Energy Research Infrastructures

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ESFRI Roadmap 2010

Needs of EU research communities in the next 10 to 20 years

- ✓**Scientific case**: uniqueness; multi-user facility of great scientific interest (open access); pan-European / international dimension
- ✓**Maturity of concept**: technologically and financially feasible

Grand Challenges: Securing energy supply and reducing greenhouse gases

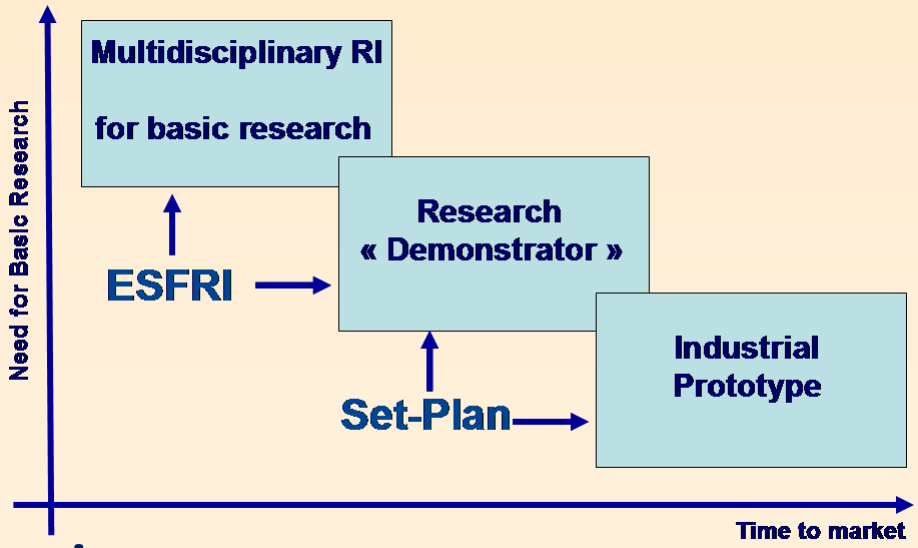
7 Energy projects out of a total of ca 50

- **JHR**: High Flux Reactor for Fission Materials Testing
- **HIPER**: High power long pulse for ignition fusion
- **IFMIF**: **International** Fusion Materials Irradiation Facility
- **MYRRHA:** Multipurpose hybrid research reactor for high-technology applications
- **ECCSEL**: European Carbon Dioxide Capture and Storage Laboratory Infrastructure
- **EU-SOLARIS:** The European Solar RI for concentrating solar power
- **WINDSCANNER:** The European wind scanner facility

- First thematic Conference on RIs "sponsored" by ESFRI
- "ESFRI-like" **RIs are fundamental** for stimulating energy innovations and **for implementing the SET-Plan**
- The Energy RIs are places where **industry meets basic research**, integrating research services along the full innovation chain and enabling a feedback loop from industrial products to research
- Stimulate the **development of energy-related RIs and demonstrators** to face quickly current challenges
- **Increase the use of existing multi-purpose RIs** for energy research
- **Close integration ("co-development") of RI policies, SET-Plan, and other Joint programming initiatives** of the European Energy Research Alliance and innovation policies and industry (European Industrial Inititatives)
- International dimension: no specific conclusion

ESFRI Strategy Working Group on Energy

- Identifying new important RIs (single-sited; distributed) and research demonstrators of pan-European interest:
  - emerging projects to be further developed;
  - new fields not sufficiently covered ("**gaps**") e.g. bio-energy; smart grids, energy efficiency, smart cities and sustainable transport; marine energy technologies
- Examining the development of **industrial prototypes** in the energy sector and their **interactions with RIs and research demonstrators**



