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Editor's Note :

Quite unforeseeable and regrettable delays have been occurred in the mechanics of reproduction of this first issue of the European Safeguards Bulletin.

The text (datelined Autumn 1976) was sent for reproduction in December last year, and at the final stage in early February the news of the publication of Regulation N° 3227/76 was added.

It is hoped that such printing difficulties can be avoided in future and that readers will receive their copies with a minimum of delay.

13.7.1977



EUROPEAN SAFEGUARDS BULLETIN

(together with ESARDA Newsletter)

This Bulletin is published by the Commission of the European Communities. Its aim is to inform those concerned in the application of safeguards to nuclear materials of recent developments in the relevant fields.

Publication is expected about twice a year, but additional issues devoted to specific subjects may be produced from time to time.

Together with the Bulletin is a Newsletter from ESARDA, the organisation through which Euratom and various R & D organisations in the Community maintain contact on research and development matters relative to safeguards.

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THE CHANGING SCENE OF NUCLEAR SAFEGUARDS

by

H.-W. SCHLEICHER

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With the present European Safeguards Bulletin the Commission is launching a new periodical publication aiming at a better flow of information to the public involved, relating to facts and developments in a field which is of growing importance for the nuclear industry and in which the Commission has a direct executive responsibility - Nuclear Safeguards. In particular this bulletin is intended as a link between the Euratom Safeguards Directorate at Luxembourg and the managements both of the operational units of the nuclear industry and of the relevant research organisations.

The term "nuclear safeguards" encompasses a set of measures taken in order to verify that nuclear materials which should be used in civil activities are not diverted to other, non-civil, purposes.

By the Euratom Treaty, which is one of the three basic Treaties of the European Community, the Commission is required to apply safeguards to all civil materials in the Community and it has carried out this task for more than 16 years through the Safeguards Directorate which has at its disposal the relevant means, such as a central materials accountancy system and inspection teams which regularly visit all nuclear plants.

On a worldwide scale, safeguards are applied by the International Atomic Energy Agency in Vienna, which controls the nuclear materials in those countries which have signed the Non-Proliferation Treaty (NPT) or have accepted such safeguards by means of other agreements.

## Developments in the political and legal framework

The first issue of the present bulletin appears at a moment of special importance for nuclear safeguards in the European Community and at the same time in a period where the problems of proliferation of nuclear weapons have seized the attention of a large public all over the world.

The specific event which marks the development of nuclear safeguards in the European Community at the present time is the introduction of considerable modifications in the safeguards system hitherto applied by the entry into force of the new safeguards regulation of the Commission, which was approved on October 19, 1976 by the Council of Ministers, and which is one of the most important prerequisites for the entry into force of the Verification Agreement concluded between the non-nuclear-weapon community Member states, the Community and the IAEA on April 5, 1973 in pursuance of the provisions of NPT. It is expected that this Agreement will now be operative in a very short time. A similar agreement has been signed by the United Kingdom, the Community and the Agency in pursuance of the voluntary offer of the United Kingdom to submit its civil nuclear cycle under Agency safeguards.

On a worldwide scale such events as the ratification of the Non-Proliferation Treaty (NPT), now by more than 100 States, the establishment of guidelines concerning safeguards by the most important suppliers of nuclear materials and installations ("London Club") and a reconsideration of the nuclear policy of the US characterize a rapidly developing scene.

## Technical developments

The methods and techniques of the application of safeguards have undergone a considerable development in the past, in parallel to the development of the nuclear industry itself. This was necessary in order to keep up with the increasing number of nuclear installations and the increasing amount of nuclear material in circulation, and it was facilitated by the development of certain techniques (e.g. of non-destructive methods based on the radioactivity of the nuclear material) by or for the nuclear industry itself, sometimes for quite different purposes. The evolution in data processing has greatly contributed to improve efficiency and reduce the cost of materials accountancy, both in the installations and by the safeguarding authorities.

