NULIFE – its Role in Implementing Strategic Research of LTO related to PLIM Issues in Europe

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- NULIFE to integrate R&D on PLIM issues in Europe
- Organization and working methods
- Research and development planning
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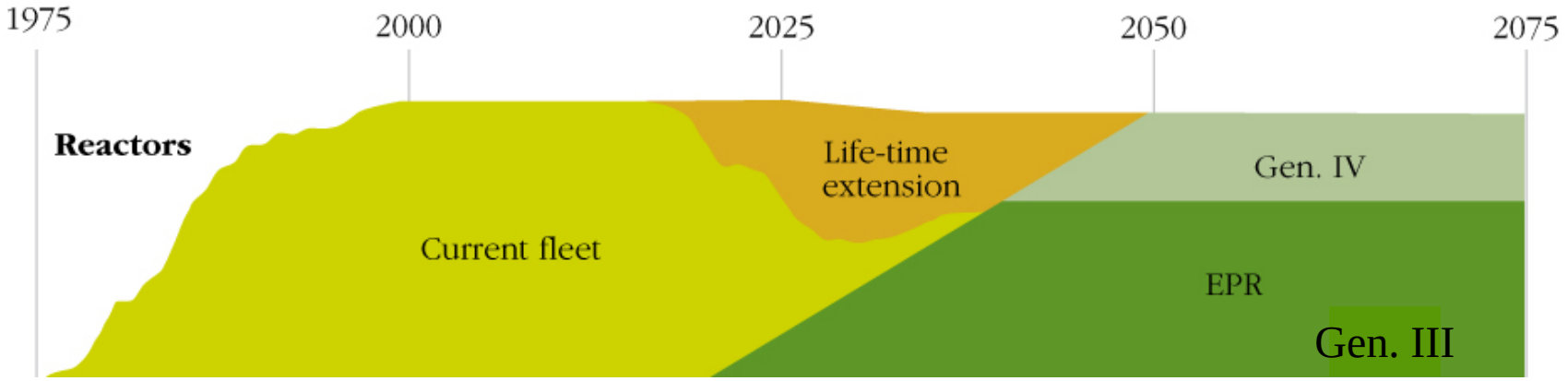
Background and introduction to NULIFE

Background

- Over the last 15 years the European Commission has sponsored a significant number of R&D projects under the Euratom Framework Programme on PLIM issues
- Joint Research Centre has developed co-operative European Networks for mutual benefits on specific topics like AMES, NESC, ENIQ
- Challenge
  - to integrate research on PLIM issues and exploiting the results of this integration through the production of harmonised lifetime assessment methods.
  - to couple R&D and future industrial needs for Long Term Operation of existing plants and future new builds.

Nuclear R&D and industrial challenges



Both ***Gen III thermal reactors and fast reactors*** are needed in parallel during the whole 21st century and even beyond.

Long term operation of current Gen II and Gen III LWRs is crucial

- in mitigating the climate change
- in providing sufficient amounts of plutonium and other actinides to be employed as fuel for fast reactors,

