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MEASURES TO STRENGTHEN INTERNATIONAL CO-OPERATION IN NUCLEAR SAFETY, RADIOLOGICAL PROTECTION AND RADIOACTIVE WASTE MANAGEMENT

Agency activities in the fields of nuclear safety and radiological protection

1. In the Attachment to the present document, which may be regarded as a "successor" to document GC(XXXVIII)/INF/6,[1] the Secretariat endeavours to give an overview of recent Agency efforts to strengthen international co-operation in nuclear safety and radiological protection. In the preparation of the Attachment, account has been taken of ongoing measures to strengthen the Secretariat's organizational structure in the safety area[2] and of

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[1] Document GC(XXXVIII)/INF/6, which was before the General Conference last year, represented - inter alia - an attempt to bring together information of a kind provided on previous occasions in a number of separate documents. It was submitted to the Conference under an agenda sub-item entitled "Measures to strengthen international co-operation in nuclear safety and radiological protection", a title used for Conference agenda items in 1987 and 1988 and succeeded by "Measures to strengthen international co-operation in matters relating to nuclear safety and radiological protection" in the years 1989-93 and by "Nuclear safety, radiological protection and radioactive waste management" in 1994. This year, for the provisional agenda item entitled "Measures to strengthen international co-operation in nuclear safety, radiological protection and radioactive waste management" the Secretariat has already issued document GC(39)/11 on "Measures to resolve international radioactive waste management issues" and document GC(39)/INF/4 on "The Convention on Nuclear Safety: Preparations for implementation of the Convention". It is the Secretariat's intention that in future years all measures to strengthen international co-operation in nuclear safety, radiological protection and radioactive waste management (the subject-matter of these two documents and of the present document) should be dealt with in a single document.

[2] In line with the increased interest in safety-related matters which the General Conference has been showing for several years and with the principle - reflected in the Convention on Nuclear Safety - that there should be an effective separation between the safety and promotional aspects of the utilization of nuclear energy, the Secretariat has arranged for most of the Agency's safety-related activities to be concentrated within a separate Department dealing exclusively with those activities (see para. 15 of the Introduction to document GC(39)/4, "The Agency's budget for 1996"). In this context, it should be noted that the Secretariat is already modifying the Agency safety standards preparation and review process, with the establishment of an Advisory Commission for Safety Standards and of four supporting Committees which should become fully operational next year (see document GOV/INF/772).

recommendations deriving from a recent performance assessment of the Agency's safety-related activities.[3]

2. The safety-related functions which the Agency is performing are grouped in the Attachment under four headings, as follows:

- **Harmonization of safety-related policies** (Part A);
- **Provision of safety-related assistance** (Part B);
- **Rendering of safety-related services** (Part C)[4]; and
- **Fostering of safety-related information exchange** (Part D).

Also, in the Attachment a description is given of Agency efforts aimed at

- **Facilitating the implementation of safety-related conventions** (Part E).

3. As far as possible, the information provided includes background summaries of the Agency's activities, accounts of recent developments and forecasts of future developments.

4. The General Conference is requested to take note of the attached overview of Agency efforts to strengthen international co-operation in nuclear safety and radiological protection.

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[3] Within the framework of the Secretariat's Programme Performance Assessment System a group of senior experts nominated by Member States recently carried out a retrospective peer review of the Agency's safety-related activities and, in the light of the findings, has recommended changes of emphasis for the future.

[4] The rendering of safety-related services by the Agency can be regarded as an aspect of the provision of safety-related assistance (see Part B). However, owing to the wide range of the Agency's safety-related services, these are reported on here separately.

PART A: HARMONIZATION OF SAFETY-RELATED POLICIES

The harmonization of safety-related policies is one of the Agency's most important safety functions. The activities associated with this function include encouraging the development of common basic safety criteria (see Annex A-1) and establishing safety standards (see Annex A-2). These activities represent a major Agency contribution to strengthening international co-operation in nuclear safety and radiological protection.

ENCOURAGING THE DEVELOPMENT OF COMMON BASIC SAFETY CRITERIA

1. The Agency has encouraged the development of common basic safety criteria mainly by supporting the work of expert bodies like the International Commission on Radiological Protection (ICRP), the International Commission on Radiation Units and Measurements (ICRU) and the International Nuclear Safety Advisory Group (INSAG), which provide the Agency with a basis for the establishment of safety standards. This Annex focuses on the activities of INSAG, which - unlike ICRP and ICRU - was established within the framework of the Agency.

2. The Director General established INSAG in 1985 to serve as a forum for an exchange of information on nuclear safety issues of international significance. INSAG seeks not only to identify such issues, but also to draw conclusions on the basis of worldwide nuclear safety experience, and especially of nuclear safety research results and of operational feedback. The functions of INSAG are:

(a) to recommend principles on which safety standards and measures can be based;*

(b) to provide a forum for an exchange of information on generic safety issues of international significance;

(c) to identify important current safety issues and draw conclusions on the basis of the results of safety activities within the Agency and of other information; and

(d) to give advice on safety issues with regard to which an exchange of information and/or additional efforts may be required.

3. The members of INSAG are appointed for a three-year term by the Director General, the major criterion for selection being high professional competence in the field of safety. The members are from regulatory organizations, research centres, academic institutions and the nuclear industry, and they serve in their personal capacity.

4. INSAG has prepared the following reports for publication:

- Summary Report on the Post-Accident Review Meeting on the Chernobyl Accident (INSAG-1, 1986);

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* INSAG's recommendations are addressed to the Agency and the scientific, technical and regulatory community; they are not recommendations from the Agency.

- Radionuclide Source Terms from Severe Accidents to Nuclear Power Plants with Light Water Reactors (INSAG-2, 1987);

- Basic Safety Principles for Nuclear Power Plants (INSAG-3, 1988);

- Safety Culture (INSAG-4, 1991);

- The Safety of Nuclear Power (INSAG-5, 1992);

- Probabilistic Safety Assessment (INSAG-6, 1992);

- The Chernobyl Accident: Updating of INSAG-1 (INSAG-7, 1992);

- A Common Basis for Judging the Safety of Nuclear Power Plants Built to Earlier Standards (INSAG-8, in press);

- Potential Exposure in Nuclear Safety (INSAG-9, in press);

- Defence in Depth in Nuclear Power Plant Safety (INSAG-10, at final editing stage).

5. The reports of INSAG have in the past been published in the Agency's Safety Series. In order to underline INSAG's independence of the Agency safety standards preparation and review process, however, they will in future be issued as a separate publications category.

ESTABLISHING SAFETY STANDARDS

Background

1. The harmonization of safety policies worldwide involves the Agency in organizing the formulation of internationally acceptable safety standards with the help of recognized experts from Member States and in providing, at the request of Member States, for the application of such standards to any of those States' activities in the field of atomic energy.

2. The safety standards of the Agency, published in the Agency's Safety Series, cover the following areas: radiation protection and safety, of which the safe transport of radioactive materials is an important sub-topic; nuclear safety; and the safety of radioactive waste.

Radiation protection and safety

3. A Safety Fundamentals document, "Radiation Protection and the Safety of Radiation Sources", was approved by the Board of Governors in June 1995. The principal Safety Standards document in this area is the "International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources" (the BSS), approved by the Board in September 1994 and published - in an interim edition - as Safety Series 115-I in December 1994. The BSS are jointly sponsored by FAO, ILO, NEA/OECD, PAHO, WHO and the Agency. They specify the requirements to be satisfied in all activities involving exposure to ionizing radiation and are intended to be implemented through national legislation and regulations.

4. The Agency's "Regulations for the Safe Transport of Radioactive Materials" were first published in 1961 (as Safety Series No. 6), since when they have undergone three revisions. The latest edition of Safety Series No. 6 was published in 1990, the review and revision process being supervised by the Standing Advisory Group on the Safe Transport of Radioactive Material (SAGSTRAM).* The Secretariat aims to submit a draft revised edition to the Board of Governors in 1996.

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* A transport-related document that the Agency helped to draft was the Code for the Safe Carriage of Irradiated Nuclear Fuel, Plutonium and High Level Radioactive Waste in Flasks on Board Ships (see the Attachment to document GC(XXXVII)/INF/325 of 26 September 1993), which was drafted by a "Joint IAEA/IMO/UNEP Working Group on the Safe Carriage of Irradiated Nuclear Fuel and Other Nuclear Materials by Sea".

Nuclear safety

5. A Safety Fundamentals document, "The Safety of Nuclear Installations approved by the Board in June 1993 and has been published as Safety Series No. 110. The safety principles set out in the document served as a basis in the formulation of the technical obligations arising out of the Convention on Nuclear Safety (see in this connection doc GC/(39)/INF/4).

6. Within the framework of a Nuclear Safety Standards (NUSS) programme launched in 1974 for the purpose of establishing internationally agreed safety standards for land-based stationary thermal-neutron power reactors, a set of five Safety Standards documents (known as Codes) and 55 Safety Guides was produced over a period of about ten years on (i) Governmental Organization, (ii) Siting, (iii) Design, (iv) Operation and (v) Quality Assurance. Subsequently, all five Codes and some of the Safety Guides have been revised by the Nuclear Safety Standards Advisory Group (NUSSAG).

7. Following a review by NUSSAG of the existing NUSS documents, the Secretariat plans to organize Technical Committee meetings on all of the documents relating to Operation, Design and Governmental Organization, the objective being to propose a programme for revising these documents and preparing new ones.

The safety of radioactive waste

8. A Safety Fundamentals document, "The Principles of Radioactive Waste Management", was approved by the Board of Governors in March 1995 and will be published in the Safety Series. It was prepared within the framework of the Radioactive Waste Safety Standards (RADWASS) programme, which was established in 1991 and under which work has been in progress on documents relating to (i) Planning, (ii) Pre-disposal, (iii) Near-surface Disposal, (iv) Geological Disposal, (v) Uranium/Thorium Mining and Milling Waste, and (vi) Decommissioning (including Environmental Restoration).

9. With the decision to establish a Department of Nuclear Safety which will be responsible for the preparation and review of Agency safety standards, the structure and content of the RADWASS programme are undergoing an in-depth examination with a view to harmonization of the Safety Series publications.

A common, coherent safety philosophy

10. With the approval of the three Safety Fundamentals documents by the Board of Governors, the Secretariat is contemplating the development of a single document presenting a common, coherent philosophy across radiation protection and safety, nuclear safety and the safety of radioactive waste - three areas where the philosophies, although expressed differently, are technically compatible.

Outlook

11. In line with this, as described in document GOV/INF/772 the Secretariat is already taking steps to unify the safety standards preparation and review processes which have existed in the different areas. It is hoped that, through the creation of the envisaged set of advisory bodies with harmonized terms of reference to assist the Secretariat in preparing and reviewing all Safety Series documents, inconsistencies among those documents will be avoided.

PROVISION OF SAFETY-RELATED ASSISTANCE

1. A significant portion of the Agency's safety-related activities is devoted to the provision of technical assistance to Member States in the safety field. The main purpose is to ensure that - through the creation and strengthening of safety infrastructures - recipient Member States can safely benefit from the peaceful uses of nuclear energy generally. The Agency provides technical assistance in the safety field through national, regional and interregional projects and through training, all of which form part of its technical co-operation (TC) programme*, but it also provides safety-related assistance funded from the Regular Budget and from extrabudgetary resources. For the TC activities in the safety field, which are supported by the Agency's regular safety programmes, the Secretariat has developed a strategy which was welcomed last September during the third Technical Co-operation Policy Review Seminar. Annex B-1 describes how the new strategy is being implemented.

2. The strengthening of radiation protection, nuclear safety and radioactive waste management infrastructures in countries of the former Soviet Union is the objective of an Agency/UNDP programme described in Annex B-2.

3. The Agency is providing safety-related assistance to the countries of Eastern Europe and the former Soviet Union with nuclear power plants. It is doing so under its TC programme and under an extrabudgetary programme, the two sets of activities being complementary and closely co-ordinated. Annex B-3 describes work done recently in this area.

4. A very specific aspect of the safety-related assistance provided by the Agency to Member States is education and training in radiological protection and nuclear safety, and recent activities relating to it are described in Annex B-4.

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* The Agency's 1994 technical co-operation programme activities are reported on in document GC(39)/INF/3.

A NEW STRATEGY FOR THE PROVISION OF SAFETY-RELATED TECHNICAL ASSISTANCE

Introduction

1. The Agency is providing safety-related technical assistance - in the form of experts' services, equipment and training - through more than 220 national, regional and interregional projects, of which about two thirds are devoted to radiation protection and about one third to nuclear safety. The projects relate mainly to:

- the establishment and updating of legislation, regulations and codes of practice on the basis of the recently approved International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources;
- the establishment and strengthening of regulatory bodies for both radiation and nuclear safety and the enhancement of safety culture in nuclear installations;
- the enhancement of radiation dosimetry services;
- the establishment of emergency planning and preparedness programmes and procedures;
- the design, control and safe use of radiation sources (including the establishment of systems for the registration and licensing of such sources);
- the strengthening of programmes for the radiation protection of workers, the public and the environment (including the control of occupational and non-occupational radon exposures);
- the improvement of national capabilities in the areas of siting, severe accident management, fire safety, safety-related ageing management, probabilistic safety assessment, and human-machine interface management; and
- the enhancement of research reactor safety.

The RAPAT programme and WAMAP

2. All these activities can be regarded, together with the activities described in Annex B-4, as contributing to the establishment and strengthening of safety-related infrastructures, and they derive in large measure from the findings of the Radiation Protection Advisory Team (RAPAT) programme and the Waste Management Advisory Programme (WAMAP), through which the Secretariat has helped to establish and strengthen such infrastructures in a considerable number of countries and identified those countries whose infrastructures still need to be strengthened.

Model Projects

3. The Agency efforts directed to the strengthening of radiation protection and radioactive waste management infrastructures are now being channelled largely through two interregional Model Projects which were approved by the Board of Governors in December 1993.[1]

4. In parallel with the initiation of these two Model Projects, the Secretariat has been working on a definition of what constitutes an adequate infrastructure for different levels of radiation utilization - from the simple industrial, medical and similar applications which exist in most countries to the nuclear fuel cycle activities which exist in only a few.

A new strategy and its implementation

5. Also, the Secretariat has developed a new strategy for the provision of safety-related technical assistance, and that strategy - spelled out in a document entitled "Guidance for the assessment of radiation protection and safety infrastructures in developing Member States and strategies for enhancement of infrastructures" - was supported last September during the Third Technical Co-operation Policy Review Seminar. The strategy, which is being implemented for individual Member States on the basis of data contained in Country Profiles relating to safety matters, involves the preparation and execution for each Member State of a safety-related Action Plan.

Country Profiles

6. The Country Profile relating to safety matters is a computerized database containing all the data known to the Secretariat on the radiation protection and nuclear safety infrastructure of a country (where such an infrastructure exists) and details of any safety-related Action Plan already prepared in respect of that country.

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[1] Model Projects INT/9/143 and INT/9/144.

7. For each country, a questionnaire (completed as far as possible within the Secretariat) has been sent to the national counterpart for the inclusion of further details. The questionnaire and subsequently the database - covers the following topics:

(1) Organizational infrastructure

(2) Legal and regulatory status, including training

(3) Extent of practices involving ionizing radiation

(4) Provisions for individual dosimetry

(5) Public exposure control

(6) Radiation protection and safety of patients in medical diagnosis and therapy

(7) Transport of radioactive material

(8) Planning and preparedness for radiation emergencies

(9) Quality assurance

Action Plans

8. The information provided through the questionnaire is examined within the Secretariat in order to assess the country's infrastructural needs. On the basis of the assessment (which may involve expert missions), the Secretariat prepares an Action Plan[2] which normally provides for actions to be carried out by the Agency and for actions to be carried out by the country within a timeframe agreed on by both.

9. The Action Plan describes the issues to be addressed, dividing them where possible into groups which can be addressed through technical co-operation activities and indicating the priorities, and includes a detailed work plan for project implementation.

10. The Action Plan is communicated to the national counterpart and, after approval, constitutes the basis for the technical appraisal of project proposals, priority being given to proposals which envisage the implementation of some part of the Action Plan.

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[2] Action Plans for the countries receiving assistance under the aforementioned Model Projects were prepared within the framework of those projects.

Country Officers for safety matters

11. For each group of developing Member States requesting and/or receiving safety-related technical assistance, the Secretariat has assigned - as Country Officer for safety matters - a staff member from the Division of Nuclear Safety who has overall responsibility for safety-related activities in those countries. The Country Officer serves as a focal point, ensuring that all activities are tailored to an Action Plan based on the Member State's needs.

12. For each Member State, the Country Officer will keep an up-to-date record of its infrastructure and maintain regular contact with the competent person(s) within the Member State's regulatory authority.

THE AGENCY/UNDP PROGRAMME[1]

Background

1. In 1993 the Agency and UNDP launched a three-phase programme aimed at strengthening radiation protection, nuclear safety and radioactive waste management infrastructures in countries of the former Soviet Union[2]. The three phases ("Forum for Information Exchange", the preparation of assistance packages and the implementation of assistance packages) were described, together with the results of the first phase, in document GC(XXXVII)/INF/318 issued for the 1993 session of the General Conference.

The second phase

2. The preparation of assistance packages was initiated immediately after the "Forum for Information Exchange", and the first fact-finding mission took place in July 1993. Assistance packages have been prepared for the following countries: Kazakhstan, Uzbekistan, Kyrgyzstan, Estonia, Latvia, Lithuania, Moldova and Belarus. Late in 1994 the Division of Nuclear Safety held a briefing for Member States on those assistance packages and on the safety situation in the eight countries in question.

The third phase

3. The programme was launched on the understanding that the Agency would be primarily responsible for the technical tasks, including preparation and implementation of the assistance packages, while UNDP would focus on securing the financial resources.

4. The Agency has provided technical support for the fact-finding missions and for the preparation of assistance packages, but UNDP has so far not succeeded in securing the financial resources necessary for implementation of the assistance packages which have been prepared.

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[1] This programme, which is quite distinct from the Agency's extrabudgetary programme for assisting countries of Eastern Europe and the former Soviet Union to improve the safety of their WWER and RBMK power plants (see Annex B-3), focuses on the strengthening of infrastructures rather than on immediate questions of plant safety.

[2] Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine and Uzbekistan.

Associated activities

5. A number of associated activities that have taken place are described below:

(1) Representatives of Georgia, Kyrgyzstan and the Russian Federation attended the 13-17 December 1993 meeting of the Technical Committee which endorsed - for submission to the Board of Governors - the draft International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources.

(2) As a follow-up to the fact-finding mission to Kazakhstan, an Integrated Safety Assessment of Research Reactors (INSARR) team visited the WWR-K research reactor at the National Nuclear Centre in Alma Ata during the period 23-30 November 1993 and conducted a peer review of the reactor's seismic, nuclear and radiation safety.

(3) An INSARR team undertook a mission to Uzbekistan from 29 November to 9 December 1993 and conducted a peer review of the operational safety of a research reactor.

(4) In November 1993, a team organized by the Agency visited Kazakhstan and carried out an assessment of the radiological situation resulting from the nuclear weapons tests at Semipalatinsk and of that resulting from the mining and milling of radioactive ores.

