Nuclearеurope response to SMR Communication Call for Evidence

Executive Summary

Nuclearеurope, the trade association representing the European nuclear industry, has long supported the development of Small Modular Reactor (SMR) technologies, and is today a key partner and contributor of the European Industrial Alliance on SMRs, to which it has contributed since its very inception.

We welcome the upcoming publication of the Communication on SMRs and their future development and deployment in Europe. This Communication should build on the vision set out in the Alliance's Strategic Action Plan adopted by the European Industrial Alliance on SMRs in September 2025. The Communication comes at a pivotal moment for the nuclear industry and for SMRs specifically, with growing interest for this technology in Europe and globally.

Against this background, nuclearеurope believes that the upcoming SMR strategy should focus on the following key areas:

- Financing
- Supply chain
- Licensing and regulatory harmonisation
- Research and development
- Fuel cycle
- End uses and system integration
- Skills
- Public engagement
- SMR reference scenarios and ambition

While SMRs will play an important role in Europe's future energy system, it is essential that the Commission also maintains a clear focus on the existing fleet and on large reactors, which will remain the backbone of nuclear generation in the near and medium term.

To translate this strategic vision into concrete results, the framework must be complemented by a well-defined, time-bound roadmap with measurable milestones, dedicated resources, and calibrated measures. This approach will provide a robust foundation for the European Commission's legislative and programmatic initiatives, turning political signals into tangible investment conditions.

Delivering a step change in **financing** for SMRs

For SMRs and Advanced Modular Reactors (AMRs) to deploy at scale, the European financing framework must become genuinely enabling, technology-neutral and aligned with the long lead times and capital intensity of nuclear projects. This means providing predictable EU support across the whole project cycle, from preparatory studies and first of a kind (FOAK) demonstration to industrial roll-out, so that private investors can commit capital with confidence. The EU also holds a strong technological leadership in several key nuclear and fuel-cycle domains, which makes it even more necessary to support this strategic industrial ecosystem through adequate access to financing. FOAK SMR and AMR projects in particular face high technology and market risks, especially when they are driven by private developers. Without tailored risk-sharing models and clear EU backing for instruments such as Power Purchase Agreements (PPAs) and Contracts for Difference (CfDs), the cost of capital will remain high and undermine competitiveness versus other low-carbon options. A coherent mix of grants, guarantees, and de-risking tools is therefore essential to bring down the weighted average cost of capital (WACC) and deliver affordable net zero energy.

Public intervention is also needed to address market failures along the fuel cycle, where large upfront investments in enrichment, reprocessing and advanced fuel facilities must precede reactor deployment. Here, EU and national instruments should provide sufficient visibility on timing and demand to unlock long-term industrial commitments. Overall, a strong and consistent EU-level signal which is reflected in the Multiannual Financial Framework (MFF), the Sustainable Finance Taxonomy, the role of the European Investment Bank (EIB) and the design of the nuclear Important Project of Common European Interest (IPCEI), will be critical to mobilise the scale of public–private investment required for SMR and AMR deployment.

Recommendations:

1. Remove nuclear exclusions and earmark substantial, multi-year specific EU resources for SMRs/AMRs in the 2028–2034 MFF, including Connecting Europe Facility (CEF)-style windows for preparatory work and support for development, demonstration, pre-commercial projects and FOAK.
2. Ensure FOAK SMR/AMR projects access tailored support (IPCEI, EIB, Strategic Technologies for Europe Platform (STEP), InvestEU) under technology-neutral models combining PPAs and CfDs, with the explicit objective of lowering WACC to levels comparable to those of global competitors.
3. Adapt EU financing tools (EIB, Innovation Fund, Modernisation and Cohesion funds) and recognise nuclear fuel-cycle activities as enabling activities under the Taxonomy to improve access to sustainable finance.
4. Use the nuclear IPCEI and dedicated nuclear envelopes in the next MFF (European Competitiveness Fund, Euratom Research & Training, coal-to-nuclear in Partnership Plans) as catalysts for public–private funding across the whole SMR/AMR chain.

Developing a strong European **supply chain** for SMRs

A competitive and robust European supply chain is a precondition for the timely and cost-effective deployment of SMRs and AMRs in the coming decade. This requires a clear picture of existing industrial capacity, bottlenecks and investment needs, and a deliberate effort to build a predominantly European value chain that supports jobs, industrial and technological sovereignty, and long-term resilience in a volatile geopolitical context.

