WP4 – WASTE MANAGEMENT FOR SMRs AND FUTURE FUELS (FORSAFF)

Tim Schatz (VTT)

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Objectives

The primary aim of FORSAFF is to identify knowledge gaps and provide recommendations for future research regarding SMR waste generation and waste management.

- Evaluate SMR waste inventories, including those related to the back end of the fuel cycle, and their main physico-chemical-radiological properties, and assess predisposal (treatment, conditioning, storage, transport) approaches and development needs in terms of anticipated waste generation across reactor designs and operating conditions.
- Review management routes for SMR wastes over a range of needs, considering both conventional as well as more recent concepts.
- Examine national policies and regulatory frameworks in the context of SMR fuel cycle and waste management as well as stakeholder perceptions and concerns.

Strategic Study

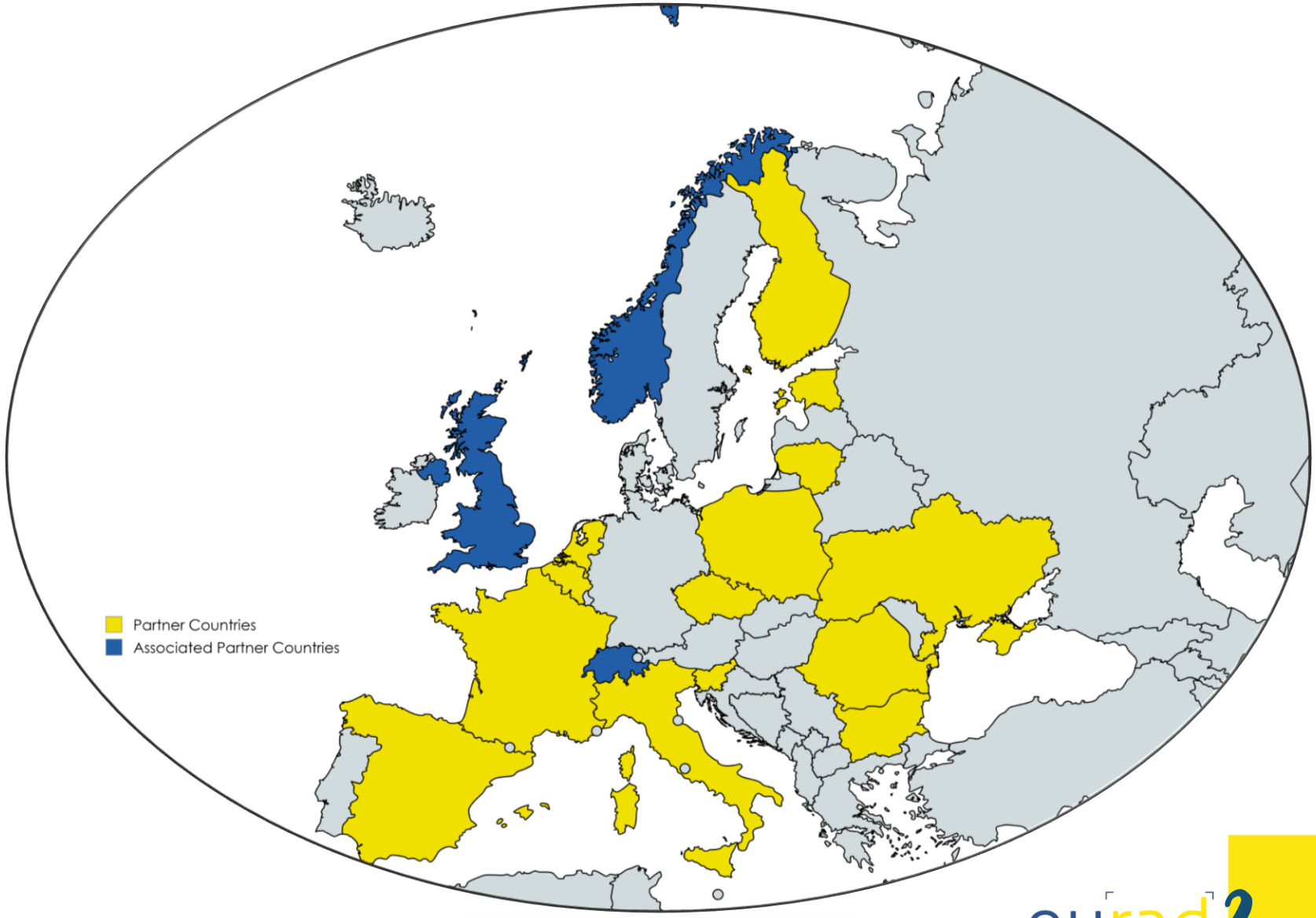
2-year duration

Total funding ~1 M€

~110 person months

FORSAFF PARTICIPATION

- 25 EC-funded partners from 14 countries
- 4 associated partners from Norway, United Kingdom and Switzerland

