

# MUSA – Management and Uncertainties of Severe Accidents

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MUSA has received funding from the Euratom research and training programme 2014-2018 under grant agreement No 847441.

# Project Description

- ▶ MUSA was founded in Horizon 2020 EURATOM NFRP-2018 call on “**Safety assessments to improve accident management strategies for generation II and III reactors**”.
- ▶ The MUSA project aims to establish a **harmonised approach for the analysis of uncertainties and sensitivities associated with severe accident (SA) analysis** among EU and non-EU entities.



MUSA kick-off meeting in Madrid, Spain  
July 10-12, 2019

# Project Description



- ▶ The project was launched in June 2019.
- ▶ The MUSA project is coordinated by **Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT)** in Madrid, Spain.



- ▶ MUSA has the **NUGENIA label** that recognises the excellence of the project (obtained on 7 July 2018)

# MUSA in Numbers



▶ 48 months



▶ Budget of € 5,768,452.50



▶ 28 partners\*



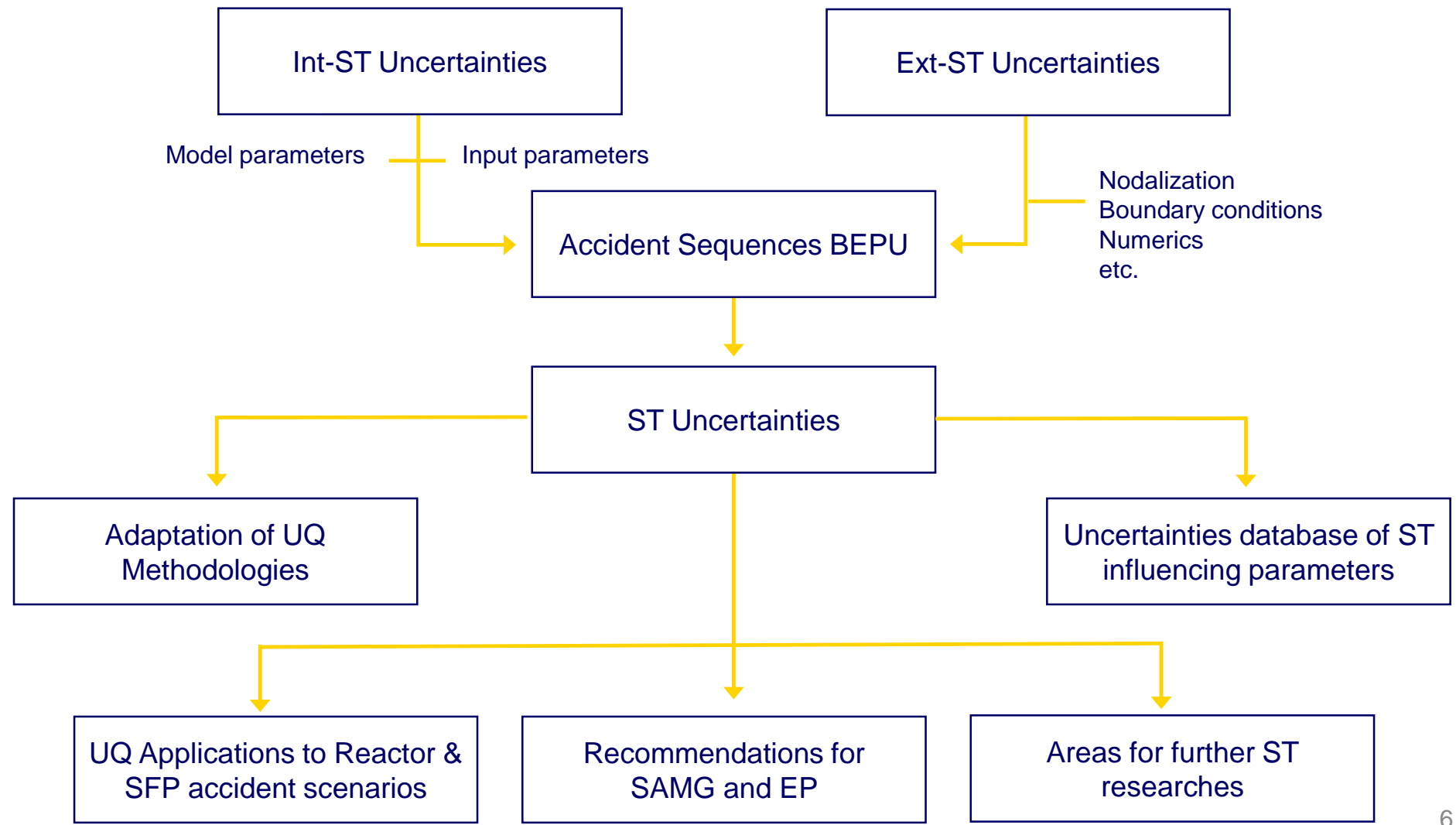
▶ 16 countries

▶ \*The MUSA project includes partnerships with non-European institutions (Canada, China, Japan, South Korea and USA).

