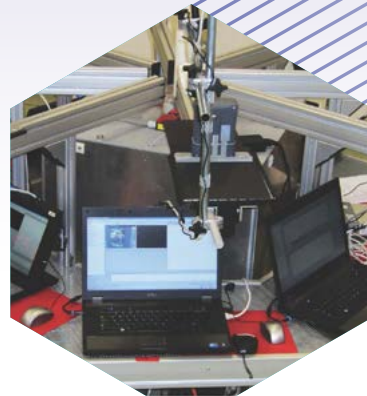




EU CONTRIBUTIONS TO NUCLEAR SAFEGUARDS



July 2024

Nuclear safeguards are measures to verify that states honour their international legal obligations to use nuclear material and technology only for peaceful purposes. The development and implementation of safeguards and related nuclear security technologies is a priority of EU policy.



EURATOM SAFEGUARDS

The Directorate General of Energy at the European Commission implements Euratom safeguards under Chapter 7 of the Euratom Treaty¹. The respective reporting requirements for holders of nuclear material are laid out in Regulation 302/2005, which is currently under revision. The European Commission's Joint Research Centre (JRC) scientific, technical, and operational support for Euratom Safeguards is crucial for the ability of the Commission to draw **annual safeguards conclusions**. The JRC's support activities for Euratom Safeguards include:

- Operating an **on-site laboratory** at the Reprocessing Plant in La Hague (France) **on behalf of Euratom Safeguards**
- Providing analysis of **nuclear inspection samples**
- Metrological quality control tools such as **Certified Reference Materials**
- Tools for **containment and surveillance**
- Tools for **process monitoring**
- Developing equipment for **Non-Destructive Analysis**
- Providing **trainings to Euratom inspectors and test newly developed Operational Technology**, thanks to the JRC unique infrastructure and availability of nuclear material



SUPPORTING THE INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA)

All EU countries are members of the IAEA and parties to the Treaty on the Non-Proliferation of Nuclear Weapons. Safeguards agreements (with respective additional protocol) have been concluded between the EU states, Euratom and the IAEA. The IAEA and the Commission collaborate closely by performing joint inspections of nuclear installations and using common instrumentations and techniques while maintaining their ability to draw independent conclusions. For more than 40 years, the European Commission has been providing technical support to the IAEA in nuclear safeguards. This collaboration with the IAEA is framed by the European Commission Support Programme (EC SP) that has included around 150 actions, out of which 36 are still active. The EC SP activities focus on multiple fields:

1 Treaty establishing the European Atomic Energy Community (Euratom)

- Analysis of **nuclear material and environmental particle samples**
- Development and provision of **reference materials and particles**
- Development of **measurement techniques**
- **Containment, surveillance and sealing/identification** techniques
- Information technologies for **non-proliferation studies**
- **Process monitoring** techniques
- Development of **concepts and approaches**
- **Training of inspectors**



STRENGTHENING INTERNATIONAL NUCLEAR DISARMAMENT VERIFICATION

Participation in the International Partnership for Nuclear Disarmament Verification: The European Commission's Joint Research Centre (JRC), through its participation in the International Partnership for Nuclear Disarmament Verification (IPNDV), **supports international efforts to develop potential procedures and technologies for disarmament verification.**

Sound verification technologies: JRC research addresses potential verification technologies such as Passive Neutron Counting; Pulsed Neutron Interrogation; Calorimetry; 3D Lasers for Design Information Verification; 3D Lasers for identification, authentication, and containment; 3D surveillance; Tamper indicating seals and enclosures.



FOSTERING COOPERATION ACROSS THE GLOBE

Research & Development cooperation agreements have been established between the **European Atomic Energy Community (Euratom)** and other partners including:

- **IAEA**
- **Non-EU countries:** US, Japan, China, Canada, Argentina, Australia, South Africa
- **Regional associations worldwide:** Brazilian–Argentine Agency for Accounting and Control of Nuclear Materials, Asia-Pacific Safeguards Network, Australian Safeguards and Non-Proliferation Office, and the European Safeguards Research and Development Association (ESARDA)

Through the **European Instrument for International Nuclear Safety Cooperation (INSC)**, the EU supports the strengthening of the State System for Accounting and Control (SSAC) of nuclear material in third countries. The EU contributes through the INSC and in partnership with Finland to the strengthening of nuclear material control systems of African States, in close cooperation with the African Commission on Nuclear Energy (AFCONE).



CONTRIBUTING TO KNOWLEDGE AND EXPERTISE DISSEMINATION

European expertise on safeguards and research results are disseminated through the delivery of specific projects funded by the European Commission. Additionally, the EU makes available for students and trainees of INSC partner countries high-quality courses on nuclear safeguards, including a 1-year master programme, through the [Safeguards Training and Education](#) (SaTE) project.

The European Nuclear Security Training Centre (EUSECTRA) offers training courses based on identified needs of EURATOM and IAEA inspectors. The Centre gathers staff with a strong expertise and capability built during the last two decades thanks to the interaction and commitment of the nuclear safeguards inspectors who deliver courses such as:

- **Additional Protocol Exercise (APEX)**
- **3D Laser-based Design Information Verification**
- **ESARDA Course on Nuclear Safeguards and Non-Proliferation**

For **analysis of nuclear material and environmental particle samples**, the JRC uses a number of Analytical Techniques accredited by ISO 17025 e.g.: Hybrid K-Edge Assay; Calorimetry; High Resolution Gamma Spectrometry; Mass spectrometric methods (thermal ionisation, secondary ion, Inductively Coupled Plasma).

The **on-site laboratory at La Hague Reprocessing Plant** provides independent verification of the nuclear material accountancy by analytical measurement of samples taken at key measurement points using radiometric assay, chemistry, and mass spectrometry to the highest quality standards.

The JRC is one of the major developers and accredited (ISO17034) producers of **reference materials** in the world. Reference materials are reliable quality assurance tools that provide confidence in measurement results. They play a key role in the calibration of laboratory instruments, for validation of analytical methods and in quality control.

Inter-laboratory Comparisons, so called **proficiency testing**, is organized to check the ability of a laboratory to deliver accurate testing results. The JRC, as accredited proficiency testing provider (ISO17043), plays a central role in organising nuclear inter-laboratory comparison programmes in support to European and international non-proliferation.

Pulsed neutron facility (PUNITA) for research in Non-Destructive Analysis methods and instrumentation for applications in nuclear safeguards and security.

PUNITA can be used e.g. for mass determination of small fissile quantities through detection of prompt fission neutrons and for the U / Pu ratio through detection of delayed neutrons.

IT tools for safeguards applications as e.g. VideoZoom for surveillance stream reviews. VideoZoom uses image summaries and a zooming interface to enable the inspector's ability to detect safeguards-relevant events, whether typical or anomalies. Inspectors see image details or context information on-demand.

Mobile Laser Scanning Platform (MLSP) is one of several JRC laser developments. It is used for fast and accurate 3D mapping and indoor localization. When a historical scan is available, the MLSP allows automatic change analysis/progress monitoring. MLSP works in outdoor and indoor environments. In addition, it can be used for material volume measurement in support of Physical Inventory Verification activities.

Sealing technologies and related trainings to safeguards inspectors. One of more recent developments, Operator Applied and Removed Seal (OARS) for transport casks (Encapsulation Plant & Geological Repository), uses sealing bolt spring equipped with an internal optical fiber connected to an electronic active monitoring device. It senses when the bolt is correctly torqued and monitors all the closing and opening parameters.