Target to extend the ***operation life up to 60 years or even beyond***

NULIFE to integrate R&D on PLIM issues in Europe

Nuclear plant life prediction – NoE NULIFE

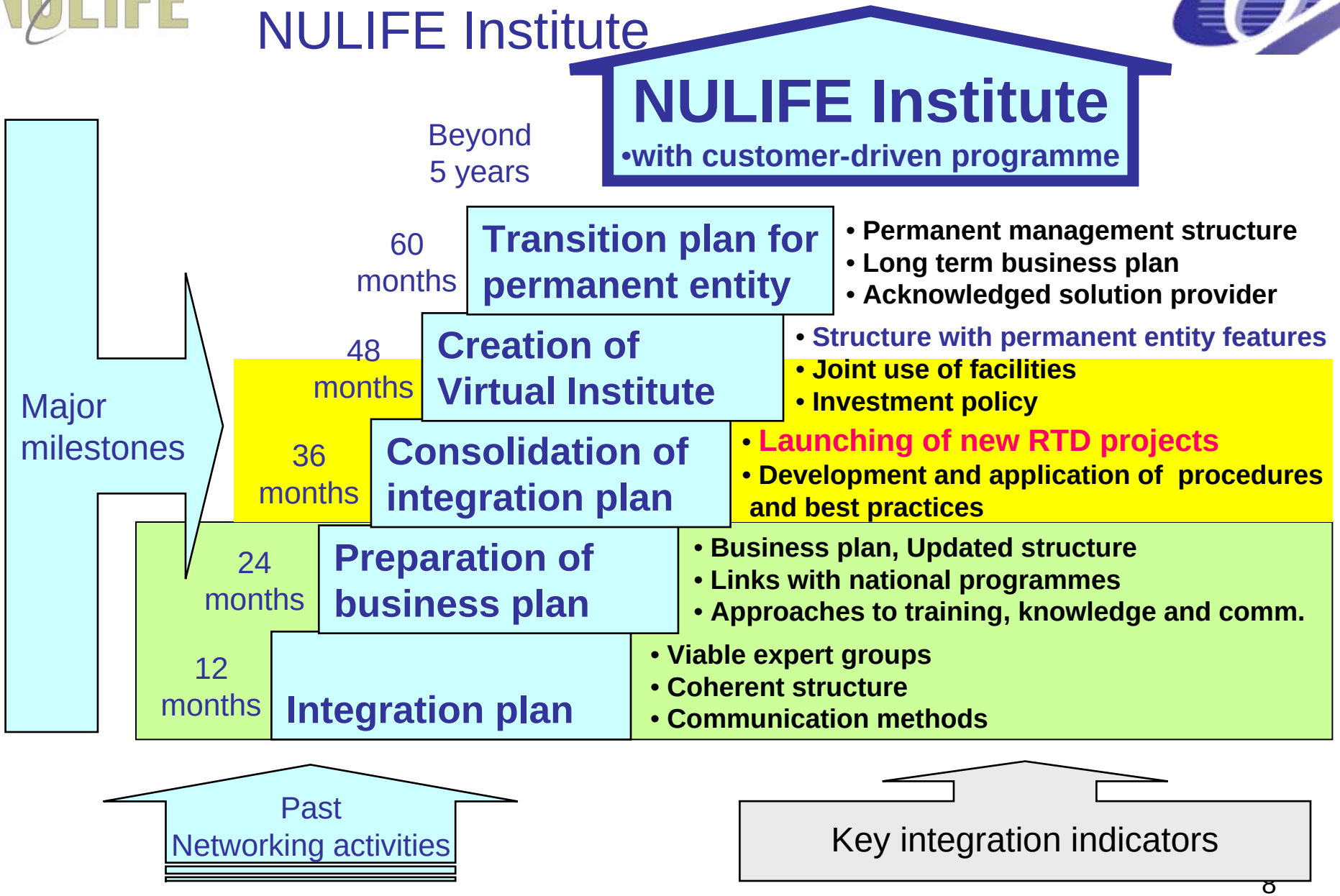
Create a single organisation structure, capable of providing harmonised R&D at European level to the nuclear power industry and the related safety authorities in the area of lifetime evaluation methods for structural components.

Vision is to create a Virtual Institute with

- Integrated RTD platform
  - Embracing all European stakeholders
  - Completely new structure with improved and efficient use of public and private RTD funding
- Sustainable forum for realizing harmonized technical procedures
  - Impact for Nuclear energy industry, National regulators and European Regulatory Working Groups
- R&D Service provider
  - Sustainable source of qualified expertise for all customers in Nuclear energy field
  - Innovator and executor of R&D projects

