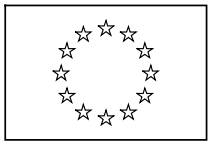

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REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL

Operation of the Euratom Safeguards Office in 2001

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1. EXECUTIVE SUMMARY

A reevaluation of ESO's missions related to the implementation of Chapter VII of the Euratom Treaty has been conducted in the second half of the year 2001. It led to recommendations made to the Commission on ESO's objectives, working methods, internal structure and management policy.

A changing environment for the nuclear industries activities, but also in the legal framework in which safeguards are applied, led ESO to take the initiative of preparing a draft for a new regulation, replacing the existing Regulation (Euratom) n° 3227/76, in force for more than 25 years.

Reporting by the nuclear installation operators on nuclear materials flows and inventories was fulfilled in compliance with Euratom treaty requirements. All data was checked and clerical errors or inconsistencies corrected.

Verification activities conducted by ESO inspection staff led to the conclusion that, apart from some discrepancies between evaluations carried out by operators and ESO inspectors, which are in the process of being solved, no diversion of nuclear material from its intended use was established.

Effective cooperation between ESO and the International Atomic Energy Agency (IAEA) on the territory of the EU resulted in confirmation – reflected in the Safeguards Implementation Report (SIR) 2000 issued by the IAEA - that no evidence of nuclear material diversion or misuse of equipment or facilities placed under safeguards in the EU was found.

In addition to its global conclusions, the SIR 2000 identified some areas for improvement concerning different technical aspects and verification procedures. The need of enhanced cooperation with the IAEA for the implementation of the Additional Protocols to the existing safeguards agreements was clearly stated.

Founded on the legal basis of the Euratom Treaty, ESO activities are financed by two different budget appropriations, one concerning general functioning of ESO as any other service of the Commission and the second one related to specific operational costs in the field of nuclear safeguards. Details on the way in which the budget was spent in 2001 are provided in this report.

As an overall conclusion of the Annual Report 2001, it may be stated that the objectives defined for ESO's activities as set out in Chapter VII of the Euratom Treaty were satisfactorily met.

2. MISSION AND LEGAL BASIS OF EURATOM SAFEGUARDS

The task of the Euratom Safeguards Office (ESO) is to ensure that within the European Union nuclear material is not diverted from its intended use and that safeguarding obligations assumed by the Community under an agreement with a third state or an international organisation are complied with. Chapter VII of the Treaty establishing the European Atomic Energy Community, commonly called the Euratom Treaty, and the implementing Euratom Regulation No. 3227/76 as amended constitute the legal basis of Euratom Safeguards[1].

3. THE YEAR IN REVIEW: MISSION AND FUNCTIONING OF THE EURATOM SAFEGUARDS OFFICE

3.1. Implementation of the Results of the Internal Commission Audit

Following the July 1999 announcement of President Prodi concerning the organisation of the new Commission, a general inspection of the structures of the Euratom Safeguards Office was carried out. The Inspectorate General of the Services (IGS) examined and reported upon the Euratom Safeguards Office's objectives and the extent to which these are fulfilled, its working methods, its structure and organisation, its use of resources, its management and its relation with headquarters in Brussels. The report, dated 15 May 2000, listed thirteen recommendations that were gradually implemented during the year 2001.

The first three recommendations concern the missions of the Euratom Safeguards Office and the way in which they were implemented. The IGS suggested that a High Level Expert Group address these issues (see point 3.2 below).

The other recommendations concern mainly issues related to the organisation and internal management of the ESO. All of them are in the process of being implemented or are awaiting additional orientations to be provided in the final report of the High Level Expert Group.

3.2. High Level Expert Group

The first recommendation of the IGS proposed the creation of a High Level Expert Group (HLEG) to *"undertake a review of Euratom Safeguards goals and objectives with the view of making appropriate recommendations…"*

Such HLEG was established by the Commission in June 2001. The mandate assigned to it encompassed the following themes:

(1) redefine the ESO's mission and its operational objectives to reflect today's circumstances, while taking into account the Commission obligations under Chapter VII of the Euratom Treaty and other relevant international agreements based on this Treaty;

(2) draw up a Mission Statement for ESO, and a procedure to update it periodically;

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[1] For further details, see chapters 2 and 3, of the 1999-2000 Annual Report (COM(2001) 436 final)

(3) analyse ESO's workings methods and inspection procedures, and identify implementation assessment methods thereof and performance indicators;

(4) assess the cost-benefit ratio between the related resources and ESO's obligations/responsibilities; set up an order of priorities to improve overall efficiency at a constant level of resources;

(5) propose more efficient and transparent reporting mechanisms between ESO, the Directorate General TREN and the Commissioner in charge;

(6) propose improved communication mechanisms about ESO's activities with other European institutions, with Member States and with the public;

(7) assess a better complementarity implementation between ESO and the IAEA inspectors on the territory of the European Union;

(8) spell out the possible consequences of these proposals in terms of internal organisation, human and financial resources, and status; distinguish the core functions of the Commission from the tasks that can be delegated and outsourced.

Three experts were appointed: a former Vice-President of the European Commission; a past Deputy Director-General of the International Atomic Energy Agency (IAEA) (Head of Safeguards Department); a retired Vice-President of an Industrial Group active in the areas of energy, nuclear and transport. The HLEG received secretarial support from an official of DG TREN (Brussels) and technical support from a team of officials of the Euratom Safeguards Office.

The HLEG has broadly considered in its work the activities of the Euratom Safeguards Office over the last two decades. The Group has noted with satisfaction the efforts already undertaken by the new management since 2000[2].

3.3. Preparation of a new Regulation

The Euratom Treaty (Art. 79) requires that a regulation defines the nature and the extent of the requirements to be fulfilled by the nuclear operators.

The existing Regulation (Euratom) no. 3227/76[3], in force since 1976, defines the obligations of the operators of nuclear installations towards the Commission as far as declaration of the basic technical characteristics of the installations and reporting of nuclear material accountancy is concerned.

