JRC activities in Nuclear Safety, Security and Safeguards

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Outline

• Overview of the JRC
• Mission of the JRC
• EURATOM HORIZON 2020 Objectives
• JRC priorities in nuclear safety, security and safeguards
• Infrastructure of the JRC Institutes
Who are we and what do we do?

JRC is the European Commission’s in-house science service. It provides the science for policy decisions, with a view to ensuring that the EU achieves its Europe 2020 goals for a productive economy as well as a safe, secure and sustainable future.

The JRC plays a key role in the European Research Area and reinforces its multi-disciplinarity by networking extensively with leading scientific organisations in the Member States, Associated Countries and worldwide.
JRC current Structure

- **IET** - Petten The Netherlands
  *Institute for Energy and Transport*

- **IRMM** - Geel Belgium
  *Institute for Reference Materials and Measurements*

- **ITU** - Karlsruhe Germany
  *Institute for Transuranium Elements*

- **IPSC** - Ispra Italy
  *Institute for the Protection and Security of the Citizen*

- **IHCP** - Ispra Italy
  *Institute for Health and Consumer Protection*

- **IES** - Ispra Italy
  *Institute for Environment and Sustainability*

- **IPTS** - Seville Spain
  *Institute for Prospective Technological Studies*

7 Institutes in
5 Member States

- **JRC Nuclear site**
- **JRC Partially Nuclear sites**
Quick Facts

- Established in 1957
- 2,822 scientific and technical personnel, of which ~1,000 are short-term staff
- 1,213 policy support deliverables in 2012
- 632 peer reviewed scientific publications in 2012
- Budget: €356 million annually, plus €62 million earned income

7th Annual International Conference on Sustainable Development through Nuclear Research and Education.
29/05/2014
The Mission of the Joint Research Centre

... is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of EU policies.

As a service of the European Commission, the JRC functions as a reference centre of science and technology for the Union.

Close to the policy-making process, it serves the common interest of the Member States, while being independent of special interests, whether private or national.
Science-based input to EU legislation and standardisation

JRC

Scientific-based Support

EU Legislation Standardisation

Innovation Jobs & Growth

Sustainability Competitiveness

7th Annual International Conference on Sustainable Development through Nuclear Research and Education. 29/05/2014
A Networked Organisation

The JRC works with over 1 000 public and private organisations, institutions and expert groups in more than 250 major networks worldwide:

• Cooperation and partnerships with key organisations
• Support to enlargement
• Training and mobility of researchers
• Access to scientific infrastructures
• Support to European Research Area policies
• Support to standardisation
Main competence areas

- Energy
- Clean transport
- Environment & Climate change
- Agriculture & Food security
- Health & Consumer protection
- Safety and security, including nuclear
- Information and communication technology
What is Horizon 2020?

EU Research Programme for Research & Innovation
A Strategy for Growth & Jobs

A core part of **Europe 2020**, Innovation Union & European Research Area:

- Responding to the economic crisis to invest in future jobs and growth
- Addressing people’s concerns about their livelihoods, safety and environment
- Strengthening the EU’s global position in research, innovation and technology
Horizon 2020 – the ‘Euratom Programme’

- Euratom Research and Training Programme
- Years 2014-2018
- Integral part of Horizon 2020

**General objective:**

- Improve nuclear safety, security & radiation protection
- Contribute to the long-term decarbonisation of the energy system, in a safe, efficient and secure way
Euratom Programme (2014-2018) complementary to the Horizon 2020

→ Council Decision on 16 December 2013

- **DG-RTD indirect actions**
  - Fusion Energy
  - € 727 million (45%)

- **DG-RTD indirect actions**
  - Nuclear Fission, Safety and Radiation Protection
  - € 316 million (20%)

- **JRC direct actions**
  - Nuclear Safety, Security and Safeguards
  - € 560 million (35%)

**Total budget: € 1603 million**


→ Council Decision on 13 December 2013
Specific objectives for indirect actions (fission):

- Support safe operation of nuclear systems;
- Contribute to development of solutions for the management of ultimate waste;
- Support development and sustainability of nuclear expertise and excellence in the EU;
- Support radiation protection and development of medical applications;
- Promote innovation and industrial competitiveness
- Ensure availability and use of research infrastructures
EURATOM direct actions objectives within Horizon 2020:

1. Improve nuclear safety including: reactor and fuel safety, waste management & decommissioning, and emergency preparedness;