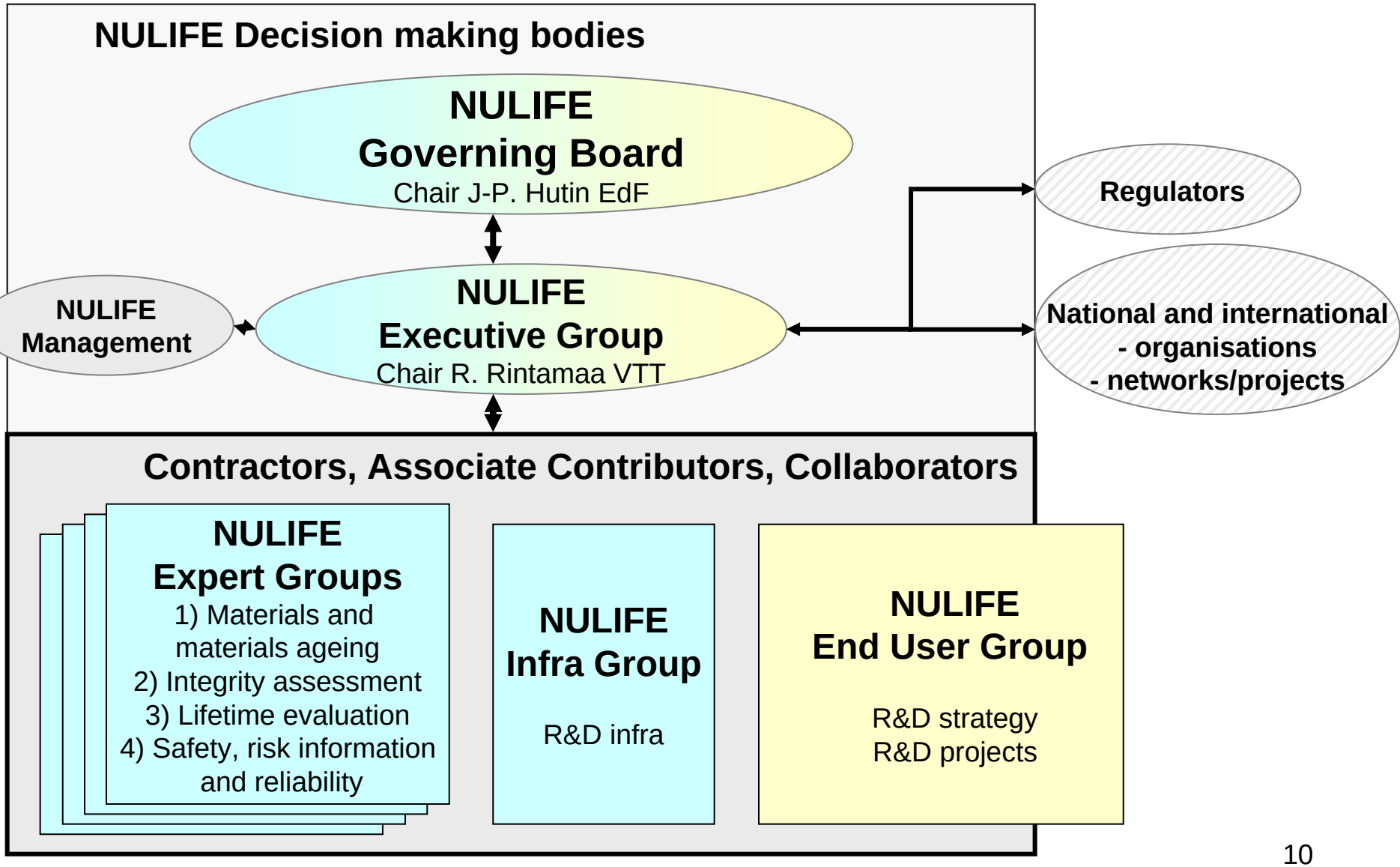
- Time schedule 10.2006 - 9.2011, 5 years
- Total budget 8.4 million euro
- EC funding 5 million euro
- VTT coordinator
- 11 Core contract members and 26 other members representing
  - National research institutes
  - Industrial research centres
  - Vendors, plant providers
  - Service providers
  - Power companies

