating, life extension study	Consortium ownership	n/a	n/a	n/a	Merchant, sell into SE3 and SE4 (avg. € 52-65/MWh)[201]
Forsmark 1-3	3×1,100 MWe (tot. 3,270 MWe)	Operating, life extension study	Consortium ownership	n/a	n/a	n/a	Merchant, sell into SE3 and SE4 (avg. € 52-65/MWh) [202]
Oskarshamn 3	1,450 MWe upgraded	Operating	Consortium ownership	n/a	n/a	n/a	Merchant, sell into SE3 and SE4 (avg. € 52-65/MWh)[203]
Ringhals SMRs	Up to 1,500 MWe	Pre-FID	State loans (repayment n/a) + 40 years CfD[204]	n/a	n/a	n/a	Uncertain. Strike price not public[205]

Note: Sweden existing fleet has no domestic CfD or regulated cost recovery precedent. The electricity market is divided into 4 bidding zones. The use of PPAs is growing, particularly for financing renewable energy investments.[206]
Refer to footnotes below for the citations used in the table.

201 SKGS. The Swedish Industry's Demand for Electricity up to 2035. (SKGS, 2024). https://skgs.org/app/uploads/sites/2/2024/09/Swedish-Industries-Electricty-Demand-SKGS-2024.pdf

202 SKGS. The Swedish Industry's Demand for Electricity up to 2035. (SKGS, 2024). https://skgs.org/app/uploads/sites/2/2024/09/Swedish-Industries-Electricty-Demand-SKGS-2024.pdf

203 SKGS. The Swedish Industry's Demand for Electricity up to 2035. (SKGS, 2024). https://skgs.org/app/uploads/sites/2/2024/09/Swedish-Industries-Electricty-Demand-SKGS-2024.pdf

204 World Nuclear News. Swedish State Taking Majority Stake in Videberg Kraft. (2026). https://www.world-nuclear-news.org/articles/swedish-state-to-take-majority-stake-in-videberg-kraft

205 World Nuclear News. Swedish State Taking Majority Stake in Videberg Kraft. (2026). https://www.world-nuclear-news.org/articles/swedish-state-to-take-majority-stake-in-videberg-kraft

206 International Atomic Energy Agency. Country Nuclear Power Profiles: Sweden. (IAEA, 2025). https://cnpp.iaea.org/public/countries/SE/profile/preview

Given the financial information for the existing and proposed nuclear plants, it is possible to assume the following financial options:

- **Merchant option.** The electricity price is set to € 60/MWh, in the expected range of electricity markets. The other inputs must be assumed, including a D:E of 70:30 with a debt repayment period of 30 years and a cost of debt of 4.2% (2% over the 10-year government yield). The cost of equity is set to 12.5%.[207]
- **Loan + CfD option.** This includes a state loan for which the main characteristics are based on the published state framework:[208] a D:E of 75:25 with a debt repayment period of 40 years, a cost of debt capped at 4% nominal (around 3.3% real), a real cost of equity of 12.5%, and a CfD strike price of öre 80/kWh (close to € 72.5/MWh). This value is an illustrative assumption, not a committed strike price. The actual CfD level will be determined for the supported project and remains subject to the final financing and State Aid arrangement.
- **Supported option.** See assumptions and Appendix for the full derivation:
  - **No EU guarantee.** The gearing ratio is raised to 80:20 and repaid over 40 years. Electricity is sold under a CfD set at € 72.5/MWh. The cost of debt is the Swedish real yield (2.15%) plus a credit margin of 0.75%, equals to 2.90% real. The cost of equity is built as a spread over the cost of debt. The spread is 4.4%: the average of a private tranche requiring 5.8% and a public tranche requiring 3.0%, each taking half the equity. The cost of equity is therefore 2.9% + 4.4% = 7.30% real.
  - **With EU guarantee.** In this option, an EU guarantee covers 80% of the senior debt, so the debt is priced at the 0.56% (real) EU benchmark, while the remaining 20% is priced at the Swedish government yield (2.15%). The obtained value is 0.8*0.56% + 0.2*2.15% = 0.88%. Considering a credit margin of 0.75%, the cost of debt becomes 1.63% (real). The cost of equity is computed using a premium of 4.4%, reaching 6.03% (real). The CfD strike price, the gearing, and the debt repayment period are maintained at € 72.5/MWh, 80:20, and 40 years, respectively.

[207] Nationalekonomiska Föreningen. Kärnkraftens verkliga kostnad. Ekonomisk Debatt (2026). https://www.nationalekonomi.se/artikel/karnkraftens-verkliga-kostnad/

[208] Nationalekonomiska Föreningen. Kärnkraftens verkliga kostnad. Ekonomisk Debatt (2026). https://www.nationalekonomi.se/artikel/karnkraftens-verkliga-kostnad/

Results

The following are the scenario results in terms of LCOE.

Table 23: LCOE simulation results by deployment trend – Sweden

Values are whole fleet levelised electricity costs in €/MWh, expressed in real 2026 money.

		Deployment trends					
		Low		Medium		High	
		Optimistic	Conservative	Optimistic	Conservative	Optimistic	Conservative
SMRs as new capacity	**Merchant**	128.15	166.38	124.83	162.39	124.72	162.27
	Loan+CfD	110.22	144.85	107.70	141.83	108.11	142.33
	Supported – no EU guarantee	85.49	115.17	81.81	110.76	80.12	108.73
	Supported – EU guarantee	76.75	104.70	73.46	100.75	71.95	98.95
SMRs as replacement	**Merchant**	124.83	162.39	117.57	153.68	114.03	149.44
	Loan+CfD	107.70	141.83	101.88	134.85	98.78	131.16
	Supported – no EU guarantee	81.81	110.76	76.48	104.39	74.31	101.77
	Supported – EU guarantee	73.46	100.75	68.96	95.35	67.06	93.08

The merchant option has no strike and is tested against its own assumed sale price of € 60/MWh:

- **Merchant option.** It is above the assumed € 60/MWh sale price in every deployment trend;
- **Loan + CfD option.** This option is 12–14% below merchant, and still 36–52% above the strike price under optimistic costs. The reduction is modest because the state loan lowers the cost of debt but leaves the cost of equity at 12.5%, unchanged from merchant;
- **Supported option without EU guarantee.** This option is 31–36% below merchant, and the first option to come close to the assumed strike price: 2–18% above the strike under optimistic costs, but still above in every cell;
- **Supported option with EU guarantee.** This option is 37–42% below merchant. It is the only option that clears the strike price, and it does so in three cells of twelve: the medium and high trends of the replacement trends and the high trend of the new-capacity trends, all under optimistic costs.

Sweden is the country where the assumed strike price benchmark is not sufficient on current cost assumptions. Three cells of 48 clear the € 72.5/MWh strike; all three requiring both the EU guarantee and the optimistic cost pair.

The four levers can be ranked by the LCOE spread they generate:

1. Moving between financing options is worth € 47–63/MWh, by a wide margin the dominant lever and the largest financing effect of the four countries.
2. Moving from optimistic to conservative life-cycle costs is worth € 26–38/MWh.
3. Moving from the new-capacity family to the replacement family is worth € 3–13/MWh.
4. Moving from the low to the high trend € 2–13/MWh.

Financing dominates in Sweden because both domestic options price equity at 12.5% real, the highest of any national option in the study, while the supported options price it at 7.30% and 6.03%: the simulation holds the required equity return unchanged in the domestic loan-plus-CfD case. This is a modelling assumption, not evidence that the CfD provides no price-risk protection. The two types of deployment (new capacity and replacement) are close together because they overlap in unit count, which confirms that the LCOE responds to the number of units and their co-siting, not to what the units are replacing.

Sweden's € 42.51/MWh wholesale price is the lowest of the four countries. A historical wholesale-price average is not, by itself, a forecast of the revenue available to a new plant. Repayment of construction debt does not determine the marginal cost of generation. Existing and new plants have different capital-recovery requirements; **the fair comparison is against other new, low-carbon capacity assessed on the same terms: how feasible it is to build at scale, the capacity and load factor it can actually deliver in Sweden, and whether it is likewise carbon-free.**

On Sweden's own figures, adding the EU guarantee to the common supported package reduces the upper endpoint by € 10.47/MWh, from € 115.17 to € 104.70/MWh. The full change from the merchant upper endpoint of € 166.38/MWh is € 61.68/MWh.

The avoided emissions are computed as described in the Appendix, however, Sweden electricity is already close to fully decarbonised. The correct statement for Sweden is that the trends maintain an existing low-carbon system as the current fleet reaches the end of its life; the displacement figures are reported for comparability with the other three countries only. For reference, the total emissions in Sweden were 47.5 $MtCO_2eq$ in 2024, but the overall removal within land use, land-use change, and forestry was 54 $MtCO_2eq$ in the same year.[209]

Table 24: Avoided emissions by deployment trend – Sweden

Trend	Units	Output [TWh/year]	SMR emissions [$ktCO_2eq$/year]	Avoided vs gas [$MtCO_2eq$/year]	Avoided vs coal [$MtCO_2eq$/year]
New capacity, low	4	12.6	151	6.0	10.2
New capacity, medium	8	25.2	303	12.1	20.4
New capacity, high	11	34.7	416	16.6	28.0
Replacement, low	8	25.2	303	12.1	20.4
Replacement, medium	17	53.6	643	25.6	43.3
Replacement, high	29	91.5	1,097	43.7	73.9

[209] Swedish Environmental Protection Agency. National Inventory Document of Sweden. (Submission to the UNFCCC, 2026). https://unfccc.int/sites/default/files/resource/NID%20SE%20submission%202026.pdf

2.6 POLAND - "The First-Build case"

2.6.1 Brief introduction

Poland has a population of 36.5 million (December 2025, Eurostat)[210] and a GDP of € 810 billion.[211] The GDP grew 3.6% in 2025.[212] Poland's main natural resources are coal, sulphur, copper, lead, zinc.[213]

Poland currently has no operating, under-construction, or decommissioned nuclear power reactors, making it the newcomer case among the four countries studied. The country's electricity system remains heavily dependent on fossil fuels, particularly coal and lignite.[214,215] Poland is now pursuing both large reactors and SMRs in parallel. On large reactors, Gen III+ PWR capacity has been proposed at the Łubiatowo-Kopalino site, with Bełchatów and Konin identified as further candidate sites.[216] On SMRs, the chosen technology is the BWRX-300, with the first units planned at Włocławek and additional units proposed at several further sites. Separately, OSGE is seeking a CfD covering part of this capacity across three sites.[217]

Poland's utilities:

- **PGE (Polska Grupa Energetyczna):** ~58% owned by the Polish State Treasury; largest power producer in Poland, generation portfolio ~80% hard coal/lignite; partnering with the Polish utility Zespół Elektrowni Pątnów-Adamów-Konin (ZE PAK) on the proposed large-reactor project near Konin/Pątnów.[218]
- **ORLEN:** state-controlled, is the largest multi-utility company in Central and Eastern Europe, dealing with refining, fuel retail, and power generation/distribution. With the privately-owned Synthos Green Energy (an SMR development platform) forms the OSGE (Orlen Synthos Green Energy) joint venture; developing the BWRX-300 SMR fleet, including Włocławek.[219]
- **PEJ (Polskie Elektrownie Jądrowe):** state-owned special-purpose company developing the Łubiatowo-Kopalino large-reactor project.[220]

Regulator: National Atomic Energy Agency (Państwowa Agencja Atomistyki, PAA), which is responsible for licensing nuclear installations and overseeing compliance with nuclear safety standards. The PAA is already engaged in the country's first nuclear power plant licensing process, but it does not yet have domestic experience licensing and overseeing the construction and operation of a commercial nuclear power plant.[221]

2.6.2 Demand orderbook

Poland has no nuclear power reactors in construction, operation, suspended, or being decommissioned. Poland has a total electricity production of 169.9 TWh, of which 61.7% from coal and lignite.[222] In 2024, it had a net electricity consumption of 154 TWh.[223] These values differ because of imports, exports, and losses. Poland has a total installed capacity of 62.3 GWe, of which 46.4% (28.8 GWe) from coal and lignite.[224]

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210 Trading Economics. Poland Population. https://tradingeconomics.com/poland/population

211 Trading Economics. Poland GDP. https://tradingeconomics.com/poland/gdp

212 Trading Economics. Poland GDP. https://tradingeconomics.com/poland/gdp

213 Crédit Agricole. Poland: Economic Overview. https://international.groupecreditagricole.com/en/international-support/poland/economic-overview

214 Polskie Elektrownie Jądrowe. The Project: Key Information. PEJ (2025). https://pej.pl/en/the-project/key-information/

215 World Nuclear Association. Nuclear Power in Poland. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-o-s/poland

216 World Nuclear Association. Nuclear Power in Poland. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-o-s/poland

217 World Nuclear News. Polish Developer Applies for CfD for Three SMR Plants. (2026). https://www.world-nuclear-news.org/articles/polish-developer-applies-for-state-funding-for-three-smr-plants

218 PGE Group. PGE Group. PGE. https://www.gkpge.pl/en/pge-group

219 Orlen Synthos Green Energy. About Us. OSGE. https://osge.com/en/about-us/

220 Polskie Elektrownie Jądrowe. The Project: Key Information. PEJ (2025). https://pej.pl/en/the-project/key-information/

221 World Nuclear News. Polish regulator ready for nuclear programme, IAEA says (2023) https://www.world-nuclear-news.org/Articles/Polish-regulator-ready-for-nuclear-programme,-IAEA

222 International Atomic Energy Agency. Country Nuclear Power Profiles: Poland. (IAEA, 2025). https://cnpp.iaea.org/public/countries/PL/profile/preview

223 Arthur D. Little. Poland Energy Outlook: 2026 and Beyond. (Arthur D. Little, 2025). https://www.adlittle.com/jp-en/insights/report/poland-energy-outlook-2026-beyond

224 International Atomic Energy Agency. Country Nuclear Power Profiles: Poland. (IAEA, 2025). https://cnpp.iaea.org/public/countries/PL/profile/preview

Table 25: Nuclear Energy Demand outlook – Poland

Demand outlook	Value
Electricity consumption today	154 TWh (net, 2024)
Consumption projection for 2040 – low	210 TWh
Consumption projection for 2040 – high	230 TWh
Nuclear share of generation today	0% (no operating nuclear power reactors)
Policy target (capacity, no official % target)	6–9 GWe large reactors; up to 26 SMR units (not fully committed)

Poland has expressed interest in both large and small reactors:

- **Large reactors.** Poland is considering the construction of 6-9 GWe of nuclear capacity from Gen III+ PWR, of which 3xAP1000 (developed by Westinghouse) in the Łubiatowo-Kopalino site.[225] Expected additional sites for large reactors are Bełchatów and Konin.[226] In 2024, the government confirmed its intention to provide state guarantees covering 100% of debt taken to finance large nuclear investment project.
- **Small reactors.** The technology of choice is the BWRX-300 (developed by GE Vernova Hitachi), with 4 units planned in the Włocławek site, and additional units proposed in at least 5 other sites.[227] In 2023, the government granted a decision-in-principle, a regulatory step short of a committed order, for the construction of up to 24 BWRX-300 reactors.[228] It is also reported that OSGE is seeking a CfD covering 14 BWRX-300's at three Polish sites, with plans to build up to 26 reactors.[229]

Electricity consumption trends are between 210 and 230 TWh by 2040, expecting a 2% annual increase.[230] Nuclear capacity trends comprise both large reactors (6-9 GWe[231] and SMRs (up to 26 reactors, not all committed).[232] District heating supplies around 40% of heat demand, like Czech Republic, and Poland has the largest installed district-heating capacity in the EU after Germany (~42 GWth).[233,234] A reduced VAT rate on district heating was used as an affordability measure during the 2022 price crisis.[235]

2.6.3 Supply chain readiness

Poland's supply chain position reflects its "first-build" starting point: no operating nuclear power reactor, a regulator with research-reactor experience but no commercial power plant, and two separate build tracks proceeding in parallel (a state-led large-reactor programme and an SMR fleet). However, "nearly 80 Polish companies have directly performed construction and assembly work or manufactured components for power plants, research and development reactors, and other nuclear facilities (e.g., nuclear fuel production plants)".[236]

225 Polskie Elektrownie Jądrowe. The Project: Key Information. PEJ (2025). https://pej.pl/en/the-project/key-information/

226 World Nuclear Association. Nuclear Power in Poland. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-o-s/poland

227 World Nuclear Association. Nuclear Power in Poland. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-o-s/poland

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229 World Nuclear News. Polish Developer Applies for CfD for Three SMR Plants. (2026). https://www.world-nuclear-news.org/articles/polish-developer-applies-for-state-funding-for-three-smr-plants

230 Arthur D. Little. Poland Energy Outlook: 2026 and Beyond. (Arthur D. Little, 2025). https://www.adlittle.com/jp-en/insights/report/poland-energy-outlook-2026-beyond

231 Polskie Elektrownie Jądrowe. The Project: Key Information. PEJ (2025). https://pej.pl/en/the-project/key-information/

232 World Nuclear News. Polish Developer Applies for CfD for Three SMR Plants. (2026). https://www.world-nuclear-news.org/articles/polish-developer-applies-for-state-funding-for-three-smr-plants

233 Euroheat & Power. District Heating and Cooling in Europe: The Share of Renewable Energy. (via IIF-IIR). https://iifiir.org/en/news/district-heating-and-cooling-in-europe-the-share-of-renewable-energy

234 Exergy ORC. Industrial Heat Pumps in District Heating: Market Outlook 2030. https://www.exergy-orc.com/industrial-heat-pumps-district-heating-market-outlook-2030/

235 International Energy Agency. District Heating. IEA. https://www.iea.org/energy-system/buildings/district-heating

236 Ministry of Climate and Environment / Polski Atom. Nowy katalog polskich firm dla sektora jądrowego. 2021. https://www.gov.pl/web/polski-atom/nowy-katalog-polskich-firm-dla-sektora-jadrowego

Overview

Poland's state-led track focuses on three Westinghouse AP1000 units at Łubiatowo-Kopalino, delivered by a Westinghouse-Bechtel consortium for state-owned developer Polskie Elektrownie Jądrowe (PEJ, a special-purpose vehicle 100% owned by Poland's State Treasury). The total project cost is estimated at roughly PLN 192-200bn (€ 42-47 billion), financed on a targeted 30% state equity/70% debt basis, with approximately PLN 60 billion (€ 14 billion) in secured state financing and a two-way CfD[237] approved by the European Commission in December 2025.[238] As a condition of that approval, the Commission required the AP1000 CfD to remunerate the plant based on its availability to generate electricity (when the system needs it), rather than on the volume of electricity produced. This change is intended to preserve incentives for efficient operation rather than simply guaranteeing output-based revenue.

PEJ submitted its construction license application, running to more than 40,000 pages, in mid-2026, with first concrete targeted for the fourth quarter of 2028 and commercial operation of the first unit in 2033.[239] Running alongside this is the SMR programme: ORLEN Synthos Green Energy (OSGE), a 50/50 joint venture between state energy group Orlen and fleet developer SGE (formerly Synthos Green Energy), holds exclusive Polish rights to GE Vernova Hitachi's BWRX-300 and has government decisions covering up to 26 units nationally, with a first application for a CfD covering 14 units at three sites submitted in June 2026 and the first unit, at Włocławek, targeted for 2032.[240] SGE has, since then, also extended the same fleet model beyond Poland, submitting an application under the UK's Advanced Nuclear Framework in July 2026 for 14 further BWRX-300 units (4.2 GW) across three UK sites, backed by £50 million invested to date and a project team including Samsung C&T, Laing O'Rourke, Aecon Group and Google Cloud.[241]

Interview evidence adds additional insights, as one interviewee describing SGE business, which includes brings capital, harmonised documentation and cross-project supply chain coordination, while GE Vernova-Hitachi brings the reactor design and a validated supplier base. On Poland's AP1000 programme, one expert also offered a pointed critique: because the large-reactor programme depends on direct state subsidy for delivery, state funding might be insufficient for more than 3 units. The same expert also stressed Poland's growing demand, which, even excluding hyperscaler or electrification growth and only considering replacing retiring coal capacity, is estimated to require on the order of 14-18 GW of new generation. This explains why Poland is pursuing both a large state-backed anchor project and the SMR fleet, rather than treating them as alternative options. Domestic analysis identifies an acute shortage of certified welders, fitters and non-destructive-testing operators as a systemic constraint, noting that nuclear supplier certification (ISO 19443, ASME NQA-1) takes two to four years.[242]

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237 World Nuclear News, December 2025. The CfD is going to provide revenue stability over the entire lifetime of the power plant of 60 years https://www.world-nuclear-news.org/articles/eu-approves-polish-state-aid-for-nuclear-plant

238 World Nuclear News. EU Approves Polish State Aid for Nuclear Plant. (December 2025). https://www.world-nuclear-news.org/articles/eu-approves-polish-state-aid-for-nuclear-plant

239 NucNet. Polish Project Company Submits Construction Licence Application for Country's First Plant. (June 2026). https://www.nucnet.org/news/polish-project-company-submits-construction-licence-for-country-s-first-nuclear-power-station-3-2-2026

240 Notes from Poland. Polish Billionaire Seeks to Build 14 Small Modular Nuclear Reactors. (2 July 2026). https://notesfrompoland.com/2026/07/02/polish-billionaire-seeks-to-build-14-small-modular-nuclear-reactors-in-uk/

241 World Nuclear News. SGE Team Targets 14 BWRX-300 SMRs in the UK. (July 2026). https://www.world-nuclear-news.org/articles/sge-team-targets-14-bwrx300-smrs-uk

242 Horyzont Atomowy. Raport Horyzont Atomowy 2026, section 4.2. (2026). https://raporthoryzontatomowy.pl/RaportHA2026.pdf

Structure

On the SMR side, GE Vernova and Hitachi's roles divide along their historic supply chain lines: Hitachi supplies the specialised nuclear-island components, while GE Vernova's balance-of-plant supply chain draws on its existing industrial gas-turbine manufacturing base.[243] For Poland, this link has been formalised in early 2026, through a Generic Design Agreement between GE Vernova, Hitachi and OSGE to develop a Polish-adapted reference design,[244] and a separate memorandum of understanding between Cameco, GE Hitachi, BWXT Canada and SGE to evaluate a Canadian uranium fuel supply chain for the Polish fleet.[245]

One interviewee corroborates what is public knowledge, i.e., that GE Vernova's advantage is the supply chain and workforce management experience at industrial scale, including global logistics. The same interviewee also described SGE's own distinctive contribution to supply chain resilience as operating across its entire multi-country orderbook at once: because component and production-slot lead times require ordering “far in advance”, SGE de-risks this by managing production slot across projects in different countries rather than looking at national projects separately and committing to a single, isolated order.

Financing

On financing-instrument choice, the interviewee offered his view: a RAB model shifts first-of-a-kind and cost-overrun risk onto consumers, which the interviewee judges appropriate mainly for a genuine “state champion” project (citing, as a hypothetical example, a Finnish state-linked combined-heat-and-power microreactor) but not for a commercially financed fleet developer. Instead, the interviewee explained the importance of a CfD with explicit contingency protections against policy reversal and commodity-price escalation, modelled directly on the CfD structure already in place for Poland's own AP1000 programme.

On alternative ownership models, one expert expressed strong personal support for the underlying logic of Finland's Mankala model, while noting the practical difficulty of assembling multiple co-investors around a single first project, and drew a sharp distinction on hyperscaler involvement specifically, suggesting that a technology investment in the low hundreds of millions of dollars is not equivalent to a genuine “hybrid Mankala” which the expert defined as a hyperscaler committing real per-unit equity capital directly into the physical asset. The same interviewee was also sceptical of the long-term credibility of PPAs signed with a single corporate offtaker, given the uncertainty of any one company's presence over a multi-decade project life. The interviewee suggested that PPAs backed by state-owned utilities – according to the interviewee, closer to a CfD- are the more credible structure for long-term revenue certainty.

2.6.4 Financial assessment

This part describes the nuclear scenarios simulated for Poland and the rationale behind them. Each scenario is a combination of 3 elements:

1. Nuclear Deployment Trends
   (How many SMRs are deployed over time).
2. Costing and economics Values
   (Life cycle cost, Electricity Price).
3. Financing and Funding Options
   (how capital is raised and remunerated).

