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JRC scientists monitor safeguards compliance of 80% of the world's reprocessed nuclear fuel

The European Commission's Joint Research Centre (JRC) operates the on-site laboratories at reprocessing plants in the nuclear sites of Sellafield (UK) and La Hague (France) to analyse samples of spent fuel in situ. The throughput of these plants represents 80% of the world's reprocessed spent nuclear fuel, which is verified by European Commission inspectors, supported by JRC scientists in these facilities in order to assure its compliance with nuclear safeguards. Thanks to its expertise in this field, the JRC was involved in the set up of the only similar facility in the world outside the EU, located in Rokkasho (Japan). In addition, the JRC also provides training to Euratom and the International Atomic Energy Agency's (IAEA) safeguards inspectors.

From the 2000 tons of spent fuel which are reprocessed per year in Sellafield and La Hague - equivalent to the consumption of 70 reactors - the JRC's Institute for Transuranium Elements (ITU) performs on average 800 sample analyses per year, checking both input and output. Following these tests, Euratom inspectors from the Commission's Directorate General for Energy evaluate the results to assure that the nuclear material is only used for declared, peaceful purposes.

JRC-ITU analysts are present on-site for more than 40 weeks per year, ensuring a continuous flow of results. They receive, analyse and inventorise samples, crucial for nuclear accountancy. The analyses performed allow Euratom inspectors to check, independently of the plant operator, the fissile material chain and inventory of these facilities.

With increased global security concerns over potential terrorist acts, undeclared nuclear activities and political issues with nations seeking nuclear capability, the need to track, detect, and safeguard nuclear material globally has never been greater.

JRC support to nuclear safeguards

The JRC supports DG Energy, whose mission is to ensure that nuclear material within the EU is not diverted from its intended use, and that the safeguarding obligations that have been agreed with third parties are complied with. At an international level, the JRC cooperates with the International Atomic Energy Agency (IAEA) on the control of nuclear materials and facilities in order to avoid proliferation or diversion.

Nuclear safeguards is a topic of substantial international concern which demands a qualified and comprehensive response. The JRC has been playing an active role in enhancing the EU member states' capabilities of developing analytical techniques and several of its scientific institutes are involved in work on nuclear safeguards within the European Commission.

Illicit Trafficking: Towards a more globalised approach

The JRC has developed an automatic intelligence gathering and risk analysis tool for containerised cargo itineraries world-wide. After a successful test in the anti-fraud domain, it is now being adapted to serve security needs, including counter-proliferation.

The JRC's Institute for Transuranium Elements (ITU) is one of the lead institutes of the "nuclear smuggling" international technical working group, established in 1996 by the G8 summit on nuclear safety and security. It has helped to implement a response action plan for seizures of illicit nuclear and radioactive materials in many new EU member states and eastern European countries. This plan is now being adopted by the IAEA.

In addition, since 2006, the IAEA, the JRC and the US Nuclear National Security Administration (NNSA) have been working together on border monitoring.

Rokkasho Reprocessing Plant (RRP), Japan

The IAEA and the Japanese Nuclear Material Control Centre (NMCC) jointly operate an on-site laboratory for accountancy verification measurements at the Rokkasho reprocessing plant in Japan. This analytical laboratory is the third facility of its type in the world after Sellafield and La Hague, which have both been designed and operated by the JRC on behalf of the European Commission for the past 10 years.

In addition, the JRC provides the necessary reference materials for the calibration and verification of results in line with international accountancy standards. It also supports the operator with a monitoring system for near real-time analysis of the chemical process areas of the facility. This unique know-how is shared with the IAEA for use at Rokkasho.

In Rokkasho, the JRC used the first world-wide automated system of verifying that such a complex installation had been built according to the declared design. This 3D technology and software developed in-house can detect changes introduced within the plant to millimetre accuracy and has since been successfully tested by other safeguards laboratories.

Training the next generation of Euratom and IAEA Inspectors

The JRC has a proven track record in providing Euratom and IAEA with training programmes. Ensuring that a state abides by its non-proliferation commitments is becoming increasingly dependent on inspectors' knowledge of novel detection techniques and equipment, more accurate analyses and their ability to handle more complex information and data.

The JRC has been requested by the IAEA to continue its training programmes to help ensure that its inspectors draw appropriate safeguards conclusions. A new course has recently been agreed for the IAEA. It aims to enhance the observation and investigative skills of IAEA inspectors in view of the detection of undeclared materials and activities.

Similarly, it has been decided that facilities established jointly by the JRC and the US Department of Energy in Obninsk, Russia, can be used by the IAEA to train its inspectors on Russian designed installations / reactors.

On-site laboratories (OSL) – 10 years on

To mark the 10th anniversary of the on-site laboratories, which represents a step forward in the domain of safeguards by avoiding the further transport of samples and allowing faster and better analysis, an event was organised today in Karlsruhe, where JRC-ITU is located.

It brought together more than 120 stakeholders in the nuclear safeguards domain, and representatives from the IAEA, DG Energy and JRC presented the latest developments in the field. Roland Schenkel, JRC Director General, affirmed: *"Direct physical verification of the nuclear material at these reprocessing plants by JRC experts is fundamental to the ability for diversion detection. Appropriate international expertise and efforts are needed to better safeguard global fissile material stockpiles and to prevent illegal activities"*.

Background information about nuclear safeguards and OSL

Under the Euratom Treaty, the European Commission, through the Directorate General for Energy, has the duty to assure that the nuclear material is only used for declared, peaceful purposes. In order to verify the flow of nuclear material, analytical on-site laboratories at the two largest European reprocessing plants were set up by the Joint Research Centre and DG Energy.

Civil operations with nuclear material must be carried out such that the material is only used for declared purposes. Euratom Safeguards provides an independent verification of this obligation to the general public, the EU member states, and the international community. In facilities handling large amounts of nuclear material, the verification measures employed must be capable of detecting a diversion of a significant amount of material with a high probability, in a timely fashion. With ten years of operation behind them, the high-quality and independent measurements performed by the on-site laboratories play a crucial role in fulfilling this task, thus contributing to the safety of the EU citizens.

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