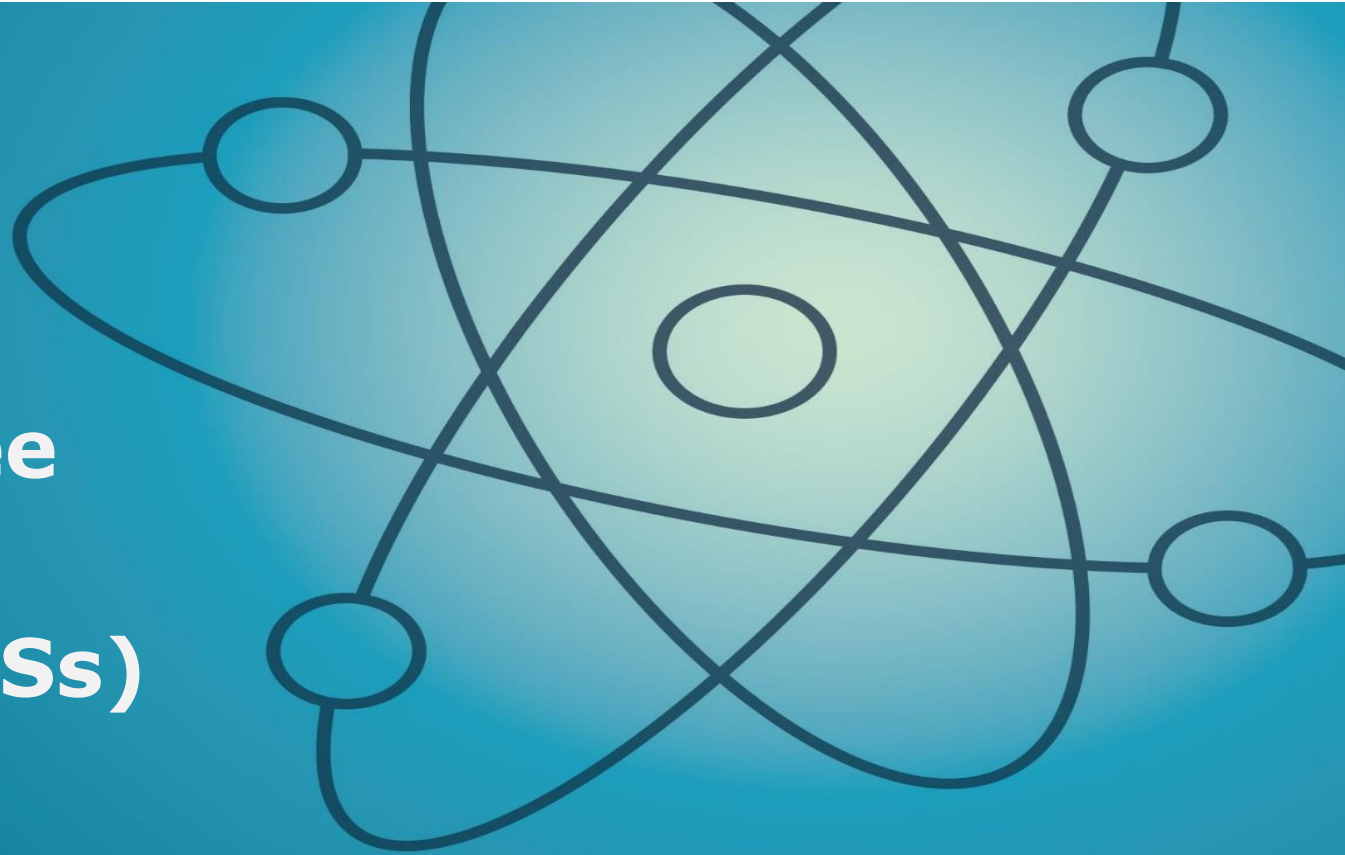


European SMR pre-Partnership



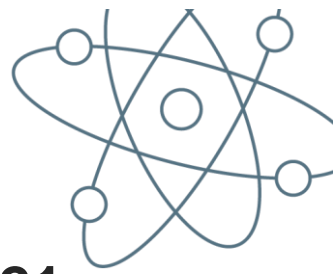
**Steering Committee
(SC) and specific
Work- Streams (WSs)**



With the support of :



