



The IAEA Environmental Sampling Programme

J. Cooley, E. Kuhn, D. Donohue, International Atomic Energy Agency

Based on a successful series of field trials conducted during Programme 93+2, the International Atomic Energy Agency's (IAEA) Board of Governors approved environmental sampling as a new safeguards measure to be implemented beginning in 1996. The initial implementation of environmental sampling is focused on swipe sampling in enrichment plants and in installations with hot cells. Under the 1995 strengthening measures, swipe samples are being collected in facilities and at locations where the Agency has access under existing arrangements during inspections and design information verification visits. After one and a half years of implementation, the Agency's environmental sampling programme is well underway.

Environmental sampling at a facility occurs in two phases. In the first phase, samples are collected and analyzed to provide a baseline nuclear signature for the facility. Once the baseline is established, requirements for sampling as part of routine activities can be determined. By June 1997 baseline swipe samples have been collected at some 700 sampling points in more than 45 enrichment plants and hot cell complexes under comprehensive safeguards agreements. Samples are taken by trained inspectors using standardized sampling kits and approved sampling protocols according to facility-specific sampling plans. An in-house training program exists to instruct inspectors in sample campaign planning and in proper swipe sample collection and handling in order to avoid cross contamination. By June 1997, more than 90 inspectors have been trained in environmental sample collection including 9 Euratom inspectors. Three additional Agency training sessions are scheduled in 1997.

All samples collected at the facilities are sent to the IAEA's Laboratories at Seibersdorf under seal. Upon receipt, the samples are given a new IAEA sample number by the Department of Safeguards to protect their identity. A protocol has been established to code the samples so that the laboratories analyzing the samples do not know their country or facility of origin. To allow the Agency to meet the special requirements for handling environmental samples, a clean laboratory was built at Seibersdorf. Commissioned in December 1995, the IAEA Clean Laboratory for Safeguards provides the Agency with the independent capability for handling, screening, analyzing, and archiving environmental samples. During 1996 analytical equipment for the laboratory was installed and the laboratory is now in full operation, handling the baseline samples that are being collected. The Clean Laboratory currently screens samples by gamma spectrometry and X-ray fluorescence and prepares sampling kits; it is also in the process of setting up and operating the quality assurance programme for the network laboratories. The Clean Laboratory has the capability for detailed low-background gamma spectrometric and alpha and beta activity measurements as well as for thermal ionization mass spectrometry and electron microscopy. Based on the screening results and the specific safeguards objectives, further laboratory analyses to be requested are determined. In addition to the measurements carried out at the IAEA's Clean Laboratory, this usually requires the distribution of samples to the IAEA's expanded Network of Analytical Laboratories (NWAL). By early 1997, specialized laboratories in four Member States with capabilities to analyze environmental samples have been certified as network laboratories; a

further expansion of this network is planned. A Consultants' Group meeting of representatives from these specialized laboratories is conducted annually to review performance and discuss procedures and arrangements for environmental sampling; this year's meeting is scheduled for December 1997.

Measurement data from the laboratory analysis of the swipe samples at the Clean Laboratory or in the NWAL are reported to the IAEA's Department of Safeguards. The results are evaluated by the Department and compared to the expected nuclear signature for the sampled facility. If the results show inconsistencies with respect to declared activities, follow-up activities including remeasurement, resampling, and obtaining additional information from the facility operator are pursued in conjunction with evaluating information obtained from other safeguards measures applied at the facility. A data base of the analytical results is being created for their long-term storage and for direct retrieval by evaluation software. The data are evaluated using techniques such as cluster analysis and fuel cycle modeling. For the ongoing baseline sampling activities, an evaluation report of the results for an individual facility is prepared for discussion with the Member State. The report includes the measurement results, a comparison of the observed results with the declared operations for the facility, and any inconsistencies observed. The evaluation report may be revised following review with the Member State if additional relevant information is obtained. The baseline signature for a facility is derived from the cumulative results of the samples collected and serves to characterize the activities performed. Results from samples taken during subsequent inspections will be compared for consistency with the baseline signature and with the declared operations. These results will then be added to the baseline for future comparisons.