- **Increasing international cooperation**

Multi-& interdisciplinarity, networking, joint programming

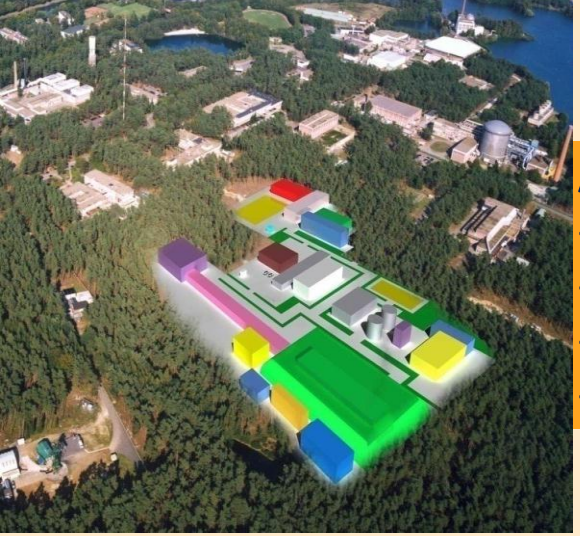
- In energy R&D, the integration of knowledge from different disciplines is essential. **Need for a more systemic approach of energy (RI) issues** (e.g. energy storage, energy mix, materials, nanoscience, bioscience, computation, ICT technologies, etc)
- In Europe, joint programming by EERA + EU Energy platforms and Joint Technology Initiatives: the specific role of, and need for, RIs in these networks should be better identified
- Need to **increase the use** of, **the transnational access** to and the **joint development** of, the existing multidisciplinary RIs, especially the analytical facilities (SR and N sources, etc)
- Creating thematic **partnerships at the facilities** with the various actors (academic, industrial) would stimulate research and innovation and pooling of resources

Energy-related materials research: main topic at SR and N sources

- Materials to store hydrogen/greenhouse gases
- Solar panels
- Photovoltaic cells
- Fuel cells & batteries
- Wind turbines
- Superconductors
- Nuclear power: structural integrity

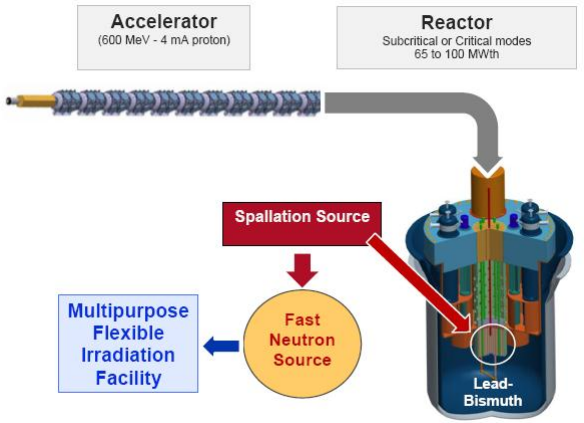
Multi-& interdisciplinarity, networking, joint programming (contd)

- **New forms of international networking of RIs** should be promoted, integrating joint research, training, diversity of partnership and mutual access (e.g. the I^3 funded by the EU FP): on thematic and cross-disciplinary topics
- **Regional specialisation** could also be envisaged, e.g. for CCS, solar, wind
- **Cooperative work on RI technologies / instrumentation**: accelerators, detectors, ICT, data infrastructure, etc
- Develop in a more systematic and innovative way the **use for energy research of (RIs in) Socio-Economic Sciences, Environment and Health + e-Infrastructures**
  - modelling of innovation processes; simulation of physical processes (e.g. energy flows); impacts of energy systems, or impact of climatic factors for renewable energy systems



An example: MYRRHA

Addresses global issues
- Burning legacy of the past
- Reducing cost of ultimate waste
- Better use of resources
- Enhance safety



A combination of a high energy proton linear accelerator and a lead-alloy cooled fast spectrum irradiation facility

A multi-purpose facility
- Fast spectrum irradiation facility for material and fuel developments for Gen IV (and fusion) systems
- Accelerator driven system (ADS) concept demonstration
- Study of the efficient transmutation of high-level nuclear waste
- Contribute (as a critical Pb-alloy based reactor) to the development of lead fast reactors as a European Technology Pilot Plant
- Fundamental research by making use of a fraction of the proton beam of the high-energy LINAC ("ISOL@Myrrha", on NuPECC Roadmap and in Interuniversity Network supported by BELSPO)
- Production of radioisotopes for medical and industrial applications, as well as doped silicon for renewable energy applications (wind turbines, photovoltaic cells and hybrid cars)

Offers **opportunities for international cooperation** (R&D) **and partnership** (construction, operation)

Impacts
- Environment
- Health
- Socio-economy
- Basic research
- Training

3 Recommendations

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- **New forms of international networking of RIs** should be promoted, integrating joint research, training, diversity of partnership and mutual access (e.g. on the model of the I^3 funded by the EU FP): on thematic and cross-disciplinary topics. **Regional specialisation** could also be envisaged, e.g. for CCS, solar, wind
- How to develop intergovernmental visions (like ESFRI for the EU)? Use the possibilities offered within the framework of the existing international organisations like OECD (GSF, IEA/Implementing Agreements) or bi- or multilateral policy instruments and meetings (examples: EU-US Energy Council, ESFRI+EU regular contacts with Australia, Russia, Brazil, Canada and China)