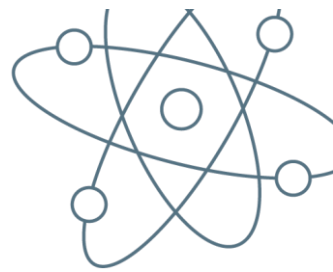
Content



- **First EU Workshop on Small Modular Reactors (SMRs) - 29 June 2021**
- **European SMR pre-Partnership Steering Committee**
 - Objectives
 - Activities
- **Work-Streams (WSs) objectives and activities**
- **Next Steps**
- **Q/A**



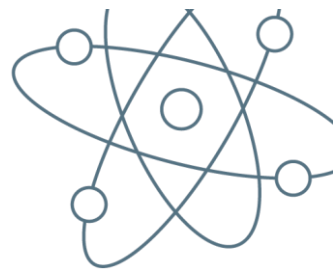
First EU Workshop on Small Modular Reactors (SMRs) - 29 June 2021



- Organised by the European Commission's DG ENER in response to the call of the European nuclear industry;
- 110 participants from 22 Member States;
- A “vision paper” of industry stakeholders widely endorsed by the participants;
- Including a proposal for a ‘European SMRs Partnership’.
 - collaboration scheme involving industrial stakeholders, research & technological organisations, interested customers (i.e. utilities and even Member States), as well as European policy-makers and regulators



European SMR pre-Partnership – Steering Committee

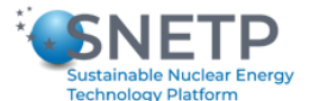


General objectives

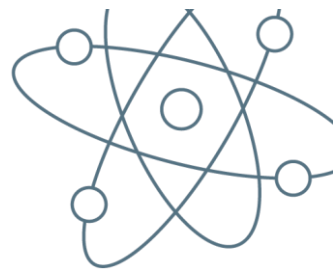
- **Identify enabling conditions and constraints, including financial ones**, towards safe design, construction and operation of SMRs in Europe in the next decade and beyond in compliance with the EU legislative framework in general and to the Euratom legislative framework in particular.

Specific objectives

- Develop the necessary industrial supply chain in Europe
- Encourage the implementation of common (harmonized) licensing process across the EU
- Establish a strategic research agenda :
 - LWR, as a mature technology to be deployed in 2030.
 - Advanced SMR (Gen IV) design have to be matured by 2035 for long term prospect
- **Composition:** FORATOM (chairing), SNETP, ENSREG, EC + chairs of 5 WS
- **Secretariat:** EC, FORATOM, SNETP
- **Meetings:** Kick-off 17 March 2022



European SMR pre-Partnership – Steering Committee

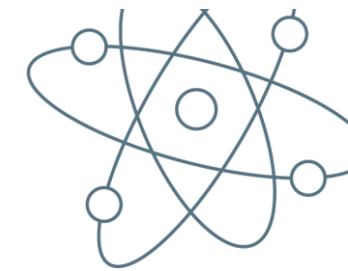


Expected activities:

- Review and validate the work program (main deliverables, schedule) for each WS;
- Ensure smooth coordination across WSs, set milestones and ensure proper conclusions / outcomes;
- Analyse potential constraints to overcome for the next phase (Partnership) and propose solutions (including policy recommendations at European / national level if needed);
- Review enabling conditions for SMRs development in Europe and propose approaches to activate them or further develop them if necessary;
- Prepare the conditions for the next phase (Partnership implementation phase) which shall cover all relevant aspects (legal, resources,) and the ground for the Partnership phase with proper benchmarking of other coalition initiatives at EU level (batteries, hydrogen, etc.);
- Interact / report on progress made with the Stakeholder forum on a regular basis;
- Coordinate relationships with international partners (such as UK, USA, CAN, JP, etc.) and international organisations (such as IAEA, OECD-NEA, etc.) in order to avoid overlap and duplication of efforts.



WS1 – Market analysis



Objectives:

- Identify future needs of the EU energy/power market (electricity, industrial and residential heat, hydrogen), SMR capabilities for these needs in a context of high RES deployment, market size, and global competitiveness;
- SMRs as technology to replace coal and gas plants, help decarbonize assets/processes such as hydrogen production, district heating, industrial heat processes, and provide load balancing capabilities to Transmission System Operators (TSOs)
- Establish a list of sustainability criteria on a shortlist of SMR technologies (SMR/AMR).

