NI 2050 Process and timeline

June 2015
- WKSP July

Scoping paper

Survey

Prep. of Survey

Filling the Survey

Assemble and Analyse Survey

January 2016
- Working MTG

Road mapping

Survey Questionnaire

Sent out

Survey Return Questionnaire

Summary Report Survey

“LAB SUMMIT”

NI 2050 ROADMAP

Cooperation

Cooperation Frameworks

Legal Models

Financial Models

© 2015 Organisation for Economic Co-operation and Development
## IEA Yearly Data Collection

Gov't RD&D funding in the field of Energy

### Nuclear Energy:

<table>
<thead>
<tr>
<th>NUCLEAR FISSION RESEARCH BUDGETS in million USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>Australia</td>
</tr>
<tr>
<td>Canada</td>
</tr>
<tr>
<td>France</td>
</tr>
<tr>
<td>Germany</td>
</tr>
<tr>
<td>Italy</td>
</tr>
<tr>
<td>Japan</td>
</tr>
<tr>
<td>Korea</td>
</tr>
<tr>
<td>Netherland</td>
</tr>
<tr>
<td>Norway</td>
</tr>
<tr>
<td>Sweden</td>
</tr>
<tr>
<td>Switzerland</td>
</tr>
<tr>
<td>USA</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
</tr>
</tbody>
</table>
IEA « Nuclear Categories »

4 Nuclear
  41 Nuclear Fission
    411 Light Water Reactors
    412 Other Converter Reactors
      4121 HWRs
      4122 Others
    Unallocated 412
  413 Fuel Cycle
    4131 Fissile Material recycling/reprocessing
    4132 Nuclear waste management
    4133 Others
  Unallocated 413
  414 Nuclear Supporting Technologies
    4141 Plant Safety and Integrity
    4142 Environmental protection
    4143 Decommissioning
    4144 Others
  Unallocated 414
  415 Nuclear Breeder
  416 Other
  Unallocated 41
NI 2050- SURVEY

1/PAST - PRESENT (actual) +
2/FUTURE (perspectives)

Categories and Subcategories

For each of them:
- Box for Description (+ annexes)
- Box for Budget (Million USD)
- Box for Manpower (man-years)

actual per year for past/present, perspective with timeline and expected necessary budget/manpower for future
NI 2050- SURVEY Categories

FISSION – scope and budget/manpower per year

RI Programmes on Reactor Technology and Safety
RI Programmes on Energy Scenarios and Fuel Cycles
RI Programmes on Waste Management and Decommissioning
Cross-cutting RI Programmes

RI programmes on Non-Electricity Applications
E&T, KM, Public Awareness Programmes in relation with RI

Large Infrastructures in support of RI Programmes

FUSION – just a budget figure per year
NI 2050- SURVEY Categories

RI Programmes on Reactor Technology and Safety

R&I Programmes on Reactor Technology and Safety

Large GEN II and III reactors:
(defined which reactor technology/type is concerned by your reply)
- Core Physics and Thermal Hydraulics
- Design optimisation/performance improvements of Systems, Structures and Components
- Optimisation of operation and maintenance
- Design Basis Safety Analysis and safety improvements – Deterministic/Probabilistic
- Beyond Design Basis Safety Analyses and Severe Accidents (phenomenons, consequences PSA Level 1/2/3, Emergency Management) and safety improvements
- Other (qualify)

Gen IV reactors and SMRs:
(defined which reactor technology/type is concerned by your reply)
- Core Physics and Thermal Hydraulics
- Development and verification of systems concepts
- Design of Systems, Structures and Components
- Safety Analyses
- Other (qualify)

Other (qualify)
NI 2050- SURVEY Categories

RI Programmes on Energy Scenarios and Fuel Cycles

R&I Programmes on Energy Scenarios and Fuel Cycle
(define which cycle U/Pu - Th/U; and which type of fuel and fuel technology is concerned by your reply. Fuel type: oxide, metal, nitride, carbide,...; fuel technology: pellets; coated particles;...)
- Energy Scenarios and role of nuclear (ia flexibility in grid)
- Fuel Cycle Strategies and Policies
- Front End Technologies (Mining, Processing, Conversion, Enrichment)
- Fuel/Cladding design and fabrication; improvement of existing and new (innovative) fuel development
- Fuel irradiation and PIE, analysis of Fuel/Cladding behaviour
- Back End Technologies: Spent Fuel Management (when not considered as waste): Storage, Reprocessing and Recycling (define the nature of reprocessing and recycling: single vs multiple, partitioning and transmutation of Minor Actinides,...)
- Others (qualify)
NI 2050- SURVEY Categories