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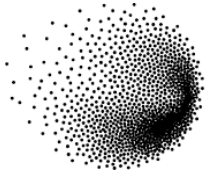

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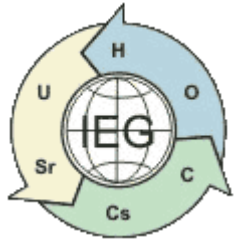
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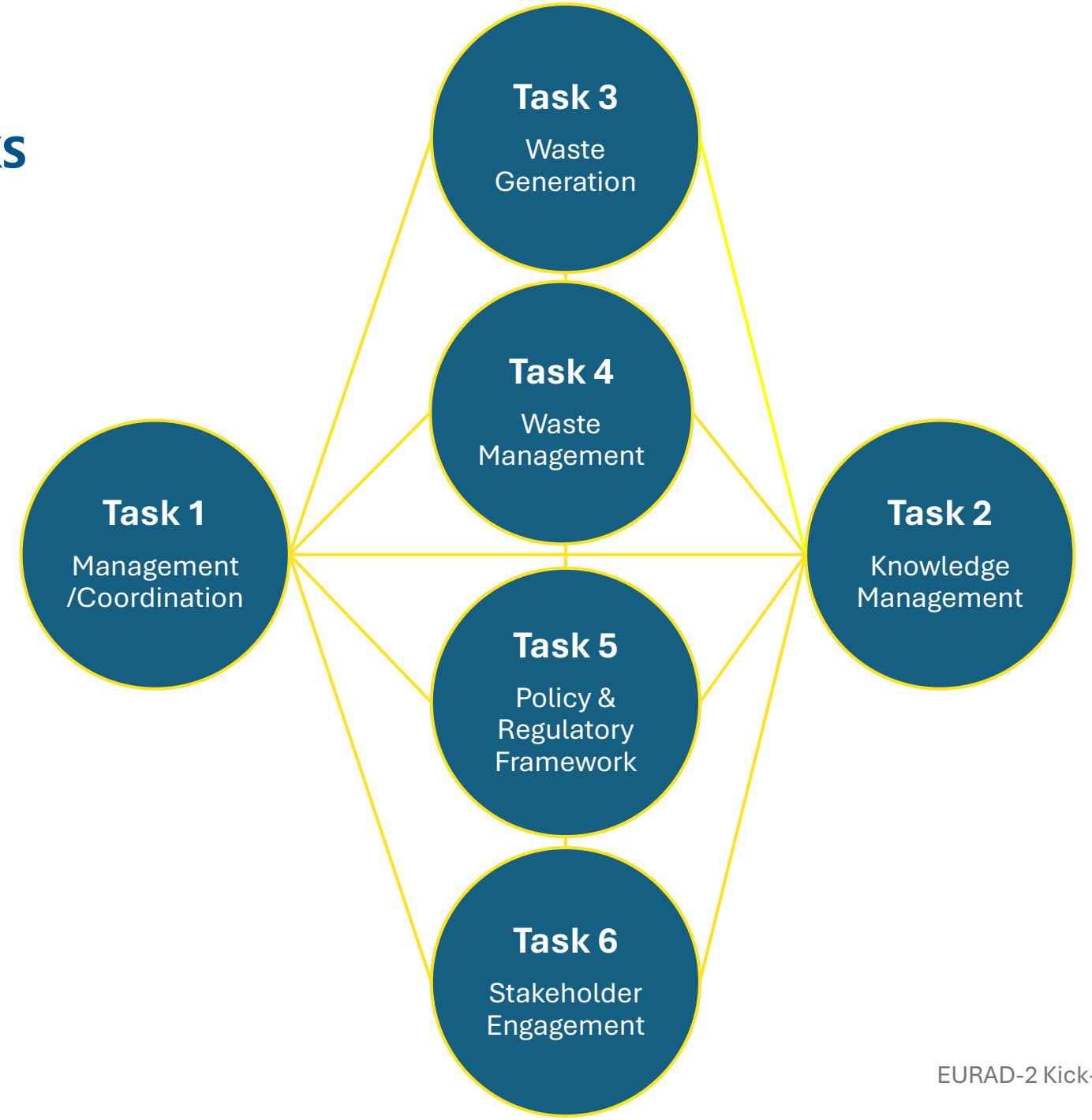
FORSAFF TASKS