Today, fragmentation along national lines and differences in codes, standards and regulatory practices limit cross-border operation, scale-up and efficient use of existing infrastructure and expertise. Greater EU-level cooperation on standardisation, mutual recognition of safety assessments and risk-mitigation mechanisms is therefore essential to unlock the "fleet effect" and make modular series production viable.

Developing a modular supply chain based on European capabilities will also depend on the rapid uptake and qualification of advanced manufacturing and construction techniques. European SMR projects can function as anchors for such a supply chain, catalysing localisation of value in Member States and strengthening competitiveness, provided they are backed by coherent EU industrial policy and access to appropriate support instruments.

Recommendations:

5. Support the Europe-wide SMR supply-chain mapping and gap analysis currently undertaken by the European Industrial Alliance on SMRs and use the results to develop a unified EU codification and standardisation framework for modular construction and transport logistics.
6. Use the Net Zero Industry Act (NZIA), the Innovation Fund, the nuclear IPCEI and EIB instruments to co-finance new or repurposed module factories and yards (especially civil and Mechanical, Electrical and HVAC modules) and promote key techniques such as steel–concrete structures as qualified EU solutions.
7. Establish an EU-funded accelerated training and qualification programme for modular supply-chain actors, covering nuclear safety, Quality Assurance (QA) codes and advanced manufacturing, with mutual recognition of qualifications across Member States.
8. Recognise European-designed SMR projects as anchor projects for a European supply chain and support strategic partnerships and localisation models that maximise EU industrial content and sovereignty.

Modernising EU **licensing frameworks** for modular reactors

Licensing will be a decisive factor for the timely deployment of SMRs and AMRs in Europe. Currently, national frameworks offer limited phasing, which tends to concentrate key regulatory decisions late in the project and is poorly suited to modular, series-produced technologies that rely on standardisation, replication and predictable schedules. Without more flexible and predictable approaches, licensing risks becoming a structural barrier to scaling factory-based solutions.

Divergent national regulatory frameworks, developed over decades, are generally robust and aligned with IAEA principles, but differ in detailed requirements, processes and expectations. For SMR vendors, this leads to redesigns, repeated demonstrations and delays when moving from one Member State to another, undermining the "fleet effect" and fragmenting the internal market. Stronger convergence at EU level would streamline deployment, pool scarce expertise, and reduce costs while maintaining high safety standards.

Licensing reforms should be complemented by a coherent regulatory framework across the fuel cycle, including the treatment of reprocessing, back-end technologies and fuel transport. Clear and coordinated EU-level signals in these areas will further reduce uncertainty for project developers and investors and help ensure that licensing and fuel-cycle regulation evolve consistently with Europe's SMR and AMR ambitions.

Recommendations:

9. Promote phased, sequential licensing frameworks for SMRs/AMRs and encourage Member States to adapt national processes so designs already assessed in one country require only limited additional work elsewhere, including innovation-friendly tools such as regulatory sandboxes for AMRs.
10. Support the development of a common EU SMR licensing package and strengthen initiatives such as the Joint Early Review and ENSREG processes as tools for convergence and shared safety positions.
11. Facilitate structured regional cooperation between regulators, including joint reviews, shared expert groups, digitalised procedures and common guidance for SMR/AMR licensing.
12. When reviewing the Euratom waste directives and related work, recognise and promote reprocessing and back-end fuel-cycle technologies, and support common European solutions for fuel and material transport (e.g. standard low enriched uranium {LEU} +/ high assay low enriched uranium {HALEU} containers).

Driving coordinated **R&D** for next-generation reactors

Coordinated, long-term Research & Development (R&D) is indispensable to enable the timely and competitive deployment of SMRs and AMRs in Europe. R&D efforts should focus on closing key technological gaps, de-risking designs for licensing and industrial deployment, and consolidating European leadership in advanced reactor technologies.

Euratom projects, IPCEI programmes and other EU instruments should be used to structure this effort around a coherent set of priorities and shared infrastructures, ensuring that research outputs are rapidly translated into qualified materials, components and methodologies that can be deployed at scale. A strong focus on collaboration—across Member States, industry, research organisations and partner countries in the wider European research area—will be essential to avoid duplication, pool scarce expertise and maintain Europe's position in the global SMR/AMR landscape.

