FISA EURADWASTE 2025

SNETP Forum

The TANDEM Euratom project Small Modular ReacTor for a European sAfe aNd Decarbonised Energy Mix

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OBJECTIVES OF THE R&D PROJECT

- Development of an **integrated vision of the low-carbon energy mix** on a local/regional scale (a urban area or an industrial area) for **heat, electricity and hydrogen**
- **Support for the deployment of multi-purpose Small Modular Reactors** (SMRs) integrated into nuclear hybrid energy systems as reliable, resilient, and affordable clean energy options in Europe

METHODOLOGY IMPLEMENTED IN THE PROJECT

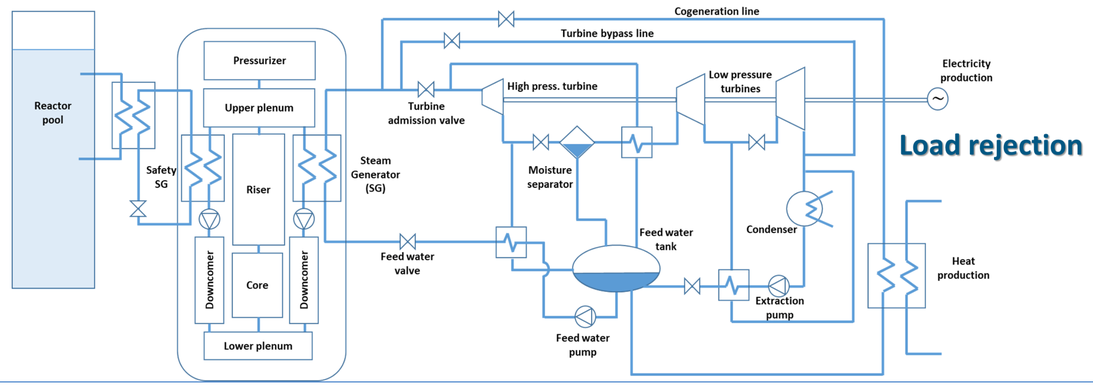
PHASE	ACTIVITIES	OUTCOMES
PHASE 1 Identification of hybrid systems incorparating SMRs to study	**- Analysis of the European energy scenarios - Configuration of two hybrid systems for the selected scenarios**	Characterization of two hybrid energy systems to study
PHASE 2 Development and implementation of tools for SMR assessment	**Development of new tools, modelling in existing tools, numerical coupling between tools**	- TANDEM model library - Hybrid system simulator - CATHARE/ATHLET safety modelling - Coupling for safety /techno-economics
PHASE 3 Safety and feasibility studies for SMR integration into hybrid systems	**- Safety assessment - Techno-economics and operatinonality analysis - Citizen engagement**	Safety recommandations, technical and economical guidance, policy briefs, etc.
PHASE 4 Building enabling environment for future projects and initiatives	**- Scientific training - Interaction with SAC and IUG - Outreach activities - Organisation of workshops**	- Improved scientific cooperation - New project ideas identified - Increased public acceptance - Raised awareness of stakeholders

MAIN OUTCOMES OF THE PROJECT

- Development of **tools and methodologies** to assess nuclear hybrid energy systems
- Implementation on **demonstrative study cases** to assess safety, technical performances (flexibility of energy supply), techno-economics, environmental impact and citizen engagement
- Release of **technical recommendations and policy briefs**
- Set-up of an **open and long-term European community** supporting the development and deployment of nuclear hybrid energy systems
- Creation of **close links with other international communities** (international organizations, Euratom projects)

SAFETY ANALYSIS OF HYBRIDIZATION TRANSIENTS

- Development of a **coupling** between nuclear safety codes (ATHLET & CATHARE) and modelica BOP model
- Simulation of normal operation, AOO and DBA
- First results: analysis enabling to **show the hybrization impact** on safety assessment - no major new challenge to overcome



NEW MODELICA LIBRARY TO BUILD SIMULATORS

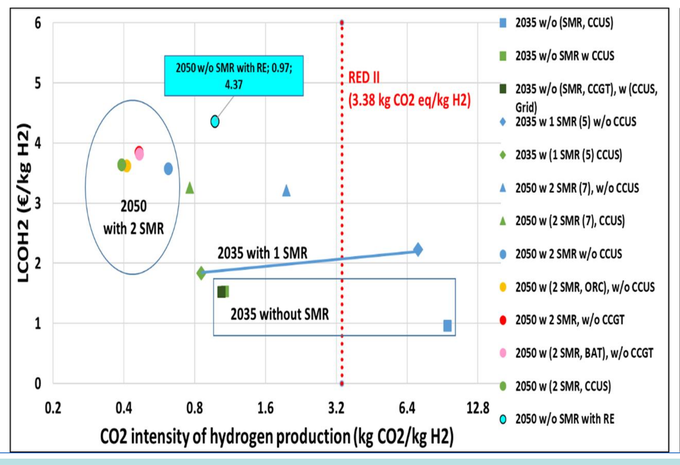
List of models available in the library

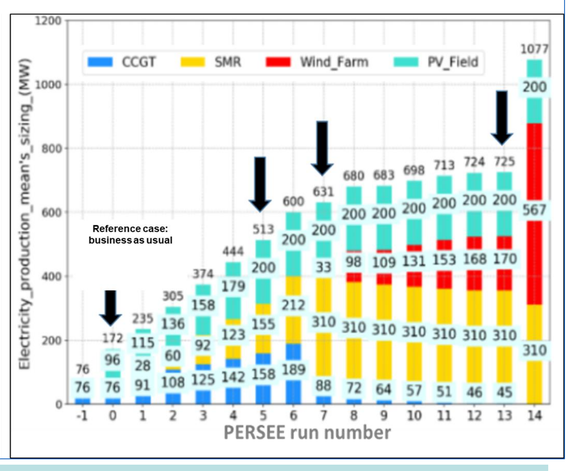
- SMR: a) NSSS; b) BOP
- Combined Cycle Gas Turbine (simplified)
- Heat pump (simplified)
- Electrical Grid
- District Heating Network
- Desalination (simplified)
- H_2 production: LTE and HTSE
- Storage : a) Thermal; b) Electrical (simplified)

SCAN ME

TECHNO-ECONOMICS AND ENVIRONMENTAL IMPACT

- **Optimization of an objective function** taking into account constraints on environmental impact to **size the components** of the hybrid energy systems with Backbone and PERSEE
- **Analysis of studies cases**: two cases for the district heating and electricity supply (Helsinki metropolitan area in Finland, Moravian-Silesian region in Czech Republic), one for an energy hub (port with virtual data in France)





HYBRID ENERGY SYSTEMS STUDIED IN THE PROJECT

Electricity & district heating supply in an urban area

Energy hub in a port area

BEYOND THE TANDEM PROJECT…

It is now time to **turn the integration of SMRs and AMRs in hybrid energy systems into reality**, with new projects and initiatives to study nuclear cogeneration and nuclear hybrid energy systems.

Duration: 3 years (2022-2025) | Budget: 3.8M€ (including EC grant: 3.4M€) | Consortium: 18 partners from 8 European countries

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