During the 25 years the Regulation has been in force, a number of developments have occurred, not only in the nuclear industry and in information technology, but also in the legal framework under which safeguards are applied (i.e. The New Partnership Approach agreed between the Commission and the IAEA in 1992 and the Protocols Additional[4] to the Safeguards Agreement between the Community, the Member States and the IAEA).

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2 The HLEG submitted its report to the Commission in February 2002.

3 Commission Regulation (EURATOM) no. 3227/76 of 19 October 1976, OJ L 363, 31.12.1976, p. 1

4 OJ L 67/1 of 13.3.1999

Therefore, the Euratom Safeguards Office took the initiative of working out a new draft Regulation which would review existing obligations under Regulation 3227/76, cover the new reporting requirements imposed by the Additional Protocols and allow for modernised reporting systems in line with state of the art information technology.

During 2001, a dedicated task force within the ESO prepared a draft of the new Regulation, which after the successful consultations with other Commission services, was approved by the Commission on 22 March 2002[5].

4. THE YEAR IN REVIEW: EURATOM VERIFICATION ACTIVITIES

4.1. Nuclear Material Accountancy

The European Union area contains the full range of nuclear fuel cycle activities, although they are not evenly dispersed throughout the Member States. The nuclear material inventories in the installations under safeguards are constantly growing. For example, the plutonium stocks during the last decade increased from 203 tonnes in 1990 to about 548 tonnes at the end of 2001. It has special safeguards interest because of the sensitive nature of this material. During the same period, the total of all types of uranium inventories in the European Union increased from 200 400 tonnes to about 314 610 tonnes at the end of 2001.

The nuclear installation operators reported all nuclear material inventories and flows to the Euratom Safeguards Office. These reports amount to about 1.5 million accountancy lines per year, the large majority of which is already received by electronic means. All these data are checked for internal and external consistency (transit matching) and compliance with the provisions of the Co-operation Agreements with third countries.

All clerical mistakes and inconsistencies revealed during 2001 could be corrected after consultation with the operators involved.

Accountancy reports were also sent to the IAEA in fulfilment of the obligations, undertaken by the European Union in the framework of its Safeguards Agreements with the IAEA. During the period covered by this report, the quality and the timeliness of the reports met with the satisfaction of the IAEA.

4.2. Inspection Efforts and results

In 2001 inspection activities conducted by the Euratom Safeguards Office amounted to 7 661 man-days, showing a reduction of about 9% in comparison with the year 2000.

Such an evolution results from the combination of three factors:

– a slight reduction in the staff available for the conduct of inspections (- 1,5%);

– a temporary slow down of activities in important reprocessing installations;

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[5] Ref.: COM(2002) 1999

– the progressive development and implementation of new and more rational approaches, agreed case by case, allowing for substantive increases in global efficiency of the inspections undertaken during the second half of the year.

An approximate distribution of the inspection efforts made, according to the major types of installations, shows that about 50% of the effort was spent in the reprocessing facilities (see 4.2.1 below) and associated stores, 25% in Enrichment and Fabrication facilities (see 4.2.2 to 4.2.4) and another 25% in power reactors, research reactors (see 4.2.5) and other nuclear facilities (see 4.2.6).

The main concerns and/or results achieved in the course of the inspection activities for each type of installations under control are summarised hereafter.

4.2.1. Reprocessing facilities[6]

The nuclear fuel reprocessing installation at Sellafield **(THORP)** operated from April 2001 to the end of the year. The verification activities gave satisfactory results. The Verification of the Physical Inventory (PIV) 2001 was successful. However, a problem emerged in the second half of the year, whereby the operator's input sample results appear biased, due to a change in the method used for the analysis. The impact was noticed by the inspectors and the operators' internal control system. The issue is subject to investigations and is expected to be resolved before the Physical Inventory Verification in April 2002.

The results of the inspection activities in all areas of the **Magnox** reprocessing facilities were satisfactory. The implementation of the tightened safety and security measures and working rules on the Sellafield site tended to complicate the organisation and smooth running of the routine verification activities in the Magnox installations. The so-called "Written Scheme of Work for Euratom and IAEA Inspectors", issued by BNFL in the UK to strengthen the safety procedures resulted in significant additional administrative burden for the inspectors.

Beyond the routine inspections, the focus of ESO activities in Sellafield in 2001 was on granting the approval by the Commission for the chemical processing of irradiated materials in THORP (according to **art. 78 Euratom, second paragraph**) and the preparation of a series of outstanding legal documents (Particular Safeguards Provisions, PSP's). The under art. 78 approval was finally granted by the Commission on November 27; the PSP for Thorp came into force by the Commission Decision of 11/07/2001. Further PSP's entering into force in 2001 were those for the Site Rail Sidings - Magnox Fuel, the Fuel Handling Plant – Decanners, the Euratom On-Site Laboratory Sellafield and the THORP receipt and storage ponds.

At the two reprocessing plants at **La Hague** (France), routine verifications made on all Plutonium input and output flows allowed the confirmation of COGEMA declarations. Like in the previous year, it was still not possible to draw conclusions within the timeliness foreseen because of delays in declarations of some analysis results used for accountancy balance by the operator. From October 2001, a new link

[6] At reprocessing facilities, spent fuel assemblies received from power reactors are processed chemically to separate uranium and plutonium from the highly radioactive fission products. The separated nuclear materials can be re-introduced in the fuel cycle

for transfers of Uranyl nitrate between the two reprocessing plants was made operational and the transfers were verified. Due to the reduction in human resources, Uranium outputs are no longer routinely checked.

The verification of the basic technical characteristics (BTC) of the new plutonium conditioning line was successfully performed in co-operation with the operator COGEMA.

Annual inventory verifications of the two processes and of the two plutonium storages at La Hague have been conclusive.