(5) A team organized by the Agency visited the Semipalatinsk nuclear test site in Kazakhstan during the period 16-30 July 1994 in order to corroborate the reported levels of environmental contamination by means of independent analyses and measurements and to make a preliminary assessment of the present radiological situation in and around the test site.

(6) A team visited Kyrgyzstan during the period 23-26 November 1993 to assess the possible radiological consequences of occupational exposures to natural radioactivity in the radioactive ore mining and milling industry.

(7) During the period 20-30 October 1994 a team made an assessment of the radiological situation caused by massive landslides near a number of tailing piles in Kyrgyzstan, measuring concentrations of radium-226 in drinking water in the affected areas.

(8) Within the framework of the Agency's technical co-operation programme, thermoluminescence dosimetry systems have been provided to Estonia, Latvia, Lithuania, Kazakhstan, Kyrgyzstan, Moldova and Uzbekistan.

Planned activities

6. The Government of the United States has made a contribution of $300 000 in support of the Agency/UNDP programme. With this contribution, assistance in the form of expert advice, training and equipment will be provided to Moldova and Uzbekistan for the establishment of national systems for the notification, registration, licensing, conditioning and storage of sealed radiation sources.

7. A regional Workshop on Radiation Protection, Waste Management and Remedial Actions in the Mining and Milling of Radioactive Ores, organized within the framework of the Agency's TC programme and scheduled for 25 September-3 October 1995, is expected to attract 20-30 participants from Kyrgyzstan, Uzbekistan and Kazakhstan.

8. A sub-regional (Baltic States and Belarus) co-ordination and fund-raising meeting within the framework of the Agency/UNDP programme is scheduled for the last quarter of 1995.

PROVISION OF ASSISTANCE RELATED TO THE SAFETY OF NUCLEAR POWER PLANTS IN COUNTRIES OF EASTERN EUROPE AND THE FORMER SOVIET UNION

Introduction

1. In 1990 the Agency established an extrabudgetary programme for assisting countries of Eastern Europe and the former Soviet Union to improve the safety of their first-generation WWER plants (WWER-440/230s). The scope of the programme was extended in 1992 to include RBMK, WWER-440/213 and WWER-1000 plants.

2. Since last year's General Conference session, when the Conference had before it (in Annex 5 to document GC(XXXVIII)/INF/6) updated information on the work being done under the programme, this work has continued as planned, the technical results being reviewed periodically by the two Steering Committees - one for WWERs and one for RBMKs - established to advise the Agency on programme implementation.

3. A comprehensive progress report on programme activities during 1992-94 has been published by the Agency (IAEA-TECDOC-773). The report was submitted in December 1994 to an Advisory Group which has been meeting every second year to review progress and advise on future activities and necessary co-ordination. The Advisory Group concluded that the programme was proving to be a cost-effective form of international assistance and was providing important insights as a basis for safety decisions to be taken by national authorities. The detailed work schedule for 1995 was agreed with the two Steering Committees in February 1995.

4. In December 1995 the Advisory Group will review the results of programme implementation in 1995 and consider the scope of future activities.

5. The implementation of a regional technical co-operation project (RER/9/035) approved for 1995-96 to assist countries operating or constructing WWERs in reviewing the completeness of proposed safety improvements and in carrying out high-priority measures is being co-ordinated with the extrabudgetary programme.

6. INSAG has produced a report on a common basis for judging the safety of nuclear power plants (NPPs) built to earlier safety standards (INSAG-8, in press). Also, the Agency's Secretariat has drafted a paper with practical guidance on the judgement process, and the paper has been circulated to Member States for comment.

Safety of WWER-440/230 plants

7. A group of consultants meeting in September 1994 concluded (a) that significant progress had been made in resolving the safety problems of the ten operating WWER-440/230 units but that several major safety concerns remained; and (b) that progress in the implementation of safety improvements varied from unit to unit, depending on national resources and international assistance. A report on the plant-specific status of safety improvements has been prepared.

8. An in-depth study of a primary-system coolant leak event at Unit 2 of the Kola NPP was conducted at the end of 1994. Several generic lessons were learned, and recommendations have been made for preventing the recurrence of such events.

9. Reactor pressure vessel integrity remains the principal safety issue for WWER-440/230 plants, and in April 1995, at an Agency meeting on reactor pressure vessel embrittlement, plant-specific information and current and planned programmes relating to this problem were reviewed and necessary future activities identified. In May 1995, at a meeting on the analysis of pressurized thermal shock in reactor pressure vessels, the adequacy of transient selection, of thermal hydraulic analyses and of structural analyses (including fracture mechanics assessments) was discussed. Deficiencies were found in the thermal hydraulic analyses, relating to the scope of the scenarios considered and to the assumptions (including assumptions about initial conditions) made. The importance of the interface between thermal hydraulic analyses and structural analyses was highlighted.

10. With Agency support, a code for estimating neutron fluence at the reactor pressure vessel wall, originally developed for the Greifswald NPP (WWER-440/230s), has been adapted for Novovoronezh NPP Units 3 and 4. Application of the code at other WWER-440/230 plants is being considered.

11. Agency-assisted reviews in November 1994 and April 1995 of reactor pressure vessel integrity assessments carried out for Units 1-4 of the Kozloduy NPP resulted in the recommendation of measures to address safety concerns, particularly relating to Unit 1.

12. As regards other major safety issues, the application of the "leak-before-break" concept to Kozloduy NPP Units 1-4 was reviewed with Agency assistance in March 1995. WWER-440/230 confinement improvement options were reviewed at an Agency meeting in July 1995, with emphasis on the feasibility of implementation.

13. In April 1995 a team visited Armenia[1] and reviewed component integrity and progress in making safety improvements at the Medzamor NPP, where reactor pressure vessel embrittlement is a major concern. In the light of the team's findings, the Director General, in a letter to the Prime Minister of Armenia, has drawn attention to various outstanding safety problems.

14. Missions to review the implementation of safety improvements at the Kozloduy NPP and the Novovoronezh NPP are to take place later this year.

Safety of WWER-440/213 plants

15. On the basis of Agency-assisted reviews of proposed safety improvements at the Mochovce NPP and the Bohunice NPP and of the results of other national and international safety evaluations, a list of 87 safety issues associated with WWER-440/213 plants has been compiled, with individual issues ranked according to their safety importance. The associated report - prepared by the Secretariat with the help of consultants - reflects the international consensus on the safety of WWER-440/213 units, indicates the high-priority measures required and presents information on the measures taken or planned within the framework of national safety improvement programmes.

16. In March 1995 consultants prepared guidelines for re-evaluating the bubbler condenser containment of WWER-400/213 units, the structural integrity and performance of which are a major generic safety issue. In June 1995 a peer review was conducted of Agency-commissioned bubbler condenser integrity calculations performed by the Russian designers of bubbler condensers; the review confirmed the need for structural reinforcements.

17. In May 1995, at a topical meeting on containment leak rate measurements, it was concluded that leak rate values vary significantly depending on the interpretation of the measurement results, so that a harmonized approach is needed.

18. In the course of a follow-up mission to the Paks NPP, an ASSET noted the operator's commitment to preventing incidents and the actions taken in response to recommendations made by the previous ASSET.

Safety of WWER-1000 plants

19. The Secretariat and a group of consultants have prepared a draft report on the "Ranking of Safety Issues for WWER-1000 Model 320 Nuclear Power Plants" based on the WWER-1000 reconstruction programmes proposed in Russia, Bulgaria, the Czech Republic

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[1] Assistance to Armenia is being provided by the Agency within the framework of its technical co-operation programme.

and Ukraine, on safety studies of - inter alia - the Stendal NPP and the Rovno NPP, on the findings of an Agency safety review mission to the Zaporozhe NPP and on the findings of ASSET missions. The draft report, which has the same structure as the report on WWER-440/213 plants (see para. 15 above), identifies and ranks 88 safety issues and reflects the international consensus on WWER-1000 safety and the high-priority measures required. The final report will be discussed in October 1995 in the Steering Committee for WWERs.

20. In November 1994, following ASSET missions to and ASSET seminars at the Kozloduy, Khmelnitsky, Rovno and South Ukraine NPPs, consultants reviewed the mission findings with a view to gaining generic insights.

21. ASCOT seminars have been held in Russia and the Czech Republic to promote self-assessment in the area of management practices.

22. In November 1994, in response to a request from the Czech Republic, the Agency convened a meeting to exchange information on the design modifications and safety improvements being implemented at the Temelin NPP. An Agency-assisted review of Temelin NPP safety improvements in the light of the identified safety issues (see para. 19 above) is scheduled for November 1995.

23. In June 1995, at the request of Bulgaria, an Agency team helped to review - in the light of the draft report mentioned in paragraph 19 above - the safety upgrading measures being taken at Kozloduy NPP Units 5 and 6. It was found that most safety concerns were being addressed through those measures.

24. Two generic safety issues associated with WWER-1000 plants are of particular concern because their root causes have not yet been fully identified:

- steam generator integrity (particularly the cracks which have been observed in the cold collectors); and

- control rod insertion reliability.

Experience with control rod insertion problems in Western PWRs and in WWER-1000 units was reviewed in February 1995, and (following a meeting on pressure boundary integrity in September 1994) the status of national and international programmes addressing the steam generator integrity issue is being reviewed in September 1995. Reports with the latest findings on these two issues are being published by the Agency.

25. A study - commissioned by the Agency - of the effects of extending core fuel residence times (from two to three years) on safety-relevant parameters of WWER-1000 cores indicated considerable non-uniformity of energy generation in the fuel assemblies at the

core periphery. This is being studied further as a possible cause of the observed fuel assembly bending and of the control rod insertion problem.

26. In December 1994, at the request of the Czech Republic, the Agency reviewed the applicability of the "leak-before-break" concept to the Temelin NPP, and in May 1995, at the request of Bulgaria, it reviewed the surveillance programme for reactor pressure vessel embrittlement monitoring at Kozloduy NPP Units 5 and 6.

Safety of RBMK plants

27. In October 1994, following a safety review performed at Smolensk NPP Unit 3 in 1993, the Agency reviewed the safety modifications proposed for the Ignalina NPP. On the basis of the Smolensk and Ignalina NPP reviews and of insights from other reviews (international and national), some 60 safety issues associated with RBMK plants have been identified and ranked. In January 1995 consultants finalized a report - drafted in 1994 - reflecting the international consensus on RBMK safety and indicating the high-priority measures required.

28. In May 1995, following the completion in June 1994 of the first phase of an international project (being funded by the European Commission and carried out by a consortium established by Western and Eastern countries) on the "Safety of RBMK design solutions and operation", the results to date of the project and of related Agency activities were presented to the international scientific community at a Technical Committee meeting. The meeting highlighted the good co-ordination between European Commission and Agency activities and the consistency of the results to date. The project results obtained so far were taken fully into account in the identification and ranking of the RBMK safety issues referred to in the preceding paragraph.

29. Recommendations for addressing safety issues relating to the shutdown system and to multiple pressure tube failures at RBMK plants were made in technical reports issued by the Agency in 1995 in a recently established series of publications relating to WWER and RBMK safety.

30. As part of an international effort being co-ordinated by the Agency and relating to the validation of LOCA (loss-of-coolant accident) analysis codes, a meeting on LOCA analysis code validation for RBMKs was held in November 1994 to determine - using experimental results made available to the Agency by Japan - the scope of calculations necessary in order to increase confidence in the modelling of accidents which could lead to multiple tube ruptures. It is expected that the results of calculations to be performed in various countries will be available before the end of this year.

31. Following a 1994 study on experimental verification of the void reactivity coefficient carried out for the Agency by the Kurchatov Institute, Moscow, consultants met in July 1995

to examine the phenomena influencing the void reactivity coefficients in RBMKs. They concluded that the present methods for calculating void reactivity coefficients appeared to be adequate. However, further validation of the computational tools and the development of a three-dimensional burnup computation code - to improve predictions of the spatial power distribution - were recommended. Further investigations of the void reactivity effect at low power were also recommended.

32. An ASSET seminar was held at the Kursk NPP in April 1995, and an OSART mission to the Ignalina NPP is scheduled for September 1995.

33. A report on the safety status of the encasement (sarcophagus) covering Chernobyl NPP Unit 4 has been prepared by an expert from the Kurchatov Institute for the Agency. The report, which indicates the first-priority safety measures needed, has been made available to other organizations providing international assistance in connection with the Chernobyl NPP.

Other activities

34. The Agency, in co-operation with Argonne National Laboratory, organized workshops on accident management and emergency planning in Bulgaria and the Czech Republic and a workshop on emergency preparedness in Ukraine.

35. The Agency has conducted peer reviews of probabilistic safety assessments (PSAs) carried out for the Paks, Kozloduy, Bohunice, Zaporozhe and Temelin NPPs and made recommendations relating to the completeness and adequacy of the PSAs.

36. Within the framework of its technical co-operation programme, the Agency organized seismic safety missions to the Medzamor, Kozloduy, Paks, Mochovce, Dukovany and Temelin NPPs.

37. The Agency has helped the G-24's Nuclear Safety Assistance Co-ordination Secretariat to develop a methodology and procedures for quality control of the information being entered into its nuclear safety project database. The information on Agency activities is now being updated three times a year.

38. The Agency has established and is maintaining a database for technical findings and recommendations related to the safety of WWER and RBMK plants. Plant-specific information on backfitting measures is also being entered into the database, which is available to Member States on request.

39. A workshop on the use of the G-24 and Agency databases was held in Japan in July 1995.

40. Workshops on experience with the licensing of modifications at NPPs built in accordance with earlier safety standards were held in Spain (in April 1995) and Russia (in May 1995), the Santa Maria de Garoña and Leningrad NPPs respectively serving as the basis for the case studies discussed.

41. For application at WWER plants, the Agency has prepared or is preparing guidelines on:

- accident analysis (completed);
- qualification requirements for in-service inspections;
- the best-estimate approach to accident analysis and the development of emergency operating actions.

Outlook

42. Following the identification and ranking of WWER-440/213, WWER-1000 and RBMK safety issues, which represented a milestone in the Agency's extrabudgetary programme, it is expected that the Agency will continue to serve as a forum for information exchange and technical reviews directed towards an international consensus on the plant-specific safety upgrading already carried out and the further actions required.

43. As recommended in December 1994 by the Advisory Group referred to in paragraph 3 above, current Agency efforts are focused on the preparation of guidelines, the conduct of peer reviews, the provision of assistance with the evaluation of plant-specific safety improvements (on request) and the organization of meetings designed to consolidate the currently available knowledge and produce international consensus on the actions already taken and still required in order to resolve generic safety issues. Assistance in reviewing safety improvements at first- and second-generation RBMKs is also a matter of high priority.[2]

44. Extrabudgetary funding will be required so as to ensure that the Agency's assistance continues in 1996 and beyond.

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[2] The Agency assistance should be regarded as being complementary to the comprehensive safety assessments which need to be carried out within the framework of the national licensing process.

PROMOTION OF EDUCATION AND TRAINING

Background

1. The Agency is promoting education and training related to its objectives, and in 1991 the General Conference - in resolution GC(XXXV)/RES/552 - requested the Director General "to prepare a comprehensive proposal for education and training in both radiation protection and nuclear safety" for consideration at the Conference's 1992 regular session.

2. In 1992, the General Conference - in resolution GC(XXXVI)/RES/584 - took note of the proposal submitted to it and requested the Director General to prepare a report on "a possible programme of activities on education and training in radiological protection and nuclear safety" based on that proposal. The report prepared in response to that request and outlining an education and training programmes was submitted to the General Conference in 1993. The report included a draft Standard Syllabus of Post-Graduate Educational Courses in Radiation Protection.

3. The Secretariat reported to the General Conference last year on activities relating to education and training in radiological protection and nuclear safety in Annex 6 to document GC(XXXVIII)/INF/6. Activities since the Conference's 1994 regular session are described below.

Educational courses

4. The three post-graduate courses (one each in English, French and Spanish) planned for 1994 were held, with a total of 64 graduates participating. They were designed to provide multidisciplinary theoretical and practical training related to existing international recommendations and safety standards and to their implementation for young professionals from developing countries who need to acquire a sound basis in radiation protection and a knowledge of related nuclear safety fundamentals in order to become, in the course of time, decision-makers and trainers in their home countries. The courses were also pilot events organized in order to test the applicability of the Standard Syllabus.

5. The courses being held during 1995 are:

- a Regional Post-Graduate Educational Course in Radiation Protection and Nuclear Safety (in Spanish) being held in Buenos Aires, Argentina, from 3 April to 27 October (19 Agency-sponsored participants)[1]; and

- an Interregional Post-Graduate Educational Course in Radiation Protection (in English) to be held at Argonne, USA, from 18 September to 17 November (24 participants).

6. A Technical Committee on Programmes for Post-Graduate Educational and Specialized Training Courses in Radiation Protection, meeting in Vienna from 12 to 16 December 1994, advised on the contents and structure of such courses in the light of the experience gained in 1994 from pilot courses based on the Standard Syllabus of Post-Graduate Educational Courses in Radiation Protection.

7. The Advisory Committee on Training in Nuclear Power and Safety, meeting in Vienna from 16 to 18 May 1995, had before it - inter alia - proposals for regional post-graduate educational courses to be held during the period 1996-2000. The courses recommended by the Committee for inclusion in a forecast covering that period will be listed in a document to be issued later this year.[2]

Specialized training courses/workshops

8. Listed in the table on pages 5 and 6 are the interregional/regional training courses and workshops held within the framework of the Agency's technical co-operation programme during the period 1 July 1994-30 June 1995.[3] In addition, a number of national training courses and workshops took place within the framework of technical co-operation projects.

9. Specialized interregional and regional training courses recommended by the Advisory Committee on Training in Nuclear Power and Safety (see para. 7 above) for inclusion in a forecast covering the period 1996-2000 will also be listed in the document referred to in paragraph 7 above.

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[1] Of these 19 participants, 13 are attending only that part of the course which deals with radiation protection (from 3 April to 18 August).

[2] A forecast of interregional and regional training courses to be given during the period 1994-98 was presented by the Secretariat in October 1993, in document GOV/INF/715.

[3] Further information about the courses and workshops held during the second half of 1994 can be found in Annex II to document GC(39)/INF/3 ("The Agency's technical co-operation activities in 1994").

Other mechanisms

10. In addition to organizing courses and workshops, the Agency arranges for scientists and engineers from Member States to receive training through fellowships and scientific visits, organizes seminars and produces educational and training material.

Fellowships and scientific visits

11. During the period July 1994-June 1995, some 300 applications for fellowships and scientific visits were received from about 45 Member States and evaluated within the Secretariat.

Seminars

12. A "Seminar on the Advancements in the Implementation of the New Basic Safety Standards" will be held in Vienna from 20 to 24 November 1995.

13. A regional (East Asia and the Pacific) "Seminar on Education and Training in Radiation Protection and Nuclear Safety" is to be held in Melbourne, Australia, from 27 November to 1 December 1995.

Educational and training material

14. The Standard Syllabus of Post-Graduate Educational Courses in Radiation Protection (see paras 2 and 4 above) has been published in Arabic, Chinese, English, French, Russian and Spanish as a Special Report (reference number IAEA-SYL-01).

15. The material prepared for one of the 1994 post-graduate courses referred to in paragraph 4 above (held in French) is due to be published as an IAEA-TECDOC before the end of 1995.

16. The training manual on "Safe Transport of Radioactive Material" has been published in Russian and Spanish in the Training Course Series.