Main ongoing activities:

- Task 1 : Literature analysis done ; the draft of the report has started with inputs expected on 1) the EU market size/needs, 2) technical-economic capabilities of SMRs, 3) market potential for SMR development
- Task 2 : Three surveys are being consolidated : 1st survey for industrial users will be launched by the end of April ; 2nd survey for Member States must be coordinated with WS 4 (questions are being gathered) : 3rd survey for TSOs is in preparation.
- Task 3 : Validate the list of sustainability criteria to be considered, and add a question regarding the relevance/importance of these criteria in the SMR users survey(s)

Responsibility: FORATOM

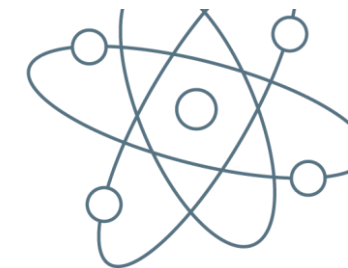
Chair: Tractebel

Contributors:

- Foratom-SMR-task force: Tractebel, Engie, Fortum, Rolls-Royce, EDF, Orano, Vattenfall, SCK-CEN, CEA.
- Kick-off meeting: 14 January 2022



WS2 – Licencing



Objective:

- Identify the elements for establishing a European pre-licensing process based on commonly accepted safety assessments from different ENSREG members interested in the licensing of the same SMR design

Main ongoing activities:

- Establish a clear state of play of activities in other fora (IAEA, SMR Regulatory Forum, NEA Committees, WENRA, ENISS, CORDEL, etc.) in relation to SMR licensing
- Develop a common understanding on NPPs licensing processes in different EU countries interested in SMR licensing (main milestones, etc.)
- Review ongoing or starting H2020 research projects in the field of SMR safety and licensing

Responsibility: ENSREG

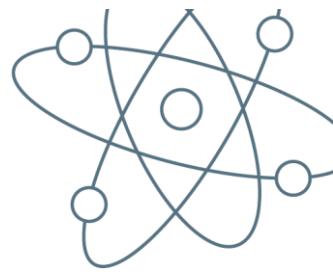
Chair: ASN

Contributors:

- 16 experts from 13 countries' nuclear safety authorities from: DE, HU, LT, FI, SE, IT, FR, RO, SK, NL, ES, CZ and PO + industry representative: ENISS
- Kick off meeting: 3 March 2022



WS3 – Financing



Objectives:

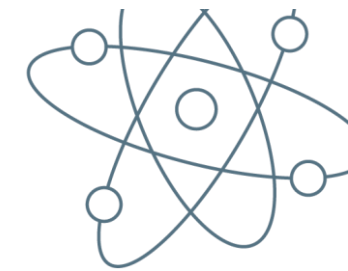
- To clarify specifics of SMRs financing (e.g. conditions for a Private Public Partnership at EU level) and
- To define the needs for a conducive investment environment / framework for SMRs in Europe.

Responsibility: FORATOM

To be launched in the second half of 2022



WS4 – Supply chain adaptation



Objectives:

- Identify the key features of an SMR supply Chain (vs. current practice)
- Analyze the existing gaps and the main hurdles to overcome
- Identify which ones are largely technology-independent and define roadmaps to address them
- Identify recommendations to systematically address technology-dependent hurdles from various partnerships

Main ongoing activities:

- Early interaction with SMR Vendors to check which are the issues related to the Supply chain - Development of a questionnaire sent to a selected list involved in various SMR programmes in European countries (including UK).
- Standardisation, possible use of non-nuclear, high quality components - review of existing work in the field

Responsability: FORATOM

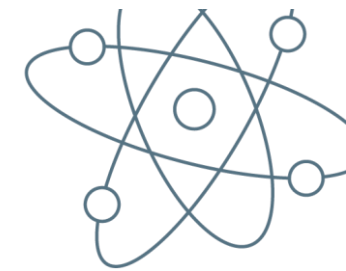
Chair : Ansaldo Nucleare

Contributors:

- Ansaldo Nucleare, Fortum, Orano, Engie, Empresarios Agrupados, Rolls-Royce, Nuclearelectrica, GIFEN, EDF, Framatome, Assystem, SNETP
- Kick-off meeting: 18 January 2022



WS5 – I,R&D



Objectives:

- Define R&D&I programme coherent with market needs and licensing requirements for SMRs development,
- Identify the needed facilities to perform this programme,
- Set up a coherent and consistent training and education programme.

