FACT SHEETS

The **IAEA** Safeguards Analytical Laboratories

The Science Essential to Verifying the Peaceful Use of Nuclear Material

The IAEA is responsible for deterring the proliferation of nuclear weapons by detecting early the misuse of nuclear material or technology, and by providing credible assurances that States are honouring their safeguards obligations. The analysis of nuclear material samples and environmental samples taken by IAEA inspectors is an essential component of this undertaking. Samples collected by IAEA inspectors are analysed at the IAEA's *Nuclear Material Laboratory (NML)* and the *Environmental Sample Laboratory (ESL)*, both of which are located at Seibersdorf in Austria. A third laboratory, the *On Site Laboratory (OSL)* at the Rokkasho Reprocessing Plant in Japan, a joint facility staffed by the IAEA and host nation scientists, also conducts analysis of nuclear material samples from the reprocessing plant.

Safeguards Sample Taking and Analysis

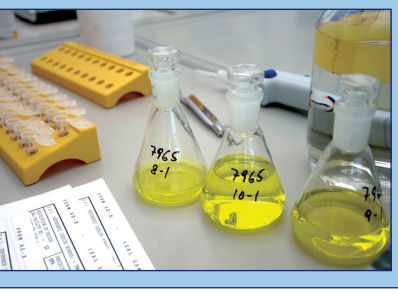
A key element of the safeguards system is the physical inspection of nuclear facilities by IAEA inspectors. States declare in considerable technical detail the types and quantities of nuclear material they possess. Among other verification measures, IAEA inspectors may take nuclear material samples from various points of the nuclear fuel cycle and collect environmental samples by swiping surfaces at various locations during the conduct of a verification activity.

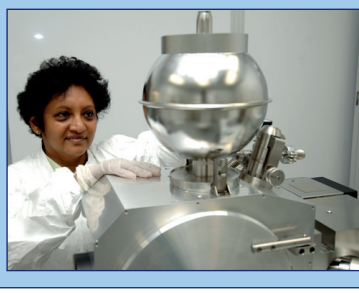
These samples, which may be in solid, liquid or gaseous form, are then subject to sophisticated analysis by IAEA scientists. The scientists focus on the isotopic make-up of uranium and plutonium contained in the samples, unaware of the country from which they were obtained. The analytical results provide a powerful tool for supporting conclusions as to the correctness and completeness of States' nuclear material declarations and help to inform the IAEA's evaluation of whether a State is complying with its safeguards obligations.

In carrying out this work, the IAEA laboratories coordinate and cooperate with a wider Network of Analytical Laboratories (NWAL), comprising an additional 18 laboratories located in nine different IAEA Member States. The ESL receives and screens all swipe samples but then shares the analytical workload with its NWAL partners.

On average, approximately 600 samples of nuclear material and over 400 environmental swipe samples are received and analysed by the Safeguards Analytical Laboratories each year.

In addition, the OSL currently receives and analyses around 80 samples per year and, if and when the Rokkasho Reprocessing Plant is fully operational, will be able to handle 350 samples each year.



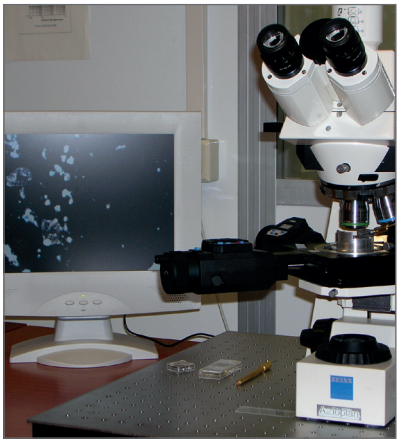



Nuclear Material Laboratory

As part of the verification of a State's declarations, the NML (in continuous operation since 1976) receives samples consisting of uranium, plutonium, diluted samples of spent fuel dissolver solution and high activity liquid waste materials from all points along the nuclear fuel cycle, which it then processes and measures. Analytical chemistry, radiometric techniques and mass spectrometric techniques are used to condition and determine the elemental and isotopic composition of radionuclides found in the samples. Strict quality control is essential for maintaining confidence in the results. This is attained internally through the use of certified reference materials and proven analytical methods, and externally through the IAEA's participation in numerous inter-laboratory comparison programmes. Confidentiality is strictly maintained; the laboratory receives samples in anonymous bar-coded containers accompanied by a set of analytical requests. Findings are reported promptly for evaluation by the IAEA's Department of Safeguards.

Environmental Sample Laboratory

The IAEA began its environmental sampling programme in the mid-1990s. The ESL is an extensive 'clean room' facility whose functions include the screening, chemical processing and analysis of environmental samples and the preparation of environmental swipe kits for sample collection. Mass spectrometers are used to determine the isotopic composition of uranium or plutonium contained in samples in the nanogram to femtogram range. These samples may have as much mass as an average human cell, or as little mass as the DNA within that cell. The Large Geometry Secondary Ion Mass Spectrometer, brought into service in 2011, provides a powerful analytical tool for the isotopic 'fingerprinting' of individual uranium particles and in future may be validated to do the same for plutonium particles.



Inspection, Analysis and Evaluation in Close Partnership

Laboratory staff provides comprehensive training for IAEA safeguards inspectors, for example, in the procedures for collecting environmental swipe samples and mitigating cross-contamination, or in the importance of sampling nuclear material items in order to achieve representative samples. The Safeguards Analytical Laboratories keep pace with technological developments through the use of state of the art instruments, frequent consultation with other experts in the field, and the support of relevant Member State programmes. The laboratories' mechanical and electronic workshops, equipped with advanced machinery, customize laboratory hardware to meet the specific requirements of safeguards analysis.

Enhancing Capabilities

The project *Enhancing Capabilities of the Safeguards Analytical Services*, or ECAS project, is a multi-year endeavour to design and construct new laboratory facilities that will enable the IAEA to meet safeguards analytical requirements for decades to come. A Clean Laboratory Extension for the ESL was completed early in 2011. A new NML, under construction at Seibersdorf, is expected to be in full operation by the end of 2014 and will replace the existing Safeguards laboratory building that has been in service since the 1970s.