[243] GE Vernova. Deployment of the BWRX-300 Small Modular Reactor in Poland. Press release (February 2026). https://www.gevernova.com/news/press-releases/deployment-bwrx-300-small-modular-reactor-poland-major-step-forward-design-development

[244] GE Vernova. Deployment of the BWRX-300 Small Modular Reactor in Poland. Press release (February 2026). https://www.gevernova.com/news/press-releases/deployment-bwrx-300-small-modular-reactor-poland-major-step-forward-design-development

[245] Cameco. Cameco, GE Hitachi, GEH SMR Canada and Synthos Green Energy Agreement. Via Stock Titan (2026). https://www.stocktitan.net/news/CCJ/cameco-ge-hitachi-geh-smr-canada-and-synthos-green-energy-to-upnyczemfmvr.html

Table 26: SMR deployment trends – Poland

Site name	Deployment trends		
	Low	Medium	High
Włocławek	3×0.4 SMRs	3×0.4 SMRs	3×0.4 SMRs
New Site A	0	3×0.4 SMRs	3×0.4 SMRs
New Site B	0	4×0.4 SMRs	4×0.4 SMRs
New Site C	0	0	4×0.4 SMRs
New Site D	0	0	4×0.4 SMRs
Total new nuclear capacity	1.2 GWe	4.0 GWe	7.2 GWe
	Deployment of only the planned SMR capacity in Włocławek	Deployment of the SMR capacity sought by OSGE for CfD covering	Deployment of the total capacity mentioned for Poland in 5 sites

Nuclear Deployment Trends

Given Poland's interest in SMRs, the following trends could be assumed:

- **Low trend.** Only the first SMR site (Włocławek) is completed with an expected new SMR capacity of 1.2 GWe.[246] Thus, a 3×400 MWe SMRs deployment is assumed.
- **Medium trend.** OSGE is seeking a CfD covering 14, 300 MWe units in 3 sites (total of 4.2 GWe).[247] This capacity value is between the planned one in Włocławek and the 24-26 units mentioned in[248] and,[249] thus, it is assumed as a medium scenario. It is also assumed that this new SMR capacity is divided among the three sites with a 400 MWe SMR size as convention: 3×400, 3×400, and 4×400 MWe SMRs (total of 4.0 GWe). The first site is Włocławek, as mentioned.[250]
- **High trend.** The full 7.2 GWe (in the form of 24xBWRX-300) deployment presented in[251] Is assumed. The deployment follows the medium trend for the first three sites and expands it considering two additional sites with 4×400 MWe SMRs each (for a total of 7.2 GWe).

The full schedules are reported in the Appendix.

246 World Nuclear Association. Nuclear Power in Poland. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-o-s/poland

247 World Nuclear News. Polish Developer Applies for CfD for Three SMR Plants. (2026). https://www.world-nuclear-news.org/articles/polish-developer-applies-for-state-funding-for-three-smr-plants

248 World Nuclear Association. Nuclear Power in Poland. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-o-s/poland

249 World Nuclear News. Polish Developer Applies for CfD for Three SMR Plants. (2026). https://www.world-nuclear-news.org/articles/polish-developer-applies-for-state-funding-for-three-smr-plants

250 World Nuclear Association. Nuclear Power in Poland. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-o-s/poland

251 World Nuclear Association. Nuclear Power in Poland. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-o-s/poland

Table 27: OCC input assumptions, optimistic and conservative – Poland

Input	Optimistic value	Conservative value	Reference
OCC [€/kWe]	8,069	13,448	See Appendix
O&M [€/MWh]	12	24	See Appendix
Fuel cycle [€/MWh]	9	12	Based on[252,253]
D&D [€/MWh]	2		Based on[254]

Refer to footnotes below for the citations used in the table.

Costing and economics

The OCC of a nuclear plant is largely country specific. Its value varies because of construction know-how and delays, but also because of labour costs, supply chain maturity, commodity and equipment prices, and regulations. The OCC and O&M cost for a 400 MWe SMR in Poland are estimated in the Appendix. Fuel cycle costs are based on public data. The same is done for D&D costs, that are also maintained equal between the conservative and optimistic scenarios.

Moreover, the simulations require additional Poland's data. In particular:

- Electricity price (2025 average): € 103.73/MWh.[255]
- Inflation (June 2026): 2.5%.[256]
- 10-year government bond yield (July 2026): 5.37% nominal,[257]around 2.8% real.

252 Idaho National Laboratory. Nuclear Energy Cost Report. (INL, Idaho Falls, ID, 2026). https://inldigitallibrary.inl.gov/content/uploads/50/2026/04/Sort_107010.pdf

253 MIT Center for Advanced Nuclear Energy Systems. Total Cost Projection of the Next AP1000. (MIT CANES, Cambridge, MA, 2024). https://canes.mit.edu/media/2024-total-cost-projection-of-next-ap1000

254 Idaho National Laboratory. Nuclear Energy Cost Report. (INL, Idaho Falls, ID, 2026). https://inldigitallibrary.inl.gov/content/uploads/50/2026/04/Sort_107010.pdf

255 Ember. European Wholesale Electricity Price Data. https://ember-energy.org/data/european-wholesale-electricity-price-data/

256 Trading Economics. Inflation Rate: Europe. https://tradingeconomics.com/country-list/inflation-rate?continent=europe

257 Trading Economics. Poland 10-Year Government Bond Yield. https://tradingeconomics.com/poland/government-bond-yield

Financing and funding

Poland has no current nuclear plant; thus, Table 28 comprises financial structures for proposed nuclear plants.

Table 28: Financial structure of proposed nuclear projects – Poland

Plant	Size	Status	Financial structure	D:E	Cost of debt	Cost of equity	Electricity price
Łubiatowo-Kopalino	3xAP1000	Construction license application submitted in 2026	State loan + 60 years CfD[258]	70:30 (seeking)[259]	n/a	n/a	Strike price not disclosed yet by CfD but assumed to be less than PLN 500/MWh[260] (around€115/MWh)
OSGE BWRX-300 fleet	Up to 26×300 MWe	Signed design agreement	No approved financial regime but CfD considering first 14 units[261]	n/a	n/a	n/a	Strike price not disclosed yet by CfD[262]

Refer to footnotes below for the citations used in the table.

A CfD is mentioned for both large and small reactors. Therefore, it is possible to assume the following financial options:

- **Loan + CfD option.** This includes a state loan with a D:E of 70:30[263] and a CfD strike price of € 115/MWh.[264] The other inputs need to be assumed, including: the debt repayment period of 30 years, a cost of debt of 3.8% (1% over the 10-year government bond yield, given the state guarantees),[265] and a cost of equity of 10%.

258 World Nuclear News. PEJ Signs First Loan Agreement with US Export Credit Agency. (2026). https://www.world-nuclear-news.org/articles/pej-signs-first-loan-agreement-with-us-export-credit-agency

259 World Nuclear News. PEJ Signs First Loan Agreement with US Export Credit Agency. (2026). https://www.world-nuclear-news.org/articles/pej-signs-first-loan-agreement-with-us-export-credit-agency

260 Polskie Elektrownie Jądrowe. Green Light from the European Commission for Nuclear Power in Poland. Press release (2025). https://pej.pl/en/press-center/news/green-light-from-the-european-commission-for-nuclear-power-in-poland-brussels-agrees-to-state-aid-for-the-nuclear-power-plant-in-pomerania/

261 World Nuclear News. Polish Developer Applies for CfD for Three SMR Plants. (2026). https://www.world-nuclear-news.org/articles/polish-developer-applies-for-state-funding-for-three-smr-plants

262 World Nuclear News. Polish Developer Applies for CfD for Three SMR Plants. (2026). https://www.world-nuclear-news.org/articles/polish-developer-applies-for-state-funding-for-three-smr-plants

263 World Nuclear News. PEJ Signs First Loan Agreement with US Export Credit Agency. (2026). https://www.world-nuclear-news.org/articles/pej-signs-first-loan-agreement-with-us-export-credit-agency

264 Polskie Elektrownie Jądrowe. Green Light from the European Commission for Nuclear Power in Poland. Press release (2025). https://pej.pl/en/press-center/news/green-light-from-the-european-commission-for-nuclear-power-in-poland-brussels-agrees-to-state-aid-for-the-nuclear-power-plant-in-pomerania/

265 World Nuclear Association. Nuclear Power in Poland. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-o-s/poland

- **Supported option.** See assumptions and Appendix for the full derivation:
  - **No EU guarantee.** The gearing ratio is raised at 80:20 and repaid over 40 years. Electricity is sold under a CfD set to € 115/MWh (equal to the strike price assumed in the Loan+CfD option). The cost of debt is the Polish real yield (2.80%) plus a credit margin of 0.75%, equals to 3.55% real. The cost of equity is built as a spread over the cost of debt. The spread is 4.4%, the average of a private tranche requiring 5.8% and a public tranche requiring 3.0%, each taking half the equity. The cost of equity is therefore 3.55% + 4.4% = 7.95% real.
  - **With EU guarantee.** In this option, an EU guarantee covers 80% of the senior debt, so the debt is priced at the 0.56% (real) EU benchmark, while the remaining 20% is priced at the Polish government yield (2.80%). The obtained value is 0.8*0.56% + 0.2*2.80% = 1.01%. Considering a credit margin of 0.75%, the cost of debt becomes 1.76% (real). The cost of equity is computed considering a premium of 4.4% as above, reaching a value of 6.16% (real). The CfD strike price, the gearing, and the debt repayment period are maintained at € 115/MWh, 80:20, and 40 years, respectively.

Table 29: LCOE simulation results by deployment trend – Poland

Values are whole fleet levelised electricity costs in €/MWh, expressed in real 2026 money.

	Deployment trends					
	Low		Medium		High	
	Optimistic	Conservative	Optimistic	Conservative	Optimistic	Conservative
Loan+CfD	97.67	162.46	93.57	155.63	90.03	149.73
Supported – No EU guarantee	82.24	136.74	75.58	125.63	72.07	119.79
Supported – EU guarantee	70.43	117.07	64.60	107.35	61.63	102.37

Results

Results in terms of LCOE are presented in Table 29 and the following:

Poland has the highest wholesale price of the four countries, € 103.73/MWh in 2025,[266] and the assumed CfD strike price was set to € 115/MWh sits 11% above the market average:

- **Loan + CfD option.** Clears the wholesale average by 6–13% under optimistic costs and the strike price by 15–22%. Under conservative costs it is above both;
- **Supported option without EU guarantee.** This option sits 16–20% below the Loan + CfD one, clearing the wholesale average by 21–31% and the strike by 28–37% under optimistic costs. Under conservative costs it is 4–19% above the strike;
- **Supported option with EU guarantee.** This option sits 28–32% below the Loan + CfD option. It clears the strike in five cells of six, failing only in the low trend under conservative costs, and it is the only option in Poland that clears under conservative costs.

[266] Ember. European Wholesale Electricity Price Data. https://ember-energy.org/data/european-wholesale-electricity-price-data/

Eleven of the eighteen Polish configurations clear the strike price and ten clear the wholesale average. Every optimistic Polish configuration has an LCOE below its assumed wholesale-price benchmark; this is also true in the Czech case. Under conservative costs, only the EU-guaranteed supported option has any configuration below the assumed strike price. This is a cost-versus-benchmark comparison, not a complete appraisal of bankability or of the contract's value. The three levers can be ranked by the LCOE spread they generate:

- Moving from optimistic to conservative life-cycle costs is worth € 41–65/MWh, by a wide margin the dominant lever and the largest cost effect of the four countries.
- Moving between financing options is worth € 27–48/MWh.
- Moving from the low to the high deployment trend is worth € 8–17/MWh.

The cost lever dominates in Poland because the optimistic and conservative OCC values, € 8,069 and € 13,448/kWe, are the widest pair in the study: the optimistic value is the lowest of the four countries and the conservative value the highest. That spread is also the least settled number in the study. The largest derives from the escalation of the three-unit AP1000 programme.

Poland is also modelled without a merchant option, because no merchant nuclear financing structure has been proposed there and the model assumes a CfD for the SMR programme, drawing on the large-reactor precedent; it does not establish an approved SMR support regime. The comparison in Poland is therefore between two forms of support, not between support and its absence. On Poland's own figures, adding the EU guarantee to the common supported package reduces the upper endpoint by €19.67/MWh, from €136.74 to € 117.07/MWh. The full change from the domestic upper endpoint of €162.46/MWh is € 45.39/MWh.

The avoided emissions are estimated following the Appendix. For Poland, the coal column is a realistic possibility rather than the upper bound. Coal and lignite still supply most Polish generation, and the SMR programme is explicitly framed as coal replacement, so the coal figures are the ones that describe what the programme could displace. In 2023, the Polish energy-industry emissions were 290 $MtCO_2eq$.[267]

Table 30: Avoided emissions by deployment trend – Poland

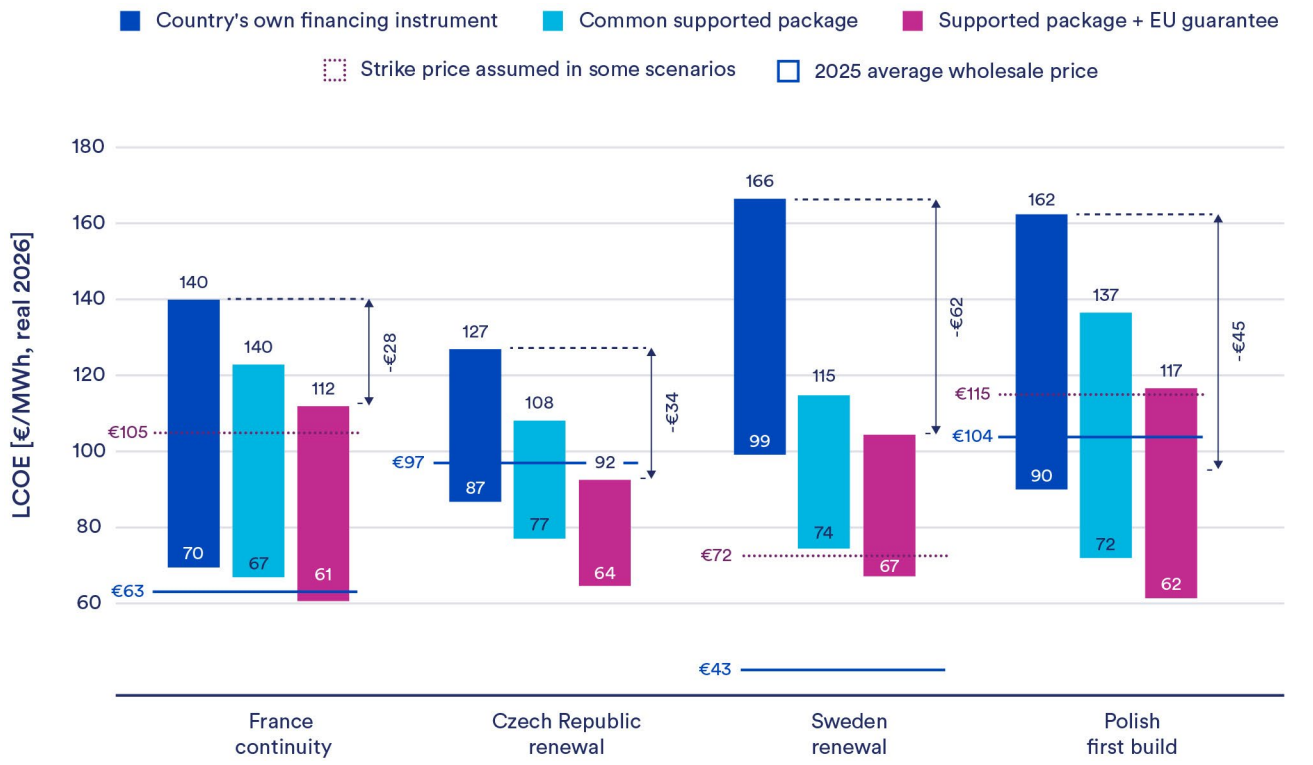
Trend	Units	Sites	Output [TWh/year]	SMR emissions [$ktCO_2eq$/year]	Avoided vs gas [$MtCO_2eq$/year]	Avoided vs coal [$MtCO_2eq$/year]
Low	3	Włocławek	9.5	114	4.5	7.6
Medium	10	3 sites	31.5	378	15.1	25.5
High	18	5 sites	56.8	681	27.1	45.9

[267] National Centre for Emissions Management. National Inventory Document of Poland. (Submission to the UNFCCC, 2025). https://unfccc.int/sites/default/files/resource/NID%202025%20POL%2015.04.2025.pdf

2.7 Cross-country synthesis

Figure 1: Country evidence: fleet LCOE range by financing structure for France (continuity), Czech Republic (renewal), Sweden (renewal) and Poland (first-build), under the country's own financing instrument, a common supported package, and a supported package with EU guarantee, against national strike-price and 2025 wholesale-price benchmarks

Each band spans all deployment trends and both cost cases; upper-endpoint reductions compare the full domestic-to-guaranteed package, not the guarantee alone. All values are real 2026 €/MWh.



Taken together, the four case studies show the same underlying pattern despite very different starting points (Figure 1). France's continuity case, the Czech Republic's renewal case, Sweden's renewal case and Poland's first-build case span a wide range of deployment scale, cost assumptions and market benchmarks, yet in every country the LCOE band compresses substantially as the financing structure improves: moving from the country's own financing instrument to the supported package with EU guarantee lowers the upper endpoint by roughly € 28/MWh in France, € 34/MWh in the Czech Republic, € 62/MWh in Sweden and € 45/MWh in Poland; the guarantee alone accounts for € 11, 16, 10 and 20/MWh of this.

The comparison is only valid within each country, and the bars are not a ranking of countries against one another. France, the Czech Republic, Sweden and Poland are modelled under their own cost assumptions, deployment pathway and market or strike-price benchmark, and all four use a generic 400 MWe unit rather than the design each has actually selected. The common supported package with the EU guarantee gives a WACC of 2.48–2.71% in all four countries; without the guarantee the range is 3.66–4.78%. These are conditional financing outputs, not a test of whether financing matters more than country-specific factors.

SECTION 3

Europe as a single country

This section presents the results of a quantitative economic analysis of deploying coordinated SMR (Small Modular Reactors) fleets across the European Union (EU). Deployment scenarios range from a total capacity of 0.1 GWe to 51.2 GWe, across sites of 100, 400, 800 and 1600 MWe with reactor sizes of 100 MWe and 400 MWe. Results are expressed in real 2026 €/MWh under optimistic and conservative cost assumptions. Results indicate that the cost of SMR electricity in the EU is significantly influenced by whether Europe finances and builds a coordinated, multi-country fleet. An orderbook of at least 5-8 GWe, deployed in multi-unit sites, and financial de-risking together capture a substantial share of the achievable cost reductions, i.e., it achieves a substantial fraction of the savings expected, by the so-called "economies of replication" or "economies of multiples", depending on reactor size and site configuration.

3.1 LCOE Analysis: The fleet effect

Figure 2: LCOE variation against total deployed capacity: 400 MWe reactor-unit scenarios, optimistic and conservative

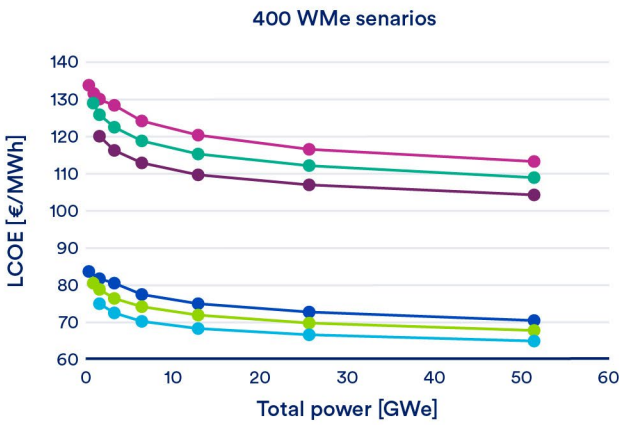


Figure 3: LCOE variation against total deployed capacity: 100 MWe reactor-unit scenarios, optimistic and conservative

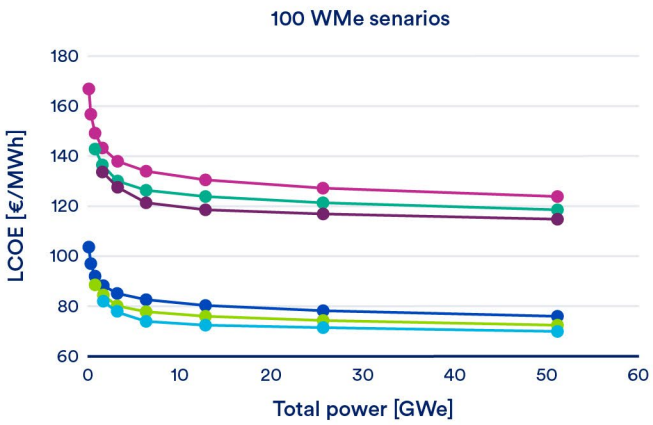
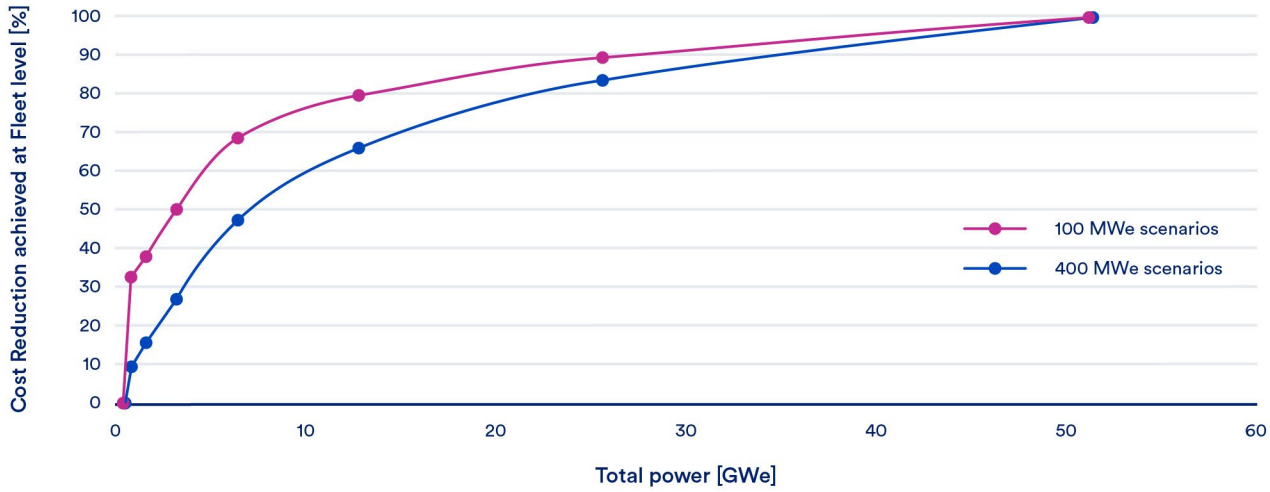




Figure 4: The fleet effect: LCOE variation [€/MWh and %] against varying total deployed capacity [GWe] under different unit and site configurations



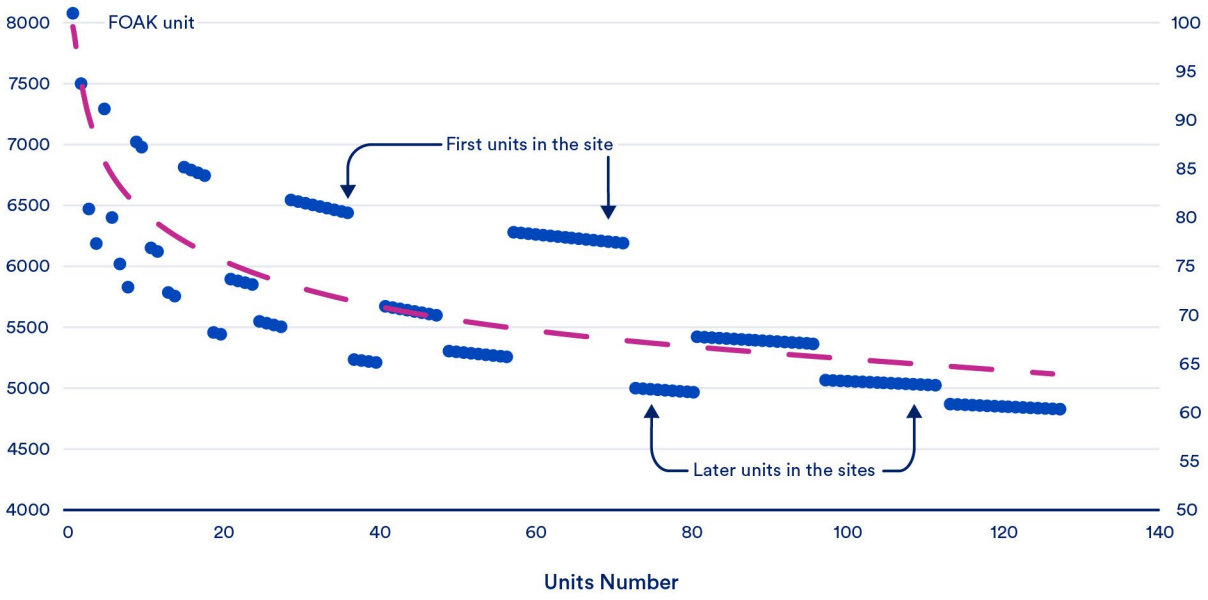
The OCC[268] and the way SMR projects are financed are the two variables with the largest impact on LCOE (confirmed by the sensitivity analysis reported in Section 3.2). This first section examines the first of these, showing how coordinated fleet reduces OCC through learning and co-siting. Across both optimistic and conservative assumptions,[269] and for both 400 MWe and 100 MWe SMRs, the same structural pattern is evident: **LCOE declines as total deployed capacity increases, and further when units are grouped into larger sites.** This indicates that the economics of SMRs depend less on isolated first projects and more on whether the EU can create a credible repeat-build programme. **The key is to move from bespoke, first-of-a-kind (FOAK) delivery towards a fleet deployment strategy with standardised procurement, repeated licensing, serial construction, supplier learning and shared operating experience.** These are separable conditions (identical design, a common platform, harmonised licensing, replicated project organisation, shared procurement and repeat manufacturing) and a common design alone does not guarantee the others. **A coordinated multi-country programme at the 5-8 GWe[270] scale would be sufficient to capture a substantial share of the achievable cost reductions, about half to two-thirds depending on reactor size and site configuration. In policy terms, the priority is therefore to create a bankable pipeline which is large enough for industry to invest in factories, qualified labour, component standardisation and construction capacity with confidence.**

[268] Defined as "The base construction cost plus applicable owner's cost, contingency, and first core costs. It is referred to as an overnight cost in the sense that time value costs (IDC) are not included (i.e., as if the plant were constructed "overnight" with no accrual of interest [OC = TCIC – IDC]). The total overnight cost is expressed as a constant dollar amount in reference year dollars" (so no cost escalation): https://www.gen-4.org/gif/upload/docs/application/pdf/2013-09/emwg_guidelines.pdf. Also consistent with IAEA glossary and IAEA Economic Evaluation Of Bids For Nuclear Power Plants 1999 Edition

[269] Analysis based on the assumption of a sufficient number of EU countries collectively deciding on a standard SMR design and sharing to a large extent the project delivery chain, i.e., an EU orderbook. See methodological appendix for details.