FORSAFF TASK 1 – MANAGEMENT/COORDINATION

Lead: VTT

Partners: SSTC NRS, Polimi, CEA, Amphos 21, Andra, UJV, EIMV, UTARTU

Objective: Overall management of the WP including scientific/technical coordination, monitoring and reviewing the WP progress and outputs against work plans and dissemination/outreach of results,

- **Subtask 1.1: Coordination**
  - Ensure WP is progressing as planned; meet regularly with WP Board; report work progress, deliverables and milestones; communicate with stakeholders
- **Subtask 1.2: Dissemination**
  - Organise annual meetings; contribute to EURAD-2 newsletters and website; produce synthesis document during last year of WP
- **Subtask 1.3 Quality Control**
  - Review milestones, deliverables and KPI targets; certify alignment with GA; implement data management requirements; address risk management for the WP

FORSAFF TASK 2 – KNOWLEDGE MANAGEMENT

Lead: SSTC NRS

Partners: All (?)

Objective: Capture knowledge relevant to the SRA topic and to contribute to knowledge transfer to the EURAD-2 community and beyond through the EURAD-2 KM programme.

- **Subtask 2.1: Knowledge capture**
  - D4.1 (M6): State of the art (SOTA) report – Challenges in SMR waste management and fuel cycle considerations
  - D4.2 (M12): Green Paper - Guidance on SMR implementation and deployment from the back end of the fuel cycle perspective
  - D4.3 (M18) White Paper - Identification of knowledge gaps for future R&D activities
- **Subtask 2.2: Knowledge transfer**
  - Organize, in cooperation with EURAD-2 KM programme, specific activities to transfer knowledge to interested parties (for example, online training, face-to face-training, e-learning materials, workshops, posts for social media, summary sheets, videos, guidance)

FORSAFF TASK 3 – WASTE GENERATION

Leads: Polimi and CEA

Partners: Amphos 21, Andra, NRG, PSI, SIIEG, VTT, UTARTU

Objective: Define SMR waste inventories (including spent fuel or waste generated after reprocessing) and main physico-chemical-radiological properties.

- **Subtask 3.1: Methodology for waste stream identification**
  - Investigate and definine overall waste inventories arising from SMRs; develop a common methodology for waste stream identification based on key waste descriptors (volume, mass, activity, etc.)
- **Subtask 3.2: Waste inventory and main characteristics**
  - Identify the most significant properties impacting SMR waste management; discuss with SMR designers via formation of an End-user group
- **Subtask 3.3: Spent fuel inventory and management**
  - Investigation of main characteristics of spent fuel and specific reprocessing waste generated from selected SMR designs; consider less conventional fuel types (thorium, HALEU, molten salts, TRISO)