In the Community, this innovative process in safeguards methods has

been carried out through a continuous exchange of information between the Commission and the Joint Research Centre of Euratom, the nuclear industry itself, which has always shown a great awareness of the importance of safeguards, the various nuclear research organisations in the member countries (mainly members of ESARDA - the European Safeguards Research and Development Association -), and, of course, appropriate organisations outside the Community, for example the IAEA.

Very valuable and useful work has thus been done and will certainly be done in the future, but it is felt that the effort of the groups involved, which in the past has been mostly dedicated to research and development, should now be oriented more directly towards implementation and towards the practical problems of specific installations or types of installations. So here we again find ourselves at an important turning-point on our road, which in the future may need more intimate contact with plant operators than in the past.

#### Structures and links in the Safeguards scene of the European Community

It may be useful, in this first issue of the Bulletin to give, for a better understanding of the overall structure, a quick outline of the general relationships between the various organisations working in the field.

The basic document establishing the requirements, structures and responsibilities in nuclear material safeguards, is the Treaty establishing the European Atomic Energy Community (EURATOM), signed in Rome in 1957; this covers the original six Member states, and its provisions were extended to cover the three new Member states on their accession to the Communities in 1973. Through this treaty the Commission is designated as the responsible safeguarding authority for nuclear materials within the Community; the Commission is required to place the necessary obligations on the operators to maintain operating records, perform accountancy and make declarations, and the Commission is also required to inspect and verify both materials and documentation.

The responsibility for the transmission of information on nuclear material stocks and flow rests entirely with the management of each operational unit (registered as an installation), even if, for convenience, the data transmission is in some cases delegated to a centralised or associated data processing or accounting system.

The signing of the Non-Proliferation of Nuclear Weapons Treaty has

created a situation in which one can distinguish, within the nine Member states subject to Euratom safeguards, four groups of states:

- a) Denmark and Ireland, which were subject to IAEA safeguards before their accession to the Communities;
- b) Belgium, Germany, Luxembourg, the Netherlands and Italy, who have not been subject as yet to IAEA safeguards, but, in the terms of the Community's Verification Agreement will very soon be subject to IAEA verification of the Commission's safeguarding activities; Denmark and Ireland will be incorporated in this group at the time of implementation of the Verification Agreement, to which they are also signatories;
- c) the United Kingdom, which has signed the NPT, but as a nuclear-weapon state has no obligation under the NPT to submit the IAEA safeguards, has however made a voluntary offer in respect of the application of safeguards, similar to those applied in non-weapon states, subject to exclusions only for reasons of national security; the UK, the Commission and the IAEA have consequently concluded a safeguards agreement similar to the above-mentioned Verification Agreement, which will apply to all civil nuclear activities in the UK, and
- d) France, which has not signed the Non-Proliferation-Treaty and currently is subject only to Euratom Safeguards.

Pursuant to the new safeguards regulation the Commission will establish in the future for each nuclear installation a specific document called the Particular Safeguards Provisions (PSP) which sets out the obligations which devolve upon the operator with respect to safeguards. It is formulated on the basis of the fundamental technical characteristics of the plant (Design Information) supplied by the operator, after consultation with the operator and the appropriate Member state. It defines, for the particular plant, the material balance areas, the key measurement points, the measurement, recording and reporting systems, the time limits for flow of information to the Commission, etc. The document is established as an Individual Decision of the Commission, but respects the general rules defined in the Regulation.

For the installations which are also subject to IAEA safeguards, the Particular Safeguards Provisions have to be consistent with the so-called Facility Attachment agreed upon, for each particular installation, between IAEA and the Commission, and requiring the consent of the Member state concerned. Its content will be largely identical to that of PSP, and will

specify, in addition, the average routine inspection efforts of the IAEA and the Commission, foreseen in pursuance of the Verification Agreement.