The decommissioning plan for the **Dounreay** (UK) reprocessing facility includes *inter alia* the removal of nuclear material from a number of areas on the site. Accordingly, safeguards activities during the 2nd half of the year were dominated by the sealing of SNR[7] (MOX) fuel elements for shipment, an activity which was undertaken successfully. In addition, there were two physical inventory verification (PIV) inspections at Dounreay during the year. These activities, as well as routine verifications were conclusive. The quality of safeguards at Dounreay greatly improved in 2001 since site management implemented improvements as requested by the Euratom Safeguards Office.

4.2.2. Installations for the Fabrication of Mixed Oxide Fuels (MOX)[8]

At the end of the year 2001 the British Authorities gave their consent for the operation of the **Sellafield MOX fabrication Plant** (SMP). The facility is expected to introduce Plutonium in the process by March 2002. The verification of the Basic Technical Characteristics has been completed. The commissioning of Euratom equipment for collection and treatment of data is prepared to start routine operations. Data transmission tests (state of health information) to Luxembourg started in April 2001. The Uranium PIV did not give rise to comments.

An incident of erroneous declarations of a shipment of a small quantity of Natural Uranium to another British installation was investigated by BNFL and measures to avoid recurrence were taken. PSP (Particular Safeguards Provisions) for this installation were drafted and are being reviewed.

The **Sellafield MOX Demonstration Facility** (MDF) status changed from Manufacturing Facility to Support Facility. The inspection activities did not give rise to major problems.

Inspections were carried out successfully together with the IAEA under the New Partnership Approach (NPA) arrangements at the **MOX fabrication plant in Dessel**, Belgium. Some equipment failures occurred during the early part of the year which led to re-verification of material.

Increased inspection effort was dedicated to the **MOX fabrication plant of Cogema Cadarache** following the new inspection approach followed since 2000. This meant a high frequency inspection regime and the installation of new NDA (non-destructive

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7 Schnell Neutron Reactor (DE)

8 In MOX Fuel Fabrication Plans, the plutonium oxide produced in reprocessing installations is used in a mixture with uranium oxide to fabricate MOX fuel elements for subsequent use in nuclear power plants.

assay) equipment. In the year 2001 Euratom inspection objectives were fully satisfied.

The safeguards operations at **MELOX in Marcoule**, France continued at the usual good level. The undue delays in presenting items sampled for non-destructive assay during interim verifications were addressed by ESO and the operator is taking measures to avoid recurrence. The annual Physical Inventory Verification of the plant was conducted by ESO inspectors in July, with satisfactory results.

At the **Siemens MOX Fabrication Plan**t and BfS Hanau (Germany) the decommissioning activities continued throughout 2001 and for the first time included the Plutonium bulk handling part of the installation. Despite the fact that there is no longer any production, this site still has a large safeguarded direct use material inventory. Verifications were conclusive.

4.2.3. Enrichment Facilities[9]

The **Eurodif** gas-diffusion enrichment plant in Pierrelatte was subject to high frequency (weekly) inspection throughout 2001, including one Physical Inventory Verification. During these inspections all of the Low Enriched Uranium (LEU) output from the plant was verified. However, neither the input of natural uranium nor the tails were verified systematically due to limitations in resources. There was no evidence found that the civil material in the facility was anything other than properly accounted for. However, constraints placed by France on the inspectors due to the "particular status"[10] of the facility and the large stocks of nuclear material present mean that the level of the achieved safeguards assurance is somewhat limited.

All three **URENCO** centrifuge enrichment plants in the Union (Almelo-NL, Gronau-DE and Capenhurst-UK) are safeguarded together with the IAEA, the one in the UK having been voluntarily offered for safeguards by the UK authorities. The safeguards approach includes verification of all feed material before it is connected to the process and all product or tails material before it is shipped from the facility. Verifications done in addition to accountancy checks, include weighing, Non Destructive Assay, Destructive Assay and containment & surveillance measures. On that basis, the operator declarations of nuclear material flow and inventory were deemed acceptable.

For reasons of commercial sensitivity as well as proliferation risk, access to centrifuge cascade areas is highly restricted. Therefore, in the course of 2001, a new generic safeguards approach incorporating an appropriate mix of different measures has been formulated and presented to the plant operators of all centrifuge enrichment plants. The innovation mainly concerns the consolidation of existing and recently developed techniques (such as HPTA[11]) applied for the direct confirmation of absence of high enriched uranium production in plant areas with restricted access.

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[9] Modern Light Water Reactors need fuel with about 3 to 5 percent of the fissionable uranium isotope U235. As natural uranium contains only 0.7 percent of this nuclide, an enrichment process is needed to achieve the desired concentration. In the European Union, two companies offer this service for civil customers: URENCO and EURODIF

[10] Due to the presence in the installation of material not under safeguards.

[11] High Performance Trace Analysis

4.2.4. LEU and HEU Fuel Fabrication Plants, Conversion Facilities[12]

Routine inspections and Inventory Verifications at the Fuel Fabrication Plants at Juzbado (**ENUSA, Spain**) and Västerås (**Westinghouse Atom AB, Sweden**) were performed with satisfactory results. In October 2001, Westinghouse Atom reported an erroneous shipment of an "empty" container to Ranstad Mineral (Sweden) which contained Nuclear Material. The matter was evaluated, and recommendations to avoid recurrence were made by ESO to the operator. The PSP for Westinghouse Atom came into force in 2001.

At the **FBFC LEU fabrication plant** in Belgium, three new reference rods were brought into use following a rigorous procedure of procurement, analyses, and continuity of knowledge. These will be used to confirm safeguards verification measurements on production rods at monthly inspections. New methods and equipment for waste and scrap material measurements were initiated and partially tested during the PIV. The results of the PIV were satisfactory.

At **COGEMA Pierrelatte** (France), inspections were carried out as necessary in accordance with the operational plan in order to verify the transfers of civil material to and from a (non safeguarded) process, imports, exports, and some receipts and shipments. One annual inventory was carried out. There was no evidence that the civil material in the facility was anything other than properly accounted for. The large stocks of material at the facility mean that the achieved level of safeguards assurance is somewhat limited.

At **COMHURHEX Pierrelatte and Malvesi** (France), annual inventories were performed. There was no evidence that the civil material in the facilities was anything other than properly accounted for.