[270] The number of participating countries needed to reach 5–8 GWe depends on the capacity each commits; it is not quantified by the model. For instance, recent announcements point to the emergence of an SGE-led regional BWRX-300 platform. According to OSGE/SGE, Synthos Green Energy holds exclusive rights to implement the BWRX-300 in nine countries and is already advancing the most mature programme in Poland, where OSGE has secured decisions in principle for up to 24 units (about 7.2 GWe). In parallel, SGE has entered early-stage cooperation arrangements in Bulgaria and Hungary, as well as a cooperation agreement in Lithuania, and it has signed a memorandum with Slovakia's Slovenské Elektrárne to explore BWRX-300 project development in Slovakia, the Czech Republic, and other European countries.

Figure 5: Single unit capital cost by build sequence (51.2 GWe fleet, 32 sites of 1600 MWe, 4×400 MWe units per site, optimistic assumptions)



A single build sequence shows where this fleet-level decline in LCOE comes from. E.g., in the scenario with 51.2 GWe fleet delivered across 32 sites of 1600 MWe, each hosting four 400 MWe units, under optimistic assumptions, the capital cost of each successive unit falls as the programme progresses (Figure 5). Early units carry the fixed costs of FOAK engineering, licensing and site set-up that later units no longer bear, so they are priced at a premium; this higher upfront cost is recovered as the fleet matures, with learning and co-siting driving down the cost of each subsequent unit. The single-unit trajectory makes explicit at the project level what the fleet-average LCOE curve reports in aggregate: it is the coordinated build programme, not any change to the reactor, that turns expensive early units into a competitively priced fleet.

Site size is the second major driver. Larger sites systematically outperform smaller ones; doubling the site from 400 to 800 MWe leads to a cost saving of around 2-8 €/MWh with respect to the 400 MWe site LCOE values through shared fixed costs. This cost reduction increases to 6-12 €/MWh as the site is scaled from 400 (1 units of 400 MWe or 4 units of 100 MWe) to 1600 MWe (reasonably 4 units of 400 MWe). This effect is relevant for both reactor sizes. Grid connection, security, emergency planning, control facilities, maintenance capability, local services and site management all contain fixed (or semi-fixed)-cost elements.

As for the unit size, the 400 MWe reactor benefits from unit-level economy of scale with fixed costs spread over a larger unit rather than replicated across four smaller ones and therefore starts from a lower LCOE. It is better positioned where larger increments of firm low-carbon capacity can be absorbed by the grid and where sites can accommodate reactor units of 400 MWe or larger. Unit-level economy of scale can be further supported by locating projects at sites with existing or planned higher capacity grid connections. The 100 MWe reactor size carries a clear diseconomy-of-scale penalty at single-unit scale, around +20 €/MWh on LCOE relative to the 400 MWe unit. However, this penalty is reduced through fleet learning and co-siting, falling to around +6 €/MWh in the largest deployment scenarios. **Smaller units, therefore, do not eliminate scale effects, and they can recover part of their initial disadvantage when deployed as part of a coordinated fleet rather than as isolated units. This distinction should guide the policy case for smaller SMRs.**

The value proposition of the 100 MWe SMR, and smaller reactors in general, is different. While the 100 MWe has a diseconomy of scale with respect to the 400 MWe, smaller reactors might be an appropriate option for situations calling for smaller capacity increments, heat integration, brownfield replacement of fossil assets, smaller grids, industrial demand centres or land- or water-constrained sites that make a larger reactor unit less suitable. In those contexts, the system value of modularity and siting flexibility may justify a higher initial unit cost, if deployment is organised around common designs, repeatable licensing and project delivery chain,[271] and multi-module configurations. The selection of unit sizes should therefore be made as part of a portfolio strategy. Larger modules may deliver lower-cost bulk firm power where site and grid conditions are favourable. Smaller modules may extend nuclear options to industrial, regional or constrained applications.

All in all, **the decisive factor is whether deployment is organised as a fleet** – moving from bespoke, first-of-a-kind delivery towards a fleet deployment strategy with standardised procurement, repeated licensing, serial construction, supplier learning, and shared operating experience. The **EU Member States should avoid treating early SMR projects as separate and discrete "national demonstration" projects. Cost reductions depend on coordination before projects are individually built**; it implies common reference designs, aligned or mutually recognised licensing steps, joint procurement where feasible, qualified project delivery chains, predictable orderbooks and financing structures that reward serial delivery.

The choice between 400 MWe and 100 MWe designs should therefore be framed less as a binary technology preference and more as a portfolio strategy under the same fleet approach framework. In practice, the project delivery chain of today's leading SMR designs are poorly overlapped: reactor vendors tend to rely on design-specific components with only partial overlap with conventional balance-of-plant equipment. This fragmentation is a barrier to joint procurement: a cross-border orderbook yields fleet-level savings only if multiple countries commit to the same reference design and to some extent the same project delivery chain, rather than each pursuing a different reactor with a different project delivery chain.

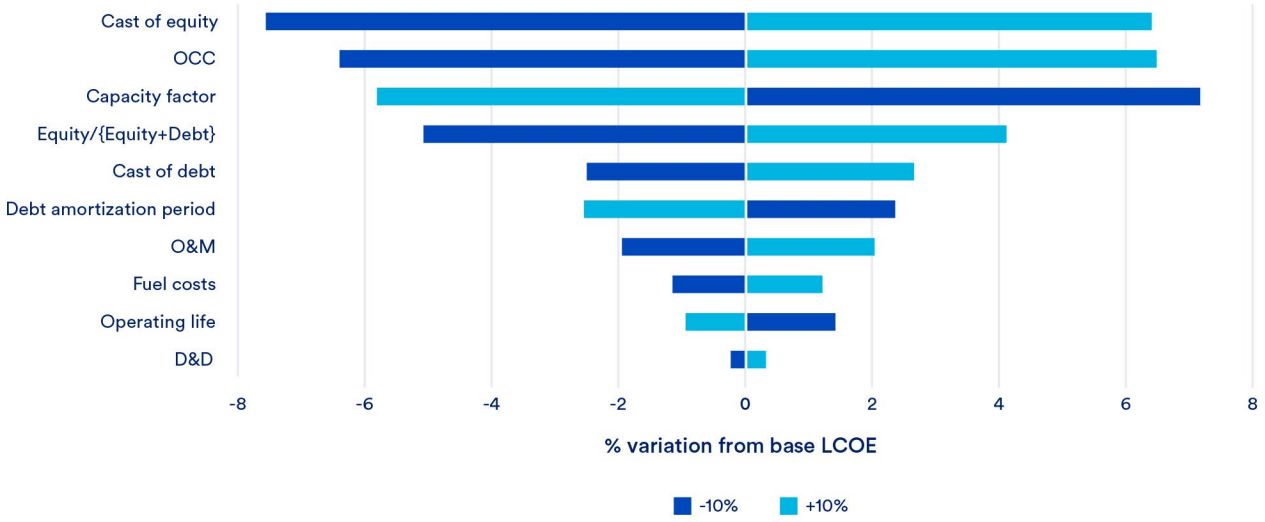
Larger modules may deliver lower-cost bulk firm power where site and grid conditions are favourable. Smaller modules may extend nuclear options to industrial, regional or constrained applications. In both cases, the decisive factor is whether deployment is organised as a European Member States fleet, or at least within a meaningful number of countries. Where national programmes are individually too small to achieve viable SMR economics, countries should pool demand into cross-border orderbooks, with each orderbook committed to a single reference design across participating countries, that reach the minimum scale required for an efficient deployment pipeline,[272] around 5-8 GWe. **Capturing this fleet effect is not an automatic market outcome: it depends on policymakers actively creating the conditions – a common reference design, aligned licensing and a de-risked financing structure – under which countries are willing to pool demand rather than each defending a separate national programme.**

[271] We use the expression "Project delivery chain" which includes the "supply chain" (of material, service and equipment), but also the other stakeholders that concur to a nuclear project: the owner/utility, financers, regulator(s) etc.

[272] This has broader implications in terms of licensing, local content, fit to the environment/context, which are relevant, but outside the scope of this document.

3.2 Sensitivity analysis: what moves LCOE the most?

Figure 6: Sensitivity analysis of input parameters on LCOE



The cost of equity and the overnight construction cost (OCC) have the largest impact on LCOE in this sensitivity analysis (see Appendix D for details on the scenario considered in this analysis). The base case assumes a relatively low cost of debt, which is why the cost of debt has a smaller impact in the sensitivity analysis. When projects rely on a higher cost of debt, the sensitivity of LCOE to this value increases substantially (see Figure 7). As shown in Figure 6, variables such as operation and maintenance (O&M), fuel cycle, and decommissioning and decontamination (D&D) costs have a much more limited impact.

Therefore, the way to lower SMR electricity costs includes reducing the risk premium, reducing capital costs and ensuring reliable construction delivery and capacity factor. SMRs, like other nuclear assets, are capital-intensive. A large share of the lifetime cost is committed before power generation starts. As a result, any factor that changes the cost of capital or the construction cost base has a magnified effect on LCOE.

The cost of equity is particularly important because it reflects the risks that private investors believe they are being asked to bear: construction delays, licensing uncertainty, political risk, market price exposure, project delivery chain immaturity and first-of-a-kind delivery risk. If those risks remain uncovered, investors require a higher return, and the technology becomes more expensive to finance. The implication is that financial de-risking is essential. **Contracts for difference (CfD), regulated asset base (RAB) models, sovereign-backed loans, public co-investment, European Investment Bank lending and other credit-enhancement instruments can significantly lower LCOE by more effective risk allocation.** Indeed, these financial instruments allocate risks to the actors best able to manage them.

The importance of overnight construction cost (OCC) points to a second, equally important policy priority: reducing capital costs themselves, as previously discussed in relation to the fleet effect. Here, the focus should be on building sufficiently large, coordinated sites and fleets to reduce fixed cost per MWe, alongside an industrial policy that supports project delivery chain scale-up, which could lead to greater manufacturing capacity, more efficient labour and systems at factory sites, and ultimately, cheaper kits.

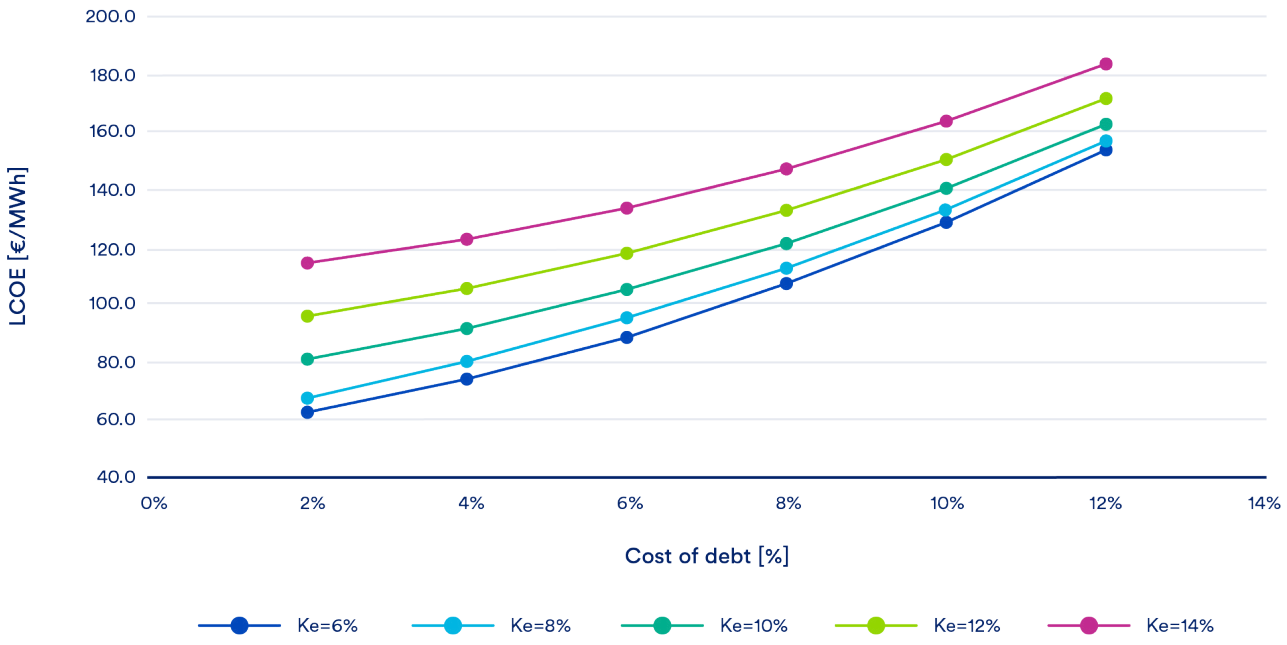
Capacity factor[273] is also essential: if SMRs are financed and built as firm low-carbon assets but are then exposed to market conditions that lead to low utilisation or frequent curtailment, the LCOE rises. **This calls for a policy design that connects deployment decisions to the offtake strategy.** Elements such as **long-term electricity contracts, industrial heat agreements, district heating integration, hydrogen production or other stable demand channels** can protect utilisation. The plant's economics require both an efficient construction programme and stable market-access conditions.

[273] In this work, a 90% capacity factor is considered in the simulations. In the sensitivity analysis it is decreased and increased by 10% of its value, becoming 81% and 99%, respectively.

3.3 Financing leverage

Nominal financing costs for recent EU and US projects and studies are in the region of 3–6% for the cost of debt (Kd), e.g., 3.5% for the DOE-guaranteed Vogtle 3–4 debt and 5% assumed for new AP1000 units,[274] and 10-year sovereign yields of 2.9–5.4% in the four case-study countries (see Table 40); and 8–12% for the cost of equity (Ke), e.g., a 9% expected investor return for Hinkley Point C against 8.5–13.8% on comparable infrastructure,[275] and 12% in Lazard's 2025 US analysis.[276] Values at 4% or below are hardly representative for merchant scenarios. However, they could represent scenarios with consistent state intervention, e.g., through money lent to the project at a very low discount rate or through various forms of risk offsetting.

Figure 7: Financing leverage: LCOE variation under varying cost of debt and cost of equity values (see Appendix D for details on the scenario considered in this analysis).



[274] U.S. Department of Energy. Pathways to Commercial Liftoff: Advanced Nuclear. 2024. https://gain.inl.gov/content/uploads/4/2024/11/DOE-Advanced-Nuclear-Liftoff-Report.pdf

[275] National Audit Office. Hinkley Point C. 2017. https://www.nao.org.uk/wp-content/uploads/2017/06/Hinkley-Point-C.pdf

[276] Lazard. Levelized Cost of Energy+ (Version 18.0). 2025. https://www.lazard.com/media/uounhon4/lazards-lcoeplus-june-2025.pdf

Table 31: LCOE [€/MWh] by cost of equity and cost of debt: financing-leverage sensitivity matrix (see Appendix D for details on the scenario considered in this analysis).

14%	114.2	122.7	133.5	147.0	163.5	183.1
12%	96.0	105.7	117.8	132.7	150.4	171.3
10%	81.0	91.9	105.2	121.2	140.2	162.4
8%	67.6	80.5	95.3	112.6	132.9	156.6
6%	62.8	74.3	88.6	107.2	128.5	153.5
LCOE [€/MWh]	2%	4%	6%	8%	10%	12%
	Cost of debt					

The financing-leverage graph shows that **SMR economics are highly dependent on the cost and structure of capital.** At the lower end of financing costs (comparable to what could be achieved through long-term revenue contracts, sovereign guarantees, or public co-investment) the LCOE is about 62.8 €/MWh. LCOE rises rapidly as the costs of debt and equity increase. The same SMR technology can therefore appear economically viable or non-viable depending on how construction, market and policy risks are mitigated.

If SMR projects are financed as merchant or quasi-merchant assets, investors will price in uncertainty over build time, licensing, future power prices, political durability and project delivery chain performance. For instance, in the case of a 6% cost of debt and 8% cost of equity, the LCOE would be 95.3 €/MWh, i.e., 52% more. That premium is then embedded in the electricity cost paid by consumers or taxpayers. Conversely, **if policy creates credible long-term revenue stability and reduces risks that private investors cannot control, the financing curve moves closer to the cost floor.**

- **Public instruments should target risks that the market cannot efficiently manage, such as regulatory uncertainty, revenue instability during early fleet formation.**
- **Developer-controlled risks, such as construction management, quality control and schedule discipline, should remain subject to performance incentives, milestone payments and transparent cost scrutiny.**

Moving from a low-risk financing structure to an unguaranteed equity model can add tens of euros per MWh without changing the reactor design. For instance, considering a fixed cost of debt of 4%, the expected LCOE is 74.3 €/MWh at 6% cost of equity, but it rises to 105.7 €/MWh when the cost of equity increases to 12%, which is a 42% increase in LCOE. The financing structure alone could determine whether SMRs are seen as a competitive low-carbon option or an expensive niche technology.

For European policymakers, this shifts the focus of the financing debate. The question to be answered is not only “How much will the deployment of SMRs cost?” but primarily “under what regulatory, financing, and contractual models might investors or European Member States decide to develop an SMR programme?” The answer changes the LCOE dramatically. Once financing has been de-risked, remaining cost reductions must come from construction learning, project delivery chain maturity, site standardisation and high utilisation.

The policy conclusion is therefore two-sided. First, **without financial de-risking, even a technically sound SMR programme may be priced out of the market.** Second, **financial de-risking must be tied to an industrial delivery strategy so that lower capital costs translate into real cost reductions rather than protected inefficiency.**

3.4 Key takeaways

Five key insights:

1. LCOE (Levelised Cost of Electricity) falls consistently with increasing total installed capacity and larger site configurations. A substantial share (close to half to two-thirds) of the savings that would be achieved with a large fleet (50 GWe or more) due to learning and co-siting are already captured at 5-8 GWe.
2. Doubling the site from 400 to 800 MWe leads to a cost saving of around 2-8 €/MWh through shared fixed costs; the value increases to 6-12 €/MWh as the site is scaled from 400 to 1600 MWe.
3. The 100 MWe diseconomy-of-scale effect, relative to a 400 MWe reactor size, shrinks from ~20 €/MWh at the single-unit scale to ~6 €/MWh for large, coordinated fleets.
4. Financial parameters, OCC, and capacity factor are the drivers that most influence LCOE. Policies should focus on financial de-risking, capital cost reduction through industrial policy, construction schedule management to avoid delays, and utilisation protection, i.e., securing capacity factor through offtake agreements.
5. Nuclear plant's LCOE is highly sensitive to the cost of financing. Innovative capital structures, which leverage innovative risk-sharing instruments (CfD, RAB, sovereign loans, public co-investment) to attract private investments with targeted public capital, can effectively lower LCOE of nuclear projects.

SECTION 4

The European nuclear supply chain: Cross-country analysis of qualitative data and information from interviews

This section is the results of the qualitative cross-country analysis of data and information from interviews at a European level.

4.1 European SMR supply-chain landscape

Europe retains a strong nuclear-industrial base that is unevenly distributed, spanning, for example, France's Framatome/Orano ecosystem, Czech Republic's ČEZ/Škoda JS and Italy's forging, valve and pump manufacturers. This base can maintain an operating fleet, but interviewees questioned whether present capacity could support several GWe of simultaneous new build without expansion, which is a concern for the interviewees. At present, the Framatome Le Creusot site includes (amongst other workshops, equipment and analysis laboratory):[277]

- *"A forging shop equipped with two presses rated at 11,300 tons and 9,000 tons, supported by a 200-tonne manipulator";*
- *"16 furnaces capable of accommodating components weighing up to 600 tons and heating them to temperatures of 1,300°C"*

The cross-country evidence from interviews therefore points not to an absence of European heavy-component capability, but to limited capacity at the upper end and a likely concentration of the largest-forging work among a small number of suppliers Europe-wide.

A related gap concerns delivery organisation rather than manufacturing: more than one interviewee is concerned that no European actor currently plays the role of an experienced nuclear systems integrator/EPC contractor. One interviewee also made this the single highest-priority recommendation, suggesting that a dedicated European EPC entity, potentially a utility/major-civil-contractor joint venture, could be the clearest remedy. The same interviewee noted that even SMR modularisation only partially addresses this, shifting complexity from on-site construction to off-site module assembly, where Europe currently has no sufficient established organisational capability either.

[277] Framatome. Le Creusot, Creusot Forge. https://www.framatome.com/en/implantations/le-creusot/ (accessed August 2026); Berger, T. et al. High Intensity Forging for Nuclear Applications: Manufacturing and Properties of Nozzle Shell with Integral Flange for EPR Reactor Pressure Vessel. Ironmaking & Steelmaking 34, 205–210 (2007). https://doi.org/10.1179/174328107X174717

Fuel and enrichment present a narrower but more acute constraint. Orano is expanding the Georges Besse II enrichment plant at Tricastin by 2.5 million SWU per year, an increase of about 30%, through four additional enrichment modules; initial productive operations are planned from 2028, with full commissioning targeted for 2030.[278] However, French and Italian interviewees independently described enrichment as an acute, geopolitically sensitive bottleneck, with a joint EU-UK enrichment initiative still, in their accounts, years away.

About the overall supply chain, one concrete example of an emerging cross-border fleet and supply chain coordination is Rolls-Royce SMR. By mid-2026, the vendor had a UK contract covering three units at Wylfa, an Early Works Contract with ČEZ for the Czech programme, and had been selected by Sweden's Videberg Kraft for three units at Värö.[279] Taken together, these commitments amount to an orderbook of roughly nine to twelve units[280] of a single 470 MWe design across three jurisdictions.

The industrial model is also relevant: Aker Solutions was selected as the primary Module Partner for the modularisation programme, while Škoda JS and Doosan Enerbility received pre-production work on key nuclear-island components. This is a dual-supply strategy intended to reduce risk and support manufacturing readiness. Rolls-Royce SMR is also establishing its Pioneer Works manufacturing-development centre in Derby to develop build processes, precision assembly and testing for the UK, Czech and Swedish fleet. ČEZ, moreover, holds an approximately 20% equity interest in Rolls-Royce SMR.[281] This is therefore more than a set of parallel country sales: it is an early attempt to link a standard design and a multi-country orderbook.

4.2 Elements supporting/enabling a European fleet deployment

The elements supporting/enabling a European SMR fleet deployment are listed below.

Improving regulatory-related coordination, which means sharing and reusing (when suitable) technical assessments and design-review findings across national regulators rather than each country repeating a full evaluation from first principles. The UK Office for Nuclear Regulation has invited five European nuclear regulators to observe the Rolls-Royce SMR Generic Design Assessment, the first observer arrangement in the GDA process. As of August 2026, however, the Rolls-Royce SMR remains in Step 3 of GDA; the Environment Agency states that the associated public and stakeholder consultation will launch in February 2027.[282]

The value of this model is narrower than creating a single European licence, but it has practical advantages: regulators can understand another authority's evidence base, reuse relevant findings and reduce avoidable duplication while retaining national decision-making responsibility. Interviewees were also clear that a centralised EU licensing body is institutionally and politically unrealistic in the short term. The more credible direction is therefore structured regulatory cooperation, joint early review and, where national law permits, alignment or mutual recognition of specific assessments rather than wholesale transfer of licensing authority.

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278 Orano. Orano Announces 30% Increase in Uranium Enrichment Capacity by 2028. (26 October 2023). https://www.orano.group/usa/en/our-news/news-releases/2023/orano-announces-30-increase-in-uranium-enrichment-capacity-by-2028; Orano & European Investment Bank. European Investment Bank and Orano Sign a Loan Agreement for 400 Million Euros Relating to the Project to Extend the Georges Besse 2 Uranium Enrichment Plant. (March 2025). https://www.orano.group/en/news/news-group/2025/march/european-investment-bank-and-orano-sign-a-loan-agreement-for-400-million-euros-relating-to-the-project-to-extend-the-georges-besse-2-uranium-enrichment-plant

279 Rolls-Royce SMR. Rolls-Royce SMR Secures Contractual Certainty to Build Europe's First SMR Fleet. (13 April 2026). https://www.rolls-royce-smr.com/press; Rolls-Royce SMR. Rolls-Royce SMR Secures Czech Contract to Deliver Small Modular Reactor Programme. (24 April 2026). https://www.rolls-royce-smr.com/press; Rolls-Royce SMR. Sweden Selects Rolls-Royce SMR for Its Nuclear Future. (15 June 2026). https://www.rolls-royce-smr.com/press

280 These figures stem from summing 3 units at Wylfa (UK), 3 at Värö (Sweden) and considering the Czech programme commitment of "up to 3 GW", i.e. up to six units.