FORSAFF TASK 4 – WASTE MANAGEMENT

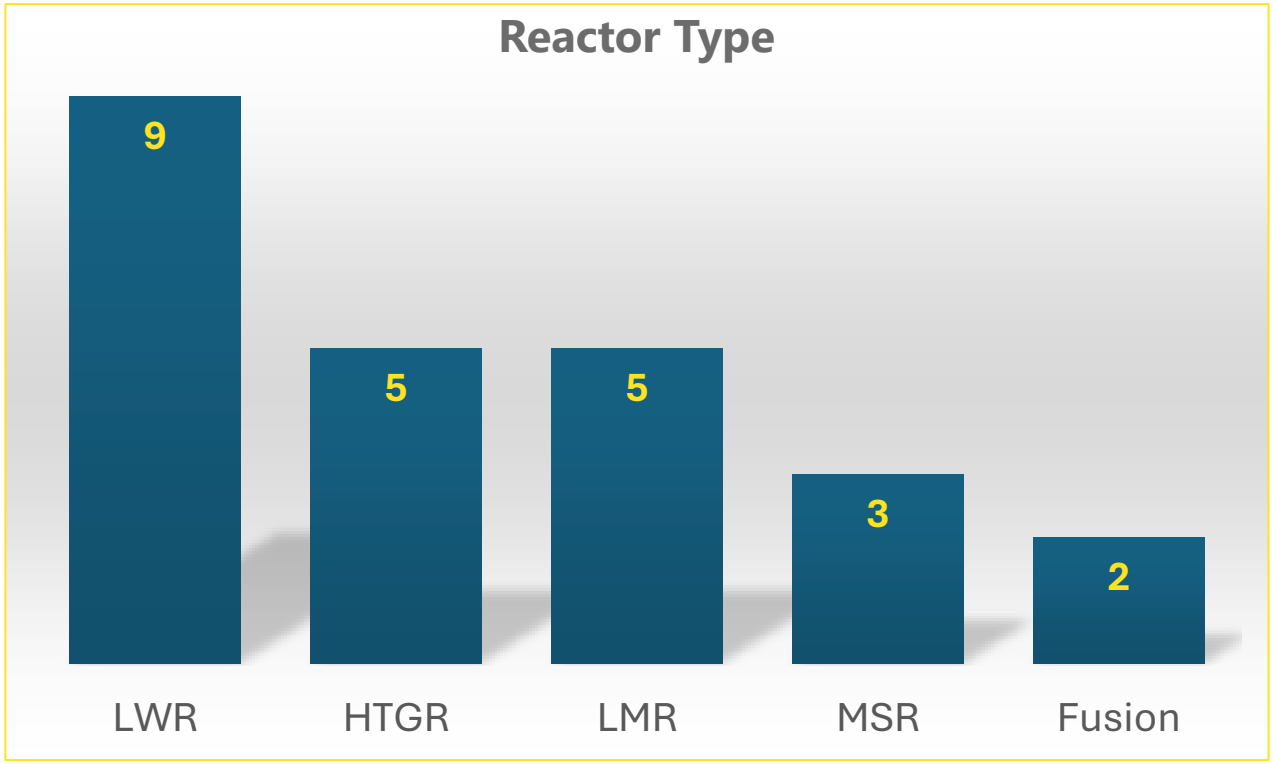
Leads: Amphos 21 and Andra

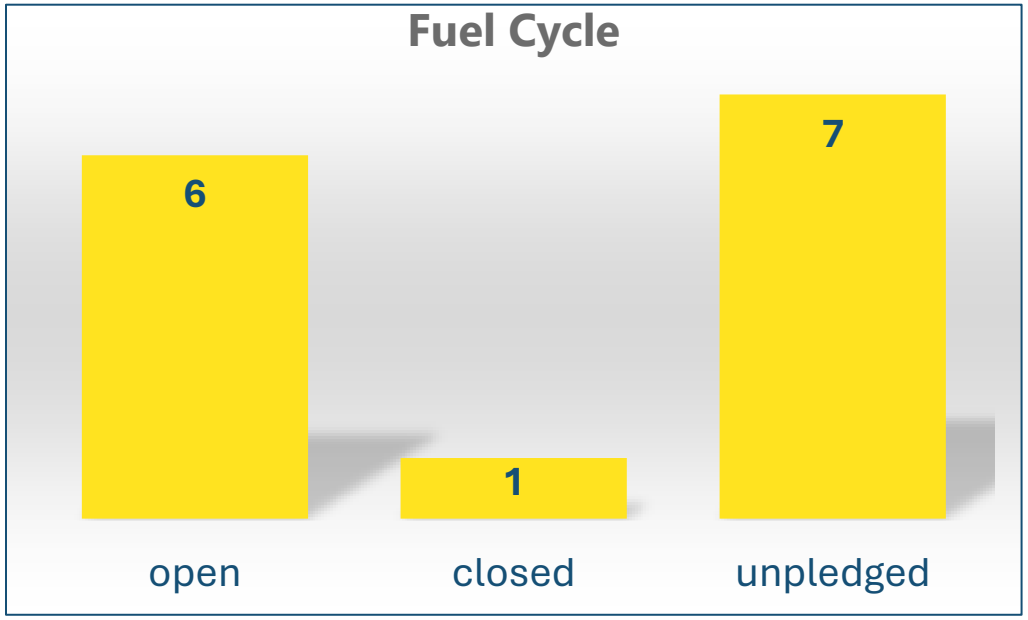
Partners: CEA, CIEMAT, CVR, GSL, IFE, INCT, LEI, NWS, POLIMI, TVO, PSI, RATEN, SCK CEN, SSTC NRS, SURO, VTT, UTARTU