17. There has been a delay in the publication of a training manual on "Safety and Regulation of Radiation Sources" (in English), which is now at the final draft stage and due to be published before the end of 1995.

18. Safety-related Agency publications - including the new International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (Safety Series 115-I) - and guides, technical reports, practical manuals and technical documents have continued to be used extensively, together with visual aids, at educational courses and specialized training events.

Outlook

19. It is expected that a group of consultants, after meeting in Vienna from 28 August to 1 September 1995, will finalize a technical report on programmes for post-graduate educational courses in radiation protection. The report - with model course contents, lecture outlines, descriptions of practical work and exercises, and guidelines for review/examination sessions and the evaluation of courses - will provide further guidance on integrating the Standard Syllabus into the curricula of educational institutions in Member States when that is justified by national needs.

20. An Advisory Group on Policy in Radiation Protection Training, meeting in Vienna from 6 to 10 November 1995, will consider the question of a comprehensive long-range policy and strategy for a coherent programme of radiation protection training - including fundamental training - beyond the end of this century.

Interregional/regional training events held during the period 1 July 1994-30 June 1995*

Title	Host country (project number)	Date
Radiation Protection		
Interregional Training Course (ITC) on Physical Protection of Nuclear Facilities and Materials	USA (INT/9/145)	March/April 1995
Sub-Regional TC on Radiation Protection in Diagnostic Radiology	Panama (RLA/9/017)	July 1994
Regional Working Group Meeting on Upgrading Regulations on Radiation Protection in Accordance with Basic Safety Standards	Uruguay (RLA/9/016)	July 1994
RTC on Radiation Protection in Medical Practice	Brazil (RLA/9/014)	August 1994
Regional Training Course (RTC) on System of Notification, Registration, Licensing and Control of Radiation Sources and Installations	Tanzania (RAF/9/013)	October/November 1994
RTC on Radiation Protection in Medical Practice: Occupational Protection of Medical Staff and Protection of Patients in Diagnostic Radiology and Radiotherapy	Tunisia (RAF/9/012)	October/November 1994
RTC on Practical Tools for Accident Assessment and Consequence Projection during Radiological Accidents	Slovenia (RER/9/032)	April 1995

* Not including safety-related training events in the field of radioactive waste management.

Title	Host country (project number)	Date
Radiation Protection (contd.)		
RTC on System of Notification, Registration, Licensing and Control of Radiation Sources and Installations	Indonesia (RAS/9/006)	April 1995
RTC on Safe Transport of Radioactive Material	France (RER/9/031)	May 1995
Regional Workshop (RW) on External Dose Assessment Techniques	China (RAS/0/015)	July 1994
RW on Off-site Planning and Countermeasures for Radiological Emergencies	Australia (RAS/9/013)	September 1994
RW (Africa) on Standardization of Dose Measurements at National Calibration Laboratories	Vienna/Seibersdorf (RAF/9/005)	November 1994
Nuclear Safety		
ITC on Assessment Techniques for Operational Safety of Nuclear Power Plants	USA (INT/9/146)	February 1995
ITC on Safety in the Operation of Research Reactors	USA/Canada (INT/9/147)	May/June 1995
RTC on Operational Safety Assessment Techniques	Spain (RER/9/028)	October/Nov. 1994
RTC on Regulatory Control of NPPs	Slovak Rep. (RER/9/023)	October/Nov. 1994
RTC on Safety and Reliability Improvements through Optimized Maintenance of NPPs	China (RAS/9/015)	February/March 1995
RTC on Regulatory Control of NPPs	Finland (RER/9/023)	June 1995

PART C: RENDERING OF SAFETY-RELATED SERVICES

1. With a view to strengthening national capabilities in the safety area on the basis of international experience, the Agency has for several years been rendering a wide - and widening - range of safety-related services to Member States. Information on the following services is provided in the Annexes hereto*:

- The Operational Safety Review Team (OSART) service, Annex C-1;
- The Assessment of Safety Significant Events Team (ASSET) service, Annex C-2;
- The Engineering Safety Review Service (ESRS), Annex C-3;
- The International Peer Review Service for Probabilistic Safety Assessments (IPERS-PSA), Annex C-4;
- The Integrated Safety Assessment of Research Reactors (INSARR) service, Annex C-5;
- The International Review of Irradiator Safety (IRIS) service, Annex C-6;
- The Transport Safety Advisory Review Team (TRANSART) service, Annex C-7;
- The Assessment of Safety Culture in Organizations Team (ASCOT) service, Annex C-8; and
- The International Regulatory Review Team (IRRT) service, Annex C-9.

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* The style of reporting differs from Annex to Annex largely because of differences between the services provided and the differing degrees of "maturity" of those services.

2. The teams providing these services have scrutinized many facilities and organizations in many countries and submitted recommendations for improvement, and in some areas the emphasis is now shifting to follow-up visits made with a view to ascertaining how the recommendations are being implemented.

3. The demand for such safety-related services has been increasing, and the Secretariat, which expects that with time they will in some countries be provided by national institutions and be the subject of peer reviews organized by the Agency, is preparing for that eventuality. Whatever the role of the Agency vis-à-vis the Member State, however, the aim will continue to be to provide services of high technical quality and also to give frank advice, even if that involves criticism.

THE OPERATIONAL SAFETY REVIEW TEAM (OSART) SERVICES

Background

1. The OSART service was inaugurated in 1982 to provide advice and assistance to Member States in enhancing the operational safety of nuclear power plants. The members of OSARTs are technical experts from Member States, most being senior, experienced personnel from operating nuclear power plants. OSART reviews, which are available to all countries with nuclear power programmes, are carried out through missions of three basic types: missions to operating reactors (OSART missions); missions to reactors under construction or at the pre-commissioning stage (Pre-OSART missions); and Technical Exchange missions, which cover a limited range of topics or differ in some other way from missions of the other two types. When design reviews are also involved, the missions are known as "Safety Review missions".

2. The Agency is able to conduct up to ten missions of different types a year, and by the end of July 1995 a total of 79 missions and 31 follow-up visits to 69 nuclear power plants in 28 countries had been completed (see the table at the end of this Annex). All but three Member States with operating nuclear power plants have received OSART missions.

3. OSART reviews are concerned with management practices, operational programmes and the performance of plant equipment and personnel rather than with plant design. Normally, eight areas (management, organization and administration; training and qualification; operations; maintenance; technical support; radiation protection; chemistry; and emergency planning and preparedness) are reviewed over a period of three weeks at the nuclear power plant. The areas covered during Pre-OSART missions are normally: commissioning; project management; civil engineering and construction; mechanical equipment installation; electrical and I&C equipment installation; and quality assurance in construction and commissioning.

4. OSARTs do not attempt to assess overall plant safety or to compare the safety performance of different plants. Rather, they aim to provide the plant operator and the Member State with *recommendations* and *suggestions* for strengthening safety performance and to identify *good practices* that might usefully be followed at other plants. In the formulation of its findings, each OSART draws on guidelines derived from the best international operational safety standards and practices (issued in IAEA-TECDOC-744), on the International Nuclear Safety Advisory Group's report on "Safety Culture" (published as Safety Series No. 75-INSAG-4) and on the experience of the individual OSART members.

5. The results of OSART missions and follow-up visits are entered into the OSART database (see paras 8 and 9 below) and summarized in the annual Nuclear Safety Review. In addition, they are being disseminated in IAEA-TECDOCs (see "OSART mission highlights 1991-1992", IAEA-TECDOC-797, May 1995).

Programme development

6. On the basis of the experience gained by Agency staff members in operating the OSART service and of advice received in December 1994 from a group of nuclear industry consultants, the Secretariat plans to:

- place greater emphasis on review skills (as a complement to technical and managerial skills) and English language capability when selecting OSART members;
- increase the duration of the training in review skills provided for OSART members from 3½ hours to about 12 hours;
- simplify and clarify the guidance for the conduct of missions;
- call for increased work observation by OSARTs (as opposed to discussions based on plant documentation) as a means of identifying worthwhile safety performance improvement opportunities;
- call for a reduction in the amount of descriptive information in mission reports that is not related to safety performance improvement opportunities or to good practices;
- examine mission results with a view to ensuring that they reflect an international perspective and will clearly benefit the host plant; and
- focus follow-up visits on the most significant mission results (recommendations), allowing more latitude for host plant operators to react to suggestions as they see fit.

7. In addition, the Secretariat is considering how best to use OSART experience in assisting Member States with the self-assessments that may be needed in connection with implementation of the Convention on Nuclear Safety.

OSART database

8. The Secretariat has established a database of OSART mission results (OSMIR) covering all missions (and follow-up visits) since January 1991.* The database is being updated as each mission's results are agreed, and it will ultimately contain at any given time the results of the missions carried out during the preceding five-year period.

9. At the end of June 1995, the database contained the results of 27 missions and 12 follow-up visits. The information in the database consists of:

- background information (details of plant - name, country, reactor type and size; dates of mission; type of mission; etc.);
- mission results (currently over 1500 recommendations and 1000 suggestions for enhancing safety performance and about 500 identified "strengths", which are categorized by review area and according to significance - whether or not the result is of generic interest;
- follow-up visit results, with a description of planned or completed remedial actions pursuant to all mission recommendations and suggestions and with Agency experts' comments.

* The database, which should be of particular interest to plant operators, utilities, regulators and relevant research institutes in Member States, will be made available on request.

OSART MISSIONS REQUESTED BY MEMBER STATES (as of July 1995)					
NO.	TYPE	COUNTRY	NPP/LOCATION	DATE	PLANT TYPE
1.	O	Korea, Rep.	Ko-Ri 1	8-26 Aug. 1983	PWR 600 MW
2.	O	Yugoslavia	Krsko	6-17 Feb. 1984	PWR 670 MW
3.	P	Philippines	PNPP-1	25 Jun.-12 Jul. 1984	PWR 650 MW
4.	O	Pakistan	Kanupp	7-20 Jan. 1985	PHWR 140 MW
5.	P	Philippines	PNPP-1	4-15 Feb. 1985	PWR 650 MW
6.	O	Brazil	Angra I	12-30 Aug. 1985	PWR 660 MW
7.	O	France	Tricastin	4-29 Oct. 1985	PWR 950 MW
8.	P	Mexico	Laguna Verde	12-31 Jan. 1986	BWR 680 MW
9.	O	Finland	Olkiluoto	3-21 Mar. 1986	BWR 740 MW
10.	O	Sweden	Barsebäck	1-19 Sep. 1986	BWR 620 MW
11.	O	Netherlands	Borssele	6-24 Oct. 1986	PWR 480 MW
12.	O	Germany	Biblis A	17 Oct.-14 Nov. 1986	PWR 1200 MW
13.	O	Korea, Rep.	Ko-Ri 3, 4	1-19 Dec. 1986	PWR 950 MW
14.	P	Mexico	Laguna Verde	12-30 Jan. 1987	BWR 680 MW
15.	O	Germany	Krümmel	16 Feb.-6 Mar. 1987	BWR 1320 MW
16.	O	Italy	Caorso	16 Mar.-3 Apr. 1987	BWR 890 MW
17.	O	Netherlands	Dodewaard	27 Apr.-15 May 1987	BWR 60 MW
18.	O	Canada	Pickering	1-19 Jun. 1987	PHWR 540 MW
19.	O	USA	Calvert Cliffs	10-28 Aug. 1987	PWR 860 MW
20.	P	Mexico	Laguna Verde	4-15 Sep. 1987	BWR 680 MW
21.	O	Germany	Philippsburg	2-20 Nov. 1987	PWR 1350 MW
22.	O	Spain	Almaraz 2	30 Nov.-18 Dec.1987	PWR 930 MW

O = Operational Safety Review Team (OSART) mission
P = Pre-operational Safety Review Team (Pre-OSART) mission
T = Technical Exchange mission
S = Safety Review mission

NO.	TYPE	COUNTRY	NPP/LOCATION	DATE	PLANT TYPE
23.	P	Italy	Alto Lazio	18 Jan,-5 Feb, 1988	BWR 1000 MW
24.	O	Sweden	Forsmark 3	22 Feb,-11 Mar, 1988	BWR 1150 MW
25.	O	Japan	Takahama 3, 4	3-21 Oct, 1988	PWR 870 MW
26.	O	France	St. Alban 1, 2	24 Oct,-11 Nov. 1988	PWR 1380 MW
27.	O	Hungary	Paks	14 Nov.-1 Dec. 1988	WWER 440/213
28.	O	USSR	Rovenskaya 3	5-23 Dec. 1988	WWER 1000
29.	O	Pakistan	Kanupp	8-19 Jan. 1989	PHWR 140 MW
30.	O	Brazil	Angra I	20 Feb.-10 Mar. 1989	PWR 660 MW
31.	P	China	Qinshan	3-21 Apr. 1989	PWR 300 MW
32.	O	USA	Byron 1, 2	15 May-2 Jun. 1989	PWR 1180 MW
33.	T	South Africa	Koeberg	5-16 Jun. 1989	PWR 970 MW
34.	O	UK	Oldbury	3-21 Jul. 1989	GCR 230 MW
35.	O	Korea, Rep.	Wolsong	24 Jul.-11 Aug. 1989	PHWR 680 MW
36.	P	USSR	Gorky DHNP	14 Aug.-1 Sep. 1989	WWER 500 MW
37.	O	CSFR	Dukovany	4-22 Sep. 1989	WWER 440/213
38.	P	Poland	Zarnowiec	15 Sep.-2 Oct. 1989	WWER 440/213
39.	O	Sweden	Oskarshamn 1	6-24 Nov. 1989	BWR 460 MW
40.	T	South Africa	Koeberg	20 Nov.-8 Dec. 1989	PWR 970 MW
41.	O	Spain	Cofrentes	22 Jan.-9 Feb. 1990	BWR 990 MW
42.	P	CSFR	Temelin	23 Apr.-11 May 1990	WWER 1000
43.	T	Canada	Point Lepreau	2-13 Jul. 1990	PHWR 680 MW
44.	P	Bulgaria	Belene	2-20 Jul. 1990	WWER 1000
45.	T	CSFR	Bohunice 1, 2	3-7 Sep. 1990	WWER 440/230
46.	P	Romania	Cernavoda	24 Sep.-12 Oct. 1990	PHWR 700 MW
47.	O	Bulgaria	Kozloduy 5	15-26 Oct. 1990	WWER 1000
48.	O	Finland	Loviisa	5-23 Nov. 1990	WWER 440/213
49.	P	China	Guangdong	26 Nov.-14 Dec. 1990	PWR 980 MW

NO.	TYPE	COUNTRY	NPP/LOCATION	DATE	PLANT TYPE
50.	T	China	Guangdong	21 Jan.-1 Feb. 1991	PWR 980 MW
51.	O	Sweden	Ringhals 3, 4	14 Jan.-1 Feb. 1991	PWR 960 MW
52.	S	CSFR	Bohunice 1, 2	8-26 Apr. 1991	WWER 440/230
53.	S	Bulgaria	Kozloduy 1-4	3-21 Jun. 1991	WWER 440/230
54.	O	Bulgaria	Kozloduy 5	15 Jul.-2 Aug. 1991	WWER 1000
55.	S	USSR	Novovoronezh 3, 4	12-30 Aug. 1991	WWER 440/230
56.	S	USSR	Kola 1, 2	9-27 Sep. 1991	WWER 440/230
57.	T	CSFR	Dukovany	14-25 Oct. 1991	WWER 440/213
58.	O	South Africa	Koeberg	4-22 Nov. 1991	PWR 970 MW
59.	O	Germany	Grafenrheinfeld	25 Nov.-13 Dec. 1991	PWR 1300 MW
60.	O	France	Blayais	13-31 Jan. 1992	PWR 950 MW
61.	O	France	Fessenheim	9-27 Mar. 1992	PWR 920 MW
62.	O	Japan	Fukushima Daini 3, 4	23 Mar.-10 Apr. 1992	BWR 1100 MW
63.	T	Brazil	Angra I	11-15 May 1992	PWR 660 MW
64.	O	USA	Grand Gulf	3-21 Aug. 1992	BWR 1370 MW
65.	P	UK	Sizewell B	26 Oct.-13 Nov. 1992	GCR 1260 MW
66.	P	Slovakia	Mochovce	11-29 Jan. 1993	WWER 440/213
67.	O	France	Gravelines	15 Mar.-2 Apr. 1993	PWR 950 MW
68.	P	Romania	Cernavoda	26 Apr.-14 May 1993	PHWR 700 MW
69.	P	China	Guangdong	17 May-4 Jun. 1993	PWR 980 MW
70.	S	Russia	Smolensk	7-18 Jun. 1993	RBMK 1000 MW
71.	O	Slovenia	Krsko	5-23 Jul. 1993	PWR 670 MW
72.	S	Ukraine	Chernobyl 1,3	7-18 Mar. 1994	RBMK
73.	O	France	Cattenom	14-31 Mar. 1994	PWR 1360 MW
74.	O	UK	Hunterston B	11-29 Apr. 1994	AGR 620 MW
75.	S	Ukraine	Zaporozhe	9-27 May 1994	WWER 1000
76.	O	Korea, Rep.	Ulchin 1, 2	6-24 Jun. 1994	PWR 950 MW
77.	O	Switzerland	Leibstadt	21 Nov.-9 Dec. 1994	BWR 1050 MW

NO.	TYPE	COUNTRY	NPP/LOCATION	DATE	PLANT TYPE
78.	O	France	Flamanville	30 Jan.-17 Feb. 1995	PWR 1380 MW
79.	O	Japan	Hamaoka	27 Feb.-17 Mar. 1995	BWR 1100 MW
80.	T	Bulgaria	Kozloduy 5, 6	26 Jun.-1 Jul. 1995	WWER 1000
81.	O	Lithuania	Ignalina	4-22 Sep. 1995	RBMK 1500 MW
82.	O	Argentina	Embalse	2-20 Oct. 1995	PHWR 650 MW
83.	T	Ukraine	Rovenskaya	2-13 Oct. 1995	WWER 1000
84.	O	Ukraine	Khmelnitsky	23 Oct.-10 Nov. 1995	WWER 1000
85.	T	Ukraine	Zaporozhe	30 Oct.-2 Nov. 1995	WWER 1000
86.	T	Czech Rep.	Temelin	20-24 Nov. 1995	WWER 1000
87.	O	Switzerland	Beznau	13 Nov.-1 Dec. 1995	PWR 360 MW

OSART FOLLOW-UP VISITS REQUESTED BY MEMBER STATES (as of July 1995)					
NO.	TYPE	COUNTRY	NPP/LOCATION	DATE	PLANT TYPE
1.	O	Netherlands	Borssele	6-10 Apr. 1987	PWR 480 MW
2.	O	Italy	Caorso	16-24 Apr. 1989	BWR 890 MW
3.	O	Sweden	Barsebäck	30 Oct.-3 Nov. 1989	BWR 620 MW
4.	O	Sweden	Forsmark 3	30 Oct.-3 Nov. 1989	BWR 1150 MW
5.	O	Yugoslavia	Krsko	30 May-1 Jun. 1990	PWR 670 MW
6.	O	USSR	Rovenskaya 3	25-29 Jun. 1990	WWER 1000
7.	O	UK	Oldbury	15-19 Oct. 1990	GCR 230 MW
8.	O	CSFR	Dukovany 1/4	12-16 Nov. 1990	WWER 440/213
9.	P	China	Qinshan	14-18 Jan. 1991	PWR 300 MW
10.	O	Hungary	Paks	25 Feb.-1 Mar. 1991	WWER 440/213
11.	O	Sweden	Oskarshamn 1	11-15 Mar. 1991	BWR 460 MW
12.	O	Spain	Cofrentes	13-17 May 1991	BWR 900 MW
13.	P	Romania	Cernavoda	9-13 Sep. 1991	PHWR 700 MW
14.	P	CSFR	Temelin	17-21 Feb. 1992	WWER 1000
15.	S	CSFR	Bohunice 1, 2	27-30 Apr. 1992	WWER 440/230
16.	O	Brazil	Angra I	4-8 May 1992	PWR 660 MW
17.	T	China	Guangdong	18-22 May 1992	PWR 980 MW
18.	O	Sweden	Ringhals 3, 4	2-6 Nov. 1992	PWR 960 MW
19.	O	South Africa	Koeberg	29 Mar.-2 Apr. 1993	PWR 970 MW
20.	S	Bulgaria	Kozloduy 1-4	26-30 Apr. 1993	WWER 440/230
21.	S	Russia	Novovoronezh 3, 4	28 Jun.-2 Jul. 1993	WWER 440/230
22.	O	Japan	Fukushima Daini 3, 4	25-29 Oct. 1993	BWR 1100 MW
23.	O	Germany	Grafenrheinfeld	8-12 Nov. 1993	PWR 1300 MW

NO.	TYPE	COUNTRY	NPP/LOCATION	DATE	PLANT TYPE
24.	O	USA	Grand Gulf	14-18 Feb. 1994	BWR 1370 MW
25.	P	UK	Sizewell B	14-18 Feb. 1994	PWR 1260 MW
26.	S	Russia	Kola 1, 2	6-10 Jun. 1994	WWER 440/230
27.	S	Bulgaria	Kozloduy 1-4	11-15 Jul. 1994	WWER 440/230
28.	P	Romania	Cernavoda 1	5-9 Sep. 1994	PHWR 700 MW
29.	O	Slovenia	Krsko	24-28 Oct. 1994	PWR 670 MW
30.	O	France	Gravelines 3, 4	7-11 Nov. 1994	PWR 950 MW
31.	O	France	Cattenom	12-16 Jun. 1995	PWR 1360 MW
32.	O	UK	Hunterston B	9-13 Oct. 1995	AGR 620 MW

THE ASSESSMENT OF SAFETY SIGNIFICANT EVENTS TEAM (ASSET) SERVICE

Background

1. Created in 1986, the ASSET service assists Member States to screen and analyse safety-relevant[1] events reported as a result of failures during nuclear power plant operation and of deficiencies discovered through routine surveillance testing, the objective being to help prevent incidents and accidents by learning from the root causes of events of less importance.

