

Title and acronym: ADVANCED NUCLEAR SAFETY EVALUATION OF LIQUID METAL USING SYSTEMS
[ANSELMUS]

Call: [HORIZON-EURATOM-2021-NRT-01-02] — [Safety of advanced and innovative nuclear design and fuels]

Grant Agreement Number:101061185

Promoter /Coordinator: STUDIECENTRUM VOOR KERNENERGIE / CENTRE D'ETUDE DE L'ENERGIE
NUCLEAIRE (SCK CEN)

Duration: 48 months, from 1/09/2022 to 31/08/2026

Total grant for the University of Pitești (UPIT): 15000 Euro

Local coordinator for the University of Pitești (UPIT): University Lecturer PhD. Bogdan MARINESCU

Summary:

Climate change, due to CO₂ emission is a problem that needs to be tackled in various ways including optimising energy efficiency and maximising low-carbon sources. In that context it is unwise to a priori discard an essentially carbon free energy source like nuclear fission. Nuclear energy indeed has objectively proven itself a safe and reliable energy source. Yet, fundamental improvements are possible, particularly regarding intrinsic and passive safety on the one hand and waste generation and fuel efficiency on the other hand. Fast neutron advanced nuclear systems hold the key to reach this objective as they can combine intrinsic safety with fuel and waste minimisation.

In the EU, the heavy liquid metal (HLM) cooled nuclear systems ALFRED, the European lead fast reactor (LFR) demonstrator, and MYRRHA, a lead-bismuth eutectic (LBE) cooled accelerator driven system (ADS) that will serve as the only fast spectrum research reactor and irradiation tool in the EU, are clearly among the frontrunners in this field. The priority on HLM systems is reflected in the charter of the European Sustainable Nuclear Industrial Initiative (ESNII), one of the pillars of the Sustainable Nuclear Energy Technology Platform (SNETP). The latter is recognised as a European Technology and Innovation Platform (ETIP) by the European Commission.

In support of ALFRED and MYRRHA, ANSELMUS gathers the main actors in the development of HLM systems in the EU, including designers and research and will bundle their expertise in a collaborative spirit to perform the next steps required towards the realisation of innovative HLM technology.

Objectives:

ANSELMUS is set up with a single **central objective** in mind: support deployment of HLM cooled advanced reactors in Europe.

In order to achieve this within the boundaries of the work plan, the central objective is made concrete, measurable and verifiable by defining a set of **particular objectives**. These were set at the start of the proposal initiative via a consultation round by collecting the input on priorities from the design teams of ALFRED and MYRRHA and feasibility assessments by the research teams. As a result, ANSELMUS will:

- perform safety evaluation of the designs;
- assess fuel assembly safety by experiment and modelling;
- validate the safety performance of essential components;
- develop non-destructive test-based reactors safety monitoring and vessel inspection for LFR;
- address the social impact of the HLM systems:
 - by assessing their integration into a low-carbon energy system
 - by addressing social and ethical considerations regarding the safety of advanced nuclear technology.

The objectives make ANSELMUS a pertinent a response to the Horizon-EURATOM-2021-NRT-01-02 call. The particular objectives will be achieved by implementing concrete actions, as planned under each of the following work packages:

- WP1 - PIRT on HLM systems
- WP2 - Fuel assembly safety
- WP3 - Validation of safety systems
- WP4 - Reactor safety monitoring & inspection
- WP5 - Social impact of innovative heavy metal cooled nuclear technology
- WP6 - Dissemination, Education, Training, Communication
- WP7 - Management

Outcomes:

ANSELMUS supports the safety of advanced nuclear reactors that use a heavy liquid metal as a coolant. It focusses on several of the expected outcomes in the call. In particular:

- safety assessment of advanced and innovative nuclear concepts, their designs and technologies in relation with the requirements of the nuclear safety directive.
- demonstration of safety performance and reliability of advanced structural materials, and innovative fuels for demonstrators, their monitorability, innovative instrumentation, system integration, component design, balance of plant, for advanced and innovative reactors”
- development of methods and tools for enhanced modelling assessment, correlations and uncertainties, core and plant advanced surveillance, monitoring, diagnostics and prognostics.

Partnership:

Participant #	Official name	Country
1	STUDIECENTRUM VOOR KERNENERGIE / CENTRE D'ETUDE	Belgium
2	AGENZIA NAZIONALE PER LE NUOVE TECNOLOGIE, L'ENERGIA E LO SVILUPPO ECONOMICO SOSTENIBILE	Italy
3	NUCLEAR RESEARCH AND CONSULTANCY GROUP	Netherlands
4	KARLSRUHER INSTITUT FUER TECHNOLOGIE	Germany
5	INSTITUT VON KARMAN DE DYNAMIQUE DES FLUIDES	Belgium
6	ANSALDO NUCLEARE SPA	Italy
7	CENTRO DI RICERCA, SVILUPPO E STUDI SUPERIORI IN SARDEGNA SOCIETÀ A RESPONSABILITÀ LIMITATA	Italy
8	REGIA AUTONOMA TEHNOLOGII PENTRU ENERGIA NUCLEARA - RATEN	Romania
9	CONSORZIO INTERUNIVERSITARIO NAZIONALE PER LA RICERCA TECNOLOGICA NUCLEARE	Italy
10	POLITECNICO DI MILANO ¹	Italy
11	UNIVERSITA DEGLI STUDI DI ROMA LA SAPIENZA ²	Italy
12	UNIVERSITA DI PISA ³	Italy
13	KAUNO TECHNOLOGIJOS UNIVERSITETAS	Lithuania
14	EMPRESARIOS AGRUPADOS INTERNACIONAL SA	Spain
15	UNIVERSITATEA DIN PITESTI	Romania
16	PAUL SCHERRER INSTITUT ⁴	Switzerland
	JRC -JOINT RESEARCH CENTRE- EUROPEAN COMMISSION ⁵	Belgium

ANSELMUS work meeting in Romania

<http://www.anselmus.eu>