RI Programmes on Waste Management and Decommissioning

- Decommissioning (excluding waste management) (decontamination, dismantling processes and tools, land and environment restoration,...)
- High/Medium/Low Level Waste Management and Storage (including SNF as waste) before final disposal
- Final and Geological Disposal
- Other (qualify)
Crosscutting R&I Programmes
- Multiphysics and multiscale modelling of fuels and materials, and validation/benchmarking
- Existing materials ageing (except fuel covered above): testing and prediction of behaviour, in-service inspection – for metal, concrete, polymers, others.
- New (innovative) material development (except fuel covered above): define which material, what objective pursued: ia thermal properties, mechanical properties, nuclear properties,...
- Equipment manufacturing and assembling, modular construction
- Instrumentation and Control (ia digital)
- Harmonisation, Codes and Standards: prenormative research
- Regulatory aspects and Licensing
- Health Effects of radiation and Radiation Protection, Shielding and Transport
- Human factors
- Others (qualify)
**NI 2050- SURVEY Categories**

**RI programmes on Non-Electricity Applications**

E&T, KM, Public Awareness Programmes in relation with RI

**R&I Programmes for Non Electricity Applications:** qualify

Radioisotopes for medical and industry, Cogeneration, Process Heat for industry uses, Hydrogen,…

**E&T, Knowledge Management, and public awareness Programmes in relation with Research**

- Number and level of students/postdocs engaged in research programmes (described above)
- Infrastructures (described above or others) used for E&T purposes
- Knowledge Management policies and tools
- Public Communication
NI 2050- SURVEY Categories

Large Infrastructures in support of RI Programmes

Large Research Infrastructures (hardware tools of generic nature/multipurpose in support to R&I Programmes) - use of existing, upgrade and/or new build (on going or planned) (give details on the nature, type and scope of the facility, as well as the associated timeline)
- Critical Zero Power Facilities
- Research Reactors (indicate more precise type and power level)
- Large Demonstrators/Prototypes
- Accelerators
- Large test loops and benches, integral and/or partial experiments
- Fuel Fabrication facility
- Hot Cells
- Fuel Reprocessing facility
- Large calculators/super computers
- Others (qualify)
NI 2050- SURVEY Process: Guide

WHAT ? Technical scope and budgets for the defined categories

Q: Technical Scope?... From basic research to applied and experimental, up to « demonstration » (of technical, industrial, licensing feasibility)... + Cooperation ?

Q: Budgets? Public vs Private (PPPs)?... National commitment per year

Q: Which Costs? Capital and current costs (running and labor costs) when they occur (no depreciation and no VAT)

Q: How far in the past?... 2005? Aggregation

Q: Future « perspectives » and estimated budgets... first input for roadmapping...
NI 2050- SURVEY Process: Guide

HOW to avoid « double counting »?

1. Programmes versus Infrastructures:
cost of specific use of infrastructures to be reported under Programmes → limit reported cost of infrastructures to « generic » costs for design/construction/O&M/dismantling of infrastructures, not attributable to a specific Programme
NI 2050- SURVEY Process: Guide

HOW to avoid « double counting »?

2. Country A – Country B

Ex: country A using a facility in country B – Country A should report the cost of usage under its corresponding Programme

3. Specific case: Euratom Programmes

Commission is asked to report on full cost of projects = Euratom financing + consortia’ members contributions, and to provide the figures per MS
NI 2050- Open Questions for Discussion

- Categories and process for step 1 survey?
- How far in past + future perspective?
- Views for step 2 roadmapping process?
- Level for interest for step 3?
- China/India?
- E&T, KM, HRM?
- Public vs Private?
- Involve Industry and TSOs?
- Visibility of NI2050?
NI 2050: to be successful:

Need commitment by Member Countries:

- to provide inputs to the survey (Step 1)
- to interact during the roadmapping (Step 2)
- to be potentially interested in cooperation frameworks (tbd) (Step 3)

Nomination of (one) contact point per MC.

Interactions/Meetings/Consultants?
NI 2050 Process and timeline

June 2015
- WKSP (Workshop) July
- Scoping paper
- Prep. of Survey

January 2016
- Survey
- Filling the Survey
- Assemble and Analyse Survey
- Report WKSP
- Survey Questionnaire Sent out

Dec 2016
- Working MTG
- Legal Models
- Financial Models
- Cooperation Frameworks for Cooperation

Road mapping
- "LAB SUMMIT"
- NI 2050 ROADMAP
- Frameworks for Cooperation

Cooperation
- "LAB SUMMIT"
- Cooperation Frameworks
- Financial Models
- Legal Models
- X

Products
- Scoping paper
- Report WKSP
- Survey Questionnaire
- Survey Return Questionnaire
- Summary Report Survey