281 Rolls-Royce SMR. Rolls-Royce SMR Launches Modularisation Delivery Strategy. (29 April 2026). https://www.rolls-royce-smr.com/press; Rolls-Royce SMR. Rolls-Royce SMR Partners with Leading Global Suppliers of Key Nuclear Island Components. (27 May 2026). https://www.rolls-royce-smr.com/press; Rolls-Royce SMR. Rolls-Royce SMR to Open Pioneer Works in Derby. (26 June 2026). https://www.rolls-royce-smr.com/press; CEZ Group. Temelin Small Modular Reactor Project Advances to Next Phase. (24 April 2026). https://www.cez.cz/en/media/press-releases/temelin-small-modular-reactor-project-advances-to-next-phase-234050

282 Office for Nuclear Regulation. ONR Outlines International Collaboration on SMRs. (8 April 2025). https://onr.org.uk/news/all-news/2025/04/onr-outlines-international-collaboration-on-smrs/; Environment Agency. Regulating Modular Nuclear Reactors – from Design and R&D to the Factory Floor and Site. (16 July 2026). https://environmentagency.blog.gov.uk/2026/07/16/regulating-modular-nuclear-reactors-from-design-and-rd-to-the-factory-floor-and-site/

Sharing of project resources on both the component and workforce side, i.e., trading production across a multi-country orderbook, and sequencing construction timelines so skilled labour can move between projects rather than each country competing for the same scarce resources at once. One fleet-developer interviewee, speaking from direct operational responsibility for managing a multi-country orderbook, described actively trading production slots and components across projects in different countries to meet project timescales. Sweden's experience with the Rolls-Royce fleet shows the same logic applied to workforce rather than components: more than one Swedish interviewee independently shared their positive opinion on the decision to sequence UK, Czech and Swedish construction rather than building three national projects simultaneously. This allows skilled labour to move between projects, at least partially, rather than each country competing separately for the same scarce trades at the same time.

The EU's own policy architecture has started to move from rhetorical support towards a more structured, if still early, programme. The Commission's Strategy for the development and deployment of SMRs in Europe, adopted in March 2026, sets out actions intended to support first European projects in the early 2030s. The measures cover project prioritisation, supply-chain development and industrial standards, financing and de-risking, skills, regional development, regulatory cooperation, streamlining export controls (within the EU), and international engagement. Importantly for the fleet argument in this report, the Strategy explicitly calls for coordination to avoid fragmentation and maximise synergies. It builds on the European Industrial Alliance on SMRs, launched in February 2024; by September 2025 the Alliance had more than 400 members and had endorsed its Strategic Action Plan for 2025-2029.[283]

The Commission's preliminary evaluation places potential EU SMR capacity in 2050 at 17-53 GW.[284] Although some interviewees consider the high end of this range overly optimistic, most view the range as a positive policy signal. Turning that signal into deliverable capacity requires concrete EU-level financing instruments: this report recommends raising the Euratom lending ceiling, the option most directly aligned with the modelled guarantee need; removing InvestEU's nuclear-construction exclusion to enable a first-loss or counter-guarantee structure; and EU-level co-investment in a first shared European SMR reference unit (see Recommendation).

4.3 Constraints affecting a European fleet deployment

The interview analysis also identified constraints affecting fleet deployment, listed below.

Regulatory alignment, i.e., the degree to which different countries' licensing regimes and technical requirements are harmonised, since each country currently runs its own separate regulatory framework **while improving, is still not what fleet-scale delivery requires**, as most European licensing regimes were not built for serial, multi-site licensing. The shadowing and joint-review mechanisms described above are a pragmatic workaround, but they are vendor-specific rather than system-wide, and most interviewees stressed that nothing resembling a single EU nuclear regulator is realistic in the foreseeable future.

Manufacturing capacity, i.e., the industrial base able to fabricate reactor components (forgings, vessels, long lead items, modules) at the scale and pace fleet deployment requires, **is not widely available**. Beyond the specific forging bottleneck described above, several interviewees converged on the view that meaningful learning effects require an orderbook of roughly 8-10 units per reactor family, with serial production sustained at several units per year. These are interview-derived order-of-magnitude thresholds rather than externally established industry benchmarks; the corresponding GW volume depends on the unit size of the selected design (across the SMR sizes discussed in this report, roughly 2.5–4.5 GWe). If European SMR orders remain fragmented across many small, country-specific commitments, most current national deployment programmes still sit below this threshold individually.

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283 European Commission. Strategy for the Development and Deployment of Small Modular Reactors (SMRs) in Europe. COM(2026) 117 final (2026). https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52026DC0117; European Commission. General Assembly of the European Industrial Alliance on Small Modular Reactors. (1 September 2025). https://energy.ec.europa.eu/events/general-assembly-european-industrial-alliance-small-modular-reactors-2025-09-01_en

284 European Commission. Small Modular Reactors. https://energy.ec.europa.eu/topics/nuclear-energy/small-modular-reactors_en (accessed August 2026).

Workforce constraints, i.e., the availability of both nuclear-qualified engineers and specialist trades such as welders and electricians, **are similar across countries**. France's industry association estimates a need for 100,000 full-time-equivalent workers over the next decade both to sustain growth and its existing large-reactor renewal alone and to replace departures, separate from any SMR-specific build-out.[285] French interviewees also stressed this challenge. Swedish interviews described the country as lacking a Germany- or UK-style apprenticeship system and pointed to Finland's Olkiluoto 3 project (which relied heavily on imported, predominantly Polish, workers) as a precedent whose scalability is doubtful if several countries build simultaneously. Czech interviewees identified both a shortage of general industrial trades and the more specific erosion of certain manufacturing capabilities (such as steam-generator production) over a 25-year construction gap. A distinct but related "chicken-and-egg" problem recurs in multiple countries: firms are reluctant to invest in training and capacity ahead of confirmed orderbooks, while confidence in those pipelines depends partly on the existence of that same trained workforce and capacity.

Local content expectations, i.e., the expectation that a meaningful share of manufacturing, jobs, and investment stays within each participating country, **could be challenging to balance with modularisation**.[286,287] The local-content tension discussed here arises mainly from modularisation: as more work moves from the construction site into factories, "local content" increasingly means a country's share of European manufacturing rather than only on-site construction. No country evidence in this study points to an agreed mechanism for allocating that manufacturing role fairly across participating countries. One Italian interviewee flagged this explicitly as an unresolved coordination problem: a country that captures a disproportionate share of high-value component orders may leave others feeling "left out". This raises a question: is SMR standardisation compatible with the high degree of national localisation typically expected in nuclear?

A consistent pattern emerges across the interviews. At one end, duplicating the supply chain in every country would forfeit the economies of scale and learning effects that depend on coordinated, shared procurement and production volume, even if every country used the same reactor design. At the other end, concentrating production in a single country would maximise those efficiencies but leave other countries without a meaningful industrial stake. One interviewee mentioned a "happy middle ground", where a small number of qualified national suppliers produce the same standardised component design for several units across European countries. One way to reach this "middle ground" is to support industrial coordination, preserving local production and workforce, but under a structure that manages capacity allocation and shares knowledge across countries, similar to the model used in the aerospace and defence sector. On these lines, one example is again Rolls-Royce SMR that has already qualified both Škoda JS (Czech Republic) and Doosan Enerbility (Korea) to forge the same nuclear-island components, a qualification that creates optional capacity and supply-chain resilience, not a commitment to allocate orders between the two.[288]

Vendor and technology selection, i.e., which reactor design and which companies in each country are chosen to build it, **is shaped by geopolitical alignment as much as by technical or commercial merit**. The interviewee shared that Central and Eastern European countries favour US-linked vendors partly because of perceived NATO and security-related alignment. This is not necessarily an obstacle to fleet deployment. But it means technology convergence is unlikely to follow purely technical and/or commercial (e.g., supply chains coordination and integration) logic without policy intervention.

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285 SFEN. Match Report 2025: The French Nuclear Industry Is Hiring and Confirms Its Industrial Revival. Sfen in English (November 2025). https://sfeninenglish.org/french-nuclear-industry-match-report-2025/

286 Following the Generation IV International Forum cost-estimating terminology, this report uses modularisation (GIF: 'modularization') for the process of converting stick-built design and construction into factory-fabricated modules that are shipped to site for installation; modularity is reserved for the system-level effect associated with using multiple standardised smaller units.

287 Generation IV International Forum. Cost Estimating Guidelines for Generation IV Nuclear Energy Systems, Revision 4.2. GIF/EMWG/2007/004, 24 (26 September 2007). https://www.gen-4.org/resources/reports/cost-estimating-guidelines-generation-iv-nuclear-energy-systems-rev-42-2007

288 Škoda JS, Doosan Enerbility Get Key Rolls-Royce SMR Work. World Nuclear News (2026). https://www.world-nuclear-news.org/articles/skoda-js-doosan-enerbility-get-key-rolls-royce-smr-work

Financing and market design, i.e., how the cost of building a plant is funded and how revenue risk is shared between developer, state, and consumer, **is converging in structure, but questions of scale and risk allocation remain unresolved**. A two-way CfD is becoming a well-accepted EU nuclear support instrument. Under this model, the developer is protected against low prices, while the state or consumer is protected against unexpectedly high profits. This is evident, for example, in Poland's AP1000 programme and Sweden's own new-build framework. Czech Republic's Dukovany II project also follows this model, though its expanded two-unit financing package remains under European Commission review for state-aid compliance.[289] Nevertheless, when considering a CfD model, construction-phase financing still requires separate instruments that must be made available to support it. However, experts disagree over whether Europe's realistic demand is better served by a distributed fleet of many smaller SMRs or by a smaller number of concentrated large reactors. Some experts also disagree over whether the European market will naturally converge on two or three dominant SMR technology families or continue to support a wider plurality of designs, each backed by different national and geopolitical interests (which could make fleet deployment more challenging).

Transportation logistics, i.e., the physical movement of very large, heavy reactor components from factory to site, **remains a constraint to SMR fleet deployment**. One interviewee described how their own facilities' export capability depends on a combination of factors. A plant sited on an industrial seaport allows components to be loaded directly onto ships. A second facility on a large river is more limited, as components can only be barged out for around six months of the year, when river levels are sufficient. This illustrates a broader point: heavy-component logistics are shaped as much by existing river, port and site infrastructure as by manufacturing capability itself. Where that infrastructure is seasonal or geographically constrained, it can materially limit a supplier's flexibility even when production capacity is not the binding constraint. This is directly connected to SMR module size.

Transport and logistics constraints scale with the individual unit size (100 MWe or 400 MWe), not with total site capacity (400/800/1600 MWe), since a larger site is built from multiple discrete units rather than larger transportable modules. Factory modularisation delivers its intended benefit only if finished assemblies remain within practical road, rail, port or river transport. Rolls-Royce SMR, for example, describes a station assembled from around 1,500 standard transportable modules and has developed its construction approach around factory assembly followed by transport to site. The engineering trade-off is structural: larger modules can reduce field assembly and interfaces, but narrow feasible transport routes and site options; smaller modules ease logistics but transfer more assembly work back to site.[290]

4.4 Cross-country implications and key takeaways

A fleet approach differs from isolated national projects in one fundamental respect: its economics depend (even more) on repetition. Several interviewees made this point directly, describing the underlying logic as an “economy of series” in which the first unit's role is to prove the model rather than to be optimised for fleet deployment.

Examples of national-specific factors that impact the SMR fleet development are siting and permitting strategy (e.g., Czech Republic's use of existing coal and nuclear sites) and the degree and durability of political and public support (very high and durable in Czech Republic and Poland), and the specific choice of financing vehicle and state role, which (while converging in broad form, the two-way CfDs) still reflects distinct national fiscal and political constraints.

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289 European Commission. State Aid SA.117794 (2025/N) - Support for the Construction and Operation of Two New Nuclear Units at the Dukovany Site. Off. J. Eur. Union C/2026/2825 (27 May 2026). https://eur-lex.europa.eu/eli/C/2026/2825/oj/eng

290 Generation IV International Forum. Cost Estimating Guidelines for Generation IV Nuclear Energy Systems, Revision 4.2. GIF/EMWG/2007/004, 109–114 (26 September 2007). https://www.gen-4.org/resources/reports/cost-estimating-guidelines-generation-iv-nuclear-energy-systems-rev-42-2007; Rolls-Royce SMR. Our Technology. Generic Design Assessment. https://gda.rolls-royce-smr.com/our-technology (accessed August 2026); Environment Agency. Regulating Modular Nuclear Reactors - from Design and R&D to the Factory Floor and Site. (16 July 2026). https://environmentagency.blog.gov.uk/2026/07/16/regulating-modular-nuclear-reactors-from-design-and-rd-to-the-factory-floor-and-site/

Examples of factors that require European-level coordination are:

- **heavy forging and enrichment capacity**, where the economics of entry cost mean duplicating capability nationally would be wasteful and a handful of shared European facilities is the more realistic outcome;
- **the delivery-organisation gap**, where no single country's utility or contractor base is likely to build a solid EPC capability alone in the short term;
- **workforce development**, where the same craft-labour shortages recur in every country studied and cross-border mobility; and
- **local-content allocation**, which no single country can resolve alone.

The overall picture is one of a European supply chain that is "neither ready nor unready" for fleet-scale SMR deployment, but rather in transition, with the direction of travel set more by individual vendors and fleet developers making commercial decisions than by EU-level policy. Whether that bottom-up momentum consolidates into two or three European fleets, or remains a set of parallel, loosely coordinated national programmes, will depend on whether sustained order volume/pipeline, a resolved delivery-organisation gap, cross-border workforce mobility, and an accepted approach to local-content allocation are met together. Moreover, EC financial and fiscal incentives aimed at promoting coordination and integration would also strongly motivate industrial stakeholders. One important lesson this study offers for any future harmonised European model is that the compatibility between standardisation and localisation cannot simply be assumed, and there is a potentially viable "middle-ground".

In summary, Europe has real, underused industrial assets, but converting them into a scalable, multi-country SMR fleet deployment programme depends on a small number of currently - only partially - resolved conditions. Because none of these conditions – regulatory cooperation, supply chains coordination, the delivery-organisation gap, workforce mobility or local-content allocation - can be resolved unilaterally by a vendor, utility or industry association, closing them is primarily a task for policymakers at EU and Member State levels.

SECTION 5

Recommendations

From this research, the following key recommendations emerge:

Demand Orderbook

1. **Aggregate demand to at least the scale at which the fleet effect is realised.** In the model, a fleet of 5–8 gigawatts electrical (GWe), about 12–20 units (even across different sites) at 400 megawatts electrical (MWe) each, already captures a substantial share of the total modelled fleet saving available in a much larger fleet, depending on unit size and site configuration. Interviews put the industrial threshold at about 8-10 units of a family built at a cadence of several units a year.
    a. The immediate priority is focusing on a limited number of designs, and keeping the design(s) and supply chain substantially common through the first fleet, maximising return for the EU in terms of local content including e.g., job creation, innovation, intellectual property.
    b. Member States that have already selected, or are close to selecting, the same technology should establish a shared orderbook before procurement rules, licensing requirements and local-content commitments make their programmes mutually incompatible.
2. **Coordinate licensing.** A single EU nuclear regulator or a directly transferable EU licence is neither necessary for the fleet effect nor, as interviewees suggest, realistic. What is both necessary and achievable is the systematic reuse of safety technical assessment and joint early reviews on the same design, with reuse of relevant findings where national law permits and independent national licensing decisions retained. Regulators should be resourced explicitly for this work, since it front-loads effort in exchange for later savings.

Supply Chain Readiness

3. **Share the initial supply chain and workforce, and sequence projects deliberately.** The first fleet should draw on qualified suppliers across EU countries from the beginning, rather than waiting for national supply chains to develop sequentially in each country. Companies in different EU countries already have expertise in components, systems or services that can be exploited wherever the SMRs are built. Therefore, in the first deployment wave, participating countries should rely on a shared EU project-delivery chain, and project owners should sequence construction, drawing on a limited number of qualified suppliers across the EU so specialist teams, trades and practical learning move from one project to the next rather than several countries bidding for the same people at the same time.
4. **Coordinate and localise progressively, by replicating the standard rather than changing it, and plan for the full project life.** As the orderbook expands, participation can broaden and additional national suppliers can be qualified, increasing national industrial involvement without duplicating complete EU supply chains or changing the standardised design. Planning should also span the full project life. Nuclear projects combine construction, multi-decade operation and decommissioning, so supply-chain and workforce planning should integrate operations and maintenance, fuel supply, and decommissioning and waste management from the outset. Intellectual property and design-ownership terms of arrangements need early attention because they strongly influence the possibility of localisation. Negotiated separately by each country, these terms may produce national variants of the supply chain. Negotiated once for the whole pipeline, they would make it easier for a supplier qualified in one country to serve the entire fleet. Also, over decades of operation, owners need continued access to design information to source spare parts, replace obsolete equipment, make safety modifications, extend plant life and, eventually, decommission, including if the vendor leaves the market. Contracts should therefore specify, before the first order, who holds responsibility for the design over the plant's life and how design information will remain available to owners and qualified suppliers.

5. **Invest in cross-country training programmes, at both university and specialist trade level.** The workforce constraint identified throughout this study includes a shortage of nuclear-specific engineering and academic expertise, and a separate, at least equally binding shortage of specialist trades (including welders, electricians and other craft roles qualified to nuclear-grade standards). Because building competences for both takes a significant amount of time to establish a shared EU approach (such as joint university curricula and qualifications, and cross-border apprenticeship or certification schemes for nuclear-grade trades) could spread the cost and time of building this capacity in different countries. The firms are reluctant to invest in skills building without a visible and credible pipeline of orders, The coordinated approach would allow the same trained workforce to move between the deliberately sequenced projects described above, rather than each country separately rebuilding its own "full" training system from scratch. This would also support supply-chain coordination, particularly important for smaller countries. The EU-funded Nuclear4Skills project is a good first step into this direction.

Financing

6. **Structure financing for a fleet programme rather than for a single plant project.** The cost of capital, meaning the return that lenders and shareholders require, is one of the two largest drivers of the levelised cost of electricity (LCOE), together with the plant's capital cost. Policy decisions, such as putting in place Regulated Asset Bases (RABs), debt guarantees, low-interest loans, Contracts for Difference (CfDs), Power Purchase Agreements (PPAs) can reduce financing risk and the cost of capital. Support should therefore be designed at programme level. Support should also be strongest for the first units and reduce as the programme matures. The first units are where the learning is bought and should be treated as an upfront investment in the fleet rather than the price of a single plant. Such units should have a higher strike price, a longer contract term, a larger guaranteed share or greater public equity participation than later units.
7. **Create an EU financing route for fleet construction.** In the modelled "supported" option, an EU guarantee on the debt of a multi-country fleet lowers the cost of capital. InvestEU, the EU budget guarantee programme, cannot provide this guarantee, because it excludes the construction of nuclear power stations. The Euratom loan facility lets the Commission borrow on capital markets and lend the proceeds to nuclear power projects. It is a long-standing but dormant instrument: since 2000 it has financed safety upgrades, but has no loan operations under way.[291] It can lend without cash set aside in advance, but its lending ceiling is far below the scale required, and raising it requires a Council Decision. Another option is an EU backstop for national Contracts for Difference, which the EU budget would pay only if a Member State failed to honour them. These options differ in cost, legal basis and beneficiary, so the Commission should assess them separately.
8. **Consider co-investment by participating Member States in the shared development costs of a first European SMR reference unit.** One partial analogy is ITER, a unique, international (not EU-only) experimental facility rather than an industrial first-of-a-kind, and not itself a delivery or financing precedent for SMRs; despite that difference, it pools supranational funding and in-kind industrial contributions around a single first-of-a-kind programme, with Europe responsible for about 45.6% of construction costs. For instance an Important Project of Common European Interest (IPCEI) lets at least four Member States fund a joint project under EU State-aid rules, with Commission approval. For innovative technologies, it can fund research, innovation and first industrial deployment, but not mass production or commercial activities. A nuclear IPCEI is in its design phase and had not been notified as of July 2026. If its scope covers SMRs, it could pool national support for the one-off costs of a first reference unit that benefit every later unit, as far as IPCEI rules allow: for example, design completion, licensing evidence, and factory and tooling readiness. The funding would be national, because the EU budget support currently available for SMRs is small relative to the cost of a first unit. The plant itself would be financed by its owners, and responsibility for nuclear safety would stay with the licensee and the host country. Participants should be selected against transparent criteria, including design maturity, safety, standardisation and European supply-chain value, and the lessons learned should be shared across participating countries. This would reduce the penalty of being the first host country without choosing a permanent technology winner.
9. **Avoid punitive treatment of competing technologies for promoting nuclear.** Most European utilities operate diversified portfolios spanning nuclear, wind and solar; punitive taxation or regulatory disadvantage imposed on renewables to improve nuclear's relative competitiveness risks provoking resistance from the same utilities whose cooperation nuclear programmes depend on, and sits uneasily alongside the EU's own market-design principles. A more durable path likely lies in removing nuclear-specific disadvantages, rather than imposing new costs on alternative technologies. A possible approach would be to grant the same funding and financial incentives and mechanisms to both nuclear and renewables, as they are part of the solution of the same energy trilemma.

[291] European Commission, DG Economic and Financial Affairs. Ex-post Evaluation of the Euratom Loan Facility – Final Report. 2011. https://ec.europa.eu/dgs/economy_finance/evaluation/pdf/report_evaluation_loan_facility_en.pdf

SECTION 6

Conclusions

This report demonstrates that levelised cost of electricity falls with cumulative deployment and with site size; the decline is steep over the first few gigawatts and flat thereafter; and financing structure moves the result at least as much as fleet size does. A one- or two-unit programme captures a smaller share of the repetition and co-siting benefits than a larger fleet because it depends on repetition, something a single small national programme cannot supply. The second does not require repetition in the same way, i.e., de-risked financing can in principle be secured for a single project, but the negotiating scale and institutional capacity to put it in place are themselves easier to build through a coordinated programme than alone.

The EU does not lack reactor designs, candidate sites or industrial assets. In this assessment, what it lacks is a mechanism for converting national interest into repeat orders for a limited number of designs and an organisation capable of integrating and delivering those orders. The results of this study illustrate that the real economic benefits felt will come from an orderbook approach. Indeed, the practical path forward is to start small but design for scale. A group of willing Member States can pool demand into a technology-specific orderbook large enough to justify investment in suppliers, manufacturing capacity and workforce development; converge on a common reference design, shared evidence and resources across licensing processes, and a common delivery architecture; and share the initial supply chain and workforce across deliberately sequenced projects. As the orderbook becomes credible and the design is proven, localisation can follow: additional suppliers can be qualified against common specifications, national industrial participation can expand, and value can increasingly be captured across Europe. Standardisation and localisation are therefore not competing objectives, but successive phases of the same programme. The critical sequencing is to establish the common and efficient system first and build national capacity around it.

The evidence in this report provides decision-makers with quantitative and qualitative evidence indicating that coordinated, standardised deployment can reduce the modelled cost of SMR electricity under the stated assumptions; the results do not establish a uniquely optimal pathway or quantify a reduction in delivery time. The opportunity now is to turn existing national interest into a credible European orderbook that is turned into repeat builds, and with those lessons learned and durable demand signals, create the conditions needed for the industrial, financial and institutional foundations for a European nuclear fleet. The first step does not need to be perfect and will not be – it needs to be collective, deliberate and designed from the outset to be repeated.

Finally, two cautions should remain front of mind. The numbers presented in this report are scenario outputs under stated assumptions, not forecasts, and the country-level results describe national conditions rather than the economics of any named reactor. Their purpose is not to predict a single outcome, but to illuminate the choices that will determine it.

APPENDIX A

Financing and Regulatory Instruments

The Long-Term Power Purchase Agreement (PPA)

The wholesale electricity market is volatile: prices change hour by hour; over the medium to long term they remain sensitive to shocks caused by unforeseeable geopolitical events. Nuclear power plants (NPPs) have high capital costs, low operating costs and most operating costs (e.g., personnel stipends) are fixed. NPPs therefore have a "marginal cost" (i.e., the cost of producing an extra unit of energy) near zero, so they will produce even if the price of electricity is low. Yet low prices may not be enough to cover fixed operating costs and capital costs. A Power Purchase Agreement (PPA) is a long-term contract through which an energy producer and a buyer agree in advance on the terms of sale: volume, price, duration, delivery arrangements, and so on. In its simplest form, the producer commits to generating a set quantity of energy over a given period; the buyer commits to purchasing it at a price (fixed or indexed according to some mathematical formulas), regardless of what energy costs on the open market at that moment. Contract lengths might last years or decades.