2. ASSET missions can be broken down into two broad categories: analysis missions and training missions (the various types of analysis and training mission are shown on the last page of the Annex). By the end of July 1995, Member States had requested 61 analysis missions (19 countries) and 66 training missions (28 countries), as can be seen from the following tables.

REQUESTED ASSET MISSIONS - BY YEAR

YEAR	ANALYSIS	TRAINING	TOTAL
1986-1989	5	-	5
1990	6	2	8
1991	5	6	11
1992	8	10	18
1993	12	10	22
1994	7	18	25
1995	4	13	17
1996	10	5	15
1997	4	2	6
GRAND TOTAL	61	66	127

[1] The ASSET service was created before the introduction (in March 1990) of the International Nuclear Event Scale, which distinguishes between "safety-significant" and "safety-relevant" events. Although safety-relevant events are the main focus of the service, the acronym "ASSET" has not been changed.

REQUESTED ASSET MISSIONS - BY COUNTRY

COUNTRY	ANALYSIS	TRAINING	TOTAL
BELGIUM	-	1	1
BRAZIL	2	1	3
BULGARIA	4	3	7
CHINA	-	2	2
CZECH REP.	2	4	6
FINLAND	-	1	1
FRANCE	3	1	4
GERMANY	2	1	3
GREECE	-	1	1
HUNGARY	2	4	6
INDIA	-	1	1
IRAN	-	1	1
KOREA, REP. OF	-	1	1
LITHUANIA	2	1	3
MEXICO	1	1	2
NETHERLANDS	1	2	3
PAKISTAN	4	1	5
ROMANIA	2	2	4
RUSSIAN FED.	17	11	28
SLOVAKIA	2	1	3
SLOVENIA	1	1	2
SOUTH AFRICA	1	4	5
SPAIN	1	4	5
SWEDEN	1	2	3
SWITZERLAND	-	1	1
UKRAINE	12	8	20
UK	1	4	5
USA	-	1	1
GRAND TOTAL	61	66	127

ASSET missions since the 1994 session of the General Conference

3. Since the 1994 session of the General Conference, there have been (as of the end of July 1995) 14 ASSET missions: 3 analysis missions and 11 training missions. The analysis missions were requested by Bulgaria, Ukraine and Hungary, and the training missions by South Africa, the Czech Republic (2 missions), Hungary (2), Pakistan, China, the Russian Federation (2), Sweden and Bulgaria.

4. Also, within the framework of the ASSET service a three-week regional training course on "Operational Safety Assessment Techniques" organized by the Agency in co-operation with the Spanish Government was held at the Centro de Investigaciones Energéticas, Medioambentales y Tecnológicas (Centre for Energy, Environmental and Technological Research - CIEMAT) in Madrid and a three-week interregional training course on "Assessment Techniques for Operational Safety of Nuclear Power Plants" organized by the Agency in co-operation with the Government of the United States was held at Argonne National Laboratory.[2]

Development of the ASSET service since the 1994 session of the General Conference

5. Pursuant to recommendations made at the 1994 annual meeting of users of the ASSET service, two new options have been developed:

- Peer reviews of self-assessments of safety performance

  This option may prove to be of particular interest to the operators of mature nuclear power plants. The first ASSET mission of this type (to the Forsmark NPP, Sweden) is due to take place in November 1995.

- Topical analyses of events reflecting safety culture issues

  This option is intended to provide an international perspective on the root causes of problems connected with quality control, preventive maintenance, surveillance, feedback and corrective maintenance and on corrective actions. The first ASSET mission of this type (to the Kursk NPP, Russia) is due to take place in September 1995, and a total of 14 have already been requested for the period July 1995-December 1997.

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[2] In the table reproduced at the end of the Annex, these two courses appear as training missions.

6. At a workshop held in June 1995 to review the experience gained through the ASSET service and to consider ways of making the service more effective, it was recommended that the Agency's Secretariat formulate additional guidance based on the "defence-in-depth" concept for assessing the actual and potential consequences of safety problems highlighted by the recurrence of similar events.

ASSET findings

7. Similar safety problems and root causes were identified at nuclear power plants of different design. However, the corrective actions suggested by the ASSETs were all plant-specific, complementing the defence-in-depth safety measures already taken by the plant management in each case.

ASSET MISSIONS REQUESTED BY MEMBER STATES (as of July 1995)

NO.	TYPE	COUNTRY	NPP/LOCATION	DATE	PLANT TYPE
1.	R	YUGOSLAVIA	KRSKO	1986	PWR 650 MW
2.	R	BRAZIL	ANGRA	1988	PWR 650 MW
3.	A	PAKISTAN	KARACHI	MAY 1989	PHWR 140 MW
4.	A	PAKISTAN	KARACHI	SEPT. 1989	PHWR 140 MW
5.	R	USSR	IGNALINA 1,2	NOV. 1989	RBMK 1500 MW
6.	R	GDR	GREIFSWALD 1,2,3,4	FEB. 1990	WWER 440/230
7.	I	GDR	GREIFSWALD 1,2,3,4	JUNE 1990	WWER 440/230
8.	S_c	GDR	GREIFSWALD	JULY 1990	WWER 440/230
9.	A	FRANCE	GRAVELINES	JULY 1990	PWR 950 MW
10.	S_c	HUNGARY	BUDAPEST	SEPT. 1990	WWER 440/213
11.	R	CZECHOSLOVAKIA	BOHUNICE 1,2	OCT. 1990	WWER 440/230
12.	R	BULGARIA	KOZLODUY 1,2,3,4	NOV. 1990	WWER 440/230
13.	A	SPAIN	VANDELLOS 1	DEC. 1990	GCR 450 MW
14.	I	PAKISTAN	KARACHI	6-10 JAN. 1991	PHWR 140 MW
15.	I	PAKISTAN	KARACHI	13-17 JAN. 1991	PHWR 140 MW
16.	S_c	BELGIUM	TIHANGE-DOEL	28 JAN.-1 FEB. 1991	PWR 1000 MW
17.	S_c	SPAIN	TRILLO	11-15 FEB. 1991	PWR 1000 MW
18.	R	MEXICO	LAGUNA VERDE	24 FEB.-8 MAR. 1991	BWR 675 MW
19.	S_c	KOREA, REP. OF	SEOUL-TAEJON	25-29 MAR. 1991	PWR 950 MW
20.	S_c	NETHERLANDS	THE HAGUE	8-11 APR. 1991	PWR 480 MW
21.	R	USSR	KOLA 1,2	15-26 APR. 1991	WWER 440/230
22.	R	USSR	NOVOVORONEZH 3,4	13-24 MAY 1991	WWER 440/230
23.	S_c	USSR	KIEV	14-18 OCT. 1991	WWER-RBMK
24.	S_c	SWEDEN	STOCKHOLM	23-25 OCT. 1991	PWR - BWR
25.	S_c	CZECHOSLOVAKIA	BRATISLAVA	3-7 FEB. 1992	WWER 440
26.	S_c	SOUTH AFRICA	JOHANNESBURG	17-21 FEB. 1992	PWR 950 MW
27.	S_c	BULGARIA	SOFIA	2-6 MAR. 1992	WWER 440/230
28.	S_c	CHINA	WUHAN	9-13 MAR. 1992	PWR 300 MW
29.	S_c	FINLAND	HELSINKI	30 MAR.-3 APR. 1992	PWR-BWR
30.	S_c	BRAZIL	ANGRA	6-10 APR. 1992	PWR 650 MW
31.	R	FRANCE	FESSENHEIM	4-15 MAY 1992	PWR 920 MW
32.	I	BULGARIA	KOZLODUY	1-5 JUNE 1992	WWER 440/230
33.	S_c	HUNGARY	PAKS	15-19 JUNE 1992	WWER 440/213
34.	A	UKRAINE	CHERNOBYL	22-26 JUNE 1992	RBMK 1000 MW
35.	R	RUSSIAN FED.	KURSK	20-31 JULY 1992	RBMK 1000 MW

36.	S_c	UKRAINE	KHMELNITSKY	7-11 SEPT. 1992	PWR - RBMK
37.	S_c	BULGARIA	KOZLODUY	14-18 SEPT. 1992	WWER 440/230
38.	S_c	ROMANIA	CERNAVODA	21-25 SEPT. 1992	PHWR 700 MW
39.	R	RUSSIAN FED.	BALAKOVO	5-16 OCT. 1992	WWER 1000 MW
40.	R	HUNGARY	PAKS	2-13 NOV. 1992	WWER 440/213
41.	F	BRAZIL	ANGRA	23-27 NOV. 1992	PWR 650 MW
42.	R	UK	DUNGENESS "B"	7-18 DEC. 1992	AGR 600 MW
43.	S_c	NETHERLANDS	BORSSELE	12-14 JAN. 1993	PWR 480
44.	F	LITHUANIA	IGNALINA	1-12 FEB. 1993	RBMK 1500 MW
45.	R	UKRAINE	KHMELNITSKY	8-19 MAR. 1993	WWER 1000 MW
46.	S_c	SPAIN	MADRID	12-30 APR. 1993	Interreg. Training Course
47.	R	RUSSIAN FED.	LENINGRAD	17-28 MAY 1993	RBMK 1000 MW
48.	R	NETHERLANDS	BORSSELE	7-18 JUNE 1993	PWR 480 MW
49.	S_c	UKRAINE	ROVNO	28 JUNE-2 JULY 1993	WWER 440/213
50.	F	SLOVAK REP.	BOHUNICE	5-9 JULY 1993	WWER 440/230
51.	S_c	LITHUANIA	IGNALINA	12-16 JULY 1993	RBMK 1500 MW
52.	R	RUSSIAN FED.	SMOLENSK	19-30 JULY 1993	RBMK 1000 MW
53.	S_c	RUSSIAN FED.	BALAKOVO	30 AUG-3 SEPT 1993	WWER-RBMK
54.	S_A	UK	LIVERPOOL	13-14 SEPT. 1993	AGR-PWR
55.	F	BULGARIA	KOZLODUY	20 SEPT.- 1 OCT. 1993	WWER 440/230
56.	F	RUSSIAN FED.	KOLA	4-8 OCT. 1993	WWER 440/230
57.	S_A	SPAIN	MADRID	5-7 OCT. 1993	PWR-BWR
58.	R	CZECH REP.	DUKOVANY	11-22 OCT. 1993	WWER 440/213
59.	A	FRANCE	PALUEL	15-19 NOV. 1993	PWR 1400
60.	R	UKRAINE	ROVNO	22 NOV.-3 DEC. 1993	WWER 440/213
61.	F	RUSSIAN FED.	NOVOVORONEZH	29 NOV.- 3 DEC. 1993	WWER 440/230
62.	S_C	SOUTH AFRICA	KOEBERG	29 NOV.- 3 DEC. 1993	PWR 900 MW
63.	S_C	SWITZERLAND	WURENLINGEN	6-10 DEC. 1993	PWR-BWR
64.	S_A	FRANCE	PARIS	7-8 DEC. 1993	OECD/NEA
65.	S_B	UK	AGE-CROFT	24-26 JAN. 1994	Nuclear Electric plc.
66.	S_B	UK	AGE-CROFT	26-28 JAN. 1994	Nuclear Electric plc.
67.	S_B	UK	CLIFF-QUAY	31 JAN.- 2 FEB. 1994	Nuclear Electric plc.
68.	S_C	UKRAINE	ZAPOROZHE	7-11 FEB. 1994	WWER 1000 MW
69.	S_C	RUSSIA	KALININ	15-17 FEB. 1994	WWER 1000
70.	S_C	UKRAINE	SOUTH UKRAINE	21-25 MARCH 1994	WWER 1000 MW
71.	R	UKRAINE	CHERNOBYL	11-22 APRIL 1994	RBMK 1000
72.	S_A	SLOVAKIA	BOHUNICE	26-28 APRIL 1994	WWER 440
73.	S_c	INDIA	BOMBAY	2-6 MAY 1994	CANDU

74.	S_A	GREECE	ATHENS	16-20 MAY 1994	Research Reactor
75.	S_C	RUSSIAN FED.	SMOLENSK	6-10 JUNE 1994	RBMK
76.	S_C	IRAN, ISLAMIC REP.	TEHERAN	12-15 JUNE 1994	WWER 440/213
77.	R	UKRAINE	ZAPOROZHE	13-24 JUNE 1994	WWER 1000 MW
78.	R	RUSSIAN FED.	KALININ	4-15 JULY 1994	WWER 1000 MW
79.	S_C	SLOVENIA	KRSKO	4-8 JULY 1994	PWR 600 MW
80.	A	ROMANIA	CERNAVODA	8-12 AUG. 1994	CANDU 600 MW
81.	F	RUSSIAN FED.	BALAKOVO	5-14 SEPT. 1994	WWER 1000
82.	R	SOUTH AFRICA	KOEBERG	5-16 SEPT. 1994	PWR 900 MW
83.	S_B	SOUTH AFRICA	JOHANNESBURG	19-20 SEPT. 1994	PWR 900 MW
84.	S_C	SPAIN	MADRID	3-21 OCT. 1994	Reg. Training Course*
85.	S_A	SOUTH AFRICA	KOEBERG	24-28 OCT. 1994	PWR 900 MW
86.	S_B	CZECH REP.	DUKOVANY	8-9 NOV. 1994	WWER 440/213
87.	R	BULGARIA	KOZLODUY 5, 6	14-25 NOV. 1994	WWER 1000 MW
88.	S_B	HUNGARY	PAKS	6-7 DEC. 1994	WWER 440/213
89.	S_B	PAKISTAN	KANUPP	12 -16 DEC. 1994	CANDU 120 MW
90.	R	UKRAINE	SOUTH UKRAINE	16-27 JAN. 1995	WWER 1000 MW
91.	S_C	USA	ARGONNE	6-24 FEB 1995	Interreg. Training Course*
92.	F	HUNGARY	PAKS	6-10 MARCH 1995	WWER 440/213
93.	S_C	CHINA	BEIJING	20-24 MAR. 1995	PWR
94.	S_B	RUSSIAN FED.	KURSK	4-6 APRIL 1995	RBMK
95.	S_C	CZECH REP.	PRAGUE	24-28 APR.1995	WWER
96.	S_C	SWEDEN	FORSMARK	9-11 MAY 1995	BWR 1000
97.	S_A	HUNGARY	BUDAPEST	13-15 JUNE 1995	WWER 440/213
98.	S_C	BULGARIA	SOFIA	20-22 JUNE 1995	WWER
99.	S_B	RUSSIAN FED.	SMOLENSK	11-13 JULY 1995	RBMK 1000 MW
100.	T	RUSSIAN FED.	KURSK	4-13 SEPT. 1995	RBMK 1000 MW
101.	S_C	UKRAINE	CHERNOBYL	18-22 SEPT.1995	RBMK
102.	S_C	UKRAINE	ROVNO	2-6 OCT. 1995	WWER 1000 MW
103.	$S_A + S_B$	MEXICO	LAGUNA VERDE	23-27 OCT. 1995	BWR 600
104.	S_A	ROMANIA	BUCHAREST	14-16 NOV. 1995	CANDU 600
105.	Z	SWEDEN	FORSMARK	27 NOV. - 1 DEC. 1995	BWR 1000
106.	S_C	UKRAINE	KHMELNITSKY	11-15 DEC. 1995	WWER 1000
107.	S_B	RUSSIAN FED.	LENINGRAD	23-25 JAN. 1996	RBMK
108.	T	RUSSIAN FED.	SMOLENSK	5-14 FEB. 1996	RBMK
109.	S_C	UKRAINE	SOUTH UKRAINE	11-15 MARCH 1996	WWER 1000MW

* See para. 4 above.

