



SAFER2028 Framework Plan

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SAFER2028

- Purpose and vision
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- Administration structure
- Research project portfolio and SAFER capability model
- Project types in SAFER2028
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SÄTEILYTURVAKESKUS
STRÅLSÄKERHETSCENTRALEN
RADIATION AND NUCLEAR SAFETY AUTHORITY

Purpose and vision SAFER2028

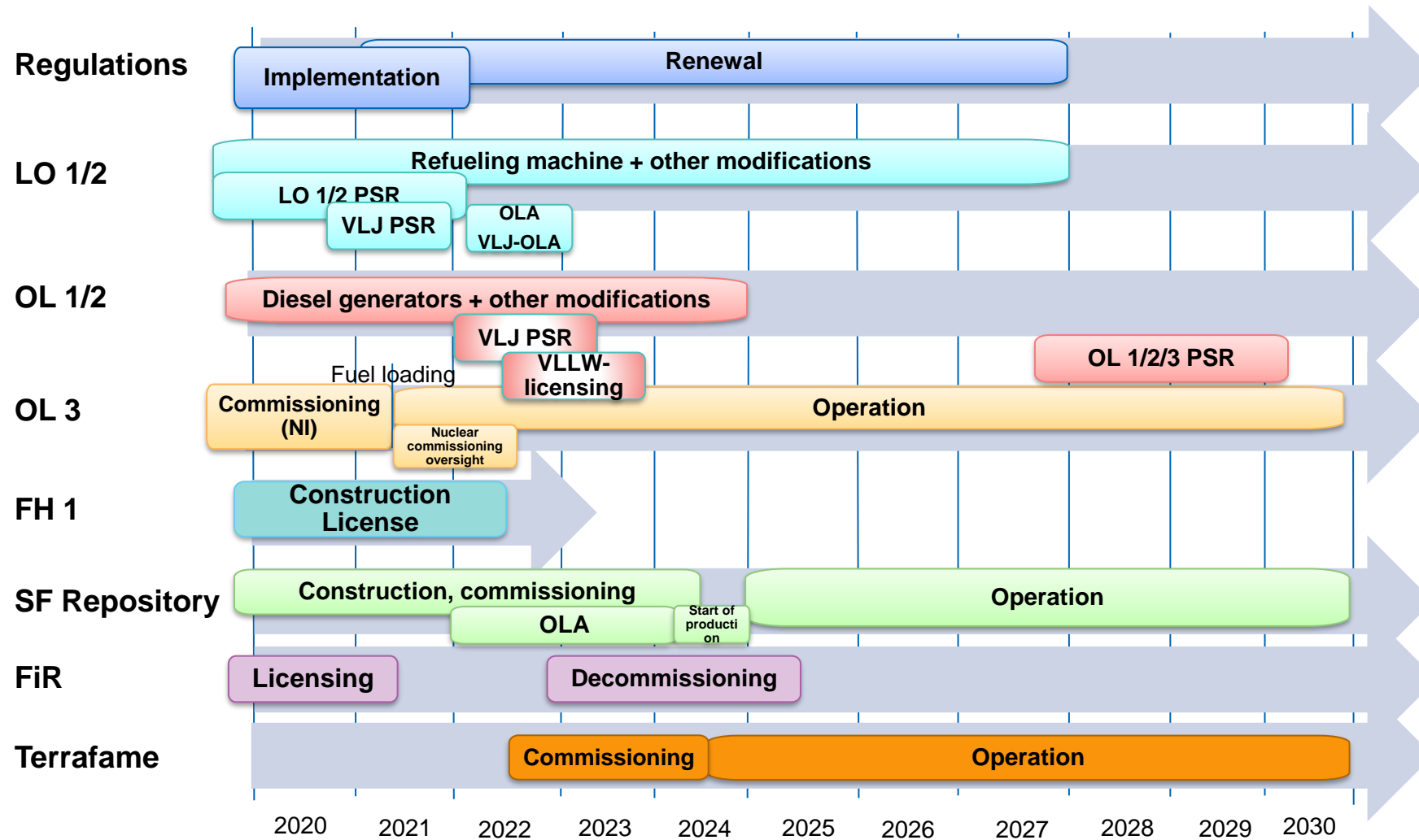
Purpose:

To ensure national nuclear energy safety expertise over generations.

Vision:

The SAFER2028 research community is a vigilant and agile competence pool that carries out excellent and internationally attractive research on topics relevant to the safety of Finnish nuclear power plants and nuclear waste management facilities.