The benefits of a PPA for a producer are several. With a PPA signed the producer can approach lenders with a credible long-term revenue forecast, reducing the project risk profile and therefore its financing cost. Even a few percentage points reduction in the cost of capital can translate into substantial savings on projects worth billions of euros. A PPA signed with a highly creditworthy counterparty can give the project access to financing that would otherwise be unavailable. The buyer's creditworthiness becomes, in effect, an indirect guarantee for the plant's lenders. For the buyer, the advantage is predictability: it knows what it will pay for electricity over the agreement duration and can plan its operating costs accordingly. PPAs are therefore particularly relevant for facilities which consume hundreds of megawatts and are planned over decades.

The Contract for Difference (CfD)

An alternative to PPA to deal with the cost structure of nuclear generation is the Contract for Difference (CfD) which stabilises electricity prices, which would otherwise be exposed to market fluctuations. Under a two-way CfD, when the reference market price is below the strike price, the designated counterparty (e.g., a market operator) pays the generator the difference; when it is above the strike price, the generator pays back the difference. A publicly supported CfD may constitute State aid and may consequently require notification/approval from the EU.

In the British model, this mechanism is managed by the Low Carbon Contracts Company and is funded through the Supplier Obligation imposed on electricity suppliers, with the cost ultimately passed on to consumers. Conversely, when the reference market price rises above the strike price, the producer returns the difference. More precisely, a CfD does not mean that the producer automatically receives the strike price for every MWh; it stabilises project revenues around the strike price in relation to the reference price. This bilateral mechanism is what distinguishes the CfD from a simple subsidy. Critics of support for nuclear power often overlook this symmetry: during periods of very high prices, for example during an energy crisis, a producer operating under a CfD does not keep the gain created by the price spike but returns it to the system. It is a redistribution mechanism, not a one-way transfer of public money to private actors. For qualifying direct price-support schemes for new generation, the EU electricity-market-design rules require two-way CfDs or equivalent schemes for contracts concluded from 17 July 2027.[292] For SMRs, the fleet structure and serial production of multiple units could make strike-price negotiations complex, and adjustment mechanisms linked to the technology's learning curve may be needed.

[292] European Union. Regulation (EU) 2024/1747. Official Journal of the European Union (2024). https://eur-lex.europa.eu/eli/reg/2024/1747/oj

The Hinkley Point C case

The Hinkley Point C plant, under construction at Bridgwater in Somerset (UK), is probably the best-known and most-discussed application of the CfD model to the nuclear sector. The project involves two EPR (European Pressurized Reactor) units of 1,630 MWe each, for a combined output of 3,260 MWe. The developer is EDF, with a minority stake held by the Chinese group CGN. The CfD, dated September 2016, is between NNB Generation Company (HPC) Limited and the Low Carbon Contracts Company Ltd, the public counterparty in the British CfD system; the key commercial terms had been settled politically as early as 2013. The reference strike price was £92.50/MWh at 2012 prices, with a reduction to £89.50/MWh contingent on an extension to Sizewell C. The contract runs for 35 years from the date of commercial operation.

The Hinkley Point C case has also exposed some limitations of the model. When construction costs rise, as they have at Hinkley Point C, the industrial risk stays with the producer rather than with consumers: the CfD secures the selling price, not cost recovery. The investors must absorb the overruns from their own balance sheet.

The Regulated Asset Base (RAB) Model

The Regulated Asset Base (RAB) is a financing and regulatory model long used across several types of infrastructure, including networks, electricity, gas, water and railways, and in recent years it has been proposed for new NPP. Its underlying logic is fundamentally different from that of the CfD or PPA: rather than securing the sale price of the electricity produced, the RAB acts on the cost of capital during construction, spreading financial risk across a broad base of network users before the plant produces a single kilowatt-hour.

As said, building an NPP requires years of expenditure without any revenue. The RAB addresses this by allowing the builder to receive regulated revenue during construction through a surcharge on network users' tariffs. In practice, the regulator recognises the investor's costs as part of a regulated asset base and allows a fixed return on that base, materially lower than the return the market would require for an unregulated investment with the same risk profile. Because the regulatory mechanism materially reduces the risk perceived by investors and lenders, the cost of capital can fall, along with total project cost. The risk, however, is not eliminated; it is reallocated and contained within parameters set by the regulator.

One important distinction: the RAB does not necessarily finance the whole project. Part of the capital, typically the equity share, remains at private risk and comes from investors who accept the regulated return as compensation for their exposure. Another part is debt, raised on more favourable terms than usual because the regulatory framework reduces the risk lenders perceive. In some cases, such as Sizewell C, the state participates directly in the project's equity, explicitly sharing in its risks and rewards. The public stake is an equity interest with rights and risks comparable to those of the other shareholders. The RAB model redistributes construction risk, delays, and cost overruns. Under the RAB model, a portion of these risks can be passed through to users via tariff adjustment mechanisms, but within limits defined by the regulator. If costs breach certain thresholds, shareholders bear the excess. The regulator sets the rules: which costs are admissible within the regulated asset base, what return they carry, and which remain at private risk. This negotiation is perhaps the most delicate stage of the entire RAB structure, because it requires fixing technical and economic parameters years in advance, in a sector where cost uncertainty is notoriously high.

The Sizewell C case

The Sizewell C project is the most advanced application of the RAB model to nuclear power in Europe. The Nuclear Energy (Financing) Act, passed by the UK Parliament in 2022, established the legal basis for applying the RAB to new nuclear plants. Following the final investment decision of 22 July 2025, the project company is Sizewell C Ltd, while Great British Energy – Nuclear is a separate public body and not the project vehicle. The British government is the largest shareholder in the project holding company with an initial stake of 44.9%, alongside EDF, Centrica, La Caisse, and Amber Infrastructure. Banks and bond investors finance the debt component on terms materially better than those achieved for Hinkley Point C, because the regulatory mechanism implicitly backstops the credit risk.

During construction, users of the British grid will begin contributing, through a dedicated tariff component, to the service of the regulated asset base recognised by the regulator. British government estimates suggest that the RAB could reduce the overall financing cost of Sizewell C by several billion £ compared to the pure CfD model used for Hinkley Point C. That reduction would translate into a net benefit for consumers over the long run, despite the tariff cost borne during construction.

The model's overall merit depends heavily on how long construction takes and on the trajectory of capital costs in financial markets: if the build is significantly delayed, the tariff cost for users rises, potentially eroding the benefits the model promises. For SMR programmes, serial production of multiple identical SMRs could enable a learning curve that progressively reduces construction costs. In this scenario, the RAB applied to the first units could finance a reduction in risk that benefits the subsequent units, which could then access financing on easier terms as technical uncertainty falls and costs become more predictable.

Possible Member State incentives and actions

Member States can complement PPAs, CfDs and RAB by intervening where government is better placed to manage policy, regulatory and financing risks, while leaving construction and operating performance primarily with sponsors and contractors. In the EU, selective support may constitute State aid and require Commission approval; the Dukovany decision shows that nuclear support can be approved under Article 107(3)(c) TFEU.[293]

Financial support

Governments can provide public equity or development funding for licensing, engineering, site preparation, supply-chain qualification and first-of-a-kind testing; the € 300 million French support for NUWARD illustrates this approach.[294][294] They can also lower financing costs through concessional loans, guarantees, export-credit support and protection against defined political or regulatory risks. The Dukovany package combines a subsidised State loan, 40 years of revenue support and protection against specified risks.[295]

Revenue, infrastructure and fleet support

Beyond direct finance, governments can facilitate bankable long-term offtake through CfDs, RABs and PPAs; clarify rules for private-wire, behind-the-meter and co-located arrangements; fund enabling grid and site infrastructure; strengthen regulators, skills and supply chains; and support repeatable fleet procurement. The strongest packages combine development support, lower-cost finance, revenue stabilisation and enabling infrastructure while keeping support conditional, preserving delivery incentives and sharing upside where taxpayers or consumers absorb material downside risk.

Possible EU-level and EIB actions

EU-level action can complement national project sponsorship. The Commission estimates around € 241 billion of investment needs to 2050 for lifetime extension of existing reactors and construction of new large reactors – € 205 billion of it for new large-reactor build and € 36 billion for lifetime extensions, in present-value terms – with additional investment required for SMRs, AMRs and microreactors.[296]

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293 European Commission. Commission Decision (EU) 2025/429 of 30 April 2024 on State aid SA.58207 (2021/N) supporting the construction and operation of a new nuclear power plant at the Dukovany site. Off. J. Eur. Union L 2025/429 (2025). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32025D0429

294 European Commission. Commission approves€300 million French State aid measure to support Nuward in researching and developing small modular nuclear reactors. (26 April 2024). https://ec.europa.eu/commission/presscorner/home/en

295 European Commission. Commission Decision (EU) 2025/429 of 30 April 2024 on State aid SA.58207 (2021/N) supporting the construction and operation of a new nuclear power plant at the Dukovany site. Off. J. Eur. Union L 2025/429 (2025). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32025D0429

296 European Commission. Nuclear Illustrative Programme presented under Article 40 of the Euratom Treaty. COM(2026) 120 final (2026). https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=comnat:COM_2026_0120_FIN

EIB and InvestEU

The EIB can provide loans, venture debt and risk-sharing across the nuclear value chain. Recent examples include a € 400 million loan to Orano and Board approval of € 800 million for Cernavoda Unit 1,[297] while the 2026 Clean Energy Investment Strategy envisages EIB products for innovative reactors and associated supply chains.[298] A key limitation is InvestEU: although a temporary € 200 million top-up is being considered for innovative nuclear technologies,[299] current rules exclude "the decommissioning, operation, adaptation or construction of nuclear power stations" from the activities the EU budget guarantee may support.[300] Direct InvestEU-style backing for reactor new-build would therefore require a change in eligibility or a separate legal vehicle.

Euratom and industrial scale-up

EU support is also available for R&D and industrial scale-up through Euratom programmes,[301] the Net-Zero Industry Act,[302] and the proposed nuclear IPCEI which Member States are designing with Commission support following the Joint European Forum's endorsement of the design phase in April 2025, and which has not yet been notified as State aid.[303]

Offtake, regulation and coordination. EU institutions can also strengthen long-term offtake and reduce transaction risk. The Commission's PPA Recommendation and the EIB's € 500 million guarantee envelope for corporate PPA, approved in June 2025 and directed at renewables, provide a model for credit enhancement that could potentially be adapted to nuclear-compatible offtake within existing legal limits.[304] More standardised State-aid guidance, regulatory cooperation and common industrial standards could further lower development and financing risk.

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297 European Investment Bank. EIB and Orano sign a€400 million loan agreement relating to the extension of the Georges Besse 2 uranium enrichment plant. (10 March 2025). https://www.eib.org/en/press/all/2025-130-eib-and-orano-sign-a-loan-agreement-for-400-million-euros-relating-to-the-project-to-extend-the-georges-besse-2-uranium-enrichment-plant; European Investment Bank. EIB Group approves over €17 billion in new financing, including for Romanian nuclear power and€800 million for Cernavoda Unit 1 refurbishment. (16 July 2026). https://www.eib.org/en/press/all/2026-253-eib-group-approves-over-eur17-billion-in-new-financing-including-for-romanian-nuclear-power-and-ukraine-eu-border-crossings

298 European Commission. Clean Energy Investment Strategy. COM(2026) 116 final (2026). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52026DC0116

299 European Commission. Strategy for the Development and Deployment of Small Modular Reactors (SMRs) in Europe. COM(2026) 117 final (2026). https://energy.ec.europa.eu/document/download/d58b8803-6bae-40dd-be80-76ac37be2cb8_en?filename=Communication+-+Small+Modular+Reactors.pdf; European Parliament. Written Question E-001728/2026, SMR projects, and joint answer given by the European Commission on 30 July 2026. (2026). https://www.europarl.europa.eu/meps/en/256951/ANJA_ARNDT/other-activities/written-questions-other

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301 European Commission. Strategy for the Development and Deployment of Small Modular Reactors (SMRs) in Europe. COM(2026) 117 final (2026). https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52026DC0117

302 European Parliament & Council of the European Union. Regulation (EU) 2024/1735 of 13 June 2024 on establishing a framework of measures for strengthening Europe's net-zero technology manufacturing ecosystem. Off. J. Eur. Union L 2024/1735 (2024). https://eur-lex.europa.eu/eli/reg/2024/1735

303 European Parliament. Written Question E-001728/2026, SMR projects, and joint answer given by the European Commission on 30 July 2026. (2026). https://www.europarl.europa.eu/meps/en/256951/ANJA_ARNDT/other-activities/written-questions-other

304 European Commission. Recommendation on removing barriers to the development of power purchase agreements and other energy purchase agreements. C(2026) 2676 final (2026).; European Investment Bank. EIB Group increases 2025 financing ceiling to record€100 billion to step up investments in security and defence, energy grids and Europe's tech leadership. (2025). https://www.eib.org/en/press/all/2025-247-eib-group-increases-2025-financing-ceiling-to-record-eur100-billion-to-step-up-investments-in-security-and-defence-energy-grids-and-europe-s-tech-leadership

APPENDIX B

Reactors named in the report

AP1000

The AP1000 is a two-loop pressurised water reactor developed by Westinghouse. The design philosophy places particular emphasis on simplification, passive safety and modular construction. Large structural modules, equipment modules, skids and preassembled packages can be fabricated or assembled away from the final installation position, allowing some activities that would otherwise be sequential to proceed in parallel and moving fabrication and inspection into more controlled environments.[305] Westinghouse describes simplification as a major design objective across safety systems, normal operating systems, instrumentation and control, and construction techniques.[306]

EPR

The EPR is an evolutionary large pressurised water reactor developed from the operating experience and engineering traditions of the French N4 and German Konvoi reactor families, incorporating substantial changes intended to strengthen accident prevention, severe-accident management and protection against internal and external hazards.[307] The EPR was also conceived at a higher unit power than the preceding N4 and Konvoi series. The EPR combines a large core and turbine-generator output with extensive redundancy and physical separation of safety systems, a core catcher for severe-accident management and robust containment arrangements.

EPR2

EPR2 is an evolution of the EPR developed by EDF and Framatome for a new French fleet programme. It retains the basic EPR nuclear steam supply concept and much of the reactor-system design, but introduces simplifications intended to improve constructability and facilitate series construction. EDF also describes EPR2 as the first reactor in its programme designed entirely in a digital environment using 3D models and construction simulation.[308] The industrial programme is structured around repeated pairs of units, with the first phase comprising three pairs at Penly, Gravelines and Bugey. This is intended to support standardisation, learning, and common supply-chain arrangements across the series.[309]

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307 IRSN. Les caractéristiques générales de l'EPR. (3 May 2024). https://www.irsn.fr/savoir-comprendre/surete/caracteristiques-generales-lepr

308 EDF. EPR2 programme. https://www.edf.fr/groupe-edf/produire-une-energie-respectueuse-du-climat/lenergie-nucleaire/nouveau-nucleaire/programme-epr2 (accessed 21 August 2026).

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GE Vernova Hitachi BWRX-300

The BWRX-300 is a 300 MWe boiling water reactor developed by GE Vernova Hitachi Nuclear Energy. It is the tenth generation of GE's BWR technology and an evolution of the 1,520 MWe Economic Simplified Boiling Water Reactor (ESBWR), a design certified by the U.S. Nuclear Regulatory Commission.[310] As a BWR, it uses a direct steam cycle: water boils in the reactor vessel, and the resulting steam is sent directly to the turbine, rather than transferring heat through separate steam generators as in a PWR. The BWRX-300 uses natural circulation through the core and passive safety systems driven by phenomena such as gravity and buoyancy.[311] Its design strategy emphasises system simplification while retaining selected ESBWR technology, licensing experience, and established BWR fuel.[312]

NuScale US460

NuScale US460 is a multi-module plant built around an integral pressurised water reactor. In an integral PWR, major primary-system components that are separate in a conventional large PWR are brought within the reactor pressure vessel. NuScale's module contains the reactor core, pressuriser and helical-coil steam generators inside the vessel, which is enclosed within a compact steel containment.[313] Normal primary-coolant flow is by natural circulation, eliminating reactor coolant pumps and the associated large primary piping.[314] Each module is installed in a water-filled reactor pool that provides a heat sink for passive decay-heat removal. The US460 configuration combines six 77 MWe modules rather than scaling a single reactor to gigawatt size.[315] This architecture is intended to make capacity divisible: modules can in principle be installed as repeated units within one plant, and individual modules can be taken out of service while others remain available. NuScale also designs the reactor module for factory fabrication and transport in sections to the site.[316] The design philosophy is consequently based on integration, natural-circulation cooling, passive heat removal, and replication of relatively small reactor modules.

NUWARD SMR

NUWARD is EDF Group's SMR programme and is based on Generation III+ pressurised water reactor technology. The current NUWARD description is a single reactor of 1,150 MWth, convertible into up to 400 MWe, with the possibility of simultaneously supplying useful heat.[317] Its design philosophy combines conventional light-water reactor technology with standardisation, modularity, and prefabrication. NUWARD states that the plant is being designed so that around 60% of operations normally performed on site can instead be undertaken in a factory or workshop.[318] NUWARD is also explicitly conceived as a multi-energy plant rather than solely an electricity generator, with potential applications including industrial heat, district heating, hydrogen production, and desalination.[319] EDF has stated that the revised SMR design will rely exclusively on proven technologies to maximise technical feasibility and improve constructability.[320]

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Rolls-Royce SMR

The Rolls-Royce SMR is a 470 MWe, three-loop pressurised water reactor. Its nuclear heat-production system uses conventional PWR principles (a pressurised primary circuit transfers heat through three steam generators to a separate secondary steam cycle) rather than introducing a new coolant or fuel technology.[321] Rolls-Royce SMR describes the plant as being divided into around 1,500 transportable modules manufactured and tested off site, with site activity focused on assembly and commissioning.[322] The company has consequently framed the programme around repeat manufacture and fleet deployment rather than bespoke EPC delivery for each unit.

VVER-1200 / AES-2006

VVER denotes a family of Russian-developed pressurised water reactors rather than a single reactor design. For this comparison, the relevant current large-reactor design is the Generation III+ VVER-1200/AES-2006 family, which evolved from earlier VVER-1000 designs and is deployed in several project variants. IAEA descriptions distinguish the VVER-1200/V-392M reference used at Novovoronezh II from the VVER-1200/V-491 reference used at Leningrad II and Belarus.[323] The design retains characteristic VVER features such as horizontal steam generators, while raising unit output to the approximately 1.2 GWe class. Safety provisions include double containment, passive decay-heat removal, and a core-melt localisation device alongside active engineered safety systems.[324]

Primary status source: IAEA PRIS.[325] Table 32 lists reactor names and PRIS commercial-operation or construction-start dates at the precision shown. A PRIS status of "Operational" is not converted into a commercial-operation date if the PRIS commercial-operation field is blank. National-regulator milestones are shown separately. Model names are retained exactly enough to distinguish AP-1000 from CAP1000 and EPR/EPR-1750 from EPR2. For VVER, the comparison is limited to the VVER-1200/AES-2006 family and does not combine it with the later VVER-TOI/V-510 design.

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Table 32: Reactor designs referenced in the report: technical and status overview (IAEA PRIS)

Reactor design	Technology and capacity	Operating reference units	Units under construction	Licensing / Development status
Westinghouse AP1000	PWR. Westinghouse nominal net output ~1,110 MWe. PRIS operating reference capacities: 1,117-1,170 MWe[326]	**6 AP-1000 units in PRIS:** Sanmen-1 – commercial operation Sep 2018 Sanmen-2 – Nov 2018 Haiyang-1 – Oct 2018 Haiyang-2 – Jan 2019 Vogtle-3 – Jul 2023 Vogtle-4 Apr 2024	No reactor currently under construction in PRIS with model designation exactly "AP-1000". PRIS records subsequent Chinese derivative units separately as CAP1000	U.S. NRC-certified standard plant design. Regulatory design certification is separate from plant-level PRIS status[327]
EPR	Large PWR. PRIS reference net capacities: Taishan 1/2 1,660 MWe; Olkiluoto-3 1,575 MWe; Flamanville-3 1,630 MWe; Hinkley Point C units 1,630 MWe each	**PRIS operational records:** Taishan-1 – commercial operation Dec 2018 Taishan-2 – Sep 2019 Olkiluoto-3 – 1 May 2023 Flamanville-3 – PRIS status "Operational"; first grid Dec 2024; commercial-operation field blank	Hinkley Point C-1 – under construction; PRIS construction start Dec 2018. Hinkley Point C-2 – under construction; PRIS construction start Dec 2019	Plant status and milestone dates shown here are taken from PRIS. Flamanville-3 is not assigned a commercial-operation date because PRIS does not currently populate that field
EPR2	PWR; approximately 1,670 MWe according to ASNR[328]	None. No EPR2 reactor is recorded in PRIS as operating	None. No EPR2 reactor is recorded in PRIS as under construction	Penly: creation-authorisation application for two EPR2s. ASNR reported completion of the safety-assessment phase in January 2026 and expects to submit its opinion to government by end-2026; public inquiry ran 22 Jan-4 Mar 2026[329]
VVER-1200 / AES-2006	Large four-loop PWR family. AES-2006 variants include VVER V-392M and VVER V-491. Operating reference capacities are approximately 1,100-1,110 MWe net; PRIS lists Paks-5 at 1,185 MWe reference power[330]	**6 operating AES-2006/VVER-1200 units in PRIS-derived records:** Novovoronezh 2-1 – commercial operation 27 Feb 2017 Novovoronezh 2-2 – Oct 2019 Leningrad 2-1 – Oct 2018 Leningrad 2-2 – Mar 2021 Belarusian-1 – Jun 2021 Belarusian-2 – Nov 2023	**PRIS records VVER-1200/AES-2006-family units under construction at multiple sites:** Rooppur-1 – Nov 2017; Rooppur-2 – Jul 2018 Akkuyu-1 – Apr 2018; Akkuyu-2 – Apr 2020; Akkuyu-3 –Mar 2021; Akkuyu-4 – Jul 2022 Tianwan-7 – May 2021; Tianwan-8 – Feb 2022 Xudapu-3 – May 2021; Xudapu-4 – May 2022 El Dabaa-1 – Jul 2022; El Dabaa-2 – Nov 2022; El Dabaa-3 – May 2023; El Dabaa-4 - Jan 2024 Leningrad 2-3 – Mar 2024; Leningrad 2-4 – Mar 2025 Paks-5 – Feb 2026	Hungary: HAEA issued the implementation/construction authorisations for Paks II Units 5 and 6 in 2022. Unit 5 first concrete was poured on 5 Feb 2026 and is recorded by PRIS as under construction; Unit 6 has not yet reached the PRIS construction-start milestone[331]
NUWARD SMR	PWR SMR concept; current NUWARD description ~1,150 MWth and up to 400 MWe; ASNR January 2026 description ~1,100 MWth[332,333]	None. No NUWARD reactor is recorded in PRIS as operating	None. No NUWARD reactor is recorded in PRIS as under construction	Phase 3 of the multi-regulator Joint Early Review launched 21 Jan 2026; conclusions expected by end-2026. This is upstream regulatory cooperation, not a construction licence.[334]

Reactor design	Technology and capacity	Operating reference units	Units under construction	Licensing / Development status
Rolls-Royce SMR	PWR SMR; 470 MWe[335]	None. No Rolls-Royce SMR reactor is recorded in PRIS as operating	None. No Rolls-Royce SMR reactor is recorded in PRIS as under construction	UK GDA: Step 1 Apr 2022-Apr 2023; Step 2 Apr 2023-Jul 2024; Step 3 commenced 31 Jul 2024 and remains ongoing[336]
NuScale US460	Integral light-water SMR; 6 × 77 MWe modules = approximately 462 MWe[337]	None. No NuScale US460 reactor is recorded in PRIS as operating	None. No NuScale US460 reactor is recorded in PRIS as under construction	U.S. NRC final safety evaluation report issued 28 May 2025; Standard Design Approval issued 29 May 2025. A project-specific licence is still required to build and operate[338]
GE Vernova Hitachi BWRX-300	Natural-circulation BWR SMR; 300 MWe[339]	None. No BWRX-300 reactor is recorded in PRIS as operating	DARLINGTON SMR1, Canada - 300 MWe BWR; PRIS status "Under Construction"; construction start 22 Apr 2026[340]	The Canadian Nuclear Safety Commission issued OPG a construction licence on 4 Apr 2025. OPG submitted a licence-to-operate application on 25 Mar 2026[341]

Refer to footnotes below for the citations used in the table.

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APPENDIX C

The INCAS model

Purpose and scope

INCAS (Integrated model for the Competitiveness Assessment of SMRs) is a proprietary MATLAB model developed at Politecnico di Milano, to assess the economic competitiveness of small and medium-sized reactors.

The DCF model

INCAS runs a bottom-up discounted-cash-flow (DCF) model that returns the full capital structure over time, which is what reveals the financial sustainability of a multi-decade build programme. In this way, costs, learning, co-siting and the construction schedule are resolved period by period, so staggered, overlapping multi-unit builds are modelled explicitly. The user can specify how much of the free cash flow generated by early-deployed units is redirected into the construction of later ones, reducing the upfront external capital requirement (self-financing). Moreover, debt-stock evolution and debt-coverage ratio are reported over time, so financial risk could be evaluated alongside profitability. A stochastic approach extends this into a full risk picture. The investment model produces the headline financial indices: levelised cost of electricity (LCOE), net present value (NPV), internal rate of return (IRR), and payback time (PBT). The investment model is divided into four sub-models: generation cost, revenue, financial cost and the integrating investment model.

