

## TANDEM

# Small Modular Reactor for a European safe and Decarbonized Energy Mix

### OBJECTIVES

Small Modular Reactors (SMRs) can be hybridized with other energy sources, storage systems and energy conversion applications to provide electricity, heat and hydrogen. SMR technology thus has the potential to strongly contribute to the energy decarbonisation in order to achieve carbon-neutrality in Europe. However, **the integration of nuclear reactors, particularly SMRs, into hybrid energy systems is a new R&D topic to be investigated.** In this context, the TANDEM project proposes to address most specifically the **SMR safety issues related to the light-water SMR integration**, considering a near-term deployment in Europe at 2030's horizon. However, the project will also provide perspectives, whenever possible, for the integration of Advanced Modular Reactors (AMRs) at 2050's horizon, in the Generation-IV framework.

The high-level objectives associated with the TANDEM project are the following:

- Assess the safety compliance of SMRs to be integrated in the future European energy mix,
- Provide guidance in a deployment perspective for future integration of SMRs and AMRs into well-balanced hybrid energy systems,
- Foster enabling environment for the development of hybrid energy systems based on SMRs and AMRs.

### EXPECTED IMPACTS

The main impacts expected from the project work are to:

- Initiate the demonstration of the nuclear safety of SMRs integrated into hybrid systems,
- Initiate the operability and techno-economics assessment of hybrid systems,
- Prepare ground for future projects related to the licensing of versatile SMRs and AMRs integrated into hybrid energy systems,
- Assess the needs of the industrial stakeholder group with respect to SMRs in hybrid systems,
- Reinforce international collaborations on the development of hybrid energy systems integrating SMRs,
- Raise awareness of concerned stakeholders and wide public on SMR technologies for power and non-power applications and their integration into hybrid systems.

### HIGHLIGHTS

The major contribution of the project is to facilitate the future deployment of SMRs and hybrid energy systems in providing technical and scientific data on the SMR safety and feasibility of the selected hybrid systems. The SMR integration into hybrid systems will induce new initiating events to consider in the safety approach; consequently, TANDEM will define a **safety approach** framework for SMRs operating in hybrid systems. TANDEM will also investigate different ways to address **energy/power production flexibility** in hybrid systems and will provide **guidance relative to hybrid system design and SMR operating** in hybrid systems.

The **delivery of methods and simulation tools** for the assessment of SMR safety and hybrid system feasibility will support the development and licensing of European versatile SMR concepts in hybrid systems at 2030's horizon.

### PARTNERS

Ansaldo Nucleare / CEA / CIRTEN (PoliMi, UniPi) / EAI / EC-JRC / EDF / ENEA / ENEN / Energorisk / FORTUM / GRS / IRSN / Nucleareurope / Tractebel-Engie / VTT / UJV

### DURATION & BUDGET

September 2022 – August 2025 - 3 years  
3,78 M€ (including EC grant: 3.37 M€)

### CONTACTS

**Technical Project Leader:**  
Claire Vaglio-Gaudard (CEA)  
Email: [claire.vaglio-gaudard@cea.fr](mailto:claire.vaglio-gaudard@cea.fr)

### EVENTS

International School in 2025  
Workshops (dedicated to stakeholder and citizen engagement, dissemination, E&T)  
Meetings with Scientific Advisory Board and Industrial User Group