Recommendations:

13. Develop a dedicated EU AMR strategy within or alongside the SMR Strategy, built around capital commitment, fuel security and regulatory enablement.
14. Establish a shared European high-flux fast reactor and complementary pan-European R&D infrastructure (including digital platforms and test facilities) for AMR and SMR materials and component qualification, with EU/Euratom funding and interim access to non-EU facilities.
15. Launch targeted EU R&D&I programmes on advanced structural materials and SMR modularity tools, ensuring clear pathways to code qualification, industrial deployment and integration into harmonised standards.
16. Support structured partnerships between SMR start-ups/scale-ups, established industry and research organisations, including shared facilities and cross-cutting work on safety, security and safeguards.
17. Ensure SMR/AMR-related R&D programmes (Euratom, IPCEI, etc.) are open to European Economic Area (EEA) and European Free Trade Association (EFTA) partners and aligned with work in European and global standards bodies and the IAEA on harmonised construction codes and standards.
18. Ensure Euratom, IPCEI and related EU R&D instruments allocate sufficient, long-term funding to the agreed SMR/AMR priorities, with clear milestones and coordination mechanisms to avoid fragmentation.
19. Establish a Euratom Joint Undertaking for advanced nuclear technologies (AMRs) to coordinate funding, infrastructure, R&D and deployment at European scale.
20. Strengthen synergies between the Euratom programme and Horizon Europe to fully leverage the non-electrical applications of SMRs and AMRs.
21. Establish test platforms to validate and qualify passive systems and new digital technologies for SMR.

Securing a resilient and circular nuclear **fuel cycle** for SMRs

The successful deployment of SMRs and AMRs in Europe will ultimately depend on the readiness of the value chain across the *entire* fuel cycle. This is especially critical for AMRs, which rely on the availability of advanced nuclear materials and fuels. The EU has a strategic advantage in back-end fuel-cycle technologies, particularly reprocessing of spent fuel, which can effectively serve as the front-end of future AMR fuel cycles.

To make full use of this advantage, Europe must plan for new or expanded enrichment, reprocessing and advanced fuel fabrication capacity, while ensuring that logistic solutions for new fuel forms are developed and licensed in time. These efforts should be supported by appropriate financial and regulatory instruments so that fuel-cycle investments keep pace with reactor deployment.

Europe is uniquely positioned to embed SMR and AMR deployment within a circular-economy approach to the fuel cycle. Existing expertise and facilities already allow high recycling rates, reduced natural uranium consumption, a lower carbon footprint and significant reductions in waste volumes and radioactivity. By fostering AMRs capable of using recycled fuel and closing the fuel cycle, the EU can turn its substantial spent-fuel stockpiles into a long-term strategic energy resource and strengthen European energy security and autonomy.

Recommendations:

22. Develop an EU SMR/AMR fuel-cycle roadmap, specifying needs and timelines for conversion and enrichment (including LEU+/HALEU), reprocessing to recover strategic materials, and advanced fuel fabrication, and strengthen or expand European capacities accordingly.
23. Support European capabilities for advanced fuels and Gen IV reactors using recycled fuel, turning existing spent-fuel stocks into a strategic energy resource and showcasing Europe's circular fuel-cycle strengths.
24. Promote and incentivize technologies able to reduce the consumption of natural resources and the production of waste.
25. Promote early development and licensing of logistics solutions for new fuel forms.
26. Promote Europe's circular-economy advantages (recycling, lower uranium use, reduced waste) in SMR/AMR communication and positioning.

Unlocking SMRs for integrated **energy systems**

Beyond electricity, SMRs can provide net zero, dispatchable heat to energy-intensive industries and district-heating networks. Co-locating SMRs with industrial clusters, ports and large heat networks would reduce dependence on fossil fuels, stabilise energy costs and decarbonise sectors that are hard to electrify, such as chemicals, pulp and paper, food processing and emerging value chains for low-carbon hydrogen and e-fuels.

High-temperature electrolysis powered by nuclear electricity and heat can also deliver hydrogen more efficiently and at lower cost than conventional electrolysis, offering a credible route to decarbonise hard-to-abate sectors, including maritime and aviation via synthetic fuels. To realise this potential, SMRs need to be explicitly considered within industrial decarbonisation strategies and regional planning, with structured dialogue between technology providers, industrial users and local authorities.

Finally, SMRs and AMRs should be seen as complementary to large nuclear power plants within an integrated energy system. While large NPPs provide firm and dispatchable electricity to the grid, SMRs and AMRs are well suited to distributed applications: supplying direct process heat, cogenerating heat and power, and reducing industrial reliance on grid electricity. Nuclear cogeneration can significantly improve overall energy efficiency, avoid unnecessary electrification and shield industries from fossil-fuel price volatility and geopolitical risks, helping to form a robust decarbonised backbone for Europe's future energy system.