110.	S_B	RUSSIAN FED.	KOLA	23-25 APRIL 1996	WWER 440 MW
111.	T	UKRAINE	ZAPOROZHE	6-15 MAY 1996	WWER 1000 MW
112.	S_B	RUSSIAN FED.	NOVOVORONEZH	21-23 MAY 1996	WWER 440 MW
113.	T	RUSSIAN FED.	LENINGRAD	3-12 JUNE 1996	RBMK
114.	T	UKRAINE	KHMELNITSKY	1-10 JULY 1996	WWER 1000
115.	T	ROMANIA	CERNAVODA	22-31 JULY 1996	CANDU 600
116.	T	UKRAINE	CHERNOBYL	19-28 AUG. 1996	RBMK 1000
117.	T	RUSSIAN FED.	KOLA	2-11 SEPT. 1996	WWER 440 MW
118.	Z	CZECH REP.	DUKOVANY	7-11 OCT. 1996	WWER 440/213
119.	T	UKRAINE	ROVNO	4-13 NOV. 1996	WWER 440/213
120.	T	RUSSIAN FED.	NOVOVORONEZH	18-27 NOV. 1996	WWER 440 MW
121.	S_D	CZECH REP.	DUKOVANY	3-5 DEC. 1996	WWER 440/213
122.	S_B	RUSSIAN FED.	BALAKOVO	FEBRUARY 1997	WWER 1000 MW
123.	T	UKRAINE	SOUTH UKRAINE	2-11 MARCH 1997	WWER 1000 MW
124.	S_B	RUSSIAN FED.	KALININ	MARCH 1997	WWER 1000 MW
125.	T	RUSSIAN FED.	BALAKOVO	JUNE 1997	WWER 1000 MW
126.	T	UKRAINE	CHERNOBYL	5-14 JULY 1997	RBMK 1000
127.	T	RUSSIAN FED.	KALININ	SEPTEMBER 1997	WWER 1000

ASSET service options
(see the column headed "TYPE" in the preceding table)

Analysis missions

A Review of analysis of safety-significant event
F Follow-up review of operational safety performance to assess progress made in incident prevention two years after a Type R mission
I Assistance with the implementation of ASSET recommendations
R Review of operational safety performance with a view to enhancing the ability to prevent incidents
T Topical analysis of events involving safety culture issues or issues such as
- quality control
- preventive maintenance
- surveillance
- feedback
- corrective maintenance

Z Peer review by an ASSET of the self-assessment of operational safety performance by plant staff using the ASSET procedures

Training missions

S Seminar for (a) training in the ASSET analysis procedures for "learning from deviations to prevent accidents" and (b) the promotion of self-assessment
S_A Analysis of the consequences of events
S_B Analysis of the causes of events
S_C Guidance in the prevention of incidents (includes S_A and S_B)
S_D Examination of ASSET findings

THE ENGINEERING SAFETY REVIEW SERVICE (ESRS)

Background

1. Through the ESRS, initiated in 1989, Member States can obtain the advice of interdisciplinary teams of independent experts on widely varying engineering safety aspects of planned or existing nuclear power plants (NPPs) - for example, siting, external hazards (such as earthquakes, hurricanes and forest fires), accident management and the impact of ageing. In practice, however, requests for reviews have tended to focus on questions connected with siting and with external hazards.[1]

2. Site safety and external hazard reviews may cover a broad range of disciplines - for example, geology, seismology, hydrology, vulcanology, meteorology and tectonics - and the teams also look into matters like the local population distribution and the impact of possible man-induced events (e.g. an aircraft crash).

Focus of reviews

3. When the focus is on seismic hazards capable of affecting the plant (which are assessed through "seismic safety review missions"), the review team includes experts in structural mechanics with experience of seismic capacity evaluation and of designing NPP structures, systems and components to resist seismic effects.

4. As only a few sites are at present being investigated with a view to the construction of new NPPs, the requests made by Member States in recent years have been mainly for reassessments of the safety of existing NPPs. In particular, the Secretariat has been receiving requests for seismic safety review missions to the sites of WWER-type NPPs.

Review findings

5. A conclusion which has emerged from such missions is that WWER-440/230 and 440/213 plants (and also RBMK plants) do not have inherent structural resistance to the types of load associated with earthquakes (and with similar external events). This is due to the fact that in such a plant only the pressure boundary (i.e. the structures and components under pressure) is designed to withstand extreme loads; the superstructures housing the reactor, turbines and emergency diesel generators are designed as normal industrial buildings with large spans and very little cross-bracing to take lateral (i.e. earthquake-induced) loads and are constructed in such a way that they have relatively low ductility. When the seismic

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[1] A list of the missions completed and still to be carried out is given at the end of the Annex.

acceleration to be allowed for is low (e.g. ~ 0.1 g), minor structural strengthening may be sufficient; when it is even only slightly higher (0.2-0.3 g), however, complex and expensive structural upgrading becomes necessary.

The seismic upgrading of NPPs[2]

6. Following seismic safety review missions, the seismic upgrading of structures, systems and components at the Kozloduy NPP (Bulgaria), the Bohunice and Mochovce NPPs (Slovakia) and the Paks NPP (Hungary) is under way. In Armenia, the seismic hazards associated with the site of the Medzamor NPP - shut down after the 1988 Spitak earthquake - have been reassessed, and the Armenian Government plans to put Unit 2 at Medzamor back into service after completion of the necessary seismic upgrading.

7. In Pakistan, seismic upgrading is in progress at the Karachi NPP, which went into service in 1972, and a seismic design review is being conducted of the 300-MW(e) NPP under construction at Chashma, use being made of the experience gained in seismic reassessments of various existing NPPs. Seismic PSA studies carried out for the Krško NPP, Slovenia, are being reviewed.

Hazards associated with volcanoes

8. A number of reviews have been performed of hazards associated with volcanoes. One related to site investigations for an NPP to be built on the Muria Peninsula in Indonesia and another to the seismic reassessment carried out of the Medzamor NPP site in Armenia (see para. 6 above).

Related activities

9. A database is being established for information on NPP sites and the possible external events associated with them. A data collection questionnaire has been prepared in this connection.

10. Twenty-two institutions in 14 countries are participating in a benchmark study connected with the seismic analysis and testing of WWER-type NPPs for which one of the units at the Paks NPP is serving as the prototype for WWER-440/213 plants and two units at the Kozloduy NPP are serving as the prototypes for WWER-1000 plants.

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[2] At a conference on structural mechanics in reactor technology held in Stuttgart, Germany, in 1993, there were a considerable number of presentations on the seismic upgrading of NPPs, and at a subsequent seminar hosted by the Agency in Vienna the seismic upgrading of NPPs in Eastern Europe was a major topic.

ESRS MISSIONS
RELATED TO SITING AND TO EXTERNAL HAZARDS

No.	TYPE	COUNTRY	NPP/LOCATION	DATE	PLANT TYPE
1.	S	Iraq	Site Survey	February 89	
2.	S	Tunisia	Site Survey	April 89	
3.	S	Indonesia	Muria	May 89	(not defined yet)
4.	S	USSR	Gorki DHP	June 89	
5.	S	Morocco	Sidi Boulbra	December 89	
6.	S	Poland	Zarnowiec	March 90	
7.	S	CSFR	Temelin	April 90	WWER-1000
8.	S	Iraq	Near Tikrit	May 90	
9.	S	Bulgaria	Belene	June 90	WWER-1000
10.	S	Bulgaria	Kozloduy	June 90	WWER-440/230, WWER-1000
11.	SC	Romania	Cernavoda	September 90	PWR 600
12.	S	Pakistan	Chashma	November 90	PHWR 300
13.	SC	Romania	Cernavoda	December 90	PHWR 600
14.	S	Indonesia	Muria	January 91	(not defined yet)
15.	S	Slovenia	Krško	March 91	PWR 600
16.	SC	Bulgaria	Kozloduy	April 91	WWER-440/230
17.	W	Bulgaria	Kozloduy	May 91	WWER-440/230
18.	S	Tunisia	Site Survey	May 91	
19.	S	USSR	Crimea	June 91	WWER-1000
20.	W	Romania	Cernavoda	September 91	PHWR 600
21.	W	CSFR	Temelin	September 91	WWER-1000

S: Review of site investigations for all disciplines involved.
S-F: Follow-up to S-type mission.
SI: Review of investigations for determining seismic input parameters (specific to the site).
SI-F: Follow-up to SI-type mission.
SC: Review of seismic capacity and necessary upgrading of systems, structures and components (SSC).
SC-F: Follow-up to SC-type mission.
W: Workshop.
WP: Review of work plans and technical procedures for the site and seismic safety assessment.
B: Activities related to benchmark project for seismic analysis/testing of WWER-type NPPs.

No.	TYPE	COUNTRY	NPP/LOCATION	DATE	PLANT TYPE
22.	SC	CSFR	Bohunice	September 91	WWER-440/230
23.	S	Tunisia	Site Survey	November 91	
24.	WP	Indonesia	Muria	December 91	(not defined yet)
25.	WP	CSFR	Temelin	December 91	WWER-1000
26.	SI	Bulgaria	Kozloduy	February 92	WWER-440/230
27.	W-WP	Slovenia	Krško	March 92	PWR 600
28.	SI	Bulgaria	Kozloduy	April 92	WWER-440/230
29.	SC-F	CSFR	Bohunice	May 92	WWER-440/230
30.	SI-SC	Armenia	Medzamor	May 92	WWER-440/230
31.	S-F	CSFR	Temelin	June 92	WWER-1000
32.	W-S	Malaysia	Site Survey	June 92	
33.	SC	Bulgaria	Kozloduy	August 92	WWER-440/230
34.	SC	Pakistan	Chashma	August 92	PWR 300
35.	S	Indonesia	Muria	September 92	(not defined yet)
36.	SI	Slovenia	Krško	October 92	PWR 600
37.	S-F	Indonesia	Muria	November 92	(not defined yet)
38.	SC	Bulgaria	Kozloduy	November 92	WWER-400/230
39.	S	Tunisia	Site Survey	December 92	
40.	S-WP	Indonesia	Muria	February 93	(not defined yet)
41.	SI-F	Bulgaria	Kozloduy	February 93	WWER-1000, WWER- 440/230
42.	SC	Pakistan	Chashma	March 93	PWR 300
43.	S-F	Czech Republic	Temelin	April 93	WWER-1000
44.	SC-F	Slovakia	Bohunice	April 93	WWER-440/230
45.	S-WP	Indonesia	Muria	April 93	(not defined yet)
46.	W	Pakistan	Chashma	May 93	PWR 300
47.	SC	Pakistan	Kanupp	May 93	PHWR
48.	S	Croatia	Site Survey	June 93	
49.	SC	Russian Fed.	Smolensk	June 93	RBMK
50.	W	China	(Generic)	July 93	
51.	S-F	Indonesia	Muria	July 93	(not defined yet)
52.	SI-B	Hungary	Paks	September 93	WWER-440/213
53.	WP	Armenia	Medzamor	August 93	WWER-440/230

NO.	TYPE	COUNTRY	NPP/LOCATION	DATE	PLANT TYPE
54.	SI	Bulgaria	Belene	September 93	WWER-1000
55.	SI	Slovakia	Bohunice	October 93	WWER-440/230, WWER-440/213
56.	SI	Slovakia	Mochovce	October 93	WWER-440/213
57.	SI-WP	Armenia	Medzamor	November 93	WWER-440/230
58.	S	Indonesia	Muria	November 93	(not defined yet)
59.	S	Morocco	Sidi Boulbra	November 93	
60.	SC	Hungary	Paks	December 93	WWER-440/213
61.	SC-F	Pakistan	Chashma	December 93	PWR 300
62.	W	Turkey	Akkuyu	December 93	(not defined yet)
63.	S-F	Indonesia	Muria	February 94	(not defined yet)
64.	SI-SC	Bulgaria	Kozloduy	March 94	WWER-1000
65.	SC	Bulgaria	Kozloduy	March 94	WWER-440/230
66.	W	Slovakia	Bohunice	March 94	WWER-440/230
67.	SC	Hungary	Paks	March 94	WWER-440/213
68.	W	Argentina	(Generic)	April 94	
69.	B	Bulgaria	Kozloduy	June 94	WWER-1000
70.	S-F	Czech Republic	Temelin	June 94	WWER-1000
71.	SI	Armenia	Medzamor	July 94	WWER-440/230
72.	SC	Slovakia	Mochovce	July 94	WWER-440/213
73.	SC-F	Hungary	Paks	July 94	WWER-440/213
74.	S	Indonesia	Muria	August 94	(not defined yet)
75.	SC	Slovakia	Mochovce	September 94	WWER-440/213
76.	B	Hungary	Paks	September 94	WWER-440/213
77.	SC	Armenia	Medzamor	September 94	WWER-440/213
78.	SC-F	Bulgaria	Kozloduy	October 94	WWER-440/230
79.	S	Bulgaria	Belene	October 94	WWER-1000
80.	S	Bulgaria	Kozloduy	October 94	WWER-1000, WWER-440/230
81.	W	Rep. Korea	(Generic)	October 94	
82.	SI-F	Slovakia	Mochovce	November 94	WWER-440/213

NO.	TYPE	COUNTRY	NPP/LOCATION	DATE	PLANT TYPE
83.	SI-F	Slovakia	Bohunice	. . November 94	WWER-440/230 WWER-440/213
84.	SC	Armenia	Medzamor	November 94	WWER-440/230
85.	B	Hungary	Paks	December 94	WWER-440/213
86.	SC-F	Pakistan	Chashma	January 95	PWR 300
87.	SI-F	Hungary	Paks	January 95	WWER-440/213
88.	S-F	Indonesia	Muria	March 95	(not defined yet)
89.	SC-F	Bulgaria	Kozloduy-5	March 95	WWER-1000
90.	SC-F	Slovakia	Mochovce	April 95	WWER-440/213
91.	SI-F	Hungary	Paks	April 95	WER-440/213
92.	SI-F	Armenia	Medzamor	April 95	WWER-440/230
93.	S	Czech Rep.	(not defined yet)	April 95	Spent Fuel Storage
94.	S	Thailand	(not defined yet)	May 95	(not defined yet)
95.	SI-F	Armenia	Medzamor	May 95	WWER-440/230
96.	SI/SC-F	Kazakhstan	Alma Ata	May 95	WWR-10 Res. Reactor
97.	SI/SC	Uzbekistan	Tashkent	May 95	WWR-10 Res. Reactor
98.	SI	Iran, Islamic Rep.	Bushehr	June 95	(being converted)
99.	SI-F	Hungary	Paks	June 95	WWER-440/213

THE INTERNATIONAL PEER REVIEW SERVICE FOR PROBABILISTIC SAFETY ASSESSMENTS (IPERS-PSA)

Background

1. Under the International Peer Review Service for Probabilistic Safety Assessments (IPERS-PSA) programme, initiated in 1988, international expert teams carry out independent reviews of PSAs being conducted in Member States.

2. The reviews are carried out, in response to requests from Member States, by carefully selected teams of experts who have in-depth experience in the required PSA field and are independent of the organizations which are performing or requested the PSA. The guidelines serving as a basis for the reviews (contained in IAEA-TECDOC-543) have recently been revised in the light of the experience gained in past reviews; the revised guidelines are being prepared for publication.

Focus of reviews

3. Since the 1994 session of the General Conference, which had a report on the IPERS-PSA programme in Attachment 6 to Annex 2 to document GC(XXXVIII)/INF/6, there have been (as of the end of July 1995) six IPERS-PSA missions and one IPERS-PSA workshop (held in Vienna). The missions were requested by Romania (two missions), Bulgaria, the Slovak Republic, the Czech Republic and Ukraine.[1]

4. The reviews focused on ensuring the reliability of Level 1 PSAs[2] to be used in the identification of safety issues and in support of backfitting and other plant improvement decisions.

5. The experience regarding the modelling of human actions which was gained through these reviews, and particularly actions carried out by plant staff who are well trained and knowledgeable but do not have detailed written procedures to which they can refer, indicated that more weight should be given to human actions so as to ensure (i) that the PSA is carried out consistently, (ii) that the methods used correspond to the current state-of-the-art and (iii) that conditions at the plant are depicted as accurately as possible in the PSA.

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[1] A table listing IPERS-PSA missions and other activities is presented at the end of the Annex.

[2] A Level 1 PSA represents the first step of a PSA. It covers initiating events, plant responses and accident sequences - including core damage.

6. Also, it was found that the modelling of computerized control systems - as was done, for example, in the case of the Temelin PSA - still represents a major challenge for PSA techniques; a PSA with a refined and detailed model of the computerized control systems is an important step towards the acceptance of such systems, and close interaction between the designers of the systems and the PSA team members is essential.

7. All the reviewed PSAs were conducted by local teams with the participation of plant staff, and they were actively supported by the utilities and the plant operators. That ensured maximum utilization of the insights, information and experience acquired through the PSAs and facilitated the collection and evaluation of plant-specific experience data.

IPERS-PSA MISSIONS AND OTHER ACTIVITIES
(as of 30 June 1995)

NO.	*TYPE*	*COUNTRY*	*NPP/LOCATION*	*DATE*	*PLANT TYPE*
1.	*P*	*CHINA*	*GUANGDONG/BEIJING*	*28 NOV.-2 DEC. 88*	*PWR*
2.	*R*	*USSR*	*GORKY/MOSCOW*	*22 MAY-15 JUNE 89*	*500 MW(th)*
3.	*S, P*	*NETHERLANDS*	*BORSSELE*	*21 AUG.-1 SEPT. 89*	*PWR*
4.	*I*	*CHINA*	*GUANGDONG/BEIJING*	*27 NOV.-8 DEC. 89*	*PWR*
5.	*P*	*SWEDEN*	*FORSMARK 1&2/VIENNA*	*5-9 MAR. 90*	*BWR*
6.	*R*	*SWEDEN*	*FORSMARK 1&2/STOCKHOLM*	*12-23 MAR. 90*	*BWR*
7.	*I*	*NETHERLANDS*	*BORSSELE*	*18-29 JUNE 90*	*PWR*
8.	*I*	*ROMANIA*	*CERNAVODA/SINAIA*	*15-25 OCT. 90*	*CANDU 6, 679 MW*
9.	*F, I*	*NETHERLANDS*	*DODEWAARD/ARNHEM*	*6-17 MAY 91*	*BWR*
10.	*P*	*REP. KOREA*	*KORI 3&4/VIENNA*	*27-31 MAY 91*	*PWR*
11.	*R*	*REP. KOREA*	*KORI 3&4/DAEJEON*	*26 AUG.-6 SEPT. 91*	*PWR*
12.	*P*	*NETHERLANDS*	*BORSSELE/VIENNA*	*9-13 SEPT. 91*	*PWR*
13.	*F, I*	*NETHERLANDS*	*BORSSELE*	*14-25 OCT. 91*	*PWR*
14.	*A*	*SWITZERLAND*	*MUEHLEBERG*	*13-17 JAN. 92*	*BWR*
15.	*F, R*	*NETHERLANDS*	*DODEWAARD/ARNHEM*	*3-14 FEB. 92*	*BWR*
16.	*I*	*RUSSIAN FED.*	*KOLA-1/VIENNA*	*28 SEPT.-2 OCT. 92*	*WWER-440/230*
17.	*I*	*SLOVAK REP.*	*BOHUNICE-V1/BOHUNICE*	*8-12 MAR. 93*	*WWER-440/230*
18.	*P*	*HUNGARY*	*PAKS/VIENNA*	*17-21 MAY 93*	*WWER-440/213*
19.	*A*	*NETHERLANDS*	*BORSSELE*	*24-28 MAY 93*	*PWR*
20.	*F, I*	*HUNGARY*	*PAKS/BUDAPEST*	*23 AUG.-3 SEPT. 93*	*WWER-440/213*
21.	*P*	*REP. KOREA*	*YONGGWANG 3&4/VIENNA*	*4-8 OCT. 93*	*PWR*
22.	*A*	*NETHERLANDS*	*DODEWAARD/ARNHEM*	*18-22 OCT. 1993*	*BWR*
23.	*F, R*	*NETHERLANDS*	*BORSSELE*	*1-5 NOV. 1993*	*PWR*
24.	*A*	*NETHERLANDS*	*DODEWAARD/ARNHEM*	*6-10 DEC. 1993*	*BWR*
25.	*F, I*	*RUSSIAN FED.*	*KOLA-1/VIENNA*	*13-17 DEC. 1993*	*WWER-440/230*
26.	*F, R*	*REP. KOREA*	*YONGGWANG 3&4/DAEJEON*	*17-28 JAN. 94*	*PWR*
27.	*F, R*	*SLOVAK REP.*	*BOHUNICE-V1/BOHUNICE*	*28 FEB.- 11 MAR. 94*	*WWER-440/230*
28.	*R*	*SLOVENIA*	*KRSKO/LJUBLJANA*	*27 JUNE-8 JULY 94*	*PWR*
29.	*F, R*	*HUNGARY*	*PAKS/BUDAPEST*	*29 AUG.-7 SEPT. 94*	*WWER-440/213*

NO.	TYPE	COUNTRY	NPP/LOCATION	DATE	PLANT TYPE
30.	P	ROMANIA	CERNAVODA/BUCHAREST	31 OCT.-3 NOV. 94	CANDU 6, 679 MW
31.	R	BULGARIA	KOZLODUY/SOFIA	21 NOV.-2 DEC. 94	WWER-1000
32.	R	SLOVAK REP.	BOHUNICE-V2/BOHUNICE	17-27 JAN. 95	WWER-440/213
33.	I	CZECH REP.	TEMELIN	24 APR.-5 MAY 95	WWER-1000
34.	P	UKRAINE	ZAPOROZHE/VIENNA	12-16 JUNE 95	WWER-1000
35.	R	ROMANIA	CERNAVODA	3-14 JULY 95	CANDU 6, 679 MW

IPERS-PSA options

Type A: *Review of specific PSA types (e.g. low power/shutdown PSAs, Level 2 PSAs)*
Type F: *Follow-up of IPERS-PSA recommendations*
Type I: *Interim review of a PSA at a preliminary stage*
Type P: *Pre-review (e.g. to identify the documentation needed for the review)*
Type S: *Seminar on review techniques*
Type R: *Review of a completed full PSA*

THE INTEGRATED SAFETY ASSESSMENT OF RESEARCH REACTORS (INSARR) SERVICE

Background

1. In 1972, the Agency began to assess the safety of research reactors in Member States by means of INSARR-type missions, both pursuant to its statutory rights and responsibilities under project and supply agreements and in response to requests from Member States. In 1987, it launched the INSARR service on the basis of the experience thus gained.