The Facility Attachments are part of the Subsidiary Arrangements to the Verification Agreement or to the tripartite UK-Euratom-IAEA Agreement as the case may be. These Subsidiary Arrangements set out the specific rules for the joint execution of safeguards by Euratom and the Agency, and have been agreed upon by the signatories of the respective agreements.

The drafting of the PSP's and their implementation necessitates close contacts between the operators and the Commission. The better the collaboration the easier it will be to find solutions satisfactory to both parties, with a minimum of burden for the operator and with an inspection effort which is as small as can be justified in the light of the recognised requirement.

As was said before, the different research organisations working in the safeguards field in the Community can be helpful in this respect. They are mostly linked to the Commission by ESARDA (the European Safeguards Research and Development Association), the collaborative organisation described elsewhere in this issue, in which the Commission participates through its executive arm, the Directorate of Euratom Safeguards, based in Luxembourg, and its research arm, the Joint Research Centre, of which Ispra is the largest establishment.

The research organisations from time to time have other contractual relationships with the Commission, for example if they perform sponsored research or development under contract, sell equipment or provide a measurement service. In this latter respect it is sometimes more cost-effective for the Commission to entrust the analysis of a series of samples of nuclear materials, possibly including some "controls", to an outside organisation, not too far from the point of origin of the samples, than to have them all despatched to the Commission's Central Bureau for Nuclear Measurements (BCMN) at Geel in Belgium or other laboratories entirely under the control of the Commission. This is a field which is by no means static, as the relative costs, and efficiencies, of the many different possibilities are subject to frequent change. The Commission has a working group ECSAM (European Commission's Safeguards Analytical Measurements Working Group) following the developments in this field, and originating comparison exercises.

Importance of communication in periods of change

In the forthcoming months, there will have to be, because of the need to establish Particular Safeguards Provisions and Facility Attachments, frequent and intimate contacts between the operators, the national authorities and the Safeguards Directorate. The relevant research organisations can be, and in many cases are already, very helpful as consultants to the interested parties on specific problems to be considered in these discussions.

The aim of all these contacts is to establish, for every particular case, safeguarding procedures which are efficient and reduce the burden imposed on the operator to a minimum. This can only be achieved if everybody takes account of the total requirement and understands the needs and problems of the other parties. And as the scene is now changing quite rapidly in nuclear safeguards, regular information of all involved parties is of primary importance.

This bulletin is intended as a means to intensify this informative process by reporting to the people directly concerned, on developments in safeguards in different fields - regulations, accountancy systems or measurement techniques as the case may be. Suggestions by the readers as to any special topics they want to see treated are welcome. I hope that a further useful link between the interested parties can thus be created.

LATE NEWS

The Council of Ministers at its meeting on 18 October 1976, approved the new Regulation, which had been adopted by the Commission to replace the existing Euratom Regulations Nos. 7 and 8. This new Regulation takes account both of the present state of techniques for safeguarding nuclear materials and of the current requirements in safeguards stemming from not only the Euratom Treaty but also the application of the Non-Proliferation-Treaty relating to Nuclear Weapons.

The topics in the Regulation and its Annexes which contain modifications or innovations of direct interest to operators of nuclear installations can be regarded as falling in two categories, relating to basic principles and relating to the technical means of implementation.

Examples in the first category concern:-

- 1) the advance communication of programmes of work;
- 2) the Particular Safeguards Provisions which are drawn up by the Commission after consultation with the operator and the appropriate Member state;
- 3) the accountancy in respect of each batch of nuclear material;
- 4) the inclusion in the operating records of the estimates of random and systematic errors of measurement;
- 5) advance notification of exports and certain transfers inside the Community;
- 6) advance notification of imports and certain transfers inside the Community;
- 7) intermediate carriers or storers, who must keep adequate records;
- 8) intermediaries taking part in the conclusion of contracts, who must keep adequate records;
- 9) the codification of all data transmitted to the Commission in the form of Inventory Change Reports, Material Balance Reports or Physical Inventory Listings.