Objectives: Assess predisposal approaches and development needs in terms of anticipated waste generation across SMR designs and operating conditions including characterisation. Explore spent fuel reprocessing options. Examine disposal routes for SMR wastes across a range of deployment needs, disposability issues and waste acceptance criteria.

- **Subtask 4.1: SMR waste predisposal and disposal**
  - Investigate predisposal and disposal management options for SMR wastes; identify pre-disposal / disposal route needs.
- **Subtask 4.2: SMR spent fuel reprocessing**
  - Assess current reprocessing technologies with respect to SMR spent fuels; identify reprocessing needs.
- **Subtask 4.3: Characterisation techniques and modelling methods for SMR waste**
  - Evaluate waste characterisation methods and modelling tools for SMR wastes; identify characterisation needs (both experimental and modelling techniques)

FORSAFF TASK 4 – PARTNER INTERESTS





- **8 specific designs/vendors highlighted (LWR, HTGR)**

FORSAFF TASK 5 – POLICY & REGULATORY FRAMEWORK

Lead: UJV

Partners: Andra, BelV, EIMV, IFE, IRSN, NRG, SSTC NRS, SURO, TUS, UTARTU, VTT

Objective: Determine needs to adjust national policies and regulatory frameworks to support SMR fuel cycle and waste management.

- **Subtask 5.1: Establish current policy and regulatory framework insight**
  - Survey current policy documents and requirements from national RWM programmes and international guidelines/recommendations with respect to SMR waste management
- **Subtask 5.2: Assess adequacy of existing policies**
  - Identify challenges related to SMR waste management across EU countries (to facilitate future permit/ licensing procedure) and explore needs for SMR-specific adjustments.