Main ongoing activities:

- Build the R&D&I roadmap according to 7 technical topics:
 - **Core/fuel**
 - **NSSS Integrated vessel and its internals**
 - **Passive systems**
 - **Severe Accidents**
 - **Modularity**
 - **Human Factors and autonomy**
 - **Hybridization/(Co)generation of heat/H2/desalination**

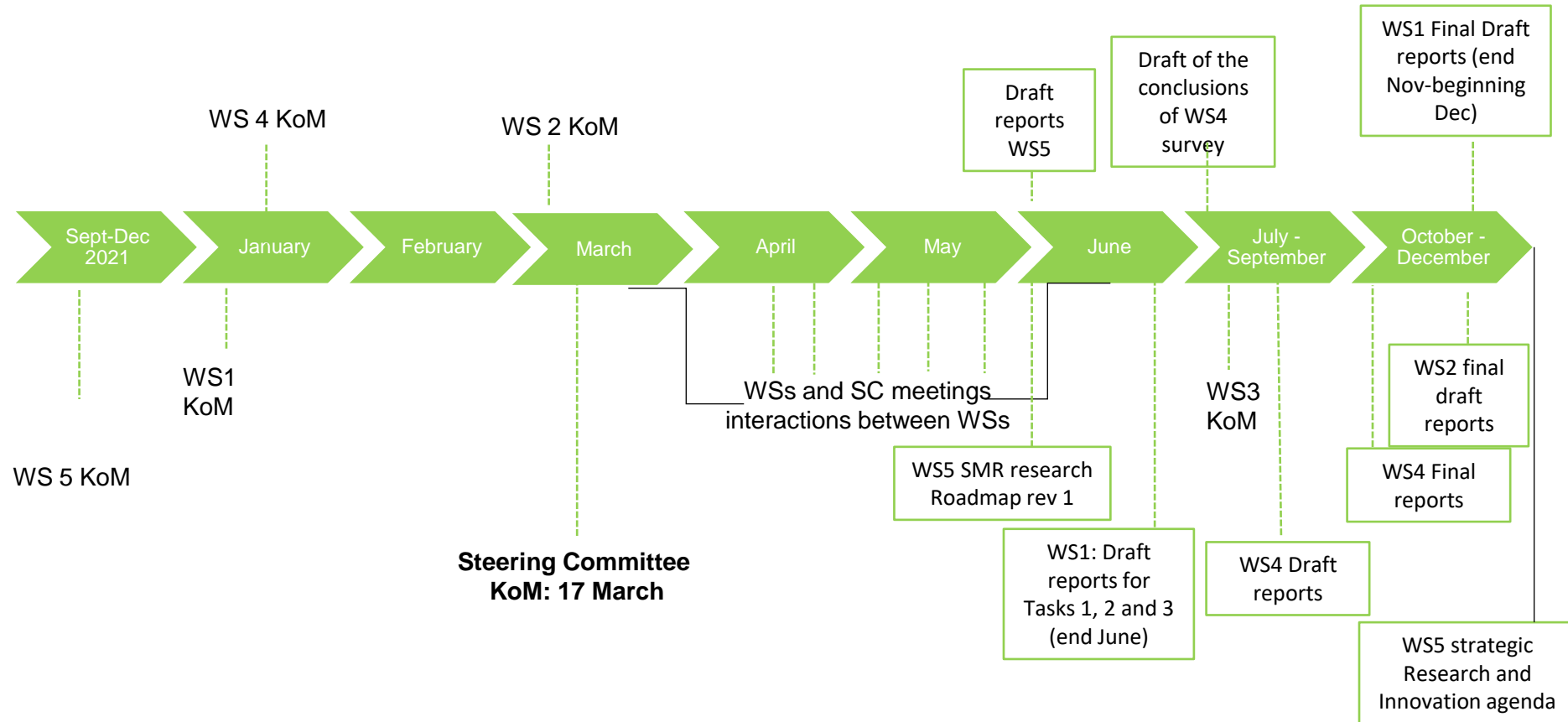
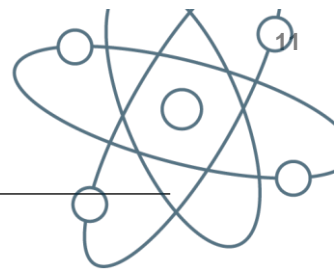
Responsibility: SNETP