At the LEU fabrication plant of **FBFC in Romans-sur-Isère** (France), the annual Physical Inventory of the plant was verified by ESO inspectors in August. Although there was no evidence of diversion, several shortcomings were detected and had to be corrected by the operator.

The annual Physical Inventory Verification at **CERCA, HEU Fabrication plant** in Romans (France) is still unsatisfactory, as the operator could not provide a computer-readable list of inventory items. Recently however the operator made an offer for developing a software that will allow him to extract the relevant data on a computer-readable device. Active neutron counting was performed on four finished fuel assemblies fabricated by CERCA for the Research Reactor in Garching, Germany. The measured items remain under Euratom seals.

At **BNFL Springfields** (UK), because of the size and diversity of the plant, the continuous nature and high frequency of imports and exports, a weekly inspection regime is maintained. Inspection effort is gradually shifting toward heavy concentration on the new oxide fuel complex and related facilities. There is a policy in place of verifying all receipts and shipments subject to advance notifications, as well as sealing of all exports from the EU. The inspections have brought to light an

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[12] At LEU Fuel Fabrication Plants, fuel assemblies are produced from low enriched uranium (LEU) for subsequent use in nuclear power plants. In HEU Fuel Fabrication Plants, fuel elements for research reactors using high-enriched uranium (HEU) are manufactured

erroneously reported transfer of material from Sellafield, systematic weight differences among some imported drums, and a large shortfall in the enriched-uranium category in the mixed installations of Springfields at the PIV. Requirements to the operator regarding measurement uncertainties to allow for better evaluation of the material balances have been defined.

At the **LEU fuel fabrication plant at Lingen** (Germany) the inspectors have undertaken actions in order to further improve the quality of the nuclear material balance. This included revised procedures for reporting shipper-receiver differences on receipt of UF6 material. Furthermore, in line with a request from inspectors, the operator reduced the relatively high amount of non-homogeneous scrap material present at the plant to improve the quality of the PIV assessment.

4.2.5. Nuclear Power and Research Reactors[13]

The planned routine and PIV inspections at power reactors in **Belgium and Germany** were performed as planned and gave satisfactory results, including however in several cases follow-up and additional inspection effort.

In terms of inspection resources required by activities in connection with the loading and sealing of CASTOR flasks in Belgium and Germany, **Greifswald** (Germany) was the most important site, and this despite several licensing problems that resulted in a lower than anticipated loading programme by the operator. During 2001 almost one thousand assemblies were verified and placed under containment and surveillance.

High priority continues to be given to reactors using **MOX fuel** in NNWS (see footnote 16). Despite several serious safeguards problems due to equipment failure or operator error, quick reaction meant that potential safeguards anomalies could be obviated (on two occasions by re-measuring the fresh MOX assemblies).

A further problem was the verification of fresh MOX fuel that was not loaded to the core during the annual refuelling. In certain cases it was difficult to convince operators to accept this additional burden.

In the UK, draft PSP proposals for **AGRs** were handed over to the operators for comments. A meeting between Euratom, British Energy and DTI (Department of Trade and Industry) on these proposals is planned for early 2002.

Spanish reactors surveillance encountered some problems during 2001. ESO currently intends to install completely new systems in five such reactors in order to apply full NPA. Following a safeguards problem in 2000 as a result of operator error in one Spanish LWR, the core fuel was successfully re-established in 2001 by a highly intrusive NDA method.

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[13] Most of the nuclear power reactors operated in the European Union are of the Light Water Reactor type (LWR), i.e. the reactors are cooled and moderated with normal water. In addition, the UK operates MAGNOX and Advanced Gas Cooled Reactors (AGR) which are moderated with graphite and cooled with CO_2 gas. The operation of LWRs using LEU is characterised by long periods (12-18 months) of continuous operation. These periods, when the in-core fuel is inaccessible, are followed by outages typically lasting 2-4 weeks when about one third of the (used) core fuel is exchanged for fresh fuel from Fuel Fabrication Plants. LWRs are inspected during this outage period when all the fuel is accessible for verification

Controls at the **High Flux Reactor site at Petten** (NL) had to be accentuated in 2001 because of the increase in the stocks in the storage pools following the lack of transport possibilities for spent fuel. The possibilities for recycling of the uranium into the production of fresh targets, thereby alleviating the problem, are being studied. In this respect it has to be noted that starting even a small reprocessing plant will require Commission approval. In the meantime the reactor was stopped on a temporary basis at the request of the Dutch Government due to concerns associated with the ageing of the pressure reactor vessel.

4.2.6. Other installations or facilities

At **Sellafield** (UK), the inspection activities in the input stores (irradiated fuel) and the output store (Plutonium Oxide) gave satisfactory results. However, persistent technical problems with the operators equipment caused long delays in the performance of the planned inspection activities in some of the spent fuel ponds.

The PSP for **Ranstad Mineral** (waste treatment facility in Sweden) came into force in 2001.

At **Berkeley Technology Centre** (UK), the problems mentioned in the last ESO report relating to the physical follow up of nuclear material have now been overcome.

A revised draft version of the Facility Attachment for **COGEMA La Hague** concerning the area for receipt and reconditioning of unirradiated MOX fuel for Japan, inspected jointly with the IAEA, has been sent to France.

Continuity of knowledge has been lost three times during 2001 for the LWR irradiated fuel **storage ponds at La Hague,** inspected jointly with the IAEA. All three anomalies were triggered by the operator following lighting problems. These losses that rendered necessary the re-establishment of the inventory knowledge constituted a heavy load for inspections.

At the **CLAB**[14] storage ponds in Sweden, a transport container was not available for verification in April 2001. The verification of the fuel assemblies, though postponed, was successful. A first draft of the Particular Safeguards Provisions for this installation has been sent to Sweden.

4.3. Global evaluation of the safeguards activities

During the reporting period of 2001, in-field statistical evaluation of the difference between physical inventory and book inventory was carried out at the moment of Physical Inventory Verifications in fuel fabrication plants to support timely decisions about the material balance for that specific period.