Examples in the second category concern:-

- 1) The basic technical characteristics, on the basis of the questionnaire to be found in Annex I of the Regulation;

- 2) the designation of Material Balance Areas (MBA's), and within each MBA, the selection of Key Measurement Points (KMP's) for flow and inventory;
- 3) reporting of material movements by Inventory Change Reports (ICR's), which may be sent either individually or periodically in a consolidated list;
- 4) the procedures for physical inventory taking by the operator;
- 5) the procedures for drawing up Material Balance Reports (MBR's), showing:
  - a) beginning physical inventory,
  - b) inventory changes,
  - c) ending book inventory,
  - d) ending physical inventory,
  - e) material unaccounted for (MUF);
- 6) reporting delays of 15 days after the end of the month for ICR's and 30 days after the PIT for MBR's;
- 7) nuclear transformation (nuclear loss, production or decay) to be reported by ICR at the latest when irradiated fuel is transferred from a reactor MBA;
- 8) special reports covering possible or actual loss, particularly in transit;
- 9) details in the ICR's concerning:
  - a) Measurement Basis
  - b) Type of Inventory Change, including inter alia:
    - Measured Discards,
    - Transfer to Retained Waste,
    - Retransfer from Retained Waste,
    - Discard from Retained Waste,
    - Accidental loss,
    - Exemption,
    - De-exemption,
    - Category Change,
    - Rebatching,
    - Nuclear Transformation,

Shipper-Receiver Difference,  
New Measurement.

- c) Corresponding MBA,
- d) Batch Designation,
- e) Material Description Codes.

The Regulation will come into force 15 days after its publication in the Official Journal of the European Communities, and be applicable in the case of each individual plant only after adoption by the Commission of the appropriate Particular Safeguards Provision (PSP).

Copies of the Official Journal can be obtained from:

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STOP PRESS

The new regulation "Commission Regulation (Euratom) No. 3227/76 of 19 October 1976 concerning the application of the provisions on Euratom Safeguards" has been published in the Official Journal Volume 19 No. L 363, dated 31 December 1976.

The price, excluding mailing charges, is 60,- Lfrs.

ESARDA NEWSLETTER

MESSAGE FROM THE CHAIRMAN

(Mr. E. BASTRUP-BIRK, Danish Energy Agency)

Welcome to the first issue of the ESARDA Newsletter. Although the name ESARDA has become well known, there are probably some people who are not sure of its function and I hope that this brief introduction will be both useful and interesting.

ESARDA is a unique forum in which representatives of Euratom and various R & D organisations in the EEC can exchange views and work together on technical problems in the field of Safeguards. In so doing, we seek to minimise unnecessary duplication of work in different establishments, to maximise the transfer of relevant technology and to ensure the relevance of technical Safeguards developments to practical plant conditions. Each participating organisation contributes information from its own programme but perhaps the greatest benefits arise through the activities of ESARDA working groups. At present these groups are concerned with, (i) Non-destructive analysis, (ii) Destructive analysis, and (iii) Isotopic correlations and reprocessing input accountancy.

These groups benefit greatly by maintaining contact with the IAEA and through the invited participation of representatives of plant operators whose practical experience helps both to elucidate problems and to ensure the relevance of research ideas and projects.

Through this Newsletter, we hope to inform all nuclear plant operators in the Community about the activities of ESARDA and to stimulate an exchange

of ideas to our mutual benefit. On a regular basis, we shall include summaries of the principal points dealt with by the Steering Committee and the various working groups. We shall also include from time to time more detailed articles on new instrumental developments, on the application of various measurement techniques and other topics of interest. In this first issue, Dr. Gupta of GfK reviews the aims and programmes of the existing working groups. Clearly, an exchange of ideas cannot be "one-way" and we hope that through this Newsletter, nuclear plant operators within the Community will develop contacts with ESARDA to present their views on relevant technical matters and to discuss their practical problems. It may be, for example, that the working group on non-destructive analysis could provide valuable advice on a particular instrument which is most suited to a specific measurement problem. To help in developing these contacts, the names and addresses of representatives from each organisation are given on page 16 together with those of the convenors of the working groups.