Generation cost model

The total cost is split into investment and operation and maintenance, and a scale elasticity is defined for each, such that larger reactors hold an advantage. SMRs offset this through four mechanisms that produce an overnight construction cost in which the N-th unit of a series costs less than its predecessors:

- **Learning.** Unit cost falls steeply over the first few units and then approaches an asymptote. INCAS distinguishes learning on a site from transfer across sites and worldwide, with on-site learning fastest because the supplier, utility and contractor curves all act at once.
- **Modularisation.** The shift from stick-built to factory-fabricated modules installed in parallel. The achievable reduction grows as plant size falls which is why smaller units benefit more.
- **Co-siting economies.** Fixed, site-related costs shared across units. The first SMR bears the full fixed-cost burden; each subsequent unit on the same site receives a corrective discount.
- **Design savings.** Concept-specific reductions from layout simplification, enhanced passive safety, primary-loop integration and the elimination of active components. (Not considered in this simulation.)

Revenue model

INCAS forecasts annual cash inflows over plant lifetime as a function of electricity consumption, plant size, reactor technology, and other variables (e.g., load factors and electricity demand trends). INCAS does not simulate the electricity market. It is interfaced with appropriate external market models and interprets their long-term price and demand forecasts as inputs.

Financial cost model

This model evaluates the cost of investment capital. The weighted average cost of capital (WACC) is built from the debt:equity gearing, cost of equity, cost of debt and tax rate. INCAS also adopts the shareholders' perspective: lenders' capital is treated as debt, cash flows are taken net of interest and principal repayment (free cash flows), and these are discounted at the cost of equity. Therefore, INCAS also provides financial indices from the equity owners' perspective.

Investment model

The integrating layer combines costs, revenues and financing to return the programme-level indicators including NPV, IRR, PBT, and LCOE. The rationale for going beyond LCOE is that a project proven cost-effective on generation cost alone may still not be undertaken by a private investor unless the financial return adequately covers market and regulatory risk.

Uncertainty treatment

Input uncertainty is handled by Montecarlo simulation within the investment risk model. Probability distributions (uniform, normal, beta, log-normal or triangular) are assigned to input variables and sampled over a user-set number of runs. Outputs are returned as distributions, and the computed variance analysis characterises how robust the programme is to changed or adverse scenario conditions.

Inputs and workflow

Inputs are organised in four layers. An existing scenario can be cloned and modified without redefining every field; each scenario can be run deterministically or stochastically.

- **Reactor library:** each design with its specific/overnight construction cost, the number of units of that type already built worldwide, and delay-driven cost escalation.
- **Investment-specific inputs:** an unbounded number of reactors and sites; financing mix and interest rates; specific construction cost scaled from a reference standard reactor via economy-of-scale rules; site-level co-siting and learning.
- **Country-specific inputs:** the macro and fiscal environment; in stochastic mode, the electricity-market model.
- **Construction schedule:** per reactor, design, site, construction start, and duration (deterministic) or delay probability/distribution (stochastic); staggered, overlapping builds; importable from CSV.

Outputs

Deterministic runs return time-series and cross-sectional results:

- Single-period and cumulative free cash flow.
- Total debt in each period; cost of debt and WACC in each period.
- Capital-investment sources per period and per reactor (debt, equity, self-financing).
- NPV computed at different financing mixes; LCOE, IRR and PBT.

Stochastic runs add the full output distribution for each variable, in addition to every graph available in deterministic mode.

Presentation and Explanation of the INCAS MODEL

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- Boarin, M. Massone, and M. E. Ricotti. INCAS User Manual. 2012. https://ia903104.us.archive.org/11/items/manualzilla-id-6881012/6881012.pdf

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APPENDIX D

General assumptions

Overnight Capital Cost

The Darlington New Nuclear Project (Ontario Power Generation, OPG, 4×BWRX-300, 1200 MWe total) is the only light water SMR under construction in OECD countries with reliable and detailed data available. OPG and WNN report a total project cost of CAD 20.9 bn.[342] The reported CAD 20.9 bn total cost, divided by the plant's 1200 MWe capacity, gives CAD 17,417/kWe, or € 10,973/kWe (CAD-to-EUR 0.63[343]). These costs include interest during construction (IDC), escalation and contingency. Assuming a 1% construction-cost escalation rate and a 5% cost of debt, the OCC is around 15-20% below the reported total cost. Considering also the range of values in Table 33, INCAS and economies of scale adjustments, the optimistic and conservative FOAK values are determined as:

- **For 400 MWe SMR:** € 8,069/kWe (optimistic) and € 12,551/kWe (conservative).
- **For 100 MWe SMR:** € 10,397/kWe (optimistic) and € 16,211/kWe (conservative).

[342] Ontario Power Generation. "Canada Growth Fund and Building Ontario Fund announce innovative equity investment in world-leading OPG SMR project". 2025. https://www.opg.com/releases/cgf-and-bof-announce-innovative-equity-investment-in-world-leading-opg-smr-project/

[343] European Central Bank. Euro foreign exchange reference rates – Canadian dollar (CAD). ECB (1 July 2026). https://www.ecb.europa.eu/stats/policy_and_exchange_rates/euro_reference_exchange_rates/html/eurofxref-graph-cad.en.html

Table 33: Literature basis for the general EU simulation inputs (cf. Table 34)

Condensed from the project's source literature review; see individual references for full detail.

Category	Reactor / parameter	Size / scope	Literature value(s)	Ref.
CAPEX (OCC)	BWRX-300 (GE-Hitachi)	300 MWe	FOAK ≈ € 12,650–16,500/kW; NOAK (multi-unit, shared site) ≈ € 7,000–11,200/kW	344
	NuScale Power Module	77 MWe/module (462–924 MWe plant)	FOAK ≈ € 4,700–19,800/kW; NOAK ≈ € 3,500/kW	345
	SMART (KAERI/KEPCO)	100 MWe	FOAK ≈ € 5,150/kW	346
	UK SMR (Rolls-Royce SMR)	470 MWe	≈ € 4,980/kW, implied by the announced UK Government contract value	347
	Generic SMR: basis for Table 34	~300 MWe	FOAK ≈ € 8,300–12,900/kW (median ≈ € 10,600); NOAK ≈ € 4,100–6,900/kW (median ≈ € 5,500)	348,349
O&M	Generic SMR: basis for Table 34	~300 MWe	Fixed ≈ € 109–199/kW-yr; variable ≈ € 2.0–2.6/MWh; ≈ € 16.5/MWh total in an earlier general FOAK estimate	350,351
	BWRX-300	300 MWe	≈ € 25.8–35.6/MWh, lower end for a 4-unit fleet with shared staffing	352
	SMART	100 MWe	$25/MWh (2014$)	353
Fuel cycle	Generic SMR: basis for Table 34	~300 MWe	≈ € 8.6–11.1/MWh.	354,355
	BWRX-300	300 MWe	≈ € 8.3/MWh, assumed equal to AP1000 fuel cost	356
D&D	Generic SMR: basis for Table 34	300 MWe	Total ≈ € 276–828 M/reactor; levelised ≈ $1.2/MWh decommissioning + $1.0/MWh spent-fuel fee	357
	Various SMRs: basis for Table 34	45–335 MWe	$470–1,700/kW (2022$); this range is applied to all SMR sizes in this study, as in prior INCAS-based work	358
Construction duration	Generic SMR: basis for Table 34	~300 MWe	4.5–10 years first-concrete-to-operation across quartile estimates; FOAK ≈ 7 yr / NOAK ≈ 4.5 yr adopted here	359,360
Country-level inputs	Electricity price: basis for Table 34	CZ / FR / PL / SE / IT / RO	2025 country averages ≈ € 42–122/MWh; EU average adopted ≈ € 95/MWh	361
	Nominal risk-free rate (10y bond yield)	EU	≈ 2.8–7.2% across the study countries; euro area ≈ 3.4%	362
	Annual inflation rate	EU	≈ 0.7–9.0% across the study countries; euro area running ≈ 3% in 2026	363
	Corporate tax rate	EU	16–27.8% across the study countries; EU average ≈ 21.6%	364

Refer to footnotes below for the citations used in the table.

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[351] Idaho National Laboratory. Small Modular Reactor: FOAK and NOAK Economic Analysis. INL/EXT-14-32616. (August 2014). https://www.osti.gov/biblio/1167545

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EU as a single country

- The EU is treated as a fully integrated energy market (common financing, project delivery chain, electricity price). Smaller scenarios broadly represent single-country programmes; larger ones reflect coordinated multi-country action.
- All calculations use real 2026 € to isolate fleet effects from monetary dynamics. Moreover, the simulations use real cash flow values, i.e., adjusted for inflation to express them in constant purchasing power terms.
- Each INCAS simulation uses optimistic and conservative inputs for overnight capital costs (OCC), operation and maintenance costs (O&M), and fuel cycle costs. The full inputs to the simulations are found in Table 34 and Table 35.
- Sensitivity analysis (Figure 6) and financing leverage (Kd/Ke; Figure 7) results are based on the E2 scenario (Table 35): 6.4 GWe total, 800 MWe sites, 400 MWe SMRs, and optimistic assumptions.
- The sensitivity analysis changes one input variable at a time by ±10% while keeping all others constant. Applying a uniform perturbation to every variable makes the resulting LCOE impacts directly comparable.
- The scenarios represent possible deployment schedules ranging from a single SMR in one site to large-scale deployment at the EU level over 50 GWe (Table 35). Sites can be three sizes: 400, 800, and 1600 MWe per site (100 MWe only in A0). Each deployment scenario could be implemented with two reactor sizes: SMR small (100 MWe) and SMR big (400 MWe).
- The deployment schedules assume a ramp-up in construction capacity and the supply chain. The number of sites under simultaneous construction grows progressively, doubling each step (1 > 1 > 2 > 4 etc.). Site construction starts are linked to the completion of the first unit of preceding sites. This reflects a realistic deployment trajectory in which supply-chain capacity, regulations, and construction know-how improve over time, enabling later sites to be launched in larger parallel batches. The first unit (first site) is assumed to take 7 years to build (FOAK). From the second to the sixth unit is 6 years ("Between"-Of-A-Kind, BOAK). All other units are built in 4.5 years (Nth-Of-A-Kind, NOAK). At a single site, each unit starts construction 2 years after the previous one. The rules apply for both SMR sizes in the three site size (400, 800 and 1600 MWe), but, for sites with 16×100 MWe SMRs, the reactors are built in pairs. Figures 8-10 report examples of deployment schedules.

Table 34: Input to simulations: optimistic and conservative scenarios

Common input parameter	Units	Value		Source / justification
		Optimistic	Conservative	
Power output	MWe	100 – 400		Smallest and largest SMR unit size considered in this study
CAPEX: OCC (FOAK 400 MWe)	€/kWe	8,069	12,551	See above
CAPEX: OCC (FOAK 100 MWe)	€/kWe	10,397	16,211	See above
O&M unit cost (FOAK 400 MWe)	€/MWh	15	30	Literature range for 300 MWe-class SMRs (Table 33)
O&M unit cost (FOAK 100 MWe)	€/MWh	18.75	37.5	Scaled +25% from the 400 MWe value; within the range implied by size-dependent O&M premiums reported in the literature (Table 33)
Fuel cycle unit cost	€/MWh	9	12	Literature range (Table 33); assumed equal for both SMR sizes, which share the same fuel
D&D unit cost	€/MWh	2		Literature range (Table 33); assumed constant across SMR sizes and scenarios
Expected construction duration	years	7 Year FOAK, 6 years BOAK, 4.5 years NOAK		Literature range of first-concrete-to-operation durations (Table 33)
Operating life	years	60		Value from the Idaho National Laboratory (INL) meta-analysis, also used in prior INCAS-based studies (Table 33)
Capacity factor	%	90		Value from the INL meta-analysis, also used in prior INCAS-based studies (Table 33)
Debt amortisation period	years	30		Financial assumption; comparable repayment periods run 27–30 years for recent European projects[365]
Dividend share during amortisation	%	0		Financial assumption
Dividend share after amortisation	%	0		Financial assumption
Equity / (Equity + Debt)	%	25		Financial assumption; recent European projects range from fully debt-financed to a 75:25 or 98:2 debt:equity split[366]
Cost of debt (real value of money)	%	3		Financial assumption, informed by recent European nuclear project debt terms[367]
Cost of equity (real value of money)	%	8		Financial assumption, informed by the post-tax equity return reported for Hinkley Point C[368]
Annual escalation rate for construction	%	0		Assumed zero; the simulation uses real cash flows
Electricity price	€/MWh	95		EU average of 2025 country-level day-ahead prices (Table 33)

Common input parameter	Units	Value		Source / justification
		Optimistic	Conservative	
Electricity price annual increase rate	%	0		Assumed zero; the simulation uses real cash flows
Nominal risk-free rate	%	0		Assumed zero; the simulation uses real cash flows. Observed country values in Table 33
Annual inflation rate	%	0		Assumed zero; the simulation uses real cash flows. Observed country values in Table 33
Corporate tax rate	%	0		Assumed zero; observed EU country rates average 21.6% (Table 33)

Refer to footnotes below for the citations used in the table.

Table 35: Input to the INCAS simulations: site size and total deployment

SMR size	Scenario	Total Power	Number of sites (400 MWe per site)	Number of sites (800 MWe per site)	Number of sites (1,600 MWe per site)
SMR big 400 MWe	A	100 MWe	1 (A0 – 1 × 100 MWe)		
		400 MWe	1 (A1 – 1 × 400 MWe or 4 × 100 MWe)		
SMR small 100 MWe	B	800 MWe	2 (B1)	1 (B2)	
	C	1.6 GWe	4 (C1)	2 (C2)	1 (C3)
	D	3.2 GWe	8 (D1)	4 (D2)	2 (D3)
	E	6.4 GWe	16 (E1)	8 (E2)	4 (E3)
	F	12.8 GWe	32 (F1)	16 (F2)	8 (F3)
	G	25.6 GWe	64 (G1)	32 (G2)	16 (G3)
	H	51.2 GWe	128 (H1)	64 (H2)	32 (H3)

[365] OECD Nuclear Energy Agency. Effective Frameworks and Strategies for Financing Nuclear New Build. (2024). https://www.oecd-nea.org/jcms/pl_96124/effective-frameworks-and-strategies-for-financing-nuclear-new-build?details=true

[366] OECD Nuclear Energy Agency. Effective Frameworks and Strategies for Financing Nuclear New Build. (2024). https://www.oecd-nea.org/jcms/pl_96124/effective-frameworks-and-strategies-for-financing-nuclear-new-build?details=true

[367] World Nuclear Association. Financing Nuclear Energy. (2026). https://world-nuclear.org/information-library/economic-aspects/financing-nuclear-energy

[368] National Audit Office. Hinkley Point C. (2017). https://www.nao.org.uk/wp-content/uploads/2017/06/Hinkley-Point-C.pdf

Figure 8: Example of deployment schedule: G3 scenario with 400 MWe units

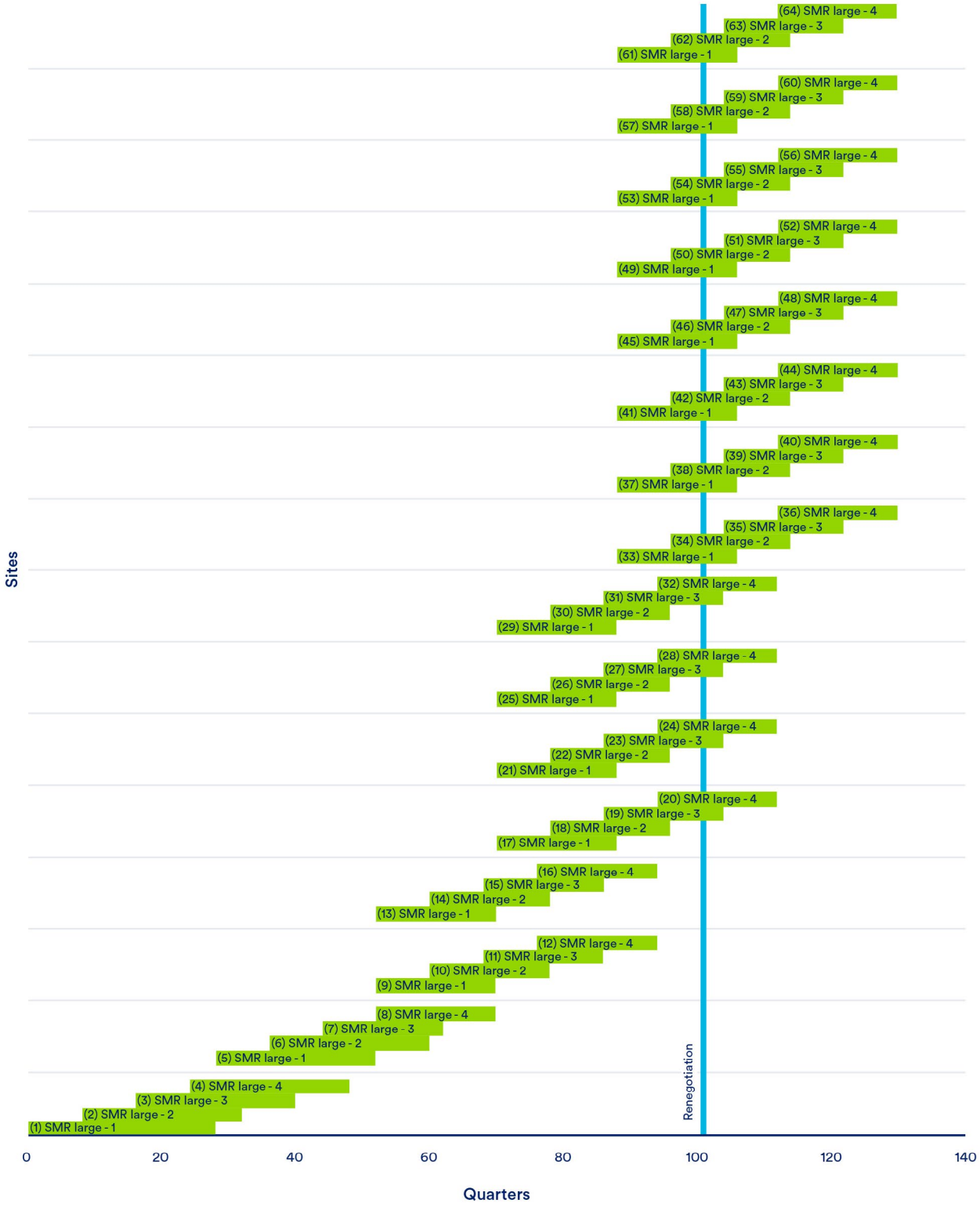


Figure 9: Example of deployment schedule: E2 scenario with 400 MWe units (considered in the sensitivity analysis)

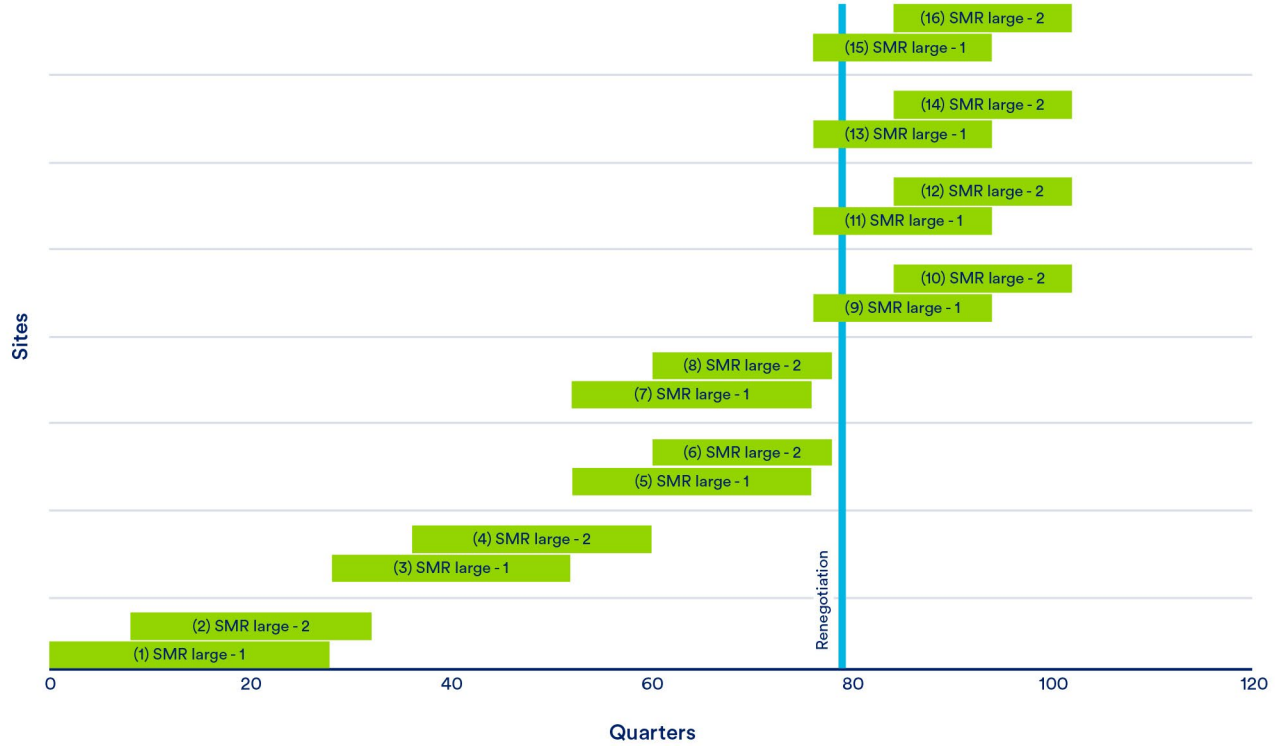
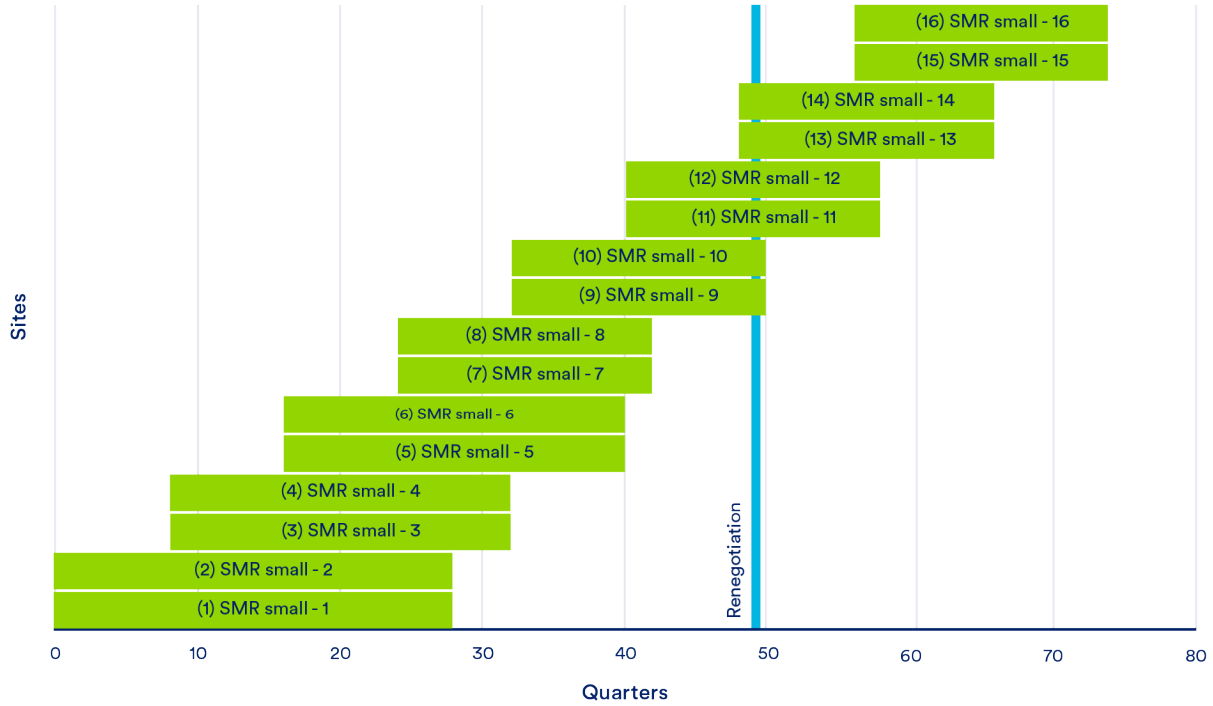


Figure 10: Example of deployment schedule: C3 scenario with 100 MWe units (16×100 MWe example)



APPENDIX E

Single countries assumptions

The interviews with stakeholders were undertaken to confirm or complement the data collected from publicly available information, elaborate on it, and, in more than one instance, point the authors to recently published reports (often not in English) and articles relevant to the study. Therefore, the study draws on 20 semi-structured interviews with elite informants conducted between June and August 2026 (one session included two interviewees from the same organisation, bringing the total number of individual participants to 21). Participants were based across eight countries, including the 4 countries that are the focus of the study – i.e., France (four interviewees), the Czech Republic and Sweden (three interviewees each), and Poland (one interviewee).