Evolution process towards - NULIFE Institute

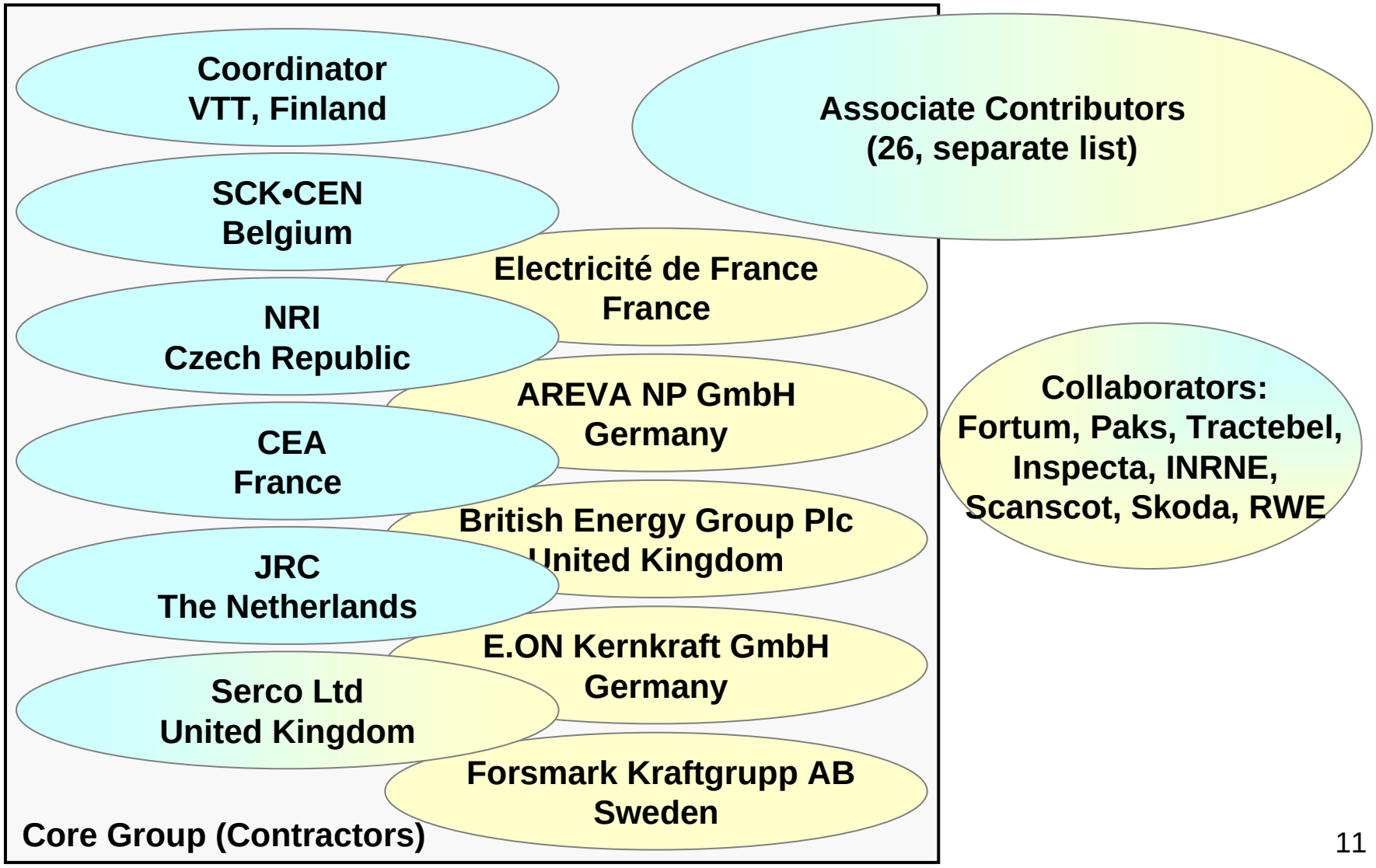


Organization and working methods

NULIFE organization
Present structure and decision making bodies

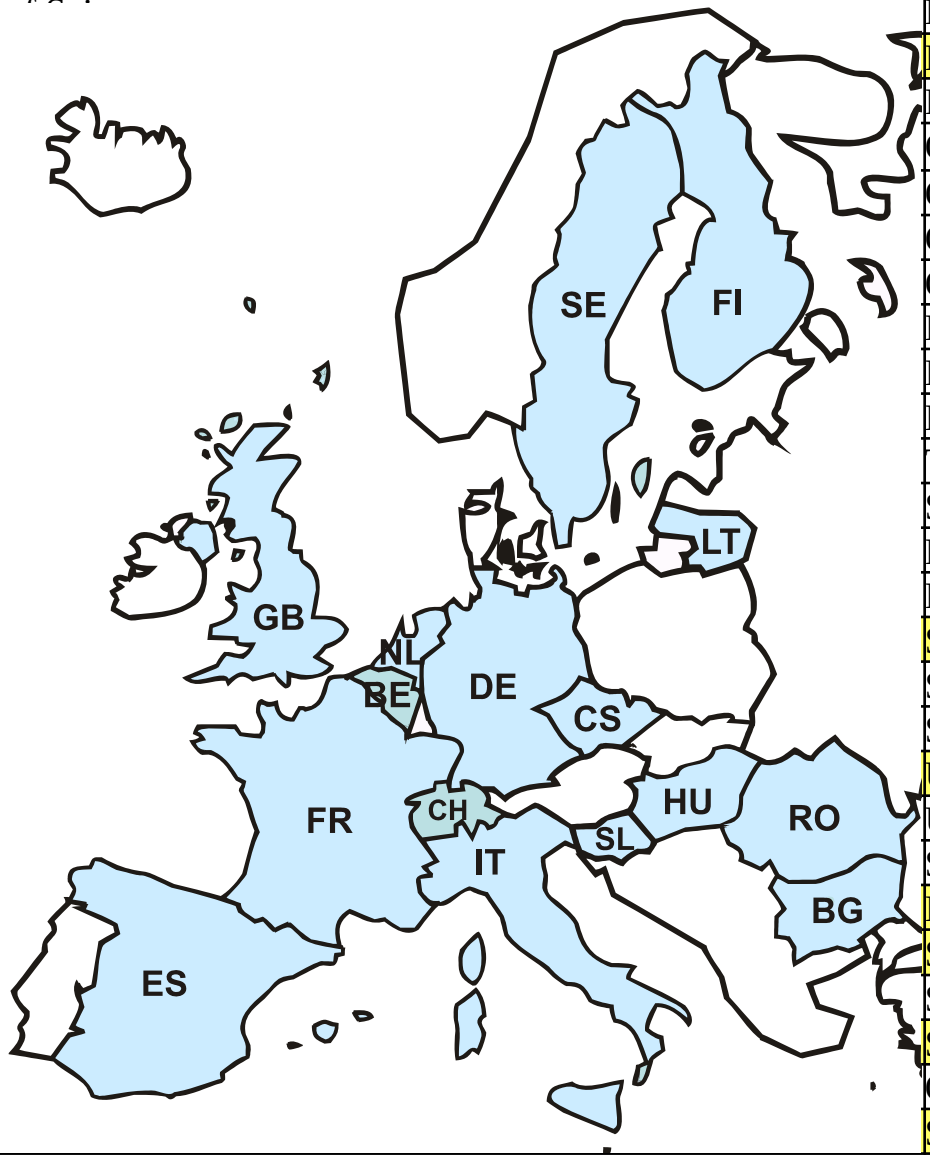


NULIFE Network member groups

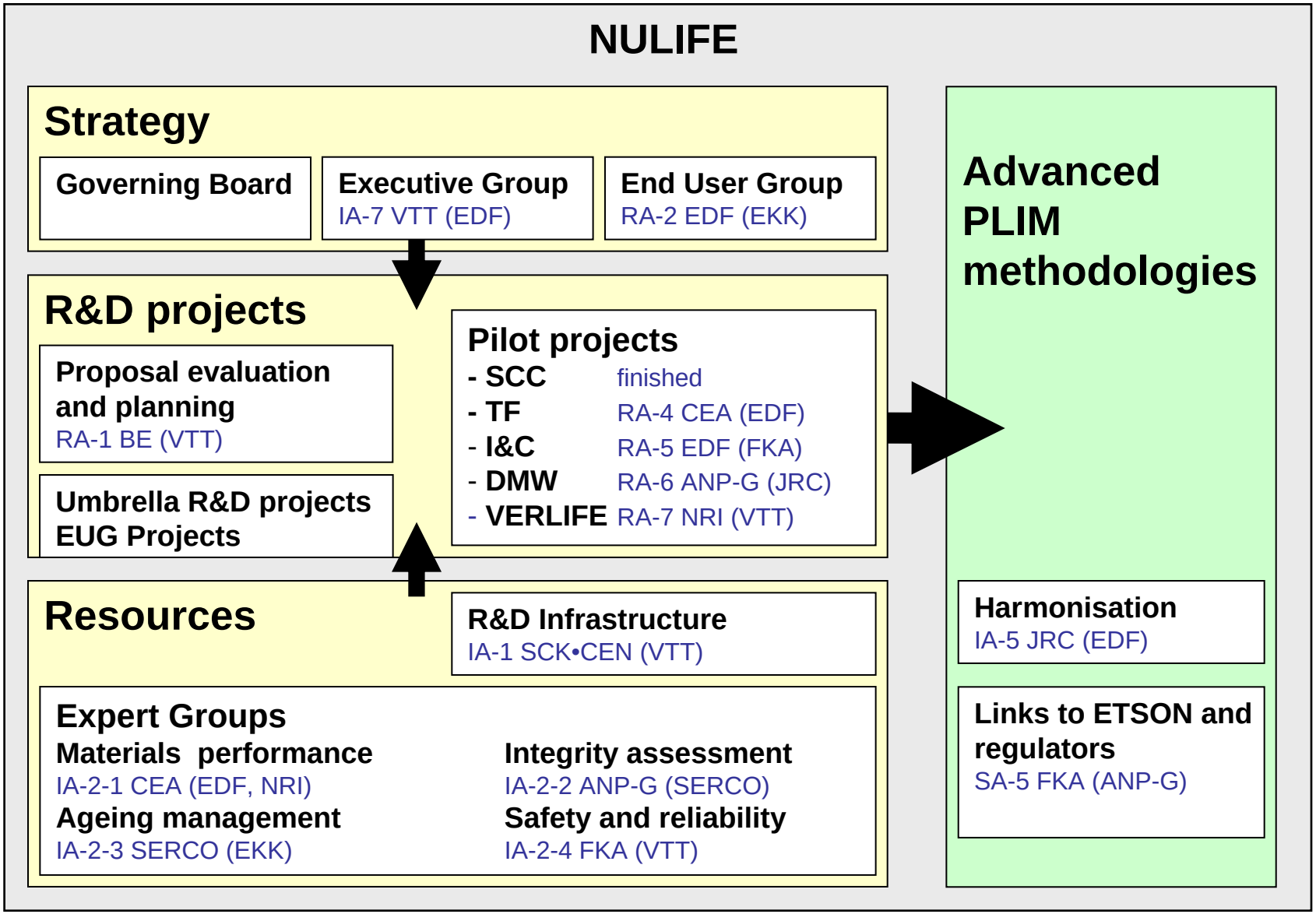


NULIFE Associate Contributors

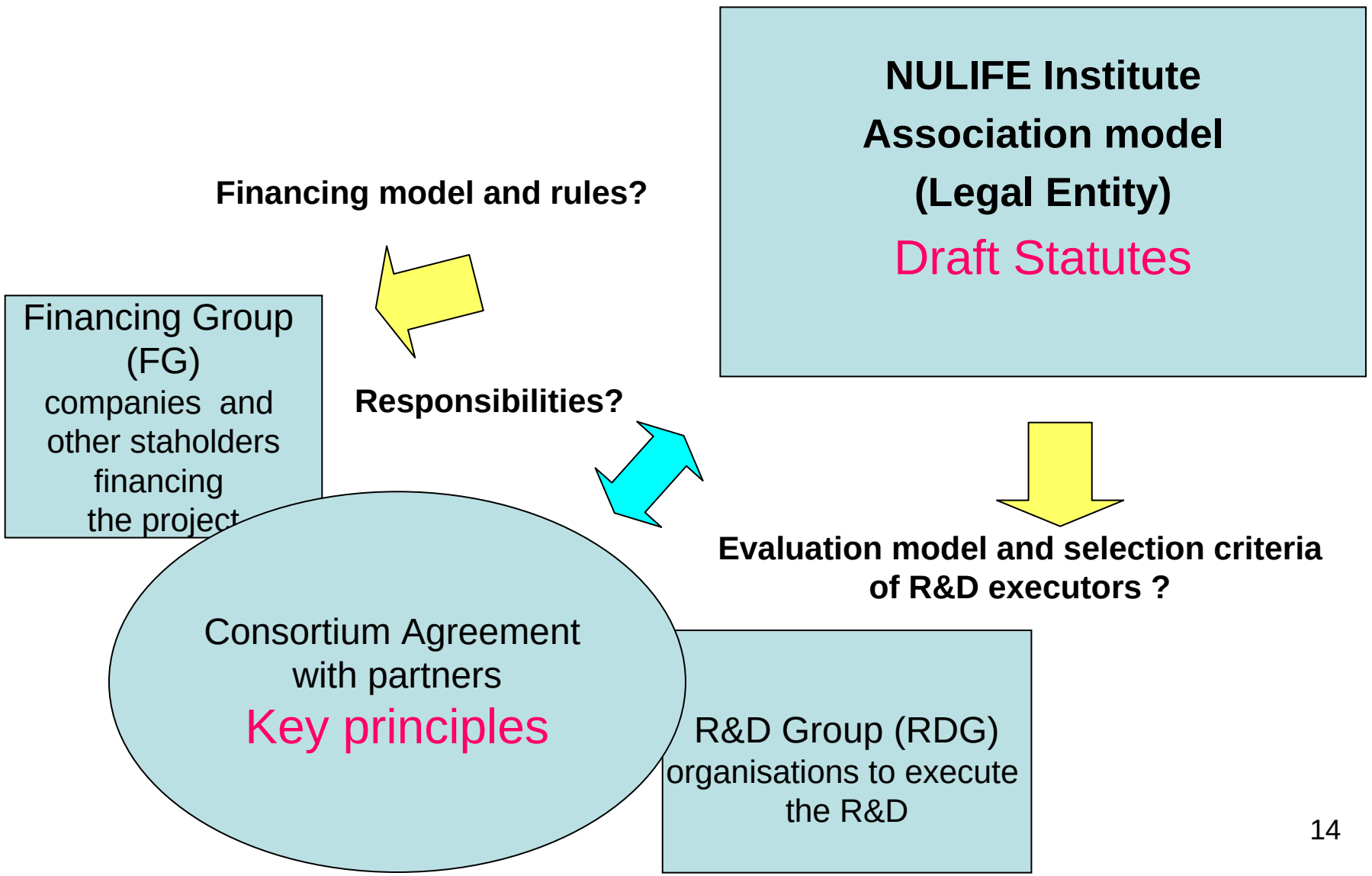
Institute of Metal Science - Bulgarian Academy	Bulgaria
AREVA NP SAS	France
Institut de Radioprotection et de Sureté Nucléai	France
Fraunhofer Institute for Mechanics of Materials	Germany
Forschungszentrum Dresden Rossendorf e.V	Germany
Gesellschaft für Anlagen- und Reaktorsicherhei	Germany
Universität Stuttgart	Germany
Bay Zoltán Foundation for Applied Research	Hungary
AEKI Atomic Energy Research Institute	Hungary
Lithuanian Energy Institute	Lithuania
Nuclear Research & Consultancy Group	The Netherlands
Centro de Investigaciones Energéticas Medioan	Spain
Institute For Nuclear Research – Pitesti	Romania
Center of Technology and Engineering for Nuc	Romania
Vattenfall Research and Development AB	Sweden
Tecnatom, S.A.	Spain
Paul Scherrer Institut	Switzerland
Rolls-Royce Power Engineering PLC	UK
The University of Manchester	UK
“Josef Stefan” Institute	Slovenia
ENEL Produzione S.p.A	Italy
Oskarshamm KG AB	Sweden
Studsvik Nuclear AB	Sweden
Westinghouse Electric Sweden AB	Sweden
Siempelkamp Pruef- und Gutachter-GmbH	Germany
Ringhals AB	Sweden