Recommendations:

27. Recognise nuclear heat as net zero heat in EU law and the Taxonomy (including for district heating) and ensure a level playing field between renewable and low-carbon hydrogen, including hydrogen derived from nuclear.
28. Strengthen dialogue with energy intensive industries (EIIs), district-heating operators and industrial clusters and fund early SMR demonstration projects in industrial hubs, ports, large heat networks and low-carbon hydrogen/e-fuel projects.
29. Harmonise and streamline licensing for SMRs on industrial and urban sites and highlight in the SMR Strategy how large nuclear power plants (NPPs), SMRs and AMRs complement each other, especially in terms of direct heat and cogeneration.
30. Provide adequate financing mechanisms (e.g., so-called "tripartites") combining public support, industrial commitments, and private investment to de-risk projects and unlock investment at scale, while ensuring financial stability throughout the entire operational life of the plant.

Building the **skills** base for Europe's nuclear revival

Scaling up SMR and AMR deployment will require a significant skilled and mobile workforce across the entire value chain, from design and licensing to construction, operation, decommissioning and the fuel cycle. Many Member States face similar challenges: an ageing nuclear workforce, intense competition for skilled workers, and rapid technological change in areas such as modular construction, advanced manufacturing and digital systems. These shared pressures make a coordinated European approach indispensable.

A robust skills ecosystem should guarantee high and consistent levels of knowledge and safety culture while remaining flexible enough to reflect national specificities. This calls for common reference profiles and transparent qualification pathways for key roles, combined with training offers that can rapidly respond to emerging needs and deployment schedules. Enabling cross-border mobility and reducing the cost and complexity of requalification will be particularly important to support peak construction phases and to allow Small and Medium Enterprises (SMEs) to enter nuclear supply chains. Together, these efforts will help secure the long-term availability of critical expertise and underpin nuclear's contribution to Europe's energy and industrial transition.

Recommendations:

31. Develop an EU-wide skills and qualification framework for nuclear, including the fuel cycle, with mutual recognition of key profiles across the value chain.
32. Support fast-track training and reskilling programmes and co-fund shared training centres and virtual academies for practical training, simulation and certification (including for SMEs).
33. Integrate nuclear skills needs into EU industrial, education and cohesion policies and align national strategies with projected SMR/AMR deployment.

Strengthening trust and **societal support** for SMRs

Social acceptance will be a decisive factor for the deployment of SMRs and AMRs in Europe. Beyond technical performance and financing, projects will only advance at scale if communities, workers and wider society understand their role in the energy transition and trust that they are safe, well-regulated and aligned with long-term societal interests. This calls for a coordinated, proactive and long-term approach to engagement at EU, national and local levels.

Effective engagement depends on transparent communication, delivered in accessible language and tailored to different audiences. It also requires credible local interlocutors and fair, inclusive processes that address concerns early on and ensure that the benefits of nuclear projects (such as jobs, infrastructure and community investment) are clearly communicated, reducing the risk of conflict around specific projects.

Public debate on SMRs and AMRs should be embedded within a broader, integrated energy-system narrative that explains how they complement renewables and other clean technologies, supported by realistic deployment timelines. Consistent political signals and visible commitment to research and innovation, including open dialogue among scientists, regulators, civil society, elected officials and industry, are essential to underpin trust and investor confidence.

Recommendations:

34. Support coordinated EU-wide public engagement on SMRs/AMRs, with transparent communication about these projects.
35. Develop EU guidelines on stakeholder dialogue, citizen participation and community benefits, and support a European forum for societal dialogue on SMRs/AMRs.
36. Promote an integrated energy-system narrative showing how SMRs/AMRs complement renewables, backed by clear political messages and realistic deployment timelines for different technologies.

Setting clear SMR **reference scenarios** and European deployment ambition

In the recently published Nuclear Illustrative Programme (PINC) Staff Working Document (SWD), the nuclear outlook focuses primarily on large reactors, both new build and lifetime extension. References to SMRs and AMRs rely on the scenarios developed during the European SMR Pre-Partnership, which date back to 2023. Since then, additional forecasting work has been conducted within the European Industrial Alliance on SMRs, including the development of an EU SMR reference scenario, issued for internal purposes in the first half of 2025.

Given that most EU Member States have now submitted their final National Energy and Climate Plans (several of which include references to SMR/AMR deployment) and considering the latest announcements from various countries on these developments, we believe it would be appropriate for the Communication to include an updated outlook on these technologies.

Recommendation:

35. Include in the Communication an updated outlook on installed capacity and potential SMR/AMR projects.