Large oversight projects at nuclear facilities in Finland



Thematic research areas

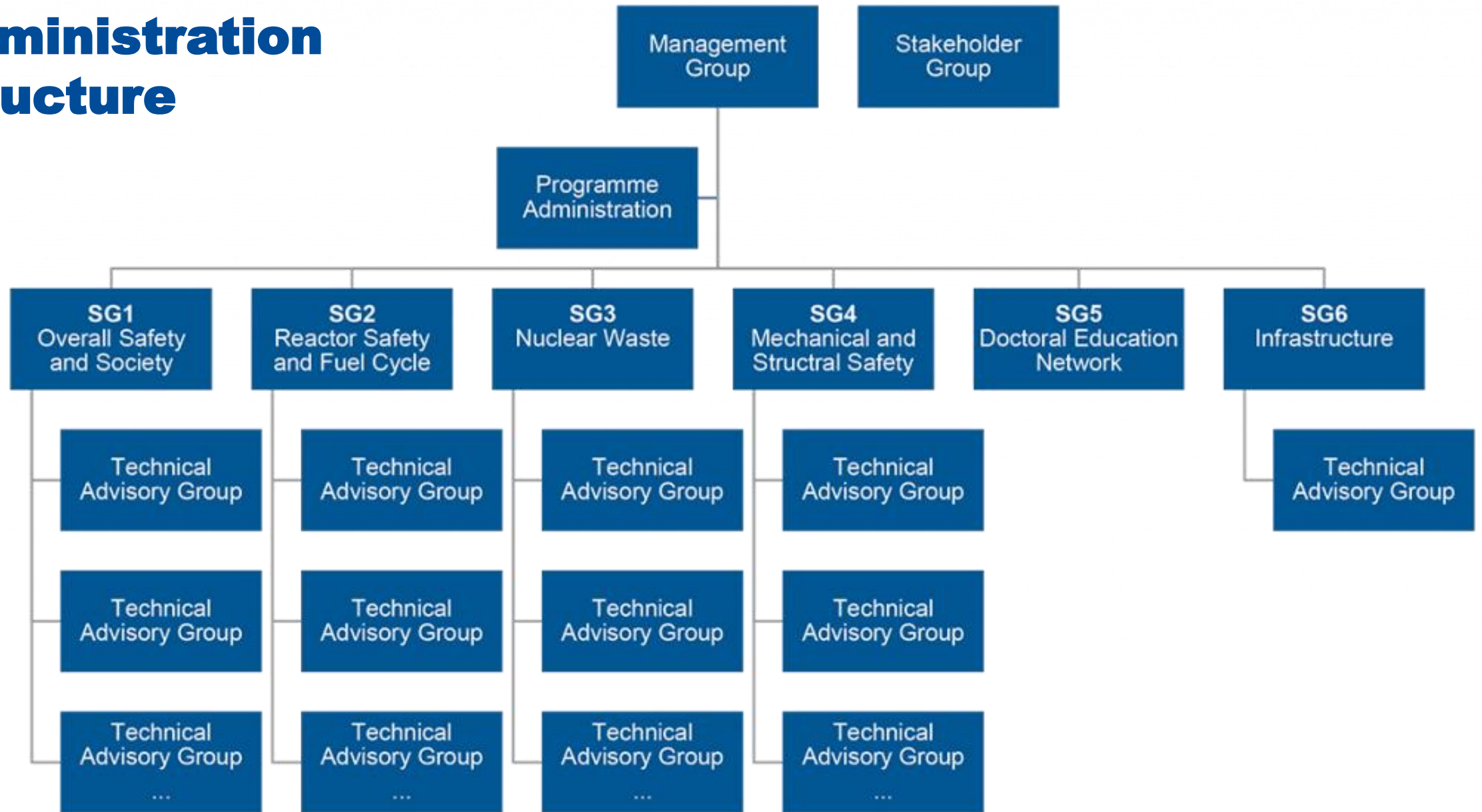
Four thematic areas

- Overall safety and society
- Reactor safety and fuel cycle
- Nuclear waste management, final disposal and decommissioning
- Mechanical and structural safety of NPPs

In addition

- Doctoral education network
- Infrastructure

Administration structure



Four thematic research areas in SAFER2028

Overall Safety and Society

- Overall safety concept
- Safety and society
- Systems engineering
- Risk assessment
- Human factors
- Organisational factors

Reactor Safety and Fuel Cycle

- Analysis tools and methods
- Experimental research
- Fuel
- Severe accidents

Nuclear Waste Management, Final Disposal and Decommissioning

- Pre-disposal of radioactive waste
- Nuclear Waste Disposal and Long-term Safety
- Long-term safety aspects and safety case methodology
- Decommissioning
- Alternative Waste Management Concepts

Mechanical and Structural Safety of NPP's

- Ageing management
- New methods and materials
- Safety related relevant loads

Research project portfolio and SAFER capability model

Crosscutting topics:

1. Infrastructure capability
2. Overall safety and systemic approach to safety
3. Validated tools and methods for safety assessment
4. Nuclear fuel and its lifecycle from reactor to final disposal
5. Ageing phenomena and the integrity of barriers of nuclear power plants
6. Long-term safety of final disposal
7. Safety and feasibility of short- and medium-term nuclear waste management activities

8. Severe accidents
9. External and internal hazards
10. Nuclear safety in a changing environment

The key areas to be assessed in the capability model are:

- 1) human resources and experts,
- 2) validated safety assessment tools,
- 3) nuclear safety research laboratories and research facilities,
- 4) career building and training and networking,
- 5) knowledge management and assets
- 6) general research programme indicators.