NULIFE Working model

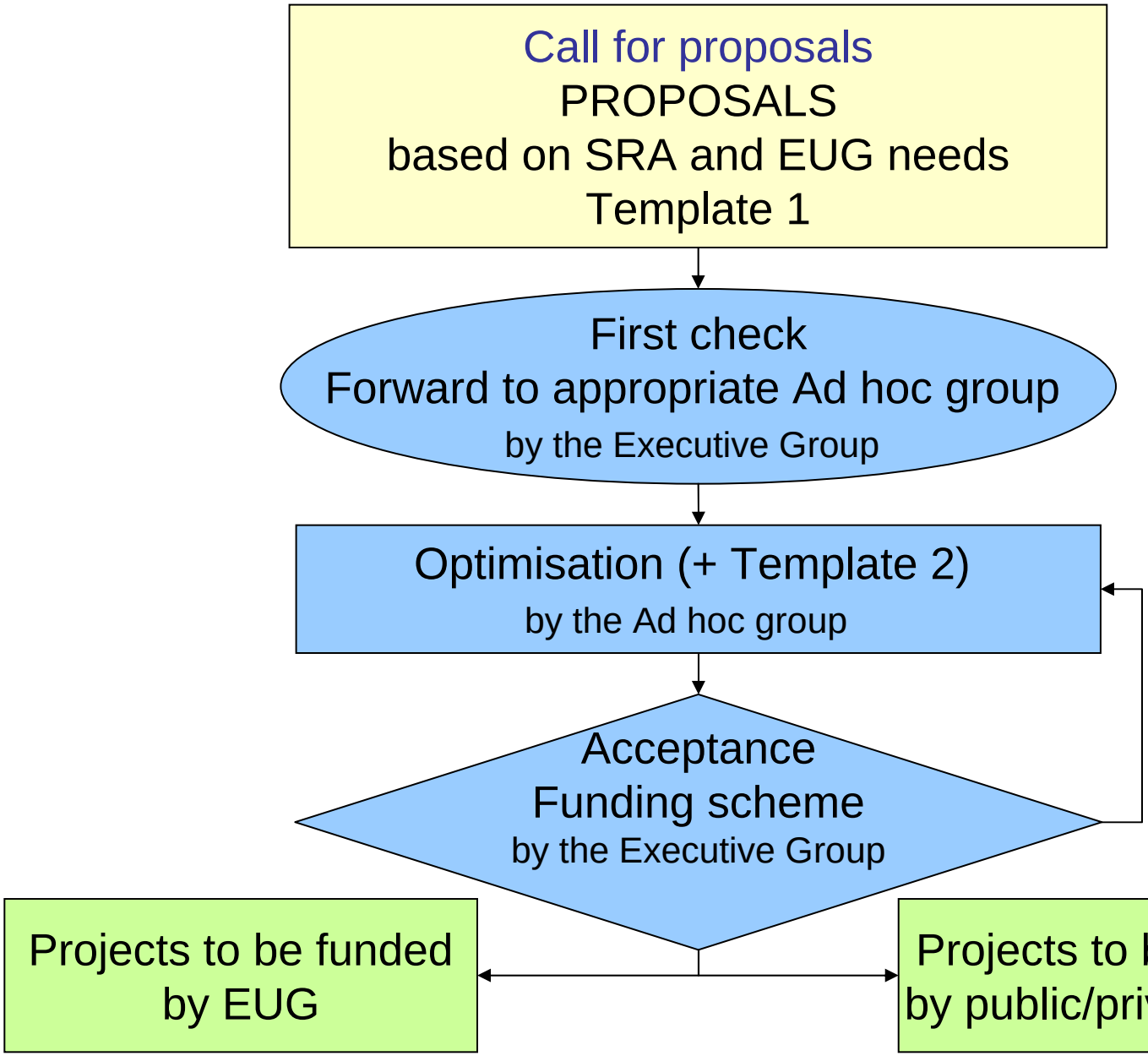


Model of NULIFE Institute
Beyond NULIFE NoE



Research and development planning

Project creation process



NULIFE Projects

Pilot projects (funded by NoE)

- Stress Corrosion Cracking SCC (completed)
  - Guideline for the High Quality Stress Corrosion Crack Growth Data
- Thermal Fatigue, TF (on-going)
  - Recommendations for high cycle fatigue tests of austenitic stainless steels, and summarize of the available tests and numerical capabilities on TH simulation
- Instrumentation & Control, I&C (on-going)
  - Databases (I&C-failures and tools to be used for degradation mechanism) developed within MAGIC (EU funded project) shall be taken over by NULIFE as well as the work performed to develop courses on I&C-management
- Dissimilar Metal Welds, DMW (on-going)
  - Provide NULIFE recommendations on good practice approach for assessment of DMWs, as part of an overall LBB procedure
- Unified procedure for WWER components VERLIFE (launching) (on-going)
- Probabilistic LBB (in launching)