2. As of the end of July 1995, a total of 123 assessments had been conducted at operating research reactors in 37 Member States, in 23 of them pursuant to project or supply agreements with the Agency (see the table at the end of the Annex).

3. The assessments address mainly the general operational safety of research reactor facilities. Upon request, they may also address a variety of specific issues such as seismic conditions, the obsolescence of equipment and documentation, the ageing of equipment, major modifications, licensing, commissioning and decommissioning.

INSARR missions

4. INSARR missions are carried out by teams normally consisting of two to five members - experts from Member States and Agency staff. The teams carry out comprehensive, independent assessments of research reactor facilities in the light of the relevant Agency safety standards.* Also, they exchange experience with reactor personnel. The duration of a mission depends on its objective and scope; a mission may last as little as three working days (at the site) if sufficient information is provided in advance.

5. The information required for the assessments relates to nuclear safety and radiation protection aspects of the operation of the reactor, and it is obtained from the operating organization by means of a questionnaire. Among the areas normally covered are:

(a) the safety documentation, including the safety analysis report (checks for updating and conformity with Agency guidelines);

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* The "Code on the Safety of Nuclear Research Reactors: Design" and the "Code on the Safety of Nuclear Research Reactors: Operation" - Safety Series No.35-S1 and 35-S2.

(b) the quality assurance programme (with the focus on procedures and record-keeping);

(c) the conduct of operations, including operating procedures, the maintenance programme and modifications;

(d) personnel training and qualification;

(e) the radiation protection programme, including dose records, waste management, and emergency planning and preparedness;

(f) the organizational arrangements as regards safe reactor operation; and

(g) the structure of the administrative organization set up by the Member State for dealing with safety matters, with the focus on the national licensing process, including evaluation procedures, inspections and supervisory examinations.

6. At the site, the team:

(a) examines the safety documentation of the reactor facility;

(b) reviews the operational status of the reactor, if possible observing operations such as start-up and shutdown; and

(c) discusses technical details with the responsible personnel.

7. At the end of the mission, the team conveys its preliminary conclusions and recommendations to the relevant authorities (the operating organization and the regulatory body) at a final meeting. Subsequently, a mission report is submitted through official channels to the Member State concerned.

8. INSARR missions are an Agency service normally provided cost-free to those Member States which are developing countries. The question of payment for INSARR missions requested by Member States which are not developing countries and for special INSARR missions dealing with issues other than the ones normally dealt with is settled on a case-by-case basis with the requesting Member State.

INSARR mission findings

9. In the course of the missions carried out by them, INSARR teams have found strong and weak points. Among the weak points found have been: poor documentation; documentation not properly updated; the lack of a quality assurance programme; poor implementation of the quality assurance programme; incomplete written procedures for

operations, maintenance, testing, inspection, emergencies and radiation protection; and poor record-keeping. In a few extreme cases (e.g. safety systems not working properly), the mission report to the Member State has been followed by a written request from the Agency that the INSARR team's recommendations be implemented and by a further mission to check on their implementation.

Technical assistance missions

10. In addition to the INSARR missions described above, there have been several missions for the purpose of helping Member States with the licensing review of safety analysis reports for new reactors and with the commissioning of new reactors. Such missions are carried out within the framework of the Agency's technical co-operation programme. Two such missions were conducted in 1995 - to Ghana and to Egypt.

Publication of new Safety Guides

11. Two new Safety Guides relating to research reactors were published in December 1994: "Safety Assessment of Research Reactors and Preparation of the Safety Analysis Report" (Safety Series No. 35-G1) and "Safety in the Utilization and Modification of Research Reactors" (Safety Series No. 35-G2).

INSARR MISSIONS

	1972-1976	1977-1981	1982-1986	1987-1991	1992-1993	1994-1995
(Reviews conducted pursuant to project or supply agreements with the Agency)						
Argentina	1973 (2)	1978 (2)			1992 (2)	
Chile	1973	1977	1986	1991		
Finland	1976	1981		1987		
Greece	1972,1976		1982,1986		1993	
Indonesia	1972,1974	1978,1979	1982,1986			1994
Iran, Islamic Rep. of	1972,1976			1990		
Jamaica			1986			1994
Japan	1976					
Malaysia		1977	1982,1986			
Mexico	1972,1973 (3)	1977(4),1981(4)	1986 (4)			1994
Norway				1987,1988		
Pakistan	1976		1985			
Peru		1978,1981		1987	1992	
Philippines	1972,1973,1975	1978	1983			
Romania			1983		1992	
Spain			1982,1986			
Thailand	1974	1978	1982	1987		
Turkey		1977	1986		1992	
Uruguay	1974	1978,1979	1984			
Vietnam			1985	1989		1995
Venezuala	1975	1979	1984	1988		
Yugoslavia (Slovenia)	1976		1985		1992	
Zaire		1979	1984			
(Reviews conducted at the request of Member States)						
Bangladesh						1995
Bulgaria				1990		
Brazil	1973	1977		1991		
Chile				1991		
Colombia		1977	1983	1987		
Egypt			1985			
Hungary			1983	1989	1993	
Indonesia		1979	1982,1986			
Iraq				1988 (2)		
Korea, Rep. of	1976		1982 (2)	1988 (2)		
Peru					1992	
Portugal					1992	
Turkey					1998	
Ukranian SSR				1991		
USSR				1990 (2)		
Yugoslavia (Serbia)			1985			
Kazakhstan					1993	
Uzbekistan					1993	

THE INTERNATIONAL REVIEW OF IRRADIATOR SAFETY (IRIS) SERVICE

Background

1. A mechanism for the peer review of irradiation plant safety and for the sharing of safety-related knowledge among plant operators and regulatory authorities has been introduced in the light of the following considerations:

(a) There have been a number of serious accidents at industrial irradiation plants, several involving fatalities. They have been analysed in order to determine the causes and see what lessons can be learned from them. From the analyses, it has been concluded that similar accidents are probably "waiting to happen" as a result of inadequate regulatory control, poor operational safety (procedures, training, maintenance), poor design of safety systems and inadequate quality assurance during construction.

(b) Of the approximately 160 known large gamma irradiation plants, some 40 were established with Agency assistance. They contain gamma-emitting radionuclide sources and are used mainly for the sterilization of medical products and the preservation of foodstuffs. From information obtained through RAPAT missions and in other ways, it seems that at some irradiation plants - including some which were established with Agency assistance - the radiation safety conditions are poor.

Developments since the 1994 session of the General Conference

2. Since the 1994 session of the General Conference, the Secretariat has, in some cases in consultation with manufacturers and other experts,

(a) drafted a Safety Practices document on lessons learned from accidents with irradiation facilities,

(b) drawn up an inventory of large "panoramic"[1] gamma irradiators (the most important ones from the safety point of view),[2]

(c) prepared a checklist of safety issues for use by the regulatory authorities in Member States,

(d) prepared a checklist of safety issues for organizations operating irradiation facilities,

(e) initiated a survey of the safety status of gamma irradiation facilities worldwide, with the emphasis on facilities provided by the Agency to Member States (letters with the above-mentioned checklists have been sent to Member States), and

(f) established an international reporting system for unusual radiation-related events - and is inviting Member States to participate in it by providing reports on such events when these occur (the system includes a procedure for disseminating the lessons learned).

3. A decision regarding what further efforts and resources should be devoted to the IRIS service will be taken in the light of the reports and other information received by the Secretariat through the activities outlined above.

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[1] A "panoramic" irradiator is a controlled-human-access irradiator in which the sealed source, when not in use, is fully shielded and, during use, is exposed within a radiation volume maintained inaccessible by an entry control system.

[2] It is believed that the inventory is far from complete as regards such irradiators in China and the former Soviet Union.

THE TRANSPORT SAFETY ADVISORY REVIEW TEAM (TRANSART) SERVICE

1. Since the 1994 session of the General Conference, at which the Conference had before it (in Attachment 13 to Annex 2 to document GC(XXXVIII)/INF/6) a brief account of the Secretariat's plans for the establishment of a Transport Safety Assessment Review Team (TRANSART) service, a Technical Committee on competent authority actions necessary for compliance with the Agency's Regulations for the Safe Transport of Radioactive Materials (the Transport Regulations) has reviewed the purpose and scope of the envisaged service and recommended that the emphasis be on "the provision of advice and assistance" rather than on "assessment"; consequently, "TRANSART" now stands for "Transport Safety Advisory Review Team".

2. TRANSARTs will focus on providing advice and assistance to Member States which want support in fully implementing the Transport Regulations. Their approach will be flexible, the advice and assistance being tailored to the needs of the particular Member State. They will advise on matters such as the role of the competent authority in establishing priorities and an appropriate regulatory framework, and they will - for example - assist in the conduct of inspections for ensuring compliance with the Transport Regulations and in evaluating the flow of radioactive materials within the Member State. Besides TRANSART missions, the Secretariat will - inter alia - arrange for experts to spend some time in Member States as "mentors", support national training programmes (for example, by helping to organize workshops - both national and regional) and arrange fellowships and scientific visits.

3. The next steps to be taken by the Secretariat include the following:

- inform Member States of the precise scope of the TRANSART service;
- contact potential donor Competent Authorities in order to determine the nature and extent of the assistance which they might provide;
- organize an overall programme of activities based on Member States' requests;
- co-ordinate the resources available for fulfilling the requests; and
- organize follow-up activities designed to ensure the long-term success of the TRANSART service.

THE ASSESSMENT OF SAFETY CULTURE IN ORGANIZATIONS TEAM (ASCOT) SERVICE

Background

1. The ASCOT service became available at the beginning of 1993, after the publication by the Agency - in 1991 - of a report of the International Nuclear Safety Advisory Group (INSAG) entitled "Safety Culture" (published as Safety Series document No. 75-INSAG-4). This report contains what is probably the most complete description so far of the "safety culture" concept. Soon after the report had been published, interest was expressed in the possibility of assessing safety culture in particular organizations despite the difficulties involved in assessing the human environment and human attitudes and performance.

The ASCOT Guidelines

2. The main purpose of the ASCOT service is to promote and support safety culture self-assessment and improvement by organizations in Member States, and the ASCOT Guidelines issued in IAEA-TECDOC-743 were developed for that purpose.

3. The ASCOT Guidelines are based on the Appendix ("Safety Culture Indicators") to the INSAG report mentioned above. Using the Guidelines, it should be possible to assess safety culture in the light of the description given in the INSAG report.

ASCOT service options

4. The following three options are offered to Member States:

(a) expert support and advice prior to self-assessments, and
expert support and advice following self-assessments;

(b) ASCOT reviews - which may be combined with, for example, ASSET reviews or Safety Review missions;

(c) standard ASCOT seminars - covering the "safety culture" concept and methods of assessing safety culture, and
expanded ASCOT seminars - covering a wide range of operational safety topics and highlighting best world practices.

Experience to date*

5. Since the inception of the ASCOT service, there have been three reviews (all carried out in conjunction with other types of review) - at the Sizewell B NPP in the United Kingdom, the Borssele NPP in the Netherlands and the Koeberg NPP in South Africa. Considerable experience has also been acquired through 22 ASCOT seminars conducted in 18 countries. The experience acquired has highlighted the importance of promoting and enhancing safety culture in view of the fact that the root causes of many problems are related to intangible factors with tangible manifestations.

6. It has been noted that some organizations - for example, in France, South Africa, Spain and the United Kingdom - are already systematically assessing, promoting and enhancing safety culture. There appears to be a fairly high level of safety culture in most organizations, but room for improvement in all.

7. Among the shortcomings noted have been: inadequacy of policy statements (especially failure to emphasize the overriding importance of nuclear safety) at the corporate and the plant level; failure to communicate policy statements to all staff; non-inclusion of safety culture topics in training programmes; inability to clearly recognize good safety performance; infrequency of work checks by supervisors; poor communication between management and workers on safety issues; lack of a questioning attitude among staff; failure to encourage and reward problem identification; and acceptance of superficial root cause investigations.

Outlook

8. As part of the effort to promote and support safety culture self-assessment by organizations in Member States, the Secretariat intends to publish reports highlighting best world practices in the area of safety culture enhancement.

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* See the table opposite.

ASCOT ACTIVITIES

	1993	
Sizewell B NPP	United Kingdom	Pilot review (during pre-OSART mission)
Paks NPP	Hungary	Seminar
Finnish Centre for Radiation and Nuclear Safety (STUK)	Finland	Seminar
Korean Institute of Nuclear Safety	Republic of Korea	Seminar
Asco NPP	Spain	Seminar
Dukovany NPP	Czech Republic	Seminar
Scottish Nuclear H.Q.	United Kingdom	Seminar
Hunterston NPP	United Kingdom	Seminar
Kozloduy	Bulgaria	Seminar
Borssele NPP	Netherlands	Review combined with ASSET review
Khmelnitsky NPP	Ukraine	Seminar
Doel NPP	Belgium	Seminar
Koeberg NPP	South Africa	2 Seminars
	1994	
Bratislava	Slovakia	Seminar
Balakovo NPP	Russian Federation	Seminar
Ljubljana	Slovenia	Seminar
Prague	Czech Republic	Seminar
Qin Shan NPP	China	Seminar
Koeberg NPP	South Africa	Review combined with ASSET review
The Hague	Netherlands	Seminar
Chernobyl	Ukraine	Seminar
Bombay	India	Seminar
Karachi NPP	Pakistan	Seminar
	1995	
Cernovoda	Romania	Seminar

THE INTERNATIONAL REGULATORY REVIEW TEAM (IRRT) SERVICE

1. The two missions scheduled for 1995 within the framework of the IRRT service*, one to the Czech Republic and one to Romania, have been postponed at the request of the Member States concerned.

2. Following discussions with a number of regulatory bodies, the Secretariat plans to expand the "Guidelines for IAEA International Regulatory Review Teams (IRRTs)", IAEA-TECDOC-703, through the inclusion of four areas (research reactors, waste management, radiation protection and decommissioning) in addition to the nine which may currently be considered by IRRTs. A group of consultants will later this year prepare draft supplementary guidance relating to those four areas.

3. Following an IRRT mission to Romania scheduled for the first half of 1996, the Guidelines will be revised in the light of the experience gained through IRRT missions, with incorporation of the new supplementary guidance.

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* The IRRT service was described in Attachment 7 to Annex 2 to document GC(XXXVIII)/INF/6.

PART D: FOSTERING OF SAFETY-RELATED INFORMATION EXCHANGE

1. Since its inception the Agency has been fostering the exchange of scientific and technical information related to safety through conferences and symposia and through specialized meetings of groups of experts, with subsequent dissemination of the information exchanged. Recent developments in this area are described in Annex D-1.

2. The Agency has also been fostering the exchange of safety-related scientific and technical information by encouraging research and development in the safety field. Annex D-2 describes the safety-related research and development activities conducted within the framework of co-ordination research programmes, which will in future be directed towards - for example - the development of safety standards.

3. More recently, the Agency has been fostering the exchange of information on nuclear incidents through the Incident Reporting System, which it operates jointly with the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (see Annex D-3).

4. For the purpose of facilitating rapid communication between the nuclear community, the media and the public regarding the significance of nuclear events, the Agency operates the International Event Scale Information System (see Annex D-4).

5. Another subject on which the Agency has started to foster information exchange is the approaches to future nuclear power plant safety which have been developed in different countries. Annex D-5 describes activities in this area.

THE EXCHANGE OF SCIENTIFIC AND TECHNICAL INFORMATION

Background

1. The Agency is mandated by its Statute to foster the exchange of scientific and technical information among its Member States. The exchange of such information entails two distinct activities: (i) the provision of opportunities for experts to meet for purposes of information exchange and (ii) the collation and dissemination of information.

2. In the safety area, the Agency has been fostering the exchange of scientific and technical information through:

- the organization of major international meetings (conferences, symposia and seminars), many of them co-sponsored by other international organizations, and subsequent dissemination of the information exchanged at the meetings through - primarily - published proceedings;

- the organization of specialized meetings of groups of experts (Technical Committee meetings) and subsequent dissemination of the information exchanged at the meetings through, for example, technical documents (IAEA-TECDOCs) and technical reports; and

- the preparation of an annual Nuclear Safety Review.

Recent developments

3. The Agency, whose conferences and symposia have largely been paper presentation meetings, recently tried out a new conference format: its "International Conference on Radiation, Health and Society: Comprehending Radiation Risks", held in Paris in October 1994, was organized essentially as a discussion meeting and provided ample opportunity for information exchange among the participants, who generally welcomed the new format.

4. A subject on which the Agency has been involved in an intensive exchange of scientific and technical information is the health and environmental effects of the Chernobyl accident, about which there are still widely differing views. Together with the European Commission and WHO, the Agency is sponsoring an international conference entitled "One Decade after Chernobyl: Summing up the Radiological Consequences of the Accident" and organized in co-operation with the United Nations (Department of Humanitarian Affairs), UNESCO and UNEP. The conference, at which a common and conclusive understanding

of the nature and magnitude of the accident's consequences will be sought, is to take place in Vienna from 8 to 12 April 1996.