Objective

Milestone 2025

Milestone 2028

Infrastructure capability

Infra SG evaluates and identifies possible development areas (roadmap) and reports to MG

Infra SG reviews progress of roadmap and reports to MG

Preparation for fuel experiments transitioning to JHR on schedule

Preparation for fuel experiments transitioning to JHR on schedule

Guidance on VYR funded infra collaborative use in SAFER2028

Overall safety and systemic approach to safety

Examples of methods and approaches presented

Methods and approaches that take the systemic nature of safety into account when safety is assessed and improved

Elements of the framework for evaluation of overall safety defined

Framework for evaluation of overall safety

Examples of risk-informed graded approach in different safety management contexts presented

Principles and practices for the application of risk-informed graded approach in different safety management contexts

Objective

Milestone 2025

Milestone 2028

Validated tools and methods for safety assessment

Further development of national computational tools, taking also into account the use in new applications

New application areas in use

Better, quantified understanding of uncertainties, how they propagate in analysis chains and how they affect the applicability of tools in different application areas

Improved ways to manage uncertainties and expand applicability to new application areas

Nuclear fuel and its lifecycle from reactor to final disposal

New relevant research questions for SMRs and spent fuel management identified and projects started

Understanding of the main features of relevant SMR spent fuel disposal concepts

Research on applicability of accident tolerant fuels

Research on damaged fuel rods in storage, encapsulation and final disposal

Objective

Milestone 2025

Milestone 2028

Aging phenomena and the integrity of barriers of nuclear power plants

Identifying the most safety relevant aging phenomena with large uncertainties

More comprehensive understanding of the aging phenomena of safety critical components and structures, state of the art

Aging phenomena are covered in research projects

Better interpretation of results (tests, NDT, monitoring, additive manufacturing, 3D printing, new concrete materials,...)

Long-term safety of final disposal

Roadmap based on competence mapping update

Interactions of release barriers are covered in research projects

Operational and transient phase phenomena effects on long term safety are included

Safeguards perspectives are included in research

Better understanding of uncertainties and adapting to changes

Objective

Milestone 2025

Milestone 2028

Safety and feasibility of short- and medium-term nuclear waste management activities

Surface repositories are considered in research projects

Alternative disposal concepts are covered in research projects

Different waste streams from decommissioning are included in research projects

Severe accidents

Severe accidents in SMRs and consequences to acceptability and licensing are included in projects

State of the art analysis tools and understanding of phenomena are covered in research projects

Accident progression in shut down reactors and fuel storages are covered in research projects

Synthesis of different severe accident analysis tools are covered in research projects

Objective

Milestone 2025

Milestone 2028

External and internal hazards

Developing and maintaining sufficient understanding and assessment capabilities of seismic, meteorological and hydrological hazards, including the effects of climate change

Capabilities for analytical or experimental qualification of structures and components for seismic events, airplane collision and explosions. The sensitivity of the simulation response with respect to model parameters will be solved.

Methods and studies on multihazard analysis

Continued methodology development and maintenance of hazard estimates

Incorporation of new methods in probabilistic risk assessment and uncertainty analysis

Objective

Nuclear safety in a changing environment

Milestone 2025

Produce relevant knowledge of SMR safety features, operation approaches and the implications for safety requirements

Understanding effects of changing energy system on nuclear safety

Milestone 2028

In-depth understanding of new operation concepts and knowhow on human factors engineering

Improved understanding of how society perceives safety, risks and regulation needs in nuclear and other industries

Project types in SAFER2028

Different types of projects to support flexibility:

- Research projects lasting one or several years that apply funding annually
- Excellence projects lasting two or more years with funding granted for the entire duration of the project
- Doctoral education projects with funding granted for the entire duration of the project
- Complementary education projects for further training of experts
- Small studies initiated by the MG outside of the call as contract projects
- Projects for improving nuclear energy research infrastructure in Finland. (Infrastructure funding can also be included in any research project.)

International co-operation is warmly welcome in the project proposals (also a merit).

- OECD/NEA projects to be included in the proposals (also the fees).
- EURATOM Framework Programme, NKS, IAEA, ...

International evaluation results SAFIR2022, KYT2022 & SAFER2028

General remarks:

- High level research
- Remarkable level of scientific output for a modest stream of funding
- Quite a broad scope compared to the funding level

Further recommendations:

- Enhance end-user engagement
- Clarify priorities and objectives on competencies
- Promote informal communication and information change
- Reinforcement of knowledge management
- Reduce administrative load in projects