I am sure that all people involved in Safeguards would endorse the need for the continuing development of a technically-effective and cost-effective system. In ESARDA, we trust that by the wider contacts established through the medium of this Newsletter we will be contributing towards the achievement of this objective.

WORKING GROUPS OF ESARDA

by

D. GUPTA, G.f.K., Germany

The Steering Committee of ESARDA establishes working groups from time to time to carry out specific tasks in a joint manner. Non-members of ESARDA may attend the meetings of these groups and contribute actively. The basic objective of these working groups is to investigate technical problems relevant to safeguards and work out operable solutions which may then be recommended to safeguards organisations (both plant operators and the Euratom Safeguards Directorate) for routine application.

Three working groups are functioning at present. They are on 1) Non-Destructive Methods, 2) Destructive Methods and 3) Isotopic Correlations and Reprocessing Input Accountancy. The objectives and activities of the working groups are summarised in the following paragraphs:

1. Non-Destructive Methods

The objective of this working group is to establish and recommend criteria to be used as a basis for agreement between plant operators and the safeguards organisations on the acceptability of non-destructive measurements of nuclear materials.

With this objective in view, a survey of NDA methods in use and under development for accountancy and verification as well as a list of NDA standard reference materials available in the Community is being prepared. A method evaluation plan has been started and an active information dissemination programme among the ESARDA members has been envisaged.

## 2. Destructive Methods

The objective of this working group is to recommend criteria to be used by safeguards organisations for acceptance of destructive methods of analysis of nuclear materials performed by plant operators.

Even though in the past the majority of measurements has been carried out by destructive methods, recent intercomparison exercises have shown the need for continued research and development in this field. The work of the group can be divided into these areas:

- (1) A review of the chapters of the IAEA Safeguards Manual dealing with destructive chemical analysis. This review is complemented by a survey of new and developing destructive methods not included in the manual to establish if they are suitable for safeguards purposes.
- (2) A listing of reference materials which are already available together with a survey to discover if a demand exists for other reference materials.
- (3) Organisation of a measurement evaluation programme for interested laboratories using common samples but possibly different methods. Ensure the connection with similar USA and/or IAEA programmes with the aim of arriving at identical and realistic criteria for measurement uncertainties.
- (4) Organisation of intercomparison exercises to determine the capabilities of specific analytical methods.

## 3. Isotopic Correlations and Reprocessing Input Accountancy

The objectives of this working group are to develop the application of isotopic correlation techniques to the problems of operators and safeguards organisations, and to develop methods for accounting at the input of reprocessing plants. The working group should also recommend criteria which the isotopic correlation and input accountancy techniques should meet so that they are mutually acceptable to both operators and safeguards organisations.

Members of ESARDA have helped in establishing data banks on isotopic correlations at Ispra and the IAEA. It is planned to collect relevant data by the working group members on a continuous basis and provide assistance and guidance in the application of isotopic correlation techniques. In the

area of reprocessing plant input, a number of specific activities have been planned. They are among others: a) development of redundant verification methods for reprocessing input analysis (tracer techniques, balancing of uranium, etc.), b) development of techniques for representativity and stability of samples and c) development of methods for determination of Pu-content and distribution in different waste streams etc.

### Results and Reports

A summary of the activities of the working groups are regularly published in the minutes of the meetings and in periodic reports to the ESARDA Steering Committee. The reports of individual members of the working groups are published as ESARDA reports. As stated in the chairman's message, anyone who requires further information about the work of the working groups should contact their national project leader.

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