For MOX fuel fabrication plants, part of the evaluation activities focussed on similar recent historical differences with a view to assess whether or not long-term systematic measurement errors exist in the measurement system on which the accounting records are based.

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[14] Centrallagret För Använt Bränsle (Spent Fuel Storage Facility)

For large-scale plutonium production plants the evaluation activities consisted, *inter alia*, in drawing-up procedures to evaluate declarations of nuclear transformations[15] and in re-verifying scale calibration parameters.

In enrichment plants, historical Operator-Inspector differences based on Destructive Analysis[16] were analysed in order to determine and assess the inspector's and operator's measurement uncertainties. The results of these activities did not give rise to any concerns and lead to the routine follow-up of such activities.

5. THE YEAR IN REVIEW: SAFEGUARDS ACTIVITIES UNDER THE NPA[17]

5.1. The IAEA Safeguards Implementation Report

The Safeguards Implementation Report (SIR) of the IAEA covering the joint activities on the territory of the EU in 2000 was made available to ESO in early June 2001. A meeting at the IAEA headquarters took place in the second half of June to review the findings and discuss details relating to nuclear installations in the EU. At the same time a critical analysis of the content of the SIR was prepared as a working paper from the Commissions services and sent to the Council for examination by the experts of the Atomic Questions Group. The mechanistic findings reported in the SIR were the subject of extensive review and evaluation within ESO. A joint ESO/IAEA review meeting was held in November 2001 to identify facts worth noting and agree on recommendations for improvements when appropriate.

All in all, the SIR 2000 concluded that there was no evidence of diversion of nuclear material or misuse of equipment or facilities placed under safeguards in the European Union.

Nevertheless, the SIR complained about slow progress in the conclusion, approval and entry into force of the IAEA Additional Protocols in the EU, despite their main aim were to facilitate the detection of illicit nuclear activities in less reliable areas in the world.

It should, however, be mentioned that the SIR 2000 recognised the efforts made by ESO to prepare for the implementation of the Additional Protocols when they will enter into force in the European Union.

For the first time, the SIR mentioned that increased co-operation with regional systems of nuclear materials accounting, such as the one established by the Euratom Treaty, could enhance the effectiveness of verification by the IAEA and its cost efficiency and welcomed further improvements along these lines.

Better use should be made by the IAEA of the safeguards results of regional systems. This would allow the Vienna Agency to concentrate its limited means where increased controls are needed and justified.

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15 Nuclear transformation is the increase or decrease in the quantity of nuclear material due to capture or radioactive decay

16 Destructive Analysis is a qualitative and quantitative determination of a characteristic of a sample, and aims at establishing the total quantity and composition of nuclear material present in the items being measured

17 New Partnership Approach

As a conclusion, the SIR noted a downward trend regarding illicit trafficking in nuclear materials. No serious case had been reported in the last two years in the EU.

In addition to its global conclusions, the SIR 2000 made recommendations for improvement in specific areas. These recommendations may be summarised as follows:

- shipment of Partially Filled or Empty Transport Containers should take place Prior to Core Opening at LWRs;

- advanced notification for movement of empty or partially filled containers should be requested by ESO and information transmitted to the IAEA in good time to facilitate inspection activities;

- a number of solutions have been identified to the generic problems associated with Plutonium Production in Large Research Reactors. The risks in these types of facilities will be eliminated after the installation of the most suitable Power Monitors at the facilities concerned;

- all LWR MOX facilities were successfully verified and passed safeguards criteria, showing improvement through enhanced co-operation with ESO, prompt follow-up actions, smooth (but cost-ineffective) execution of short notice inspections and use of underwater cameras;

- corrective actions need to be taken during or soon after a Containment and Surveillance failure is detected. The IAEA considers important to further install protective covers on seals and back-up open core surveillance systems. The IAEA should fully bear the cost of this redundant equipment not needed by ESO;

- problems occur according to the IAEA mechanistic system when nuclear material remains in closed shipping containers, over long periods or when nuclear materials at reactors are present in the form of rods in closed containers, rendering it not easily accessible.

Improvements in the way in which the NPA will be implemented in the future shall contribute further to a more even cost sharing between the two inspectorates and better consistency between conclusions drawn in the SIR and those resulting from full safeguards activities conducted by the ESO.

5.2. Preparation for the entry into force of the IAEA Additional Protocols

The main aim of the Additional Protocols is to increase the IAEA's capabilities to detect undeclared nuclear material and activities that are in violation of the NPT (Non Proliferation Treaty) provisions.

This expanded legal authority of the IAEA contained in the Additional Protocol encompasses three main categories of new measures: (a) information on nuclear activities and on nuclear related research to be provided to the IAEA in a comprehensive way; (b) complementary physical access to locations beyond purely nuclear installations to be granted to the IAEA for the purpose of verifying this information, (c) new technologies to be used by the IAEA to apply safeguards in a more effective and cost efficient manner.

These new measures may also affect the activities and responsibilities of the Euratom Safeguards Office on the territory of the European Community. The Commission might therefore be committed to carry out new tasks after the entry into force of the Additional Protocols, namely:

(1) to provide the IAEA with the information required as far as it concerns nuclear material and related sites for all Member States of the European Union;

(2) to implement all measures related to the Community's Joint Research Centre (JRC), including those which the Protocol sets out for States, in close collaboration with the State on whose territory an establishment of the JRC is located.

With a view to ensure a smooth implementation of the Additional Protocol in the EU after its entry into force, two field trials (JRC at Petten and VTT in Helsinki) are currently being carried out to test the modalities for the information flow required by the IAEA, for the delimitation of nuclear sites and the arrangements for complementary access.

In other areas subject to the rules of the Additional Protocol considered unanimously by the EU Council as of sole Member States responsibilities, Annex III of the Protocol foresees, nevertheless, a possibility to transfer the implementation of these measures to the Commission if the responsible Member State so wishes. This transfer would require a formal decision by the Commission accepting to carry out the task(s).