The authors also leveraged personal and recommended contacts and interviewed experts from Finland, Hungary, Slovenia and Italy with knowledge of the European Context. Seniority was high throughout, with most participants having roughly 15-30 years of relevant experience. The sample spans a broad range of stakeholder roles including government/ ministry officials, utilities, financial institutions, fleet developers/energy companies, regulators, supply-chain and system-integrator firms, industry/professional associations, research centres, independent experts, and a potential industrial offtaker. The mean interview duration was 48 minutes.

General assumptions

Real vs. nominal values. All cash flows, rates and prices in this report are expressed in real terms. Where an input is only available in nominal terms, it is converted to a real rate using the exact Fisher relation rather than the linear approximation (real ≈ nominal – inflation):

$$(1 + \text{real rate}) = (1 + \text{nominal rate}) / (1 + \text{inflation rate})$$

Each country's nominal yield is deflated by that country's own observed inflation at the time of the analysis. This reproduces the real rates already reported in the corresponding country's chapters.

Currency exchange rates taken from the European Central Bank's euro foreign exchange reference rates around 1 July 2026: CZK-to-EUR 0.04;[369] SEK-to-EUR 0.091;[370] PLN-to-EUR 0.235.[371]

[369] European Central Bank. Euro foreign exchange reference rates – Czech koruna (CZK). ECB (1 July 2026). https://www.ecb.europa.eu/stats/policy_and_exchange_rates/euro_reference_exchange_rates/html/eurofxref-graph-czk.en.html

[370] European Central Bank. Euro foreign exchange reference rates – Swedish krona (SEK). ECB (1 July 2026). https://www.ecb.europa.eu/stats/policy_and_exchange_rates/euro_reference_exchange_rates/html/eurofxref-graph-sek.en.html

[371] European Central Bank. Euro foreign exchange reference rates – Polish zloty (PLN). ECB (1 July 2026). https://www.ecb.europa.eu/stats/policy_and_exchange_rates/euro_reference_exchange_rates/html/eurofxref-graph-pln.en.html

Technology costing: OCC and O&M determination

For each country, two methodologies are used to estimate the OCC: an escalation from the Darlington project (Canada), and an escalation from a domestic reference project (past or proposed) in the country. Both methodologies follow the same general steps for all four countries; only the country-specific inputs differ. The determination of the O&M cost, which follows a similar logic, is reported at the end of this section.

The Darlington total project cost (OCC and interest during construction, IDC) is estimated at CAD 20.9 bn.[372] A labour-rate ratio is computed between each country's average hourly wage and the Canadian average hourly wage (CAD 38.64/hour in 2025, or around € 24.34/hour).[373] Around 35% of nuclear OCC is attributable to onsite labour and project management;[374] the remaining 65% is treated as unaffected by the labour-rate difference. The escalation ratio applied to the Darlington OCC is therefore: 35% × (country/Canada wage ratio) + 65% × 1. The result is then rescaled from the 315 MWe BWRX-300 (the reference unit behind the Darlington FOAK estimate) to the 400 MWe using INCAS.

For the second methodology, each country's OCC is cross-checked against a domestic reference project – a past or proposed reactor project, large or SMR, with disclosed cost information.

Table 36: Escalation from a domestic reference project – country inputs and results

	Czech Republic	France	Poland	Sweden
Reference project	Dukovany 2xAPR-1000 (2,110 MWe)	EPR2 programme (6×1,670 MWe)	Łubiatowo-Kopalino 3xAP1000 (3.2 GWe)	Ringhals / Videberg Kraft 3×470 MWe SMR (1,410 MWe)
Reported cost & capacity	CZK 407 bn / € 16.28 bn,[375] 2,110 MWe	€ 67.4-72.8 bn total,[376,377] ~10.0 GWe	PLN 192 bn / € 45.1 bn, 70:30 gearing,[378,379] 3.2 GWe	State stake implies ~€ 5.2 bn equity,[380] 1,410 MWe[381]
FOAK OCC derivation	INCAS back-out (debt 5%, equity 10%, D:E 75:25, 10-yr build, 2nd unit +5yr)	Direct: cost ÷ capacity	INCAS back-out (debt 5%, equity 10%, D:E 70:30, 10-yr build, 2nd & 3rd units +5/+10yr)	INCAS back-out (debt 5%, equity 10%, D:E 70:30 assumed, 7/6/6-yr build)

Refer to footnotes below for the citations used in the table.

372 World Nuclear News. What Is the Budget for Canada's First SMR Project? https://www.world-nuclear-news.org/articles/what-is-the-budget-for-canadas-first-smr-project

373 Statistics Canada. Wages and Salaries. https://www.statcan.gc.ca/hub-carrefour/quality-life-qualite-vie/prosperity-prosperite/wages-salaires-eng.htm

374 World Nuclear Association. Economics of Nuclear Power. WNA Information Library. https://world-nuclear.org/information-library/economic-aspects/economics-of-nuclear-power

375 World Nuclear News. KHNP Sets Out Plans for USD 18.6bn Czech Nuclear Project. https://www.world-nuclear-news.org/articles/khnp-sets-out-plans-for-usd186bn-czech-nuclear-project

376 Agence France-Presse. Programme d'EPR: la Cour des comptes publie un rapport. Connaissance des Énergies (2025). https://www.connaissancedesenergies.org/afp/programme-depr-la-cour-des-comptes-publie-un-rapport-critique-et-recalcule-le-cout-de-flamanville-3-250114

377 World nuclear news 2025. https://www.world-nuclear-news.org/articles/edf-estimates-epr2-programme-costs-at-eur728-billion

378 World Nuclear News. President Signs Bill on Funding for Polish Nuclear Power Plant. (2025). https://www.world-nuclear-news.org/articles/president-signs-bill-on-funding-for-polish-nuclear-power-plant

379 World Nuclear News. President Signs Bill on Funding for Polish Nuclear Power Plant. (2025). https://www.world-nuclear-news.org/articles/president-signs-bill-on-funding-for-polish-nuclear-power-plant

380 Government Offices of Sweden. Sweden Takes Next Major Step Towards New Nuclear Power. Press release (26 June 2026). https://www.government.se/press-releases/2026/06/sweden-takes-next-major-step-towards-new-nuclear-power/

381 World Nuclear Association. Nuclear Power in Sweden. WNA Information Library (2026). https://world-nuclear.org/information-library/country-profiles/countries-o-s/sweden

Table 37 summarises the optimistic and conservative OCC values used in each country's simulations, combining the results of the two methodologies above. These numbers are consistent with the international literature of Table 33.

Table 37: OCC assumed for the INCAS simulations (400 MWe SMR FOAK)

	Czech Republic	France	Poland	Sweden
Optimistic OCC (€/kWe)	8,069	8,965	8,069	8,965
Conservative OCC (€/kWe)	9,862	10,758	13,448	10,758

Country-specific O&M cost determination

A general O&M range of € 15-30/MWh is assumed as the baseline for a 400 MWe SMR.[382,383] The IAEA provides a general breakdown of O&M cost structure:[384] around 30% is utility labour and around 40% is "services" (maintenance, engineering services, training, cooling water, taxes, etc.). It is assumed that the labour share and half of the services share – 50% of total O&M – is affected by the same country/Canada wage-rate ratio used for the OCC determination above (Table 34), while the remaining 50% is unaffected. The resulting escalation factor is: 50% × (wage-rate ratio) + 50% × 1, applied to the € 15-30/MWh baseline. For France, the wage-rate ratio is close to 1.00, so the baseline range is used unchanged.

Table 38: O&M escalation by country

	Czech Republic	France	Poland	Sweden
Wage-rate ratio (Table 34)	0.56	1.00	0.58	1.09
O&M escalation factor	0.78	1.00	0.79	1.045
Escalated O&M range (€/MWh)	12-24	15-30	12-24	16-31

382 Idaho National Laboratory. Nuclear Energy Cost Report. (INL, Idaho Falls, ID, 2026). https://inldigitallibrary.inl.gov/content/uploads/50/2026/04/Sort_107010.pdf

383 Office of Scientific and Technical Information. Economic and Market Assessment of Small Modular Reactors. (US Department of Energy). https://www.osti.gov/biblio/1167545/

384 International Atomic Energy Agency. Approach for Assessing the Economic Competitiveness of Small and Medium Sized Reactors. IAEA-TECDOC-1509 (IAEA, Vienna). https://www-pub.iaea.org/MTCD/Publications/PDF/te_1509_web.pdf

Deployment schedules

This section reports in detail the schedules of the deployment trends considered in this work. All deployment trends follow the rules reported in the assumptions.

France (new capacity trends). The low-scenario trend includes a single reactor. The medium trend follows deployment rules explained in the assumptions. In the high trend, sites 3 and 4 (Gravelines and Tricastin) are built in parallel.

France (replacement trends). In the medium trend, the larger sites (Gravelines and Bugey) start as first and second; the remaining smaller two sites are built in parallel. The same reasoning applies in the high trend. The two larger sites (Gravelines and Tricastin) start as first and second. Site 3 and 4 (Blayais and Bugey) start together, and the last two sites follow.

Figure 11: Deployment schedule assumed for the medium trend (SMR as new capacity)

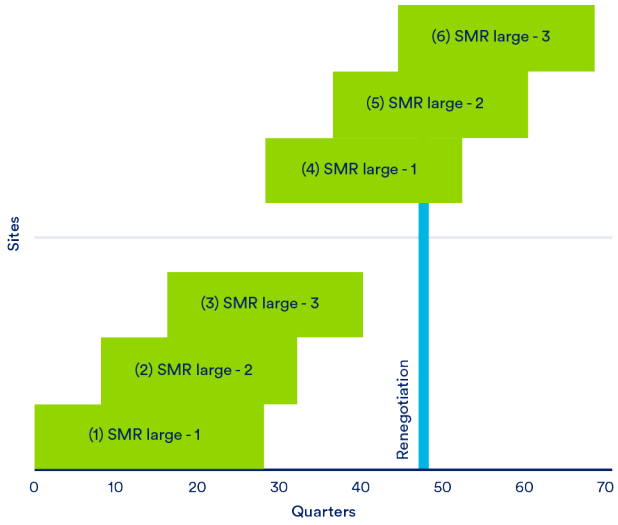


Figure 12: Deployment schedule assumed for the high trend (SMR as new capacity)

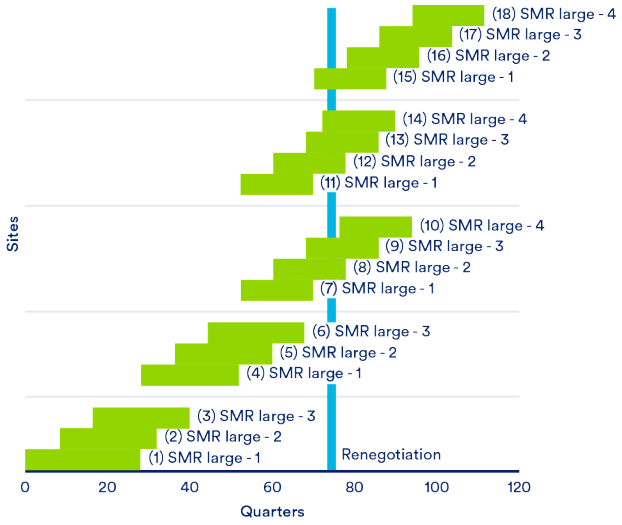


Figure 13: Deployment schedule assumed for the low trend (SMR as replacement)

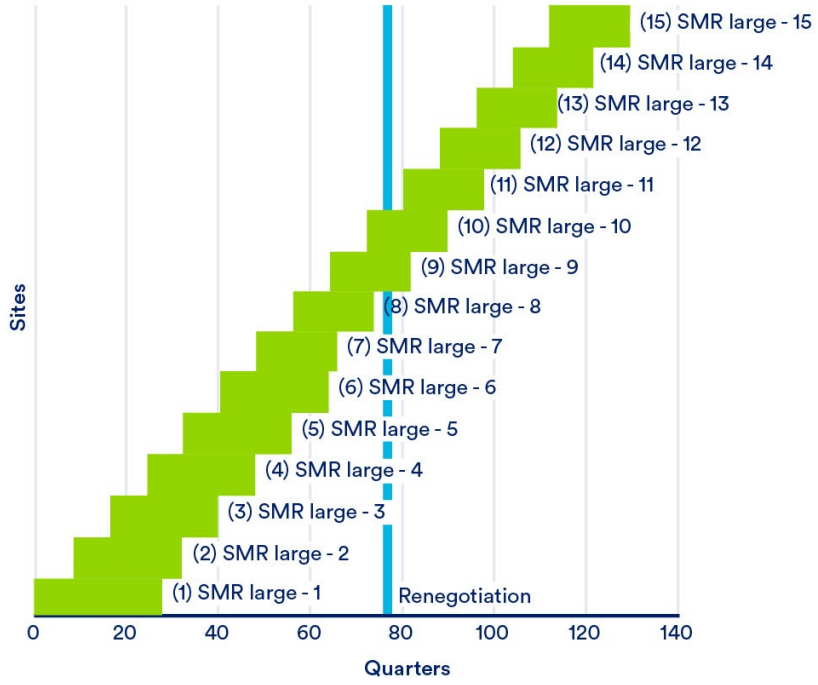


Figure 14: Deployment schedule assumed for the medium trend (SMR as replacement)

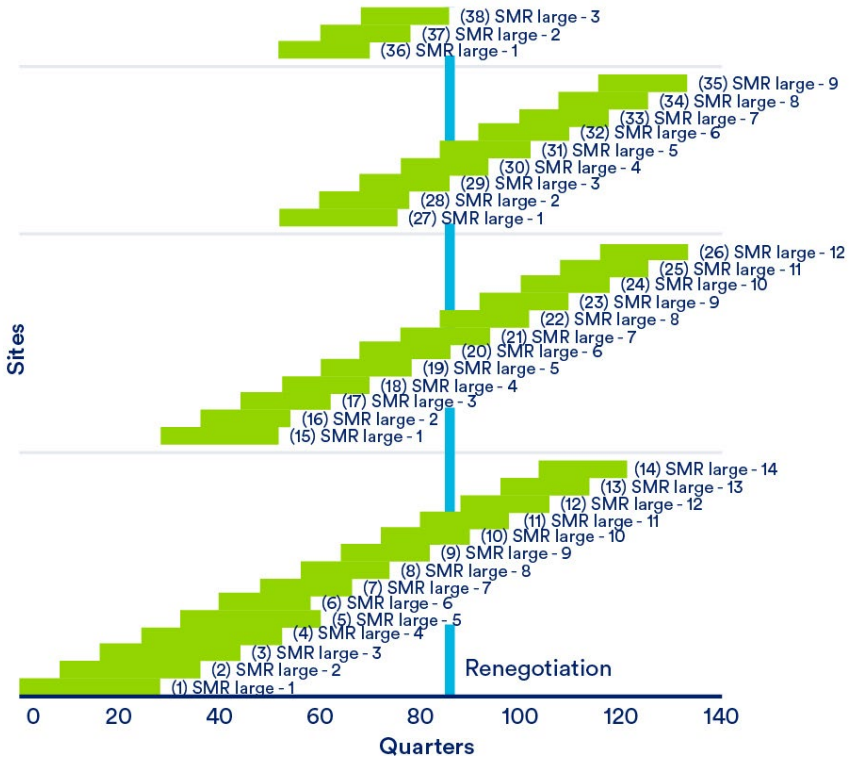
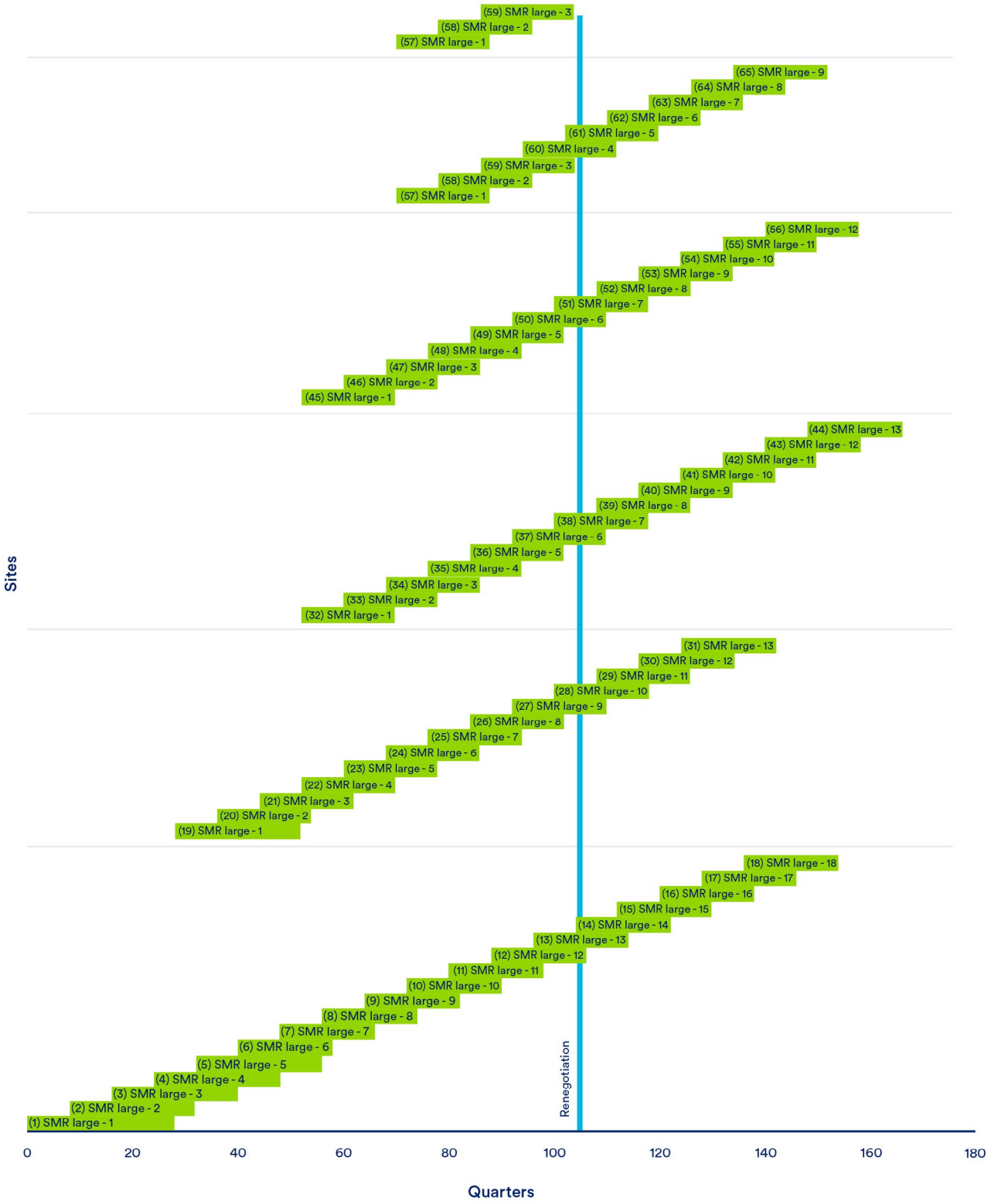


Figure 15: Deployment schedule assumed for the high trend (SMR as replacement)



Czech Republic. In the high trend, sites 3 and 4 (the two coal sites) are built in parallel.

Figure 16: Deployment schedule assumed for the low trend

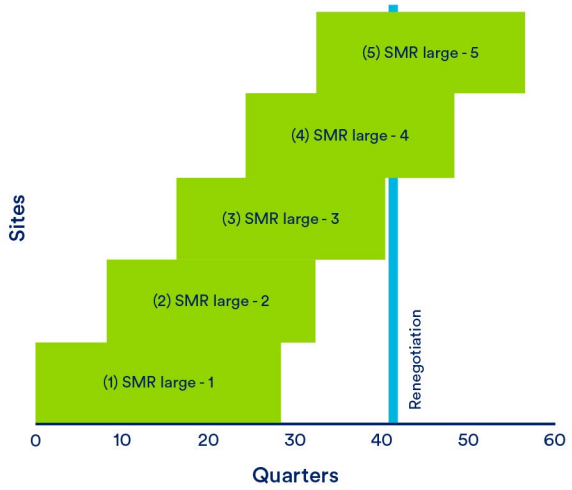


Figure 17: Deployment schedule assumed for the medium trend

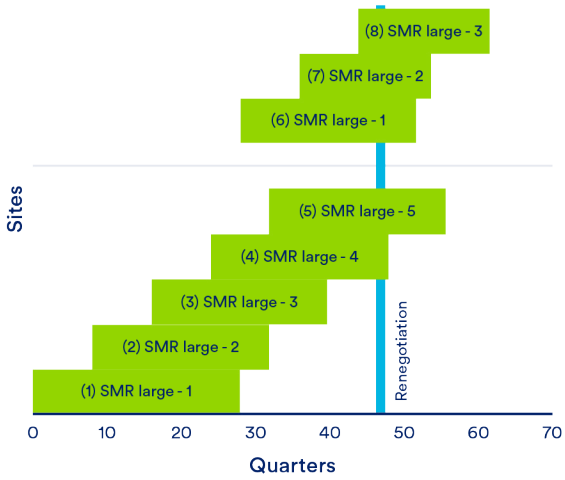
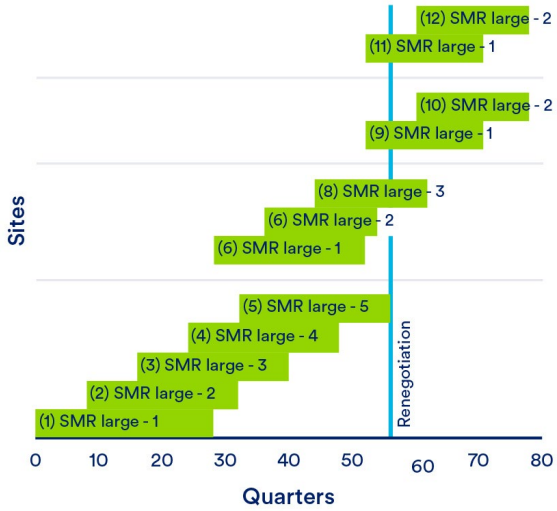


Figure 18: Deployment schedule assumed for the high trend



Sweden (new capacity trends). Given that no trend has more than 3 sites, there are no sites starting in parallel.

Figure 19: Deployment schedule assumed for the low trend (SMR as new capacity)

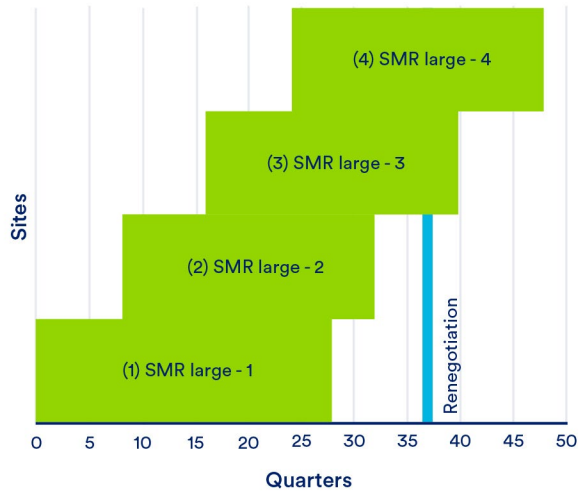


Figure 20: Deployment schedule assumed for the medium trend (SMR as new capacity)

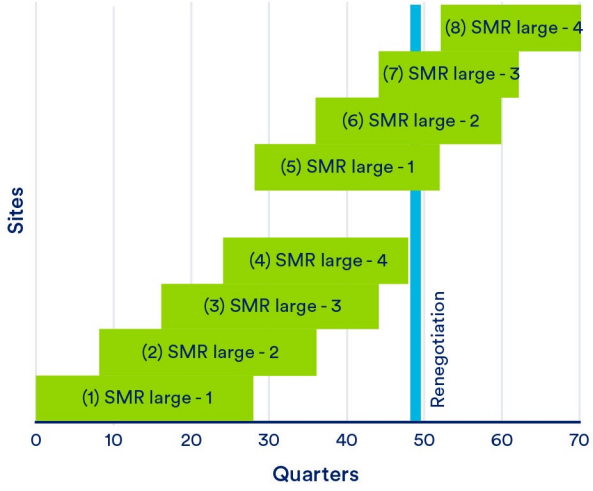
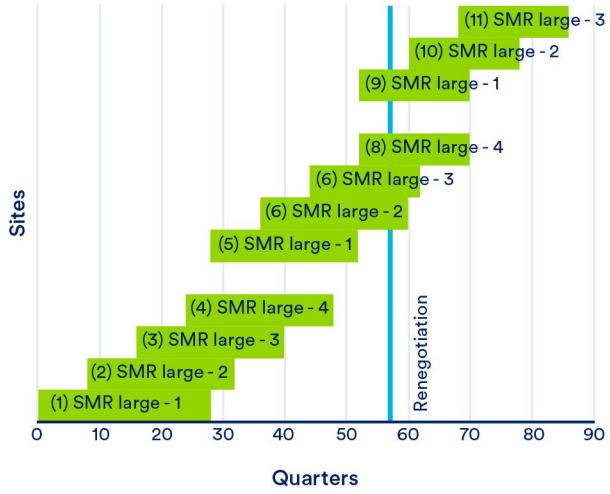


Figure 21: Deployment schedule assumed for the high trend (SMR as new capacity)



Sweden (replacement trends). The low trend schedule is the same as the medium trend in the “new capacity” part. In the medium trend, the largest one (Ringhals) is the first to be built. The same reasoning also applies to the high trend. The larger sites (Ringhals and Forsmark) are started as first and second. Sites 3 and 4 (Valdemarsvik and Oskarshamn) are built together and are followed by the last site.