2. Improve nuclear security: nuclear safeguards, non-proliferation, combating illicit trafficking, nuclear forensics;

3. Raising Excellence in the nuclear science base for standardisation;

4. Foster knowledge management, education and training;

5. Support the policy of the Union on nuclear safety and security
1. Nuclear reactor safety

- Follow up on **stress tests** implementation – National Action Plans

- "Clearinghouse"

- Contribute to scientific knowledge regarding **plant life extension**

- Support to the **EU nuclear safety policies** inside and outside the EU (Euratom Treaty, Nuclear Safety Directive)

- Euratom **Generation IV** International Forum coordination and scientific support
2. Nuclear fuel & fuel cycle safety

- Assessment of safety limits of nuclear fuel behaviour in normal, transient and accident conditions
- Safety of advanced fuels (Gen IV)
- Nuclear fuel partitionning and transmutation
3. Emergency preparedness & modelling

- Strengthen the capacity to respond to nuclear accidents and incidents by:
  - Further integrated investigation of severe accidents in nuclear power plants;
  - Improved mitigation mechanisms;
  - Development of models for source term, accident progression and radiological dispersion; radioactivity measurements; environmental monitoring tools
4. Nuclear safeguards, non-proliferation & security

- Technologies, methodologies, Reference Materials, applied for Safeguards and Additional Protocol
- Export Control, Non-proliferation Analysis based on open source information
- Development and application of enhanced methods and technologies to prevent, detect and respond to nuclear and radioactive material misuse
- CBRN (Chemical, Biological, Radiological, Nuclear) security within and outside the EU
  - EU CBRN Action Plan: strengthen CBRN security in the EU
  - EU CBRN risk mitigation and preparedness: Centres of Excellence initiative/technical support to DG DEVCO actions
5. Waste management & decommissioning

- Assessment of the long-term **behaviour of spent fuel** during storage and in disposal scenarios
- Support the implementation of the EU **2011 Waste Directive** on spent fuel and waste management
- Research in **alteration/corrosion** mechanisms
- Develop **EU research, training and education** for decommissioning: waste reduction techniques; harmonisation and standardisation of technologies; contamination, characterisation and waste qualifications
6. Education and Training, knowledge management

- Monitoring EU trends in human resources through its European Nuclear Human Resources Observatory

- Delivering dedicated nuclear training and education programmes by the European Nuclear Safety and Security School

- Collaborations, PhD's, user access programmes to JRC facilities, in the field of:
  - Basic research
  - Materials research
  - Nuclear data measurements
7. Transparency

- High priority in the nuclear field
  - Possible specific amendment to Nuclear Safety directive (2009)

- DG ENER and DG JRC initiative Energy Transparency Centre of Knowledge (E-TraCK): Facilitating public participation in energy policy implementation by:
  - Collecting and disseminating the existing knowledge and good practices on transparency governance.
  - Providing a repository of guidance and recommendation documents that might facilitate civil society participation in nuclear energy decision making at national and local level.
  - First project will be on Radioactive Waste Management
Infrastructure

Further improve the required nuclear infrastructure for training courses
JRC FACILITIES - IRMM

- Nuclear data for safety of reactors and radioactive waste management
- Basic Research in Nuclear Physics and Nuclear Data Standards
- Radionuclide metrology for primary standardisation and EU policy support
- Metrological tools to support nuclear safeguards activities

Van de Graaff

Two accelerator-based neutron data facilities
Laboratories for the preparation of nuclear reference materials
Radionuclide measurement laboratories
Underground low-level radioactivity laboratory
  - gamma-ray spectrometry with detection limits of the order of mBq/kg
**JRC FACILITIES - IET**

**High Flux Reactor (operated by NRG)**

- Research neutron standardization techniques
- Safety of reactors and fuels (Minor Actinide Recycling, HTR fuels)
- Materials for Gen III and IV thermal and fast reactors (integrity of: pins, Graphite – AGR, steels + welds)
- Materials for fusion reactors (shielding blanket in ITER)

**JRC Activities on structural materials**

- Physics-based material models (relate microstructure => global material properties)
- Test techniques: small punch test, very high high-cycle fatigue
- Environmental assisted degradation in nuclear components.
- Knowledge management and data bases
- Training
JRC FACILITIES - ITU

Solid state NMR

Hot cells (24)

Transmission electron microscopy

Large geometry secondary ion mass spectrometry (SIMS)

Surface science

Minor Actinide laboratory
Questions ?
Thank you for your attention!