# Objectives & Scope

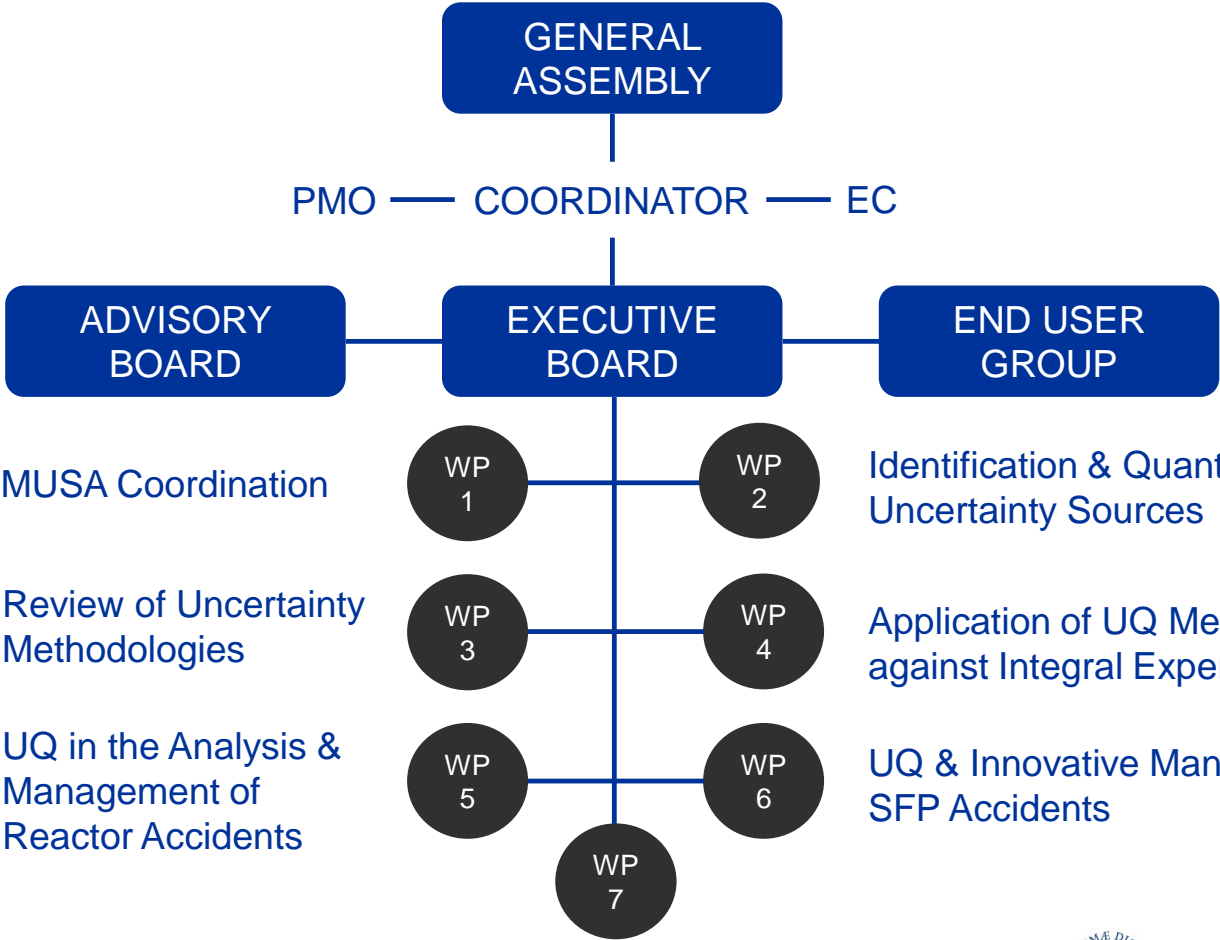
- ▶ The overall objective of the MUSA project is to **assess the capability of SA codes** when modelling reactor and Spent Fuel Pool (SFP) accident scenarios of GEN II, GEN III and GEN III+ reactor designs.
  - Identification of Uncertainties Quantification (UQ) methodologies to be employed, with emphasis on the effect of both existing and innovative SA Management (SAM) measures on the accident progression.
  - The MUSA project will determine the state-of-the-art prediction capability of SA codes & quantify the codes uncertainties applied to SA sequences.
- ▶ Emphasis will be made on:
  - SA measures (existing & innovative)
  - Source Term mitigation
- ▶ MUSA will adopt and adapt **Uncertainty & Sensitivity Analysis (UaSA)** methods to SA domain.