Chair: EDF

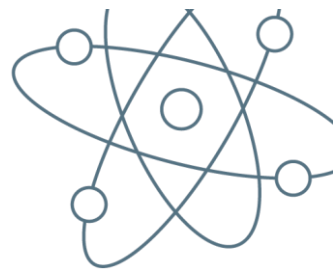
- Contributors: EDF, CEA, IRSN, Framatome, ORANO, ENGIE, SCK-CEN, VTT, Tractebel, UJV, ENEA, AREVA, ANSALDO, NCBJ, NRG, Nucadvisor,
- Kick-off meeting: Autumn 2021



Timeline for 2022



Next Steps



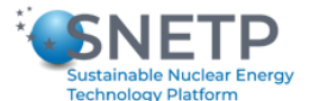
Objectives:

- Review enabling conditions and constraints for SMRs development in Europe which have emerged from the workstreams activities in 2022 and propose approaches to address any issues;
- Prepare the conditions for the next phase (Partnership implementation phase) which shall cover all relevant aspects (legal, resources, collaborations, etc.);
- Select 3 to 4 SMR designs* on which the European SMR partnership should focus its activities from 2023;
- Develop a “charter” to define the proposed structure and operation mode of the future European SMR partnership and the collaboration with the vendors/future licensees of the selected SMRs designs.

Responsibility: European SMR pre-partnership Steering Committee

To start in the second half of 2022

* based on LWR or AMR technologies, considering market opportunities, licensing and supply chain availability in Europe, in view of a deployment in the early 2030's



Detailing the Workstream 4 scope

1. Identify specific needs for SMR manufacturing

*An essential feature of the SMR business model is the expected advantages of series production of major components (vs «project driven» approach currently adopted)
Integration of reactor core and primary components is pursued in many SMR designs*

- Identify for various SMR technology key components /integrated assemblies for series production
- Key features to support series effects:
 - dedicated factory? for which components?
 - Target lead times, target capacity
 - For components procured on the market, how to combine competition among suppliers and standardisation of design&construction?
- Factory pre-assembling (at which extent?)
- In factory testing
- Fuel needs

Approach : Interaction with vendors interested to the European market (questionnaire)



Detailing the Workstream 4 scope



2. Identify supply chains in Europe and their adequacy to the SMR needs

- EU based suppliers, either qualified or eligible for nuclear components
- Wide-range categorization:
 - Type of components
 - Current qualifications
 - Industrial standards applied
 - Estimated capacity (delivered components per year)
 - Fuel suppliers?

Approach : Survey among members FORA

3. Standardisation: how, and how far, to promote it

- New codes and standards required?
- Transnational application: reconciliation among different codes & standards?

Approach : Review of IAEA works



Detailing the Workstream 4 scope



4. Modularity, Quality Requirements

Together with series manufacturing, modularization is considered an essential feature to limit costs of future NPPs and then validate the SMR business model.

NPP design shall take into account system interactions (both functional and physical) which could affect module design and viceversa

- To which extent push for modularization? (only mechanical? Structural modules?)
- How can we learn from other industrial sectors? (aerospace, E&P offshore...?)
- Any special quality requirements for the module construction supply chain?

Approach : Interviews with other industry sectors Experts



Detailing the Workstream 4 scope



5. How to maximise new tools and methods in SMR manufacturing

- How to improve series production through advanced manufacturing ?
- How to qualify new manufacturing techniques for nuclear application?

Approach : Interviews with experts, review of literature from other sectors

6. Possible use of non-nuclear, high quality components

- Path towards simplification and cost reduction?

Approach : Review of JRC works on the subject



Detailing the Workstream 4 scope



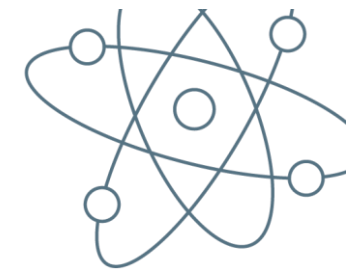
7. Robustness of the future supply chain

SMR reduced size would imply a larger number of components to be deployed for a fixed power generation growth rate

- More components per year : capability issues? Bottlenecks?
- Issues related to Dedicated factory management (constant output over the time, inventory management, etc.)
- Staffing considerations for O&M required services (i.e servicing a fleet)
- Training needs for required services

Approach : Interviews, possible expert seminar





Round table

Q&A