So far, seven to eight Member States[18] (out of the 13 NNWS)[19] have expressed their intention to request the Commission to implement these measures on their behalf[20], but the detailed modalities for such a transfer would not be identical.

On several occasions the Commission made clear that it was not prepared to accept new activities – especially outside its formal responsibilities – without receiving at the same time, from the budget authority, the resources needed in order to implement them properly.

Therefore, up to now the Commission has clearly indicated that it was not prepared to accept the transfer of responsibilities pertaining solely to the Member States. Nevertheless, preparatory work has already been carried out on a limited scale with the objective to assess the implications for the Euratom Safeguards Office of the additional tasks under consideration.

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18 Belgium, Germany, Greece, Luxembourg, Spain, Portugal, the Netherlands and still awaiting formal confirmation Italy

19 Non Nuclear Weapon States

20 A legally binding commitment by a Member State to transfer the implementation of measures to the Commission can only occur after entry into force of the Additional Protocol in form of a so-called side-letter that will have to be sent to the IAEA

6. THE YEAR IN REVIEW: PROGRESS IN SAFEGUARDS TECHNOLOGY AND VERIFICATION PROCEDURES

During the year 2001 priority has been given to the introduction of new technology into the field to replace obsolete instrumentation. In connection with this activity appropriate computer hardware and software for nuclear data acquisition and data interpretation have also been implemented.

The most important areas of progress during the year were:

– Installation and routine application of a new digital video surveillance system in plutonium bulk handling plants. The new digital surveillance systems afford possibilities to enhance data treatment and to facilitate review optimising available human resources. They also open the possibility for data transmission of recorded images to headquarters with a view to reducing manpower requirements in the field.

– The design and configuration of a new transponder seal provides the opportunity for on site verification, which will not only improve the inspection efficiency but also reduce the overall annual usage and enhance the handling logistics back at headquarters. The IAEA have been closely involved during the different phases of the testing and implementation of this new safeguards product.

– Important progress was made on the implementation of evaluation tools developed to facilitate the interpretation of measurement data. In addition tests on the feasibility of data transfer to and from ESO headquarters by satellite have been carried out using the ASTRA facility located in Luxembourg.

7. THE YEAR IN REVIEW: INSTITUTIONAL ISSUES

7.1. European Parliament (EP)

The 1999-2000 ESO activities report is the subject of an EP initiative report. For 2001 activity was dominated by M.E.P.'s questions related to nuclear safety and security. The interest focused on the possible consequences of terrorist attacks against nuclear installations, the leak of radioactive effluents into the environment and the licensing of the Sellafield MOX facility by UK government authorities.

7.2. Enlargement

The project set up to ease the implementation of the Euratom Nuclear Material Accountancy System by countries candidate to EU accession, via software tools and the required hardware progressed well. Representatives of the applicant countries actively contributed to the project through their participation in a steering committee, which also ensures that the tool is tailor-made to their needs.

7.3. Member States

While the Euratom Treaty stipulates that the Commission deals directly with nuclear material operators, ESO considers regular contacts with Member States authorities as essential for the smooth implementation of safeguards in the respective States. In

addition, discussions took place with a number of Member States to prepare for the implementation of the measures of the Additional Protocol.

The Atomic Questions Group of the Council was briefed on the progress made in the preparation of the implementation of the Additional Protocol, the revision of the Euratom Regulation no. 3227/76 (see footnote 2) and the IAEA Safeguards Implementation Reports for the Member States of the European Union.

7.4. Euratom agreements

For the period covered by this report, the three Community nuclear co-operation agreements into force, respectively with the United States of America, Canada and Australia, were implemented to the satisfaction of all Parties involved. This was in particular confirmed during the bilateral technical Working Group and Consultation between Euratom and Australia that took place in Canberra in June 2001.

The Euratom Safeguards Office actively participated in the on–going negotiation of a nuclear co-operation agreement between Euratom and Japan. The progress achieved during the negotiation rounds that took place in 2001, gives hope for a successful conclusion of the agreement in the near future.

Concerning a future nuclear co-operation agreement with China, and following the interest expressed by parties involved, a draft negotiation mandate was submitted by the Commission to the Council. It is expected that the mandate will be approved during the first half of 2002, so that the negotiations could start soon after.

8. EURATOM SAFEGUARDS RESOURCES

8.1. Budget appropriations

Article 174 of the Euratom Treaty specifically mentions the necessity to include appropriations in the Commission's budget for operational expenditure related to the activity of nuclear safeguards.

Founded on this legal basis the safeguards activities are financed by two types of budget appropriations:

(1) a general “functioning” appropriation involving the costs of ESO’s overheads such as officers’ salaries, rental of headquarters’ offices, general IT equipment, telecommunications, etc. (Part A of the Budget, lines A0-5010, A0-7002, A0-7010, A0-7030), as well as a specific appropriation for the medical survey and the radiation protection of the inspectors (Part A of the Budget, line A0-1420);

(2) specific “operational” appropriations foreseen for the expenditure of ESO, directly related to nuclear safeguards such as mission costs, rental of offices on site (including on site laboratories), purchase of technical equipment and samples taking and analysis, contracts for services (i.e. maintenance and repairs), transportation of equipment and samples, training, etc.., necessary for Euratom safeguards activities (Part B of the Budget, sub-chapter B4-2).

For 2001, the specific operational appropriations in the EU Budget for the Euratom Safeguards Office represented € 17.7 Mio. From that amount € 17.562 Mio (99.2%) were actually committed. The sharing of the expenditures were as follows:

- Inspection mission costs (travel means, daily allowances): € 4.5 Mio (26%)
- Rental of offices for the inspectors on inspected sites (and related equipment costs): € 0.75 Mio (4.3%)
- Purchase, installation, maintenance and repairs of equipment on sites, including informatic means, analysis of samples, related costs such as transport, consumables, spare parts, etc.: € 4.45 Mio (25%)
- Investments made in large scale plutonium bulk handling plants and related maintenance, operation and logistics: € 7.4 Mio (42%)
- Administrative and technical assistance, training for inspectors, and other expenses (including special insurance coverage: € 0.5 Mio (3%)

The number of inspections on site, after a stabilization in the last 3 to 4 years, have been reduced in 2001, in parallel to an increase of stand by equipment and remote controlled systems in the installations.