FORSAFF TASK 6 – STAKEHOLDER ENGAGEMENT

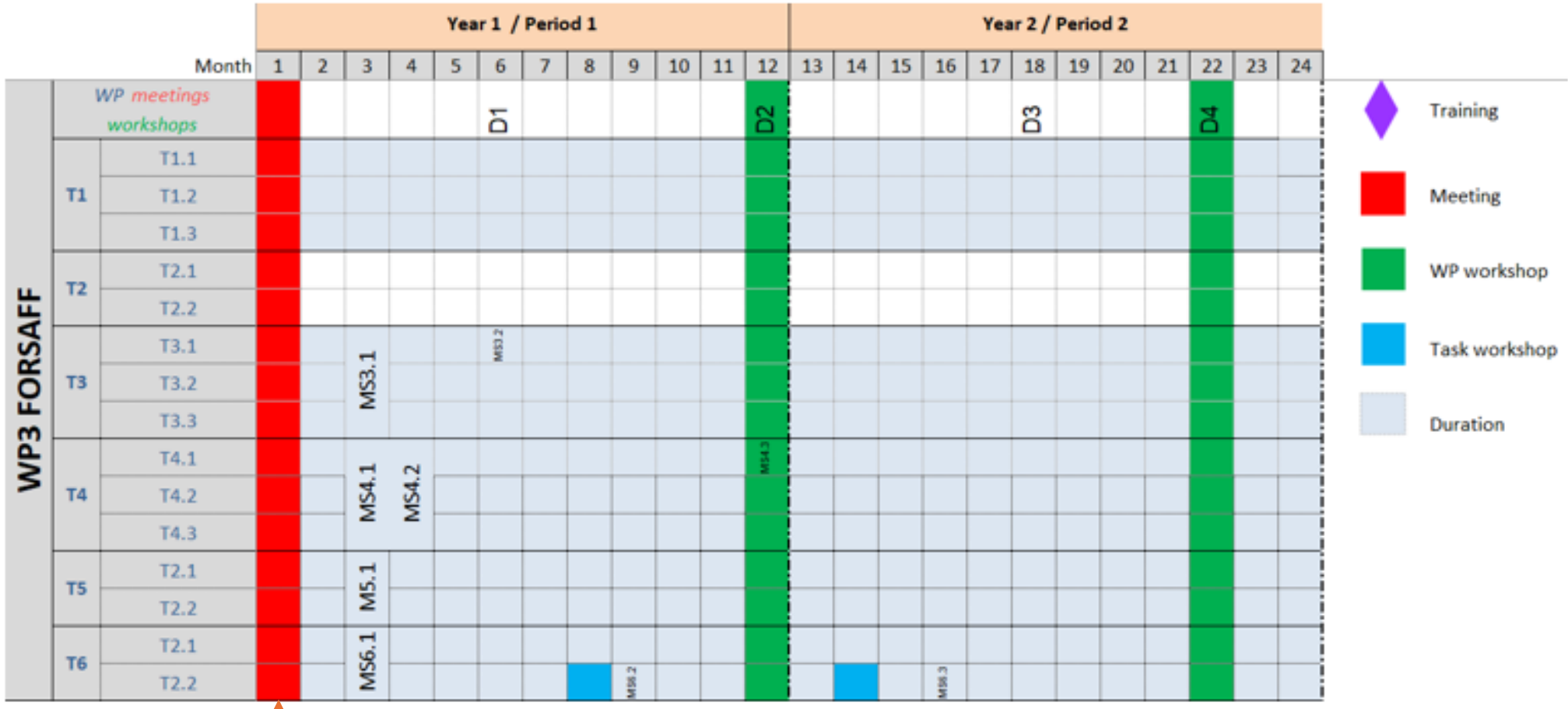
Leads: EIMV and UTARTU

Partners: NTW, Merience, CEPN, INCT, RATEN, SSTC NRS, SIIEG, Amphos 21, UJV, SCK CEN, SURO, VTT

Objective: Identify stakeholder perceptions and concerns related to SMR waste management and develop recommendations for transparent information exchange and dialogue

- **Subtask 6.1: Stakeholder perceptions and concerns**
  - Develop material for multiparty dialogue seminars to cover relevant topics from Tasks 3, 4 and 5
  - Integrate positions from the larger CS group and other stakeholders (e.g., regulators, waste generators) established in EURAD-2
- **Subtask 6.2: Multiparty dialogue seminars**
  - Organise and hold two multiparty dialogue seminars engaging Task 6 participants, Civil Society, and EURAD-2 Colleges
  - Seminars planned to be held in France (M8) and Estonia (M14)

FORSAFF TIMELINE



- WP Kick-off Meeting (15.10.2024)
- Eurad-2 Kick-off Meeting (23-24.10.2024)

FORSAFF MILESTONES

Number	Name	Lead	Due
MS7	Detailed workplans for Tasks 3, 4, 5 and 6	POLIMI, Amphos 21, UJV and EIMV	M3
MS13	Identification and prioritization of SMR designs	Amphos 21 and Andra	M4
MS28	Methodology for SMR waste stream identification	POLIMI	M6
MS41	Multiparty dialogue seminar 1 outcomes	IRSN	M10
MS49	Preliminary analysis of SMR/AMR waste routes (including both pre-disposal and disposal)	Amphos 21 and Andra	M12
MS64	Multiparty dialogue seminar 2 outcomes	UTARTU	M16

FORSAFF DELIVERABLES

Number	Name	Description	Lead	Due
4.1	State of the art (SOTA) report	Review on the challenges in SMR waste management and fuel cycle considerations	POLIMI	M6
4.2	Green Paper	Guidance on SMR implementation and deployment needs from the back end of the fuel cycle perspective	Amphos 21	M12
4.3	White Paper	Identification of knowledge gaps for future RD activities	CEA	M18
4.4	Outcome/impacts report	Summarizes the work of Tasks 3, 4, 5 and 6.	VTT	M22