NULIFE Projects

Umbrella projects (funded by public and private partnership)

- **PERFORM60**: Prediction of effects of irradiation for RPV
  - To predict the Effects of Radiation For reactor pressure vessel and in-core Materials using multi-scale modelling – 60 years foreseen plant lifetime – ***Kick-off meeting in March, 2009***
- **STYLE:** Structural integrity assessment of reactor coolant systems, piping and components (non RPV) *(under negotiation with EC)*
  - To identify **realistic failure modes relevant to the ageing and lifetime** management of pressure boundary/pressure circuit components in LWR and WWER systems as well as gas-cooled reactors
- **LONGLIFE:** Treatment of long term irradiation embrittlement effects in RPV safety assessments *(under negotiation with EC)*
  - Summary of **boundary conditions for long term operation** of 80 years (fluences, plant specifics, materials, core configurations, …)
  - Systematic (re)**evaluation of prediction tools** for irradiation embrittlement in context to safety assessment for long operation times

NULIFE Projects

EUG Projects - under planning phase

(Projects will be funded by end users (utilities), launch by the end of 2009 or early 2010)

- CABINET: Warm Pre-Stress, constraint and biaxial loading effects on integrity of RPVs
- CFD validation: Thermo-hydraulic code benchmark for heat transfer model between fluid and structure
- ACSEPT: Ageing of Concrete and Civil Structures in Nuclear Power Plants

Strategic research planning

Strategic Research Agenda

Current and Future Light Water Reactors

Strategic process of NULIFE is linked to

- Strategic Research Agenda (SRA) and Deployment Strategy (DS) of the Sustainable Nuclear Energy Technology Platform (SNETP) which define strategic challenges relevant to the scope of NULIFE.
- SNETP is a European forum gathering stakeholders sharing the same vision: from nuclear industry, research centres, technical support/safety organisations (TSO), universities, etc. June 2009: 75 members … and growing.
- The overall goal of the SENTP is to **support technological development for enhancing nuclear fission in a sustainable energy mix.**

Strategic Research Agenda

Current and Future Light Water Reactors

Stategic focus on Gen II / Gen III

- Long-term, 60 years or more, of safe and economic operation of existing Gen II Light Water Reactors
  - Safety justification
  - Ageing mechanisms (material , components & systems behaviour)
  - Modelling tools and intelligent plant monitoring systems
  - Prevention and mitigation of ageing (active asset management)
- Further development of evolutionary Gen III reactors
  - Gen III reactor will be the main reactor type until Gen IV commercial deployment
  - Need to keep and develop expertise in R&D organizations to support utilities/industry
  - Need of innovation capability
  - Need to be pro-active on safety continuous improvement

Strategic Research Agenda

Current and Future Light Water Reactors

Towards an Industrial initiative

- As a first step: Joint projects between end-users within SNETP and Nulife
  - Gen II reactor ageing to establish a strong common. understanding of the critical issues of these phenomena
  - To develop some common methods for further safety justification.

Future steps

- Prepare road maps and specific short, medium and long term research topics for each strategic focus areas identified in the SRA and DS.
- NULIFE will be a key instrument in implementing PLIM related topics of the SNETP strategies on Gen II
- The recognition of NULIFE's position in EU wide strategy implementation will assist
  - the establishment of the NULIFE Institute (legal entity) and
  - providing the sustainable LTO related to PLIM research and harmonised procedures.

Summary and Conclusions

- NULIFE NoE - an European R&D platform of high level experts integrating safety-oriented research on materials, structures and systems and exploiting the results of this integration through the production of harmonised lifetime assessment methods.
  - Well-defined and coherent structure and operation model of NULIFE NoE.
  - Competence pool of experts from 37 organisations representing national research institutes, industrial research centres, TSOs, vendors, service providers, power companies.
  - Systematic project creation process to select priorities for future NULIFE's actions and research projects.
  - New projects based on public and private R&D funding have been or are being launched.
  - Firm and active link between research organisations and end users.

Summary and Conclusions

- NULIFE is capable to be a key instrument in implementing the strategic research agenda (SRA) and the deployment strategy (DS) of the sustainable nuclear energy technology platform (SNETP) in PLIM related R&D topics.
  - Initiatives for new projects prioritised and funded by utilities are foreseen in the near future.
  - Search public and private R&D funding funding (focus on utilities) for new initiatives.
  - Search R&D providers from the NULIFE **competence pool.**
  - Provide support for project management, structure and contracting the projects.
  - Benefit from other European and international activities, collected and communicated widely in R&D forums. Synergy with international organisations and third countries is seen important and kept up.

Thank You for Your attention

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