European Community

European Community Information Service
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INFORMATION NOTE

THE EC'S NUCLEAR SAFEGUARDS SYSTEM

In 1957, six European countries - Belgium, France, Germany, Italy, Luxembourg and the Netherlands - established the European Atomic Energy Community, generally known as Euratom. Its task is "to contribute to the raising of the standard of living in the member states and to the development of relations with the other countries by creating the conditions necessary for the speedy establishment and growth of nuclear industries". It thus complemented the role of the European Economic Community, set up at the same time to create a European Common Market.

The Euratom Treaty introduced the first multinational nuclear safeguards system: the six signatory states handed over the controls for nuclear safeguards within their own territory to the EC executive body, the Commission. The Commission, therefore, has the right to control stocks and the flow of fissile material within the territory of the member states. If an infringement of safeguards is detected, the Commission may impose sanctions on the persons or undertakings responsible. Britain, Denmark and Ireland accepted these safeguard measures when they joined the EC in 1973.

Application of Safeguards in the Fuel Cycle within the Community

The Euratom safeguard system has been in operation for almost twenty years, and during that time it has proved its effectiveness. Its task is to verify non-diversion, and to maintain control over the use to which nuclear material is put for all non-military purposes.

Euratom safeguards apply not only to all civil nuclear materials in EC member states, but also to equipment and non-nuclear materials for use in nuclear installations supplied by separate agreements with non-member countries, if such agreements so require.

In contrast with most other parts of the world, the Community has nuclear installations of practically all types: gas graphite reactors, light-water reactors, research and experimental reactors, high-temperature gas reactors, fast reactors and the related enrichment, fabrication and reprocessing facilities. They use natural, slightly-enriched and highly enriched uranium and plutonium. In 1976 the Community had these installations:

- 35 preparation and fabrication plants
- 71 power reactors
- 117 research reactors
- 13 reprocessing plants
- 211 research centres, laboratories, stores, and enrichment plants

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The number of movements of fissile material among nuclear plants in the Community in 1976 was as follows:

- 5,000 for material less than 1 kg of weight
- 8,000 for material more than 1 kg of weight

In the same period 568 nuclear packages were imported and 508 were exported.

These figures indicate the importance and complexity of nuclear activities in the Community, to which the Euratom inspectors have been applying a detailed and efficient system of safeguards since 1959.

The Euratom Safeguards Department has 115 staff members, of whom about 60 are safeguards inspectors, drawn from all nine EC member states. They are permanent European civil servants and are therefore responsible to the EC Commission and not to their country of origin.

Accountancy

About 20,000 entry lines are processed per month from the 450 installations. Electronic data-processing has been adopted and the computerized system has considerably reduced the effort for book-keeping and checking. Inconsistencies are automatically detected. Euratom controls are based on declarations made by each operator on the amount and quality (enrichment) of the nuclear material being moved from plant to plant in dynamic flow as well as static (inventory) conditions. Fissile material is measured at the time of entry and exit. Inventories are taken periodically and declared by the operators: the Euratom control department checks the declarations and the measurement systems of the operators against one another.

Inspectors take full account of the fact that each installation is linked with a preceding and a subsequent installation within the cycle.

During inspection they pay special attention to plutonium and highly enriched uranium at points in the fuel cycle where transformations involve possible losses of material, such as fuel element fabrication plants or where some uncertainty in the amount of material assessed may still exist, such as reprocessing facilities.

To provide a better understanding of the way in which safeguards are applied, here is an example of the procedure followed in a generic plant for fuel element fabricatio

Flow verification

Receipts:

The verification of the input material is done by non-destructive techniques or by taking samples for analysis at the same time that commercial samples are taken, and by weighing. Quite often the verification of the material has been made at the dispatching installation. In this case the shipping containers are sealed before dispatch and at the receiving plant only checks on seals are carried out.

Dispatches:

If the plant proceeds to undertake destructive analysis and weight or volume measurements of material before the final stage of the fabrication, a direct check of those measurements is performed by the safeguards inspectors.