5. A subject on which the Agency has recently initiated an exchange of scientific and technical information is the practical application of the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources. An Agency seminar relating to this subject and to experience in applying the 1990 recommendations of the International Commission on Radiological Protection is to take place in Vienna from 20 to 24 November 1995.

6. During 1994-95, scientific and technical information exchange through specialized meetings continued, much of the information in question being subsequently disseminated by different IAEA-TECDOCs. The titles of recent safety-related IAEA-TECDOCs are listed opposite.

Outlook

7. The large number of meetings organized to foster the exchange of information on nuclear and radiation safety has been a considerable burden for Member States providing experts as participants in such meetings. In order to reduce the burden while ensuring that the information exchange continues on a regular and systematic basis, it is proposed that in future a major discussion conference on nuclear and radiation safety be held once every year, possibly together with parallel meetings on special topics. Ad hoc Technical Committees will continue to deal with special topics of interest only to small numbers of Member States. At the same time, support for the organization of regional conferences, symposia and seminars in developing Member States will be provided.

8. In addition to the annual "Nuclear Safety Review", the Secretariat will continue to produce reports on radiological accidents considered by it to be of interest to Member States.

9. Servicing of the Convention on Nuclear Safety when it enters into force (see in this connection Part E of the present document) will mean additional information exchange activities, such as the transmission to the Contracting Parties of information received in accordance with the provisions of the Convention and the distribution of reports resulting from meetings of the Contracting Parties.

10. The Secretariat intends to explore the possibilities of various network systems (e.g. Internet) as a vehicle for fostering the exchange of scientific and technical information with Member States, one objective being to give Member States - and especially those which are developing countries - direct access to a central nuclear and radiation safety database.

Recent safety-related IAEA-TECDOCs

- Experience from operation of WWER-440 model 213 nuclear power plants (IAEA-TECDOC-811, in press)
- Experimental design verification of WWER-440 model 213 nuclear power plants (IAEA-TECDOC-810, August 1995)
- Experience in the application of exemption principles (IAEA-TECDOC-807, July 1995)
- Reference design for a centralized spent sealed sources facility (IAEA-TECDOC-806, July 1995)
- Methods to identify and locate spent radiation sources (IAEA-TECDOC-804, July 1995)
- Strength analyses of the bubbler condenser structure of WWER-440 model 213 nuclear power plants (IAEA-TECDOC-803, June 1995)
- Developments in the transport of radioactive waste (IAEA-TECDOC-802, August 1995)
- Development of safety principles for the design of future nuclear power plants (IAEA-TECDOC-801, June 1995)
- OSART mission highlights 1991-1992 (IAEA-TECDOC-797, May 1995)
- Radiation doses in diagnostic radiology and methods for dose reduction (IAEA-TECDOC-796, April 1995)
- Validation of models using Chernobyl fallout data from the Central Bohemia region of the Czech Republic (IAEA-TECDOC-795, April 1995)
- Management of research reactor ageing (IAEA-TECDOC-792, March 1995)
- Reliability of computerized safety systems at nuclear power plants (IAEA-TECDOC-790, March 1995)
- Preparation of safety analysis reports (SARs) for near surface radioactive waste disposal facilities (IAEA-TECDOC-789, February 1995)

- Safety assessment of computerized control and protection systems (IAEA-TECDOC-780, December 1994)

- Fire hazard analysis for WWER nuclear power plants (IAEA-TECDOC-778, December 1994)

- Guidance for the application of the leak before break concept (IAEA-TECDOC-774, November 1994)

- The safety of WWER and RBMK nuclear power plants (IAEA-TECDOC-773, November 1994)

- Current practices and future trends in expert system developments for use in the nuclear industry (IAEA-TECDOC-769, October 1994)

- Safety indicators in different time frames for the safety assessment of underground radioactive waste repositories (IAEA-TECDOC-767, October 1994)

- Pre-OSART mission highlights 1988-1990 (IAEA-TECDOC-763, September 1994)

- Modelling the deposition of airborne radionuclides into the urban environment (IAEA-TECDOC-760, September 1994)

- Directory of national competent authorities' approval certificates for package design, special from material and shipment of radioactive material - 1994 Edition (IAEA-TECDOC-758, August 1994)

- Guidelines for multipurpose data systems for nuclear power plants (IAEA-TECDOC-756, July 1994)

- Assessing the radiological impact of past nuclear activities and events (IAEA-TECDOC-755, July 1994)

ENCOURAGEMENT OF RESEARCH AND DEVELOPMENT

1. The Agency is authorized to encourage and assist research and development (R&D) related to its objectives, and it does so through co-ordinated research programmes, which have proved to be an effective means of strengthening international co-operation in the area of radiation protection and nuclear safety.

2. Co-ordinated research has been valuable mainly as a means of bringing experts from institutions with common interests together to work on specific topics. In some cases it has helped to advance knowledge, but in others it has had more of an educational role. The Secretariat has concluded that future co-ordinated research in the safety field should be linked to major outputs expected from the Agency's programme, such as particular safety standards.

3. During the past five years, the Agency has encouraged co-ordinated research covering the following topics:

- Use of chromosomal aberration analysis in radiation protection;
- Dose per unit intake factors for the public;
- Radon in the human environment: instrumentation, modelling, dosimetry and surveys;
- Atmospheric transport model evaluation study (ATMES);
- Radon in the human environment: risk assessment;
- The radiological impact of hot beta particles from the Chernobyl fallout: risk assessment;
- Radionuclide transfer to man in tropical and sub-tropical environments;
- Limitations of radioepidemiological assessments for stochastic radiation effects in relation to radiation protection;
- The radiation protection implications of transport accidents involving radioactive materials;
- Development of probabilistic safety assessment techniques related to the safe transport of radioactive material;

- Assessment of safety of uranium hexafluoride (UF6) transport packages in fires;

- Intercomparison programme for individual monitoring;

- The use of natural materials for dose assessments;

- Radiation doses in diagnostic radiology and methods for reduction;

- Compilation of anatomical, physiological and metabolic characteristics for a reference Asian man - RCA;

- Data collection and analysis for probabilistic safety assessments;

- Reference studies on probabilistic modelling of accident sequences;

- Comparative health and environmental risks of nuclear and other energy systems, using case studies;

- Development of safety-related expert systems;

- Seismic data for the siting and site revalidation of nuclear facilities;

- Data acquisition for research reactor PSA studies;

- Management of ageing of concrete containment buildings;

- Management of ageing of in-containment instrumentation and control cables;

- Benchmark study for seismic analysis and testing of WWER-type nuclear power plants;

- Accident severity at sea during the transport of radioactive material;

- Development of relevant accident data for quantifying risks associated with the transport of radioactive material;

- Collection and classification of human reliability data for use in probabilistic safety assessments;

- Application of non-destructive testing and in-service inspection to research reactors.

4. Scientific institutions in the following Member States participated in the co-ordinated research programmes:

Algeria, Argentina, Australia, Austria, Bangladesh, Belarus, Belgium, Brazil, Bulgaria, Canada, Chile, China, Costa Rica, Croatia, Cuba, Czech Republic, Denmark, Ecuador, Egypt, Estonia, Ethiopia, Finland, France, Germany, Ghana, Greece, Hungary, India, Indonesia, Islamic Republic of Iran, Iraq, Ireland, Israel, Italy, Japan, Republic of Korea, Luxembourg, Macedonia (the former Yugoslav Rep. of), Malaysia, Mexico, Netherlands, Norway, Pakistan, Peru, Philippines, Poland, Portugal, Romania, Russian Federation, Singapore, Slovakia, Slovenia, South Africa, Spain, Sudan, Sweden, Switzerland, Syrian Arab Republic, Thailand, Tunisia, Turkey, Ukraine, United Kingdom, United States of America, (the former) USSR, Viet Nam, Yugoslavia and Zambia.

5. Co-ordinated research programmes to be initiated soon will cover the following topics:

- Intercomparison of in-vivo counting systems using a reference Asian phantom;
- Measurement of 131-I intake by the population in regions contaminated by the 1986 Chernobyl accident;
- Validation of accident and safety analysis methodology.

6. In the coming years, the Agency will place emphasis on the encouragement of R&D in the following areas:

- Monitoring for the radiation protection of occupationally exposed persons, including the physical surveillance of working environments and the development of techniques for the assessment of occupational exposure and, in particular:
  - . methods for intake determination with regard to long-lived radionuclides;
  - . neutron dosimetry (notably in the intermediate energy range);
  - . relationships between different dosimetric quantities and the equivalent dose and the effective dose in different exposure conditions;
  - . studies of individual dose distributions in various types of occupational exposure and assessments of collective doses for specific types of operations.

- Radiological safety aspects of packaging and transporting radioactive materials, considering phenomena associated with transport (placing emphasis on individual and collective doses resulting from the transport of radioactive materials and on developing and/or upgrading associated safety standards);

- Biological and medical techniques for the diagnosis, prognosis and treatment of overexposed individuals and, in particular:

  . biological dosimetry with special emphasis on localized exposures, including fixed cell chromosome analysis and studies of vascular changes with - for example - diffusion methods and thermography, and electroencephalographic methods; and

  . treatment (decorporation) or internal contamination, with special emphasis on inhalation of actinides and uranium;

- Analysis of radioepidemiology information available from Member States, considering risks, estimates and results;

- Safety problems associated with the design and useful life of radiation sources, in particular with regard to sources containing corrosive materials and age of the sources;

- The physical phenomena of material and equipment performance degradation of safety-related equipment, the detection of such degradation and identification of corrective measures for the purpose of ensuring a continuously high level of safety during all phases of nuclear facility life;

- Safety aspects of ageing in nuclear power plants and research reactors;

- Safety-assessment-related databases of existing nuclear power plants and research reactors;

- Site re-evaluation of nuclear facilities;

- Quantitative monitoring of operational safety;

- Methods and techniques for incident and accident analysis;

- Human reliability and man-machine interface;

- Modelling of PSA standard problems (benchmarks) to investigate uncertainties and sensitivity of results to model assumptions and data;

- Methods of component reliability data collection and treatment, including methods for continuous updating of data based on operational experience;

- Modelling of off-site consequences of severe accidents including emergency measures;

- Comparative assessment of the ecological impact and effect on climate change of energy sources;

- Case studies to compare health and environmental impacts of energy systems.

THE INCIDENT REPORTING SYSTEM (IRS) FOR NUCLEAR POWER PLANTS

Background

1. The IRS, which is jointly operated by the Agency and the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (NEA/OECD), collects, evaluates and disseminates information on safety-relevant incidents at operating nuclear power plants and systematically analyses the safety implications of the incidents. Designed to be a simple but effective vehicle for the exchange of such information among the participating countries, the IRS has evolved into an efficient tool for the feedback of operational safety experience.

2. Ukraine, China, Mexico and Romania recently began participating in the IRS, bringing the number of participants to 29[1], and there are ten countries with emerging nuclear power programmes which are regarded as potential participants.

Reporting to the IRS

3. During the one-year period ending June 1995, one hundred IRS reports were received by the Agency's Secretariat. Also, earlier incident reports in an NEA/OECD database were in October 1994 added to the Agency database of IRS reports, which now contains some 2000 reports with a wide spectrum of lessons learned.

4. In those reports, the categories used most frequently in classifying the root causes of the reported incidents are "human factors" (74%), "mechanical failure" (13%) and "electrical failure" (3%).

5. At their 1994 annual meeting, held in Vienna in October, IRS National Co-ordinators expressed concern about a decline in reporting to the IRS. Various aspects of the problem (for example, unclear reporting criteria and failure to distinguish between the purpose of the IRS and that of the International Nuclear Event Scale) were considered, but the main reason for the decline was widely felt to be insufficiency of the resources (human and financial) devoted to reporting. The IRS National Co-ordinators recommended that the Secretariats of the Agency and NEA/OECD look into the problem.

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[1] Argentina, Belgium, Brazil, Bulgaria, Canada, China, Czech Republic, Finland, France, Germany, Hungary, India, Italy, Japan, Republic of Korea, Mexico, Netherlands, Pakistan, Romania, Russian Federation, Slovak Republic, Slovenia, South Africa, Spain, Sweden, Switzerland, Ukraine, United Kingdom and United States of America.

The Advanced Incident Reporting System (AIRS) database

6. The Secretariat has developed a computerized system (AIRS) for the preparation, storage, dissemination, querying and retrieval of reports (full texts, illustrations and annotations) submitted to the IRS. The initial distribution of the AIRS database (on CD-ROM) is planned for the first quarter of 1996. It is hoped that the AIRS database will help nuclear safety experts to draw conclusions from the collected reports describing and categorizing significant events which have occurred at nuclear power plants over the years.

7. The Secretariat is holding a training workshop in Vienna from 9 to 13 October 1995 for potential users of the AIRS database.

The analysis of IRS reports and related activities

8. The IRS can contribute to a greater awareness of actual and potential safety problems. On one hand, the analysis of an IRS report relating to a particular incident at a particular plant may yield insights of value to the operators of similar plants. On the other, the analysis of a number of IRS reports all relating to the same kind of incident may yield insights of broader interest, such as insights about safety during low-power operation and shutdown and about possible incidents after plant upgrades and other modifications - issues which have been the subject of recent IRS-based studies (reported on in internal documents IAEA-J4-CS-14/95 and IAEA-J4-CS-23/95, copies of which are available on request).

9. In order to promote a better understanding of the incidents reported to the IRS and of possible actions to prevent a recurrence, the Secretariat has produced a compendium of actions taken in response to reported incidents (internal document IAEA-J4-CS-99/94).

10. In the interests of reducing the number of safety-relevant events during nuclear power plant operation, the Secretariat is developing Safety Practices documents on (i) the reporting of "human-dominated" incidents at nuclear power plants to the IRS; (ii) identification of the causes of incidents reported to the IRS; and (iii) operational safety experience feedback based on the use of IRS reports.

Joint NEA/OECD-Agency meeting

11. A joint NEA/OECD-Agency meeting on the exchange of information about recent events at nuclear power plants was held (together with the 1995 meeting of IRS National Co-ordinators) in Vera Cruz, Mexico, from 29 May to 2 June 1995; it was hosted by the Mexican Comisión Nacional de Seguridad Nuclear y Salvaguardias. Additional topics discussed at the meeting were (i) operational safety experience feedback and (ii) how the IRS can best serve the needs of Latin American countries.

THE INTERNATIONAL NUCLEAR EVENT SCALE (INES) INFORMATION SYSTEM

Background

1. The INES Information System was established in March 1990 for the purpose of facilitating rapid communication between the nuclear community, the media and the public regarding the significance of nuclear events. Such events are classified for INES purposes as "out of scale", "below scale" or "on scale". Events "out of scale" do not have any nuclear safety relevance, while events "below scale" (called "deviations") are safety-relevant but not safety-significant. Events "on scale" - i.e. of safety significance - are categorized on the basis of their consequences (defence-in-depth degradation; on-site impact; and off-site impact) at seven levels; those categorized at level 1 are termed "anomalies", those categorized at levels 2 and 3 are termed "incidents" and those categorized at levels 4 to 7 are termed "accidents".[1]

2. There were 55 countries participating in the INES Information System at the end of July 1995. At each nuclear facility in those countries, members of the staff are assigned the task of assessing the severity (in INES level terms) of operational events and communicating their conclusions to the INES Information System within 24 hours when the events are rated at INES level 2 or above or are important from the point of view of the public interest even if they are rated at INES level 1 or below. An updated list of participants in the INES Information System is given at the end of this Annex.

3. Information on the significance of events is conveyed on a standardized Event Rating Form through predetermined channels involving the INES National Officers of the participating countries and the Agency's INES Co-ordinator.

Events in 1994 and the first half of 1995

4. The INES Information System has received and disseminated Event Rating Forms relating to 61 events which occurred during 1994 at nuclear power plants (54) and other nuclear facilities (7). Of the 36 events "on scale", ten were rated at INES level 2 and 26 at level 1. Of the other 25 events, 24 were stated to be "below scale" (level 0) and one to be "out of scale". The 60 events rated at the levels 0, 1 and 2 were so rated on the grounds of "defence-in-depth degradation"; no event was so rated on the grounds of "on-site impact" or "off-site impact".

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[1] See Appendix 1 to Annex 4 to document GC(XXXVI)/INF/309 or "INES: The International Nuclear Event Scale User's Manual", revised and extended edition 1992, IAEA-INES-92/01.

5. During the first six months of this year, 26 events at nuclear power plants and other nuclear facilities were reported to the INES Information System. Of the 11 events which were "on scale", two were rated at level 2 and nine at level 1.

Feedback from the users of INES

6. At a meeting of Senior Regulators held during the General Conference's 1994 session, a two-hour discussion on the use of INES by regulatory bodies highlighted the following:

- INES has gained wide public acceptance, and the media appear to have had no major difficulty in using INES when reporting on nuclear events.

- The INES Information System is greatly appreciated by the participating countries as a means of promptly disseminating authoritative information on the significance of nuclear events.

- There are, however, important differences among those who are reporting events as regards their assessments of the safety significance of defence-in-depth degradation, their perceptions of what is significant from the point of view of the public interest, and the promptness with which they report.

- The regulatory body in one Member State believes that the INES procedures for assessing the severity of defence-in-depth degradation are too complicated and that simplified procedures would obviate lengthy technical discussions between regulatory and operating organizations, reduce the number of events rated at level 0 (a substantial fraction of the total number of events in some countries) and speed up the communication process at the international level.

7. The report on the 1994 meeting of INES National Officers highlighted the following views of most participants:

- The application of INES is proceeding satisfactorily in their countries.

- The Agency should continue to help INES National Officers to provide training in the assessment of the safety significance of nuclear events.[2]

- The responsibility for rating an event lies with the country where the event occurred (one should not attempt to rate events occurring in another country).

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[2] The Agency has, on a trial basis, made the INES assessment procedures available, in computerized form, to the 55 countries participating in the INES Information System.

- Redundant communication channels should be made available for the prompt transmission (by - for example - fax, electronic mail and telephone) of information on the significance of nuclear events.

- Participating countries should report all events to the INES Information System, not just those involving an initiator (on the grounds that the unavailability of safety provisions is just as important as the occurrence of initiators which challenge the safety provisions).

- INES National Officers should ensure round-the-clock coverage of their area of responsibility.

The INES Advisory Committee

8. The INES Advisory Committee has met three times since the 1994 session of the General Conference.

- In October 1994, it reviewed the ratings on the Event Rating Forms sent to the INES Information System and clarified issues raised by INES National Officers.

- In March 1995, it reviewed a questionnaire on "national communication policies and the use of INES" and approved it for circulation to INES National Officers.

- In July 1995, having considered - in March - a proposal of the French regulatory body for a four-level event scale, it considered ways of simplifying the INES procedures for rating the severity of defence-in-depth degradation at nuclear power plants and at other nuclear facilities (this matter will be taken up again at the meeting of INES National Officers scheduled for October 1995).