Major investments related to large Plutonium bulk handling installations have already been completed. The costs of those plants still represent an important part of the expenditures. Out of the € 7.400 Mio annual costs, more than 50% currently represent maintenance and technical support on the existing equipment.

8.2. Human and other Resources

8.2.1. Staff Resources and Utilisation

The Euratom Safeguards Office employs a team of officials, including inspectors, plus appropriate administrative and logistical support in its headquarters in Luxembourg, which accounted for 269 permanent posts, at the end of 2001.

Of these posts, 208 were allocated to staff having the status of nuclear inspector according to art. 81 of the Euratom Treaty.

8.2.2. Safeguards Equipment

The Safeguards equipment used by the inspectors fall into two main categories. The first corresponds to **N**on **D**estructive **A**ssay (NDA) measurements that are used by inspectors to assure themselves that the physical quantities of nuclear material in the facilities correspond to the notified accountancy values. The methods used are based upon neutron and gamma measurement techniques.

The second category corresponds to **C**ontainment and **S**urveillance (C&S) measures. These are in the form of video camera surveillance and seals and prevent the loss of knowledge on verified material.

Further efforts have been made in 2001 to rationalise and standardise the range of hardware and software equipment used. The hardware of both **NDA** and **C & S** is based upon commercially available products. The software used for the data analysis of both neutron and gamma measurements in attended mode applications were developed specifically for safeguards applications.

8.2.3 Support by the Commission Joint Research Centre

The Commission Joint Research Centre provides scientific and technical support to the Euratom Safeguards Office inspectorate for both routine activities in the laboratories and related development work for future improvements to safeguards activities through the Commission Research and Development programme. In the Fifth Framework Programme for the year 2001, the support included provision for 58 man/year and a specific credit of € 1.72 Mio distributed principally between ITU (Karlsruhe)[21] and IPSC (Ispra)[22].

The co-operation between ESO and the JRC was mainly focussed on the following areas:

- concerning the Transuranium Institute in Karlsruhe:operation of the On-Site Laboratories, Sample Analysis at ITU and in-field, High Performance Trace Analysis, and Nuclear Forensic Analysis, improvement of analytical methods;

- for the IPSC Ispra Institute: General Scientific and Technical Support in the areas of Health Physics,testing of Equipment and instruments; technical training and calibration; measurement and counting support, development of sealing and surveillance techniques;

- from the IRMM[23] Geel: Analytical Activities in the domain ofanalytical quality control and provision of high quality nuclear reference materials.

For the operation of the On Site Laboratories at La Hague and Sellafield, an administrative arrangement entered into force between the ESO and ITU (Karlsruhe), to provide the necessary appropriately trained staff (20 persons) for the running of the laboratories throughout the year. The cost of this arrangement € 1.7 Mio corresponds to a total of 340 missions per annum.

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21 Transuranium Institute (JRC)

22 Institute for the Protection and Security of the Citizen

23 Institute for Reference Materials and Measurements

9. OTHER ACTIVITIES WITH ESO INVOLVEMENT

9.1. Nuclear Safety, physical protection and illicit trafficking

In the enlargement context, ESO provided technical expertise required in the evaluation of the nuclear safety standard in Eastern European nuclear installations, and, contributed to the overall co-ordination effort in the nuclear safety evaluation.

After the tragic terrorist attacks on 11 September, and like almost all other nuclear operators and holders of nuclear material, ESO examined the adequacy of existing physical protection measures and made an effort to further strengthen activities in that field through acquisition of relevant expertise and training.

The Euratom Safeguards Office continued to play an active role in experts groups where prevention and detection mechanisms and communication and intervention procedures are discussed. ESO also worked in close co-operation with the IAEA and maintained informal contacts with national authorities, Europol and other dedicated agencies.

9.2. Support to the Nuclear Non-Proliferation Regime

ESO continued to provide support to the IAEA and the international safeguards community for the development of the Strengthened and Integrated Safeguards System. It assisted the IAEA in the development of new safeguards approaches to be implemented in States where the IAEA will be able to conclude that no State clandestine nuclear material or activities exist. ESO also assisted the IAEA in the development of new concepts for the use of State and Regional Systems of Accountancy and Control, the use of inspections announced at short notice and the resolution of anomalies.

Within the existing framework of the New Partnership Approach, which is an integral part of the safeguards co-operation between ESO and the IAEA in the European Union, information is regularly exchanged concerning new safeguards equipment and instrumentation. Both organisations work closely together in the field to optimise the financial and human resources in the establishment of an effective safeguards infrastructure within the European Union. The synergy through this co-operation greatly benefits the IAEA in the effectiveness and efficiency of the discharge of their obligations in the EU. It is now time for the ESO also to draw some benefit from the implementation of the NPA signed in 1992.

10. OVERALL CONCLUSIONS

For the activities carried out by the ESO during the period of 2001 the following conclusions can be drawn:

(1) As suggested by the report of the IGS in 2000, the mission of the ESO and its existing safeguards approaches were reviewed by a HLEG established by a Commission decision in June 2001. The implementation of the recommendations made will be carried out during the period 2002-2003.

(2) Concerning the results of the verification activities:

  (a) Matching problems between measurements and corresponding notifications made by operators on the one side, and inspection results on the other side persisted in some plants; explanations were found or investigations are still going on;

  (b) however, based on the analysis of the overall results no significant indication for the diversion of nuclear material from its declared use was found.