If the plant proceeds to undertake measurements of material content in the finished fuel by non-destructive assay (NDA) techniques, the precision and accuracy of measurement are verified by use of reference materials relating to the production. Special attention is given to the preparation of these reference materials, which must comply with the requirements of the safeguards authorities and also be recognized by the plant operators as reference elements representative of the production.

In cases where the plant does not undertake NDA measurements and the use of these techniques is possible, this verification is carried out by the safeguard authorities using their own equipment and their own reference standards.

Waste:

In this case NDA techniques are used by the plant and checked by the Safeguards Directorate against calibration curves.

Taking the inventory

The date and the procedure for taking the inventory, which is done at least once or twice a year, depending on the amount and quality of material held, have to be declared by the operators. To enable the Safeguards Directorate to carry out its verification, a physical inventory list is made available to the Safeguards Directorate. This list serves as a basis for preparing the overall verification plan, including sampling plans and the use of NDA equipment.

Increasing use of NDA instruments

In order to increase the efficiency of the verifications, Euratom inspectors are increasingly making use of NDA techniques. Safeguards Directorate equipment has been installed in several plants and, when appropriate, inspectors use portable instruments. To give some examples:

- Gamma scanners, equipped with NaI and Ge (Li) detectors connected to analyzers and minicomputers, have been installed in fabrication plants and are used to measure fuel elements and plates of enriched uranium and plutonium pins.

- A "Random Driver" is used for active or passive neutron measurements of uranium and plutonium scraps.

- An instrument, based on neutron interrogation, has been installed in a fabrication plant to measure HTR fuel pebbles.

- Portable 256-channel analyzers and Sam 2 equipment are used to measure different material quantities through their emission of gammas and neutrons.

- Neutron coincidence counters for the control of plutonium scraps and mixed U-Pu pins are in some cases installed in the plants, others are brought into the plants by a specially equipped carrier, which is also the property of the Safeguards Directorate.

- A minicomputer is used, in particular to verify the physical inventory taken by the plant operators.

In applying safeguards, the choice of points in the fuel cycle, the selection of points in the plants and the type of instrumentation most suitable for each application require thorough analysis of the fuel cycle in general and its components, as well as careful study of the equipment required in each case and selection of techniques to be used.

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For every situation, the effectiveness and accuracy of safeguards must be assured, while keeping costs and burdens for the operator to a minimum. A R&D programme has been developed by the Commission's Joint Research Centre, together with special support activities designed to solve specific problems that may be encountered by the Safeguards Directorate during its normal safeguards activities.

Euratom - IAEA Agreement

In April 1973, the Community, seven of its member states (*) and the IAEA signed a safeguards agreement, pursuant to the Treaty on the Non-Proliferation of Nuclear Weapons. This agreement is in force and the Euratom and IAEA safeguards organizations are harmonizing their activities so that the duties and responsibilities of each can be properly carried out.

Under the EC-IAEA Agreement the inventory of nuclear materials in the signatory EC member states as of 28 February 1977 has been transmitted to the IAEA, which is now regularly informed of all nuclear material stocks and movements into and out of installations in these EC states. Since then many IAEA inspections for verification of the initial inventory and for design information verification have been carried out at the same time as Euratom inspections were performed. As a result of the double checks of Euratom and the IAEA, the Community is the most highly safeguarded region in world. Studies are under way, based on Euratom's knowledge and experience in applying safeguards, to determine the best techniques and procedures for future routine application. Confidence exists that the Community and non-EC countries can develop an efficient method of working together in nuclear safeguards.

(*) The United Kingdom voluntarily signed a verification agreement with Euratom and the IAEA on 7 September 1976, even though it is a nuclear weapons state. France, although not a signatory of the NPT, is nevertheless subject to Euratom safeguards and, moreover, has committed itself to negotiations with Euratom and the IAEA on an eventual verification agreement.