Figure 22: Deployment schedule assumed for the low trend (SMR as replacement)

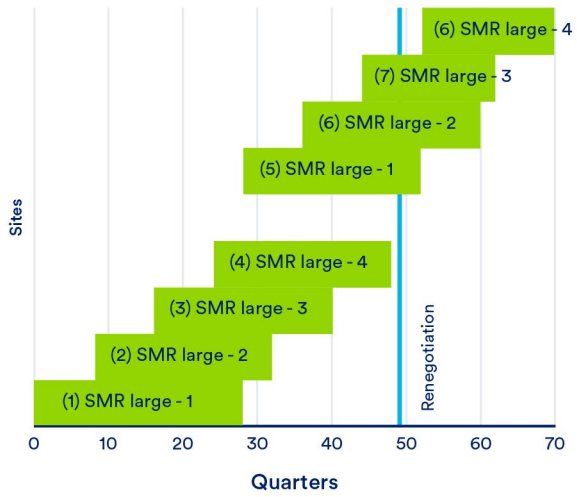


Figure 23: Deployment schedule assumed for the medium trend (SMR as replacement)

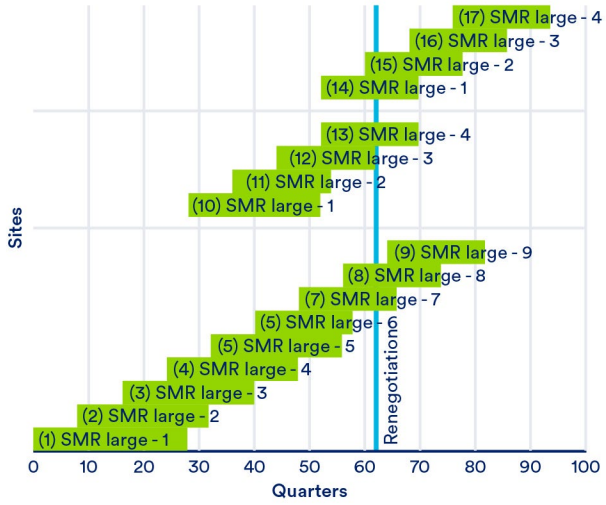
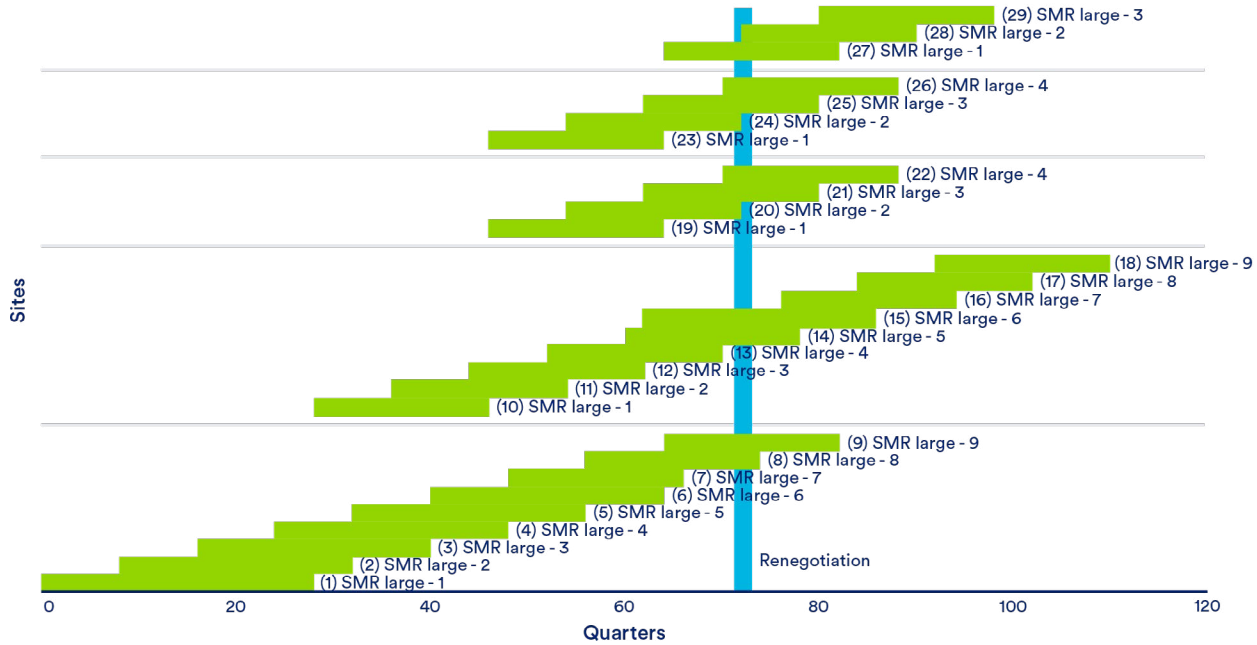


Figure 24: Deployment schedule assumed for the high trend (SMR as replacement)



Poland. In the high trend, sites 3 and 4 (sites B and C) are started together and are followed by the remaining fifth site.

Figure 25: Deployment schedule assumed for the low trend

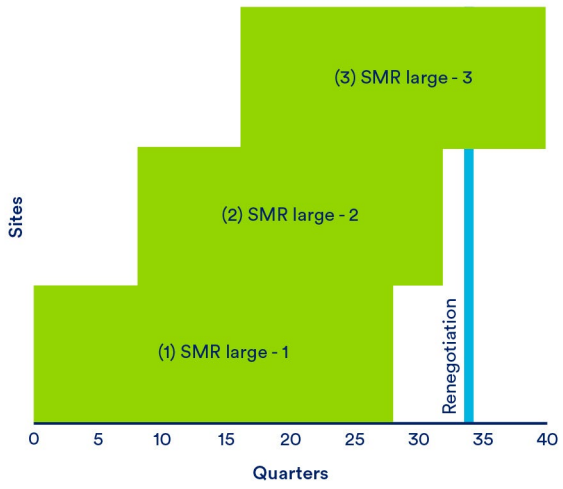


Figure 26: Deployment schedule assumed for the medium trend

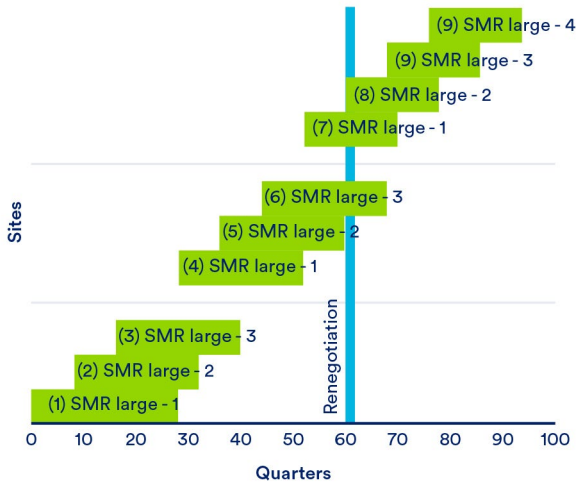
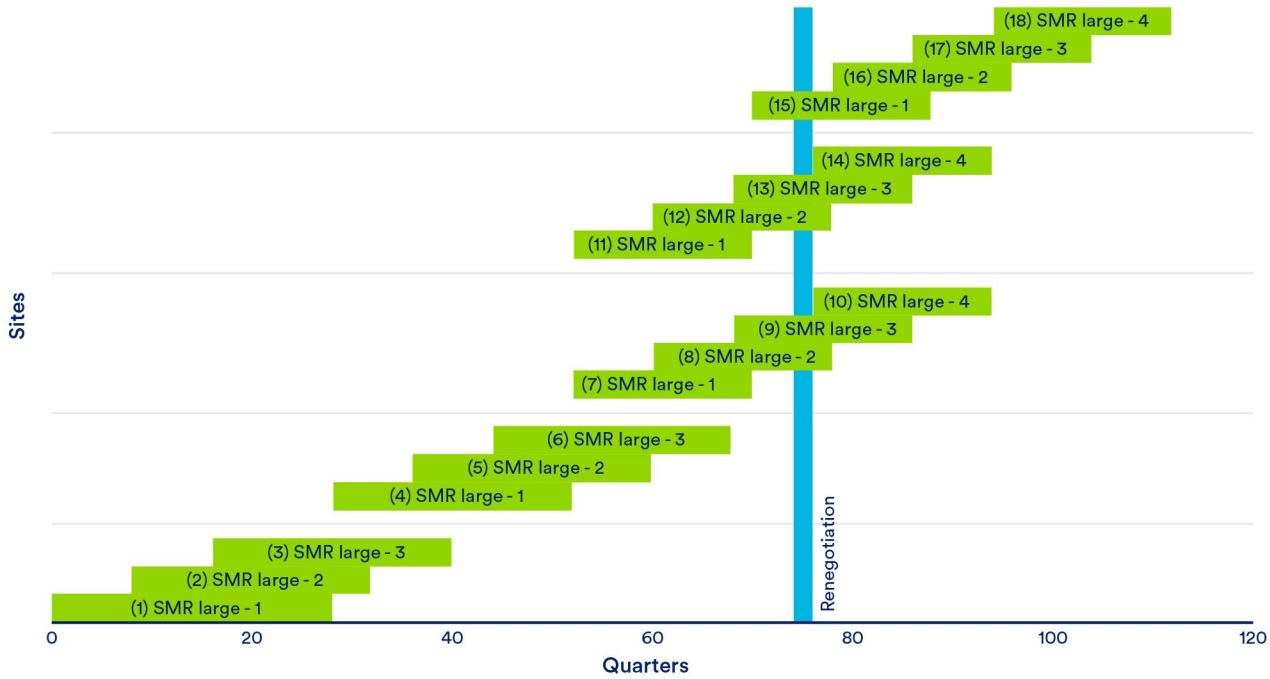


Figure 27: Deployment schedule assumed for the high trend



Supported option: derivation

This subsection documents how the rates of the supported option are built.

Table 39: Equations used to derive the supported option cost of capital

Eq.	Formula	Meaning
E1	r_nat = (1 + n) / (1 + infl) – 1	National real yield, from the 10-year government bond yield (n) and observed inflation (infl)
E2	r_EU = (1 + b + s) / (1 + infl_EU) – 1	Real EU benchmark rate: 10-year Bund (b) plus the EU/EIB spread (s), deflated at euro area inflation (infl_EU)
E3	r_base = min[r_nat , r_EU]	A guarantee can only improve a sovereign's credit
E4	sb = (1 – cov) · max[0 , r_nat – r_EU]	Sovereign basis (sb) left with the lender on the unguaranteed share of debt (1-coverage, cov)
E5	kd = r_base + sb + m	Cost of debt (kd): benchmark (r_base), residual sovereign basis (sb), and a credit margin equal in all countries (m)
E6	ERP = w · ERP_pub + (1 – w) · ERP_priv	Equity risk premium (ERP) as an average of the public tranche (ERP_pub), contributing for a fraction w to the full equity, and the private tranche (ERP_priv)
E7	ke = kd + ERP	Cost of equity (ke).
E8	WACC = g · kd · (1 – t) + (1 – g) · ke	With t = corporate tax rate and g gearing (debt:total capital). With t = 0, WACC = g · kd + (1 – g) · ke

Inputs

National yields are deflated with national inflation and the EU benchmark with euro area inflation; the resulting real rates are applied to euro-denominated debt as a simplification, so the sovereign basis (sb) is an approximation rather than an observed credit spread.

Table 40: Country inputs (observed)

	Input	Czech Republic	France	Poland	Sweden	Source
n	10-year government bond yield, nominal (July 2026)	4.70%	3.87%	5.37%	2.87%	[385,386,387,388]
infl	Inflation (June 2026)	1.5%	1.8%	2.5%	0.7%	[389]
	Real yield (E1)	3.15%	2.03%	2.80%	2.15%	[390]
p	Wholesale electricity price, 2025 average	€ 96.70	€ 62.91	€ 103.73	€ 42.51	[391]
	Price assumed in the national scenario	€ 96.70	€ 105.00	€ 115.00	€ 72.50	assumed

Refer to footnotes below for the citations used in the table.

385 Trading Economics. Czech Republic 10-Year Government Bond Yield. https://tradingeconomics.com/czech-republic/government-bond-yield

386 Trading Economics. France 10-Year Government Bond Yield. https://tradingeconomics.com/france/government-bond-yield

387 Trading Economics. Poland 10-Year Government Bond Yield. https://tradingeconomics.com/poland/government-bond-yield

388 Trading Economics. Sweden 10-Year Government Bond Yield. https://tradingeconomics.com/sweden/government-bond-yield

389 Trading Economics. Inflation Rate: Europe. https://tradingeconomics.com/country-list/inflation-rate?continent=europe

390 Trading Economics. Inflation Rate: Europe. https://tradingeconomics.com/country-list/inflation-rate?continent=europe

391 Ember. European Wholesale Electricity Price Data. https://ember-energy.org/data/european-wholesale-electricity-price-data/

Table 41: Common inputs and assumed parameters

	Parameter	Value	Status	Source / justification
b	10-year German Bund yield	3.13%	observed	[392]
infl_EU	Euro area inflation (June 2026)	2.8%	observed	[393]
s	EU/EIB spread over Bund	0.25%	assumed	Modelling assumption, AAA supranational euro issuance[394]
cov	Senior debt covered by the EU guarantee	80%	assumed	20% retained by lenders, to keep credit diligence
m	Residual credit margin	0.75%	assumed	Operating and counterparty risk outside the guarantee
ERP_priv	Equity risk premium, private tranche	5.8%	assumed	Contracted, guarantee-supported asset. Held common for all countries. See note below
ERP_pub	Equity risk premium, public tranche	3.0%	assumed	Public development bank or state holding
w	Public share of equity	50%	assumed	
g	Gearing (debt / total capital)	80%	assumed	D:E = 80:20
t	Corporate tax rate	0%	simplification	Set to zero in all countries. See Limits
	Debt repayment period	40 years	assumed	Matched to the CfD term; cf. EPR2,[395] Dukovany,[396] Ringhals[397]
	Share of output under CfD	90%	assumed	cf. Dukovany, state purchaser resells at least 70% of purchased electricity on organised markets[398]

Refer to footnotes below for the citations used in the table.

[392] countryeconomy.com. German Bonds – 10 Years: daily 10-year Bund yield, July 2026 (3.13% on 27 July 2026). 2026. https://countryeconomy.com/bonds/germany?dr=2026-07

[393] Eurostat. Annual Inflation Down to 2.8% in the Euro Area. Euro Indicators (17 July 2026). https://ec.europa.eu/eurostat/web/products-euro-indicators/w/2-17072026-ap

[394] Council of Europe Development Bank, "EUR 1bn 3.250% Benchmark due 17 June 2036 – Press Release," 10 June 2026. 10-year bond priced at mid-swaps +23 bp. https://coebank.org/documents/1856/CEB_EUR_1bn_10yr_-_10_June_2026_-_Press_Release.pdf

[395] Information Technology and Innovation Foundation. Lessons from France's Nuclear Program. ITIF (2 September 2025). https://itif.org/publications/2025/09/02/lessons-from-frances-nuclear-program/

[396] Nuclear Energy Agency. Effective Frameworks and Strategies for Financing Nuclear New Build. NEA No. 7684 (OECD Publishing, Paris, 2024). https://www.oecd-nea.org/upload/docs/application/pdf/2024-09/nea_publication_2_2024-09-18_16-50-13_471.pdf

[397] World Nuclear News. Swedish State Taking Majority Stake in Videberg Kraft. (2026). https://www.world-nuclear-news.org/articles/swedish-state-to-take-majority-stake-in-videberg-kraft

[398] Nuclear Energy Agency. Effective Frameworks and Strategies for Financing Nuclear New Build. NEA No. 7684 (OECD Publishing, Paris, 2024). https://www.oecd-nea.org/upload/docs/application/pdf/2024-09/nea_publication_2_2024-09-18_16-50-13_471.pdf

Note: the private-tranche premium is set at 5.8% in all four countries. The value is the equity premium implied by the Czech merchant option, 10.0% over a 4.2% cost of debt, which is the least supported of the options simulated in the four countries. Holding it common allows the supported option to differ across countries only through the sovereign basis, so the cross-country spread in Table 42 measures the guarantee and nothing else. Deriving the premium country by country would instead give 9.4% in France, 8.3% in Sweden and 6.2% in Poland, and would carry four different national equity assumptions into a comparison intended to isolate one variable. The common value is also conservative in level: equity under the supported option sits behind a 40-year CfD and an 80% guaranteed debt stack, so its required premium should be below, not equal to, the premium demanded of uncontracted merchant equity.

The package puts the cost of debt in a 1.6–1.8% band and the WACC in a 2.48–2.71% band, against costs of debt of 2.6–4.2% and capital structures from 60:40 to 98:2 in the national options. The residual difference between countries is sb, the unguaranteed fifth of the sovereign basis, and amounts to 0.23% of WACC.

Table 42: Supported option results by country: national inflation convention

Quantity	Czech Republic	France	Poland	Sweden
r_nat national real yield (E1)	3.15%	2.03%	2.80%	2.15%
r_EU EU benchmark rate (E2)	0.56%	0.56%	0.56%	0.56%
r_base base rate (E3)	0.56%	0.56%	0.56%	0.56%
sb residual sovereign basis (E4)	0.52%	0.29%	0.45%	0.32%
kd cost of debt (E5)	1.83%	1.60%	1.76%	1.63%
ke cost of equity (E7)	6.23%	6.00%	6.16%	6.03%
D : E	80:20	80:20	80:20	80:20
Debt repayment period	40 y	40 y	40 y	40 y
WACC, real, t = 0 (E8)	2.71%	2.48%	2.64%	2.51%

EU backstop

This section reports the national and EU level mechanism that are considered in the “supported” scenario.

National instruments

Table 43: Existing national financing and support instruments, by country (* indicates proposed initiatives)

Mechanism	Country	Applied to nuclear	Impact on financing	Impact on funding	Impact on taxpayers	Impact on consumers
Concessional state loan	CZ, FR	Dukovany 5, approved 2024*; EPR2*	Cost of debt near zero during construction; 98:2 gearing; 30 to 40 years	The state balance sheet supplies the capital. No revenue stream is created	Interest subsidy and contingent principal	–
State guarantee on debt	PL	Approved 2025*	Cost of debt compressed towards the sovereign yield, but not to zero	Private lenders supply the capital against a state promise	Contingent liability	–
Direct state equity	PL, FR, CZ	State-owned utilities throughout; 30% state share in Poland*	Lowers the cost of equity only where it changes the risk borne by the residual equity	The state budget supplies part of the equity	Cash outlay, upfront	–
Two-way CfD	FR, PL, SE	EPR2*; Poland*; Swedish enabling law, 2025*	Removes price risk	Secures the revenue stream for the contract term at the strike price	Budget-funded counterparty in all three designs	Pays below the strike price and is repaid above it, where the cost is passed to bills
Long-term PPA with a state offtaker	CZ	Dukovany, 40-year PPA; state purchaser resells, at least 70% on organized markets*	Revenue certainty equivalent to a CfD	Secures the revenue stream through a state-owned buyer	Through the offtaker's balance sheet	
Mankala, cost-price cooperative	SE	Proposed*	Equity return near zero by design; debt raised on shareholder covenants	Shareholders commit to take the output at cost, which secures the revenue	–	Industrial offtakers pay at cost and carry overruns
Prepaid industrial contract	FR	Exeltium	Demand-side prepayment, not project debt	Consumers advance the capital against future deliveries	–	Industrial consumers prepay

Existing EU-level mechanisms and backstop taxonomy

"Backstop" covers at least six mechanisms. They address different risks and cost the EU budget different amounts.

Table 44: EU-level mechanisms

Mechanism	Matters most in	Applied to nuclear	Impact on financing	Impact on funding
Senior debt guarantee	PL, CZ	No. InvestEU excludes nuclear construction	Cost of debt falls to the EU benchmark; supports 80:20 gearing and a 40-year tenor	EU budget provisioning at 40% of the guaranteed exposure. No revenue stream is created
Direct EU lending	All	Since 2000, only safety upgrades (last, Ukraine, 2017-2021); no loans underway[399]	Senior loan at the EU cost of funds; the same effect as a guarantee without provisioning	EU borrowing on-lent to the project
EIB lending	All	Cernavădă 1 refurbishment, 2026	Senior debt at AAA cost, project by project rather than for a fleet	EIB balance sheet, backed by Member State capital. No provisioning from the EU budget
Cost-overrun standby	FOAK units	No	Outside the WACC; cuts the cost tail and the equity buffer it requires	EU budget, drawn only above the overrun threshold
CfD counterparty backstop	PL, CZ	No	Contracted revenue priced as investment grade regardless of the host sovereign	EU budget pays only on Member State default. The CfD itself stays nationally funded
Orderbook backstop	Supply chain	No	Supplier investment, not the WACC of a plant	EU budget pays only if the committed volume is not called. Funds supplier capacity, not the plant

Refer to footnote below for the citation used in the table.

[399] European Commission, DG Economic and Financial Affairs. Ex-post Evaluation of the Euratom Loan Facility – Final Report. 2011. https://ec.europa.eu/dgs/economy_finance/evaluation/pdf/report_evaluation_loan_facility_en.pdf

This scenario models the senior debt guarantee and the EIB lending only. The others sit outside a plant-level model and require a separate argument. The orderbook backstop is the one closest to the orderbook question, and INCAS cannot represent it, because supply chain investment follows order visibility rather than the cost of capital of a single plant.

Existing EU instruments

- **Euratom lending.** The Commission may issue bonds on behalf of Euratom and on-lend to nuclear power projects in Member States. Lending is capped at € 4 bn, of which € 3.67 bn is allocated, leaving € 0.33 bn of headroom. € 300 m is outstanding (Ukrainian safety upgrades, 2017–21) with no ongoing operations. The legal base, Council Decision 77/270/Euratom as amended, covers the financing of nuclear power stations.[400]
- **InvestEU.** A € 29.052 bn EU budget guarantee, cash-provisioned at 40%.401 The EU SMR Strategy of 10 March 2026 has said it will consider an additional € 200 m InvestEU top-up to 2028 for first commercial units.[402] InvestEU excludes the construction, operation, adaptation and decommissioning of nuclear power stations, so the top-up cannot reach the construction phase.[403]
- **EIB.** Nuclear lending has resumed, with financing approved for the Cernavodă 1 refurbishment in July 2026.[404] This is project-by-project balance-sheet lending rather than a fleet instrument.

Avoided emissions: method and factors

Avoided emissions are computed as the difference between the life-cycle emissions of the deployed nuclear capacity and the life-cycle emissions of the same annual output supplied by a fossil alternative. Two alternatives are reported for every country: a combined cycle gas plant and a coal plant. The median values for life-cycle emission factors are:[405]

- **Nuclear**, 12 $ktCO_2eq/TWh$.
- **Combined cycle gas**, 490 $ktCO_2eq/TWh$.
- **Coal**, 820 $ktCO_2eq/TWh$.

The annual output for a single 400 MWe SMR, assuming a 90% load factor, is 3.154 TWh. Each unit therefore emits around 38 $ktCO_2eq$/year and avoids around 1.50 $MtCO_2eq$/year against gas and 2.55 $MtCO_2eq$/year against coal. Avoided emissions for a trend are the per-unit value multiplied by the number of units. Two limitations apply to every figure derived from this method. First, it assumes the fossil alternative would run at the same annual output as the nuclear unit. Second, in trends where SMRs replace retiring nuclear capacity rather than adding new capacity, the fossil counterpart is a hypothesis about what would happen if the capacity were not rebuilt, not a description of existing plant. The country parts state where this applies.

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400 European Commission. Euratom: The EU as a Borrower. https://commission.europa.eu/strategy-and-policy/eu-budget/eu-borrower-investor-relations/euratom_en

401 European Union. Regulation (EU) 2021/523 Establishing the InvestEU Programme. Official Journal of the European Union (2021). https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021R0523

402 European Commission. EU Strategy on Small Modular Reactors. COM(2026) 117 (10 March 2026). https://www.europarl.europa.eu/RegData/docs_autres_institutions/commission_europeenne/com/2026/0117/COM_COM(2026)0117_EN.pdf

403 European Union. Regulation (EU) 2021/523 Establishing the InvestEU Programme. Official Journal of the European Union (2021). https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021R0523

404 European Investment Bank. EIB Group Approves over €17 Billion in New Financing. Press release (2026). https://www.eib.org/en/press/all/2026-253-eib-group-approves-over-eur17-billion-in-new-financing-including-for-romanian-nuclear-power-and-ukraine-eu-border-crossings

405 Intergovernmental Panel on Climate Change. Annex III: Technology-Specific Cost and Performance Parameters. in Climate Change 2014: Mitigation of Climate Change, Working Group III Contribution to the Fifth Assessment Report (Cambridge University Press, Cambridge, 2014). https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_annex-iii.pdf