

(KMPs) are set up within these areas to facilitate accurate and reliable measurement of the flow of nuclear material at the beginning, at the end and during the process involved.

Material-balance areas can encompass one or more facilities. One facility may consist of several MBAs, depending on its type, size and importance. This information and all administrative details are generally determined when "subsidiary arrangements" and "facility attachments" are drawn up by the Agency and the country agreeing to safeguards.

The NPT safeguards agreement requires that countries develop and implement an accurate and complete national material-accountancy system for all their nuclear operations. Generally, the more effective and detailed these national systems are, the less time the Agency has to spend on actual inspection. Containment and surveillance include the installation of locks, seals and other devices, as well as permanent or periodic surveillance by technical means such as cameras, television and other forms of optical surveillance.

The Agency has developed its own technical manuals, which serve as a guide for its inspectors. An entire volume deals with statistical concepts and techniques. The frequency of inspections depends on the types of activity concerned. For example, the interval between inspections for MBAs located outside facilities is different from that for reactors or stores under seal, and there is yet another frequency-rate for facilities using plutonium or uranium, or uranium with more than 5 percent enrichment. The minimum period of notification for the last-mentioned category, excluding reactors, is 24 hours. No notice has to be given in the case of random sampling. The Agency can require special checks to be carried out if it feels that the information it has received is not sufficient to enable it to fulfil its responsibilities.

In 1976 alone, the Agency carried out 565 inspections in 40 countries. About \$6,400,000, or 18.6 per cent, of the Agency's regular budget was spent on these operations. The 35 or so industrialized countries that are members of the Agency provide 95 per cent of its budget, while more than 70 developing countries contribute the remaining 5 per cent.

As mentioned earlier, INFCIRC/153 defines the form and content of agreements. Article 28 of this document specifies that the object of safeguards is "the timely detection of diversion of significant quantities of nuclear material . . . and the deterrence of such diversion by the risk of

early detection". The agency has already spent several years and a great deal of effort trying to determine what is meant by "significant quantities" and "risk of early detection". The question of interpretation is one of the difficulties the Agency is currently experiencing in trying to negotiate a definitive agreement with EURATOM.

Monitoring procedures for light-water and research reactors were established to the satisfaction of all Agency members. However, some difficulties remain regarding slightly-enriched fuel-fabrication plants, reprocessing plants (the absolute uncertainty is at least ten times greater than the amount of plutonium required to build an atomic bomb), and a number of uranium-enrichment plants.

The Agency has a standing advisory committee to assist it in carrying out its tasks. In 1976, this committee produced its first assessment of the implementation of the nuclear-safeguards system, entitled *Special Safeguards Implementation Report*. On the basis of this document, the Agency's Director-General made various recommendations to the Board of Governors, especially on the interpretation of quantitative data collected by inspectors and on standards that might foster greater trust and thereby prevent nuclear materials from being used for military purposes.

Because of the extent of current monitoring operations, a great deal of effort is being devoted to standardizing the terms and conditions and techniques for implementing safeguards. Considerable sums are being spent on increasing cost-effectiveness. Improved optical-surveillance devices, automation of data-processing and standardization of the way accounting data on material balance are presented are some of the factors that will raise the quality of monitoring operations over the long term and thus increase the certainty that contractual obligations will be fulfilled.

In the final analysis, however, the obligatory nature of safeguards is worth only as much as a country's willingness to respect them.

Our mistake

The last part of the first paragraph of John Noble's article on nuclear safeguards in the July/August issue should have read: "Canada has been thrust into a leading role in the development of international arrangements designed to prevent the diversion of nuclear material and technology from peaceful power-generation programs to the development of nuclear explosives."