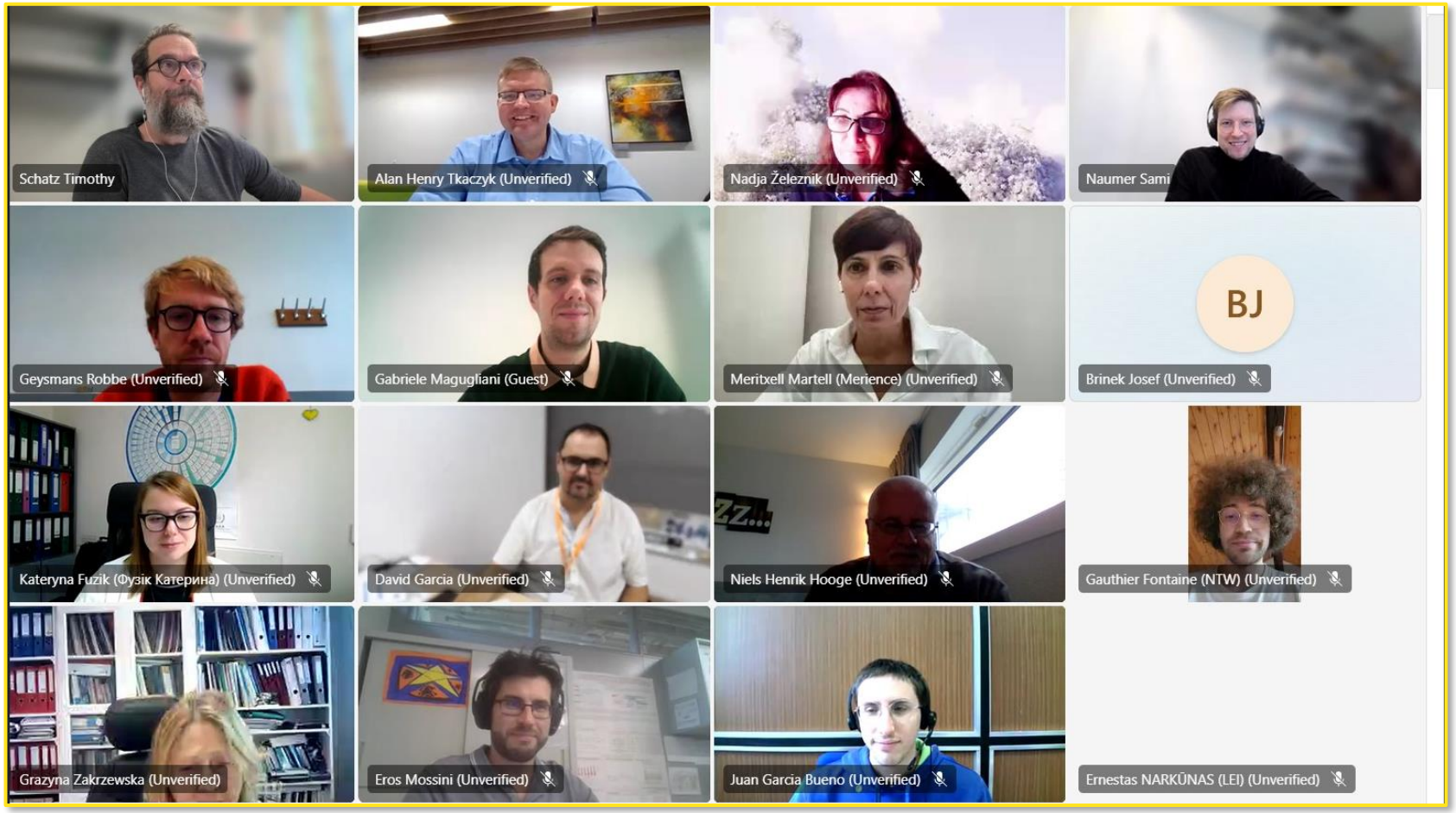
FORSAFF INTERACTIONS

- **with other EURAD-2 WPs:**

WP	Link
ASTRA	deep borehole disposal for SMR waste
ICARUS	characterization issues related to the use of alternative materials and fuels in SMRs
STREAM	predisposal treatment of new waste streams arising from SMRs
SAREC	SMR fuel inventory topics and reprocessing of SMR fuels
INCONMAND	containers to handle SMR fuel types and compatibility with existing disposal routes

- **with other initiatives:**
  - EASI_SMR (Euratom Project 2024-2028)
  - European Industrial Alliance on Small Modular Reactors
  - IAEA
  - NEA

FORSAFF KICK-OFF MEETING (15/10/2024)



THANK YOU!

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