# MUSA Approach



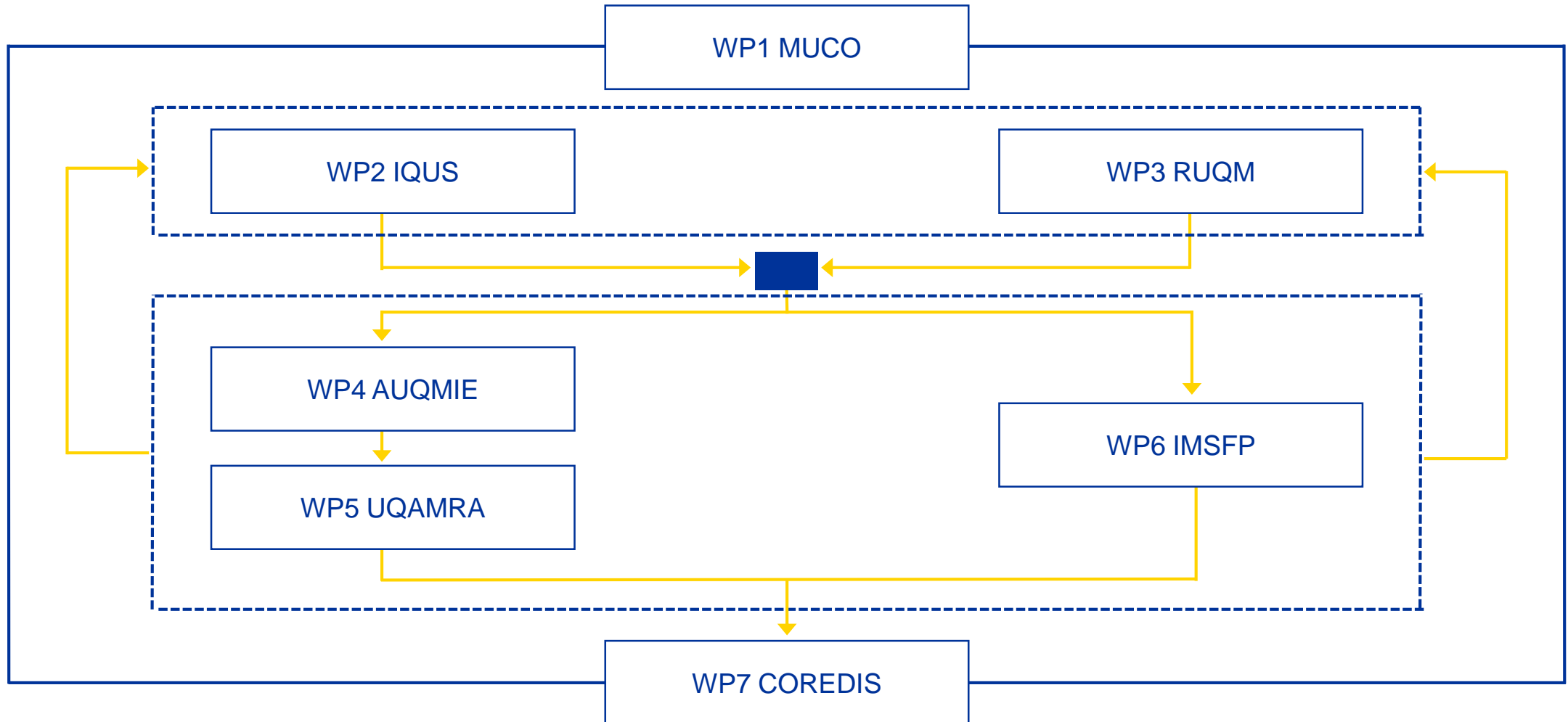
- ▶ **A systematic assessment of the uncertainty band** affecting ST in risk dominant sequences.
- ▶ **Guidelines to systematic conduct BEPU analysis** in the SA domain.
- ▶ **A database with the characterization** (upper and lower bound and pdf) **of uncertainties** in input deck parameters.
- ▶ **Insights into key elements affecting SAM** implementation (i.e., timing).
- ▶ **Additional means and actions that might optimize the accident management**, both in reactors and SFPs.
- ▶ **Hands-on training & identification of major challenges.**

# Project Governance





# Functional Structure



# Generic Expected Outcomes

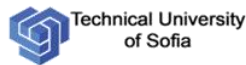
- ▶ **Close-out open issues in the SA area:** uncertainties governing the Source Term (ST) estimates will be identified so that future research can reduce ST predictions uncertainties.
- ▶ **Increase safety margins** of power plants under operation (support to NPP assessments).
- ▶ **Improve emergency response** measures and SAM strategies.
- ▶ **Enhance nuclear safety** while boosting the EU safety requirements' implementation.

# Knowledge Dissemination

- ▶ MUSA education and training activities target Masters and PhD students, as well as young researchers in the ST field.
  - **Public learning modules** on MUSA major outcomes.
  - **Mobility exchange programme** under which university students and young researchers go to internship programmes.
  - **Production of a lecture on “Uncertainty Quantification in Severe Accident Analyses”** for the different international courses that might be given on Severe Accidents and/or on “uncertainties”.



# MUSA Consortium Members





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