(3) Concerning activities at specific installations:

  (a) The Commission's approval required under Article 78, § 2, of the Euratom treaty for the operation of the THORP reprocessing plant in the nuclear complex at Sellafield was granted in November 2001. The negotiations of several PSP's for other sites were also successfully concluded over the year;

  (b) a new safeguards approach for the URENCO enrichment facilities was developed and discussed with the operator concerned and the IAEA. This new approach which draws heavily from HPTA techniques is better suited to protect commercially sensitive technology and information while providing the assurances required;

  (c) the safeguarding activities carried out in France in mixed installation, or installations of "particular status", encountered still a number of difficulties even if serious progress has been registered relating to safeguards assurances;

  (d) the Destructive Assay (DA) analysis of Plutonium and other samples collected in reprocessing plants was possible because of the existence of the onsite laboratories, avoiding the administrative and practical obstacles caused by the transport authorisations needed for a transfer of samples from other bulk installations to the ITU (Karlsruhe);

  (e) in reactors, a substantial increase in the loading of transport containers with spent fuel elements for interim storage was experienced with the associated pressure on resources for the ESO.

(4) A further improvement in the co-operation with the IAEA was achieved, reflected in the SIR which confirms the conclusions drawn by ESO on the non-diversion of nuclear material from its declared use.

(5) First experience has shown that the increased reliance on unattended surveillance/containment and remote monitoring systems can lead to efficiency gains in the use of resources, even if manpower needs were not reduced substantially.

(6) The co-operation with the JRC was carried out in a smooth and very effective way, and, thereby contributed substantially to the effectiveness of ESO and to the JRC's increase in overall scientific expertise recognition and competitiveness in the international arena.

(7) All in all, the objectives defined for ESO's activities as set out in Chapter VII of the Euratom treaty were attained in the year 2001.

Annexes

Table no. 1 – Quantities of nuclear material under Euratom safeguards

	End 1990	End 1995	End 2000[1)]	End 2001[1)]
Plutonium	203	406	525	548
Uranium				
Total	200 400	269 100	310 400	314 610
HEU[2)]	13	11	10	10
LEU[3)]	32 000	46 700	55 500	57 000
NU[4)]	44 000	51 400	53 700	52 700
DU[5)]	124 400	171 000	201 200	204 900
Thorium	2 600	4 600	4 500	4 500

1) Quantities based on final reported data
2) High Enriched Uranium
3) Low Enriched Uranium
4) Natural Uranium
5) Depleted Uranium

Table no. 2 - Inspection activities of Euratom Safeguards Office (ESO)

Person days of inspection in:	**1999**	**2000**	**2001**
Non Nuclear Weapon States	2412	2113	2328
France	3492	3426	2934
UK	2871	2895	2399
Total	**8775**	**8434**	**7661**

Table no. 3 – ESO's Staff Situation End 2001

Distribution of staff per grade among the Units and the 6 actions of the Nuclear Safeguards Activities

Actions (numbered according to ABB*) nomenclatures)	A-grade officials	B- and C-grades Support staff	TOTAL
1) Nuclear Material Accounting	3	20	23
2) Evaluation of safeguards results	3	3	6
3) Methodology and approaches of control	5	5	10
4) Inspections on site	42	97	139
5) Logistic, Technical and IT Support	9 6	37 11	46 17
6) Management, Financial and Administrative support	5	23	28
TOTAL	**73**	**196**	**269**

*) Activity Based Budgeting

Table no. 4 – ESO's Budget 2001

Expenditures committed for the specific appropriations

Table no. 4 A

Line B4-2000 : Safeguard inspections, training and retraining of inspectors

Topics	Expenditures (Thousand €)
a) Studies, convocation of experts, publications	11
b) Mission Costs	3,800
c) Transportation for staff and equipment	700
d) Rental of offices and special services on sites	750
e) Internships and Training	200
f) Special insurance	40
TOTAL	**5,501 (out of 5,600)**

Table no. 4 B

Line B4-2020 : Sampling and analyses, equipment, specific work, provision of services and transport

Topics	Expenditures (Thousand €)
a) Administrative and technical assistance	214
b) Purchase of surveillance equipment	429
c) Purchase of measurement equipment	1,132
d) Purchase of equipment for seals	378
e) Purchase and maintenance of computing equipment directly linked to inspections	424
f) Costs for destructive analysis	65
g) Equipment spares, repairs, accessories and maintenance	378
h) Consumable items, purchase of sources, transport of radioactive materials	265
i) Monitoring (warning system based in Luxembourg)	239
j) Software (Accountancy program, Management and IT Firewall)	1,137
TOTAL	**4,661 (out of 4,700)**

Table no. 4 C

Line B4-2021 : Specific safeguards for large-scale plutonium processing plants

Topics	Expenditures (Thousand €)
a) Sellafield – BNFL (THORP, MOX)	642
b) La Hague – COGEMA (UP3, UP2)	857
c) Cadarache – COGEMA	46
d) Marcoule – MELOX	70
e) Dessel – BELGONUCLEAIRE	43
f) On site laboratories (initial investments and operations)	3,355
g) Software (on sites)	401
h) Maintenance & repairs (Equipment, hardware and software support)	1,153
i) Software development (new applications, new equipment)	833
TOTAL	**7,400 (out of 7,400)**

Table no. 4 D

Line A0-1420 : Health checks for staff exposed to radiation

Topics	Expenditures (Thousand €)
a) Gamma spectrometry and Toxicological analysis (non standard)	45
b) Measurement equipment (dosimeters)	53
c) Maintenance and calibration	5
d) Material, services and other contamination controls	44
e) Mission costs (for body-counter)	56
f) Other running expenses	18
TOTAL	**221 (out of 224)**

Table no. 5 – ESO's Budget 1991-2001 (Mio €)

Evolution of expenditure for the specific budget appropriations

Budget Line	1991	1995	2001
Safeguard inspections, training and retraining of inspectors (B4-2000)	2.5	4.2	5.5
Sampling and analyses, equipment, specific work, provision of services and transport (B4-2020)	2.3	3.2	4.7
Specific safeguards for large-scale plutonium processing plants (B4-2021)	2.6	10	7.4
Health checks for staff exposed to radiation (A0-1420)	0.1	0.3	0.2
TOTAL	**7.5**	**19.5**	**17.8**