monitoring systems for different types of facilities, the Agency convened an advisory group at its Headquarters in Vienna from 8–12 September 1975, under the Chairmanship of Dr. J. Schwibach (Fed. Rep. of Germany). This group comprized designated experts from twelve Member States, together with six observers from Member States and representatives of two international organizations.

Starting from a working paper prepared within the Secretariat, the advisory group prepared the first draft of the manual. This draft includes the following sections: Introduction; Requirements for effluent monitoring; Sampling and measurement methods; Recording and reporting of effluent monitoring results. The manual will also contain a number of technical annexes, still to be prepared, covering such topics as: Examples of regulatory limits on discharges to the environment; Typical compositions of effluents from various nuclear facilities; Selected examples of specific monitoring procedures; Examples of reporting systems.

It is planned at present to convene a second meeting of the advisory group in 1976 to complete the manual by reviewing and if necessary expanding the material already produced and by preparing and incorporating the supplementary technical material.

INTERNATIONAL SYMPOSIUM ON THE SAFEGUARDING OF NUCLEAR MATERIALS, VIENNA, 20–24 OCTOBER 1975

The meeting was attended by 225 participants and 50 observers representing *34 countries and 3 international organizations.*

Safeguarding Nuclear Materials

The Agency and many of its Member States have constantly worked toward the development of effective and acceptable international safeguards systems, procedures, and equipment. The year 1975 marks both the fifth anniversary of the coming into force of the Non-Proliferation Treaty, which gave international safeguards a major thrust, and the fifth year since the last general symposium on Safeguards Techniques.

In the intervening years numerous panel meetings, consultants meetings, and working group meetings were held, and countless technical papers were written by safeguards experts throughout the world, but no broad-base Symposia were scheduled.

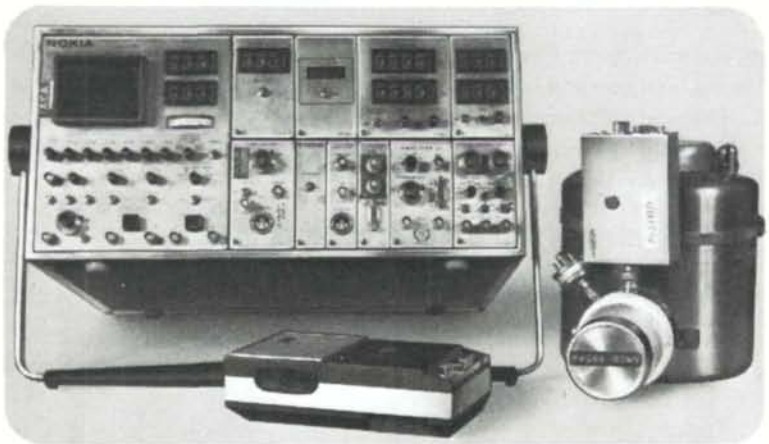
Now, five years later, the full extent of the world-wide development effort became apparent in this International Symposium on the Safeguarding of Nuclear Materials. Papers were invited on three broad topics:

Accounting for and Control of Nuclear Materials
Verification Procedures
Methods, Techniques and Instrumentation

More than a hundred papers were proposed, and 95 were finally included.

A beta reflectometer,
which determines the uranium concentration of powder or pellet samples at facilities handling nuclear materials in bulk form.
Photo: IAEA

This sophisticated Nokia multi-channel analyzer
can detect and measure a wide range of radioactive materials;
the cassette tape output can be analyzed by a computer at IAEA Headquarters.
Photo: IAEA



In his opening paper, the Inspector General of the IAEA discussed the future both of the nuclear industry and of international safeguards. Noting that the world nuclear industry was predicted to expand rapidly and almost exponentially, he suggested ways in which the future growth of international safeguards could be kept within reasonable bounds. He suggested, for example, that the relative importance of different nuclear material quantities should be determined after consideration of their suitability for weapons manufacture and the capability of the possessing State to convert them to more usable forms. He also suggested an increased reliance of the IAEA on material control measures adopted by the States themselves.

Two papers were presented on the subject of the classification of risks related to safeguards. They suggested that the probability of a successful diversion could be expressed as the product of a series of probabilities representing such factors as the probability that there exists a group of people who have a clandestine need for nuclear material, the probability that they will choose diversion as the method of acquisition, the probability that their attempt will be detected at the perimeter fence, the probability that having detected an attempt it will be defeated, etc. The authors acknowledge that in general these probabilities cannot be assessed quantitatively, but suggest that qualitative consideration may help to avoid a concentration of effort in areas which already have very low probabilities, to the detriment of safeguards in other areas with higher probabilities.

Several papers discussed combinations of computer technology and non-destructive measurement technology into real-time material control systems. Systems already in existence or under construction which can control the movement of plutonium from glove box to glove box were described. In some cases the systems are dependent on administrative control of glove box operators, who can defeat the system by neglecting to report transfers, or by reporting false information. In at least one instance, however, transfers are recorded directly from the measurement apparatus, the only operator input being batch identity. Coupled with appropriate physical security measures, such systems are claimed to provide a high degree of protection both against theft by outsiders and against smaller scale diversion by operating employees.

Returning to the question of international safeguards, a paper prepared by the IAEA staff discussed the current status of IAEA inspection efforts. In particular, the paper discussed the preparation of written safeguards implementation practices for each safeguarded facility. The technical limitations revealed by these documents, together with current efforts at reducing those limitations, were also discussed. Several other authors also dealt with verification procedures in use at specific facilities, and reviewed practical problems in their implementation.

The final two days of the meeting were devoted to destructive and non-destructive methods of nuclear material measurement. It was clear that these subjects, and especially non-destructive measurements, had received intensive effort in the five years since the Karlsruhe Symposium. Most papers described operating measurement systems which had been incorporated into a facility's overall measurement system, or which had been in routine use for a period of time sufficient to support positive claims as to their accuracy, dependability, etc. Among the many measurement topics reported, isotope correlation techniques may be singled out as worthy of comment; five authors reported on their work in this field. Under conditions which are known and reasonably achievable, isotope correlations can provide a relatively independent verification both of stated reactor operating conditions and of the plutonium input to fuel reprocessing facilities.