PARTICIPANTS IN THE INTERNATIONAL NUCLEAR EVENT SCALE (INES) INFORMATION SYSTEM

COUNTRY	STARTING DATE	COUNTRY	STARTING DATE
Argentina	January 1991	Lithuania	February 1993
Austria	March 1991	Luxembourg	March 1992
Bangladesh	November 1992	Mexico	January 1991
Belarus	January 1993	Netherlands	August 1990
Belgium	June 1990	Norway	October 1992
Brazil	January 1991	Pakistan	October 1990
Bulgaria	January 1991	Peru	September 1992
Canada	October 1990	Poland	September 1992
Chile	September 1992	Portugal	July 1994
China	March 1991	Romania	April 1991
Costa Rica	January 1993	Russian Federation	September 1990
Czech Republic	October 1990	Saudi Arabia	September 1992
Denmark	October 1990	Slovak Republic	March 1993
Egypt	October 1990	Slovenia	September 1992
Finland	June 1990	South Africa	March 1991
France	May 1990	Spain	October 1990
Germany	January 1991	Sri Lanka	October 1992
Greece	September 1992	Sweden	October 1990
Guatemala	October 1992	Switzerland	October 1990
Hungary	January 1991	Syrian Arab Rep.	August 1992
India	January 1991	Turkey	April 1991
Iran, Islamic Rep.	September 1992	Ukraine	March 1992
Ireland	January 1993	UK	November 1990
Italy	January 1991	USA	October 1992
Japan	July 1991	Viet Nam	August 1992
Kazakhstan	April 1995	Yugoslavia	October 1990
Korea, Rep. of	January 1991	Zaire	August 1992
Kuwait	October 1992		
ORGANIZATION	**STARTING DATE**	**ORGANIZATION**	**STARTING DATE**
CEC Luxembourg	September 1990	OECD Paris	March 1990
Nuclear Publications	November 1992	NEI	February 1992
NucNet Berne	December 1991	WANO London	September 1990

SAFETY PRINCIPLES FOR FUTURE NUCLEAR POWER REACTORS

Background

1. Annex 8 to document GC(XXXVIII)/INF/6, which was before the General Conference last year, gave a brief account of work being done on the preparation of an IAEA-TECDOC entitled "Development of safety principles for the design of future nuclear power plants". Below is a brief account of work done since the General Conference's 1994 session.

Developments since the 1994 session of the Conference

2. In October and November 1994, consultants reviewed the comments received from experts in Member States on the current version of the draft IAEA-TECDOC "Development of safety principles for the design of future nuclear power plants" and produced a final draft, which was issued in June 1995 as IAEA-TECDOC-801.

3. At meetings held late in 1994 and early in 1995, INSAG agreed that its document "Basic safety principles for nuclear power plants" (INSAG-3) needed to be revised. A draft revised version of document INSAG-3, based to some extent on the material subsequently issued in IAEA-TECDOC-801, was prepared and discussed by INSAG in July 1995, and a new draft is being prepared on the basis of the comments made at the INSAG meeting for consideration by INSAG at a future meeting.

4. In May-June 1995, a Technical Committee considering the approaches to future nuclear power plant safety which have been developed in different countries expressed appreciation of the Agency's activities in promoting the formulation of safety objectives and principles and an exchange of information among Member States regarding those approaches. It urged the Agency to continue the activities in question, with the focus on:

- the views of utilities, regulatory authorities and designers in different countries regarding safety objectives and design approaches (and especially areas of agreement and divergence);

- international harmonization of the safety objectives and principles which may influence the general safety of future nuclear power plants; and

- co-ordination in seeking a greater degree of international consensus on which severe accidents should be addressed in the design of future nuclear power plants.

5. The draft of an IAEA-TECDOC on approaches to the safety of future nuclear power plants has been prepared on the basis of the presentations which were made and the discussions which took place during the Technical Committee's meeting, the key issues being: national approaches to the safety of future nuclear power plants; the harmonization of national approaches through international co-operation; attributes of importance for the safety of future nuclear power plants; and other areas where harmonization is necessary.

PART E: FACILITATING THE IMPLEMENTATION OF SAFETY-RELATED CONVENTIONS

Background

1. Since the establishment of the Agency, the international community has adopted four safety-related international conventions conferring depositary functions on the Director General and various other functions on the Agency itself, which plays a role in facilitating the implementation of the four conventions:

(i) the Convention on the Physical Protection of Nuclear Material (reproduced in document INFCIRC/274/Rev.1), which was opened for signature on 3 March 1980 and entered into force on 8 February 1987;

(ii) the Convention on Early Notification of a Nuclear Accident (reproduced in document INFCIRC/335), which was adopted by the General Conference at a special session in September 1986 and entered into force on 27 October 1986;

(iii) the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (reproduced in document INFCIRC/336), which was also adopted by the General Conference at the special session in September 1986 and entered into force on 28 February 1987; and

(iv) the Convention on Nuclear Safety (reproduced in document INFCIRC/449), which was adopted on 17 June 1994 and opened for signature on 20 September 1994.

Also, in response to a request made of the Board of Governors and the General Conference last year in resolution GC(XXXVIII)/RES/6, preparatory work has started on a convention likely to confer additional functions on the Agency and its Director General - namely, a convention dealing with the safety of radioactive waste.

2. The status of these conventions and recent developments concerning them are described below.

Convention on the Physical Protection of Nuclear Material

3. Pursuant to the Convention, the Secretariat maintains a list of parties' (and also non-parties') central authorities and points of contact responsible for the physical protection of

nuclear material. A table listing the parties and non-parties which have made known their points of contact is reproduced below.

Argentina	Greece	Philippines
Australia	Hungary	Poland
Austria	Indonesia	Portugal
Bangladesh[1]	Iran, Islamic Rep.[1]	Romania
Belarus	Ireland	Russian Fed.
Belgium	Italy	Slovakia
Brazil	Japan	Slovenia
Brunei Darussalam[1, 2]	Kazakhstan[1]	Spain
Bulgaria	Kenya[1]	Sweden
Canada	Korea, Rep. of	Switzerland
Cape Verde[1, 2]	Liechtenstein	Turkey
Chile	Lithuania	Ukraine
China	Luxembourg	United Kingdom
Croatia	Malta[1, 2]	United States
Czech Republic	Mexico	Uruguay[1]
Denmark	Monaco[1]	
Ecuador	Netherlands	
Finland	Norway	CEC
France	Papua New Guinea[1, 2]	IAEA
Germany	Paraguay	

[1] Not a party to the Convention.
[2] Not an Agency Member State.

4. On 11 January 1995, Peru acceded to the Convention, which entered into force for Peru on 10 February 1995. As of 31 July 1995, there were 53 parties (52 States and EURATOM) to the Convention (see the table on pages 5 and 6 below).

Convention on Early Notification of a Nuclear Accident (Early Notification Convention)

5. Since the General Conference's 1994 session, there have been no notifications of accidents of the kind specified in Article 1 of the Early Notification Convention.

6. Lithuania and Peru acceded to the Convention on 16 November 1994 and 17 July 1995 respectively, so that 72 States and three organizations had as of 31 July 1995 consented to be bound by the Convention (see the table on pages 7-11 below, which indicates both for the Early Notification Convention and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency - dealt with in paragraphs 7-9 below -

whether the Agency has received notification of the points of contact provided for in the two Conventions).

Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (Assistance Convention)

7. On 28 November 1994, the Agency received from Estonia - under the terms of the Assistance Convention - a request for medical help for five persons overexposed to radiation from a stolen source. One male adult died, while his son underwent successful treatment for acute radiation sickness, light-to-medium bone marrow syndrome, and second- and first-degree local radiation trauma of the left hand. Three other persons suffered less severe injuries.

8. The Emergency Response Unit, which is the Agency's focal point for responding to any incident covered by the Assistance Convention (and also by the Early Notification Convention), arranged for an international medical team to visit Estonia and assist with the treatment of the overexposed persons. Also, two Agency staff members visited Estonia in order to assist in determining the extent of the exposure and the nature of the source.[1]

9. Peru acceded to the Convention on 17 July 1995, so that 68 States and three organizations had as of 31 July 1995 consented to be bound by the Convention (see the table on pages 7-11 below).

Convention on Nuclear Safety

10. Paragraph 1 of Article 31 ("Entry into Force") of the Convention, which was adopted on 17 June 1994 and opened for signature on 20 September 1994, states that the "Convention shall enter into force on the ninetieth day after the date of deposit with the Depositary of the twenty-second instrument of ratification, acceptance or approval, including the instruments of seventeen States, each having at least one nuclear installation which has achieved criticality in a reactor core." As of 31 July 1995, instruments of ratification or acceptance of the Convention had been deposited by seven States (Japan, Norway, Poland, Romania, the Slovak Republic, Spain and Turkey), of which three (Japan, the Slovak Republic and Spain) have at least one such nuclear installation.[2]

11. The Agency is facilitating consultations among the signatories of the Convention with a view to the Convention's future implementation.

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[1] It was established that the source, which was never found, was a caesium-137 source.

[2] For a list of signatories of the Convention (to which Ghana should be added, having signed on 6 July 1995) and for information on preparations for implementation of the Convention, see document GC(39)/INF/4.

Convention on the safety of radioactive waste

12 From 3 to 6 July 1995, an open-ended group of legal and technical experts met in Vienna to identify the main substantive elements necessary in a radioactive waste safety convention. The group agreed that the Convention on Nuclear Safety, which is an "incentive convention", should be the model for a "sister" convention on radioactive waste safety. The group is to meet again from 4 to 8 December 1995.[3]

13. Participants from the following 53 countries and observers from the following four organizations participated in the 3-6 July 1995 meeting of the group:

Countries: Algeria, Argentina, Australia, Austria, Bangladesh, Belgium, Brazil, Bulgaria, Canada, Chile, China, Colombia, Croatia, Cuba, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Holy See, Hungary, India, Ireland, Israel, Italy, Japan, Republic of Korea, Kuwait, Malaysia, Mexico, Morocco, Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Romania, Russian Federation, Saudi Arabia, Slovak Republic, Slovenia, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, Ukraine, United Kingdom, United States of America.

Organizations: Commission of European Communities, NEA/OECD, UNEP (Secretariat of the Basel Convention), WHO.

[3] For further details regarding the work of the group, see Attachment 2 to document GC(39)/11.

CONVENTION ON THE PHYSICAL PROTECTION OF NUCLEAR MATERIAL

Signature, ratification, acceptance, approval or accession

State/Organization	Date of signature	Means/Date of deposit of expression of consent to be bound		Entry into force
Antigua/Barbuda		acceded	4 Aug 93	3 Sep 1993
Argentina	28 Feb 1986	ratified	6 Apr 89	6 May 1989
Armenia		acceded	24 Aug 93	23 Sep 1993
Australia	22 Feb 1984	ratified	22 Sep 87	22 Oct 1987
Austria	3 Mar 1980	ratified	22 Dec 88	21 Jan 1989
Belarus		succession notified	9 Sep 93	effect from 14 Jun 1993
Belgium	13 Jun 1980(*)	ratified(*)	6 Sep 91	6 Oct 1991
Brazil	15 May 1981	ratified	17 Oct 85	8 Feb 1987
Bulgaria	23 Jun 1981	ratified	10 Apr 84	8 Feb 1987
Canada	23 Sep 1980	ratified	21 Mar 86	8 Feb 1987
Chile		acceded	27 Apr 94	27 May 1994
China		acceded	10 Jan 89	9 Feb 1989
Croatia		succession notified	29 Sep 92	effect from 8 Oct 1991
Czech Republic		succession notified	24 Mar 93	effect from 1 Jan 1993
Denmark	13 Jun 1980(*)	ratified(*)	6 Sep 91	6 Oct 1991
Dominican Republic	3 Mar 1980			
Ecuador	26 Jun 1986			
Estonia		acceded	9 May 94	8 Jun 1994
EURATOM	13 Jun 1980	confirmed	6 Sep 91	6 Oct 1991
Finland	25 Jun 1981	accepted	22 Sep 89	22 Oct 1989
France	13 Jun 1980(*)	approved(*)	6 Sep 91	6 Oct 1991
Germany	13 Jun 1980(*)	ratified(*)	6 Sep 91	6 Oct 1991
Greece	3 Mar 1980	ratified(*)	6 Sep 91	6 Oct 1991
Guatemala	12 Mar 1980	ratified	23 Apr 85	8 Feb 1987
Haiti	9 Apr 1980			
Hungary	17 Jun 1980	ratified	4 May 84	8 Feb 1987
Indonesia	3 Jul 1986	ratified	5 Nov 86	8 Feb 1987
Ireland	13 Jun 1980(*)	ratified(*)	6 Sep 91	6 Oct 1991
Israel	17 Jun 1983			
Italy	13 Jun 1980(*)	ratified(*)	6 Sep 91	6 Oct 1991

(*) Signed/Ratified as EURATOM Member State.

Japan		acceded	28 Oct 88	27 Nov 1988
Korea, Rep.of	29 Dec 1981	ratified	7 Apr 82	8 Feb 1987
Liechtenstein	13 Jan 1986	ratified	25 Nov 86	8 Feb 1987
Lithuania		acceded	7 Dec 93	6 Jan 1994
Luxembourg	13 Jun 1980(*)	ratified(*)	6 Sep 91	6 Oct 1991
Mexico		acceded	4 Apr 88	4 May 1988
Mongolia	23 Jan 1986	ratified	28 May 86	8 Feb 1987
Morocco	25 Jul 1980			
Netherlands	13 Jun 1980(*)	accepted(*)	6 Sep 91	6 Oct 1991
Niger	7 Jan 1985			
Norway	26 Jan 1983	ratified	15 Aug 85	8 Feb 1987
Panama	18 Mar 1980			
Paraguay	21 May 1980	ratified	6 Feb 85	8 Feb 1987
Peru		acceded	11 Jan 95	10 Feb 1995
Philippines	19 May 1980	ratified	22 Sep 81	8 Feb 1987
Poland	6 Aug 1980	ratified	5 Oct 83	8 Feb 1987
Portugal	19 Sep 1984	ratified(*)	6 Sep 91	6 Oct 1991
Romania	15 Jan 1981	ratified	23 Nov 93	23 Dec 1993
Russian Federation	22 May 1980	ratified	25 May 83	8 Feb 1987
		continued	26 Dec 91	
Slovakia		succession notified	10 Feb 93	effect from 1 Jan 1993
Slovenia		succession notified	7 Jul 92	effect from 25 Jun 1991
South Africa	18 May 1981			
Spain	7 Apr 1986(*)	ratified(*)	6 Sep 91	6 Oct 1991
Sweden	2 Jul 1980	ratified	1 Aug 80	8 Feb 1987
Switzerland	9 Jan 1987	ratified	9 Jan 87	8 Feb 1987
Tunisia		acceded	8 Apr 93	8 May 1993
Turkey	23 Aug 1983	ratified	27 Feb 85	8 Feb 1987
Ukraine		acceded	6 Jul 93	5 Aug 1993
United Kingdom	13 Jun 1980(*)	ratified(*)	6 Sep 91	6 Oct 1991
United States	3 Mar 1980	ratified	13 Dec 82	8 Feb 1987
Yugoslavia	15 Jul 1980	ratified	14 May 86	8 Feb 1987
		continued	28 Apr 92	

Note: The Convention entered into force on 8 February 1987, i.e. on the thirtieth day following the deposit of the twenty-first instrument of ratification, acceptance or approval with the Director General pursuant to Article 19, paragraph 1.

1995-07-31
Status: 45 signatories
53 parties

	EARLY NOTIFICATION CONVENTION				ASSISTANCE CONVENTION			
	DATE SIGNED	DATE BOUND (NOTIFIED RATIFIED ACCEDED SUCCEEDED)	ENTRY INTO FORCE	CONTACT POINT[1]	DATE SIGNED	DATE BOUND (NOTIFIED RATIFIED ACCEDED SUCCEEDED)	ENTRY INTO FORCE	CONTACT POINT[1]
Afghanistan	26-09-86			N	26-09-86			N
Algeria	24-09-87			Y	24-09-87			Y
Argentina		17-01-90	17-02-90	Y		17-01-90	17-02-90	Y
Armenia		24-08-93	24-09-93	Y/U		24-08-93	24-09-93	Y/U
Australia	26-09-86	22-09-87	23-10-87	Y	26-09-86	22-09-87	23-10-87	Y
Austria	26-09-86	18-02-88	20-03-88	Y	26-09-86	21-11-89	22-12-89	Y
Bangladesh		07-01-88	07-02-88	Y		07-01-88	07-02-88	Y
Belarus	26-09-86	26-01-87	26-02-87	Y	26-09-86	26-01-87	26-02-87	Y
Belgium	26-09-86			Y	26-09-86			Y
Belize[2]				Y				N
Bolivia				Y				Y
Brazil	26-09-86	04-12-90	04-01-91	Y	26-09-86	04-12-90	04-01-91	Y
Brunei Darussalem[2]				Y				Y
Bulgaria	26-09-86	24-02-88	26-03-88	Y	26-09-86	24-02-88	26-03-88	Y
Cameroon	25-09-87			N	25-09-87			Y
Canada	26-09-86	18-01-90	18-02-90	Y	26-09-86			Y
Cape Verde[2]				Y				N
Chile	26-09-86			Y	26-09-86			N
China	26-09-86	10-09-87	11-10-87	Y	26-09-86	10-09-87	11-10-87	Y
Colombia				Y/U				Y/U
Costa Rica	26-09-86	16-09-91	17-10-91	Y/U	26-09-86	16-09-91	17-10-91	Y/U
Cote d'Ivoire	26-09-86			Y	26-09-86			N
Croatia		29-09-92	08-10-91	Y		29-09-92	08-10-91	Y
Cuba	26-09-86	08-01-91	08-02-91	Y	26-09-86	08-01-91	08-02-91	Y
Cyprus		04-01-89	04-02-89	Y		04-01-89	04-02-89	N

26-07-1995

[1] Y: Yes - notification officially received by the Emergency Response Unit (ERU)
Y/U: Yes/Unofficially - notification not received directly by the ERU, or unspecific regarding the two Conventions
N: None

[2] Not an Agency Member State

	EARLY NOTIFICATION CONVENTION				ASSISTANCE CONVENTION			
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Czech Republic		24-03-93	01-01-93	Y		24-03-93	01-01-93	Y
DPR Korea	29-09-86			Y	29-09-86			Y
Denmark	26-09-86	26-09-86	27-10-86	Y	26-09-86			Y
Dominica[2]				Y				N
Dominican Republic				Y				N
Ecuador				Y				Y
Egypt	26-09-86	06-07-88	06-08-88	Y	26-09-86	17-10-88	17-11-88	Y
Estonia		09-05-94	09-06-94	Y		09-05-94	09-06-94	N
Ethiopia				Y/U				Y/U
Finland	26-09-86	11-12-86	11-01-87	Y	26-09-86	27-11-90	28-12-90	Y
France	26-09-86	06-03-89	06-04-89	Y	26-09-86	06-03-89	06-04-89	Y
Gabon				Y				Y
Georgia[2]				Y/U				Y/U
Germany	26-09-86	14-09-89	15-10-89	Y	26-09-86	14-09-89	15-10-89	Y
Ghana				Y				Y
Greece	26-09-86	06-06-91	07-07-91	Y	26-09-86	06-06-91	07-07-91	Y
Grenada[2]				Y				N
Guatemala	26-09-86	08-08-88	08-09-88	Y	26-09-86	08-08-88	08-09-88	N
Guinea-Bissau[2]				Y				N
Haiti				Y/U				Y/U
Holy See	26-09-86			Y	26-09-86			N
Hungary	26-09-86	10-03-87	10-04-87	Y	26-09-86	10-03-87	10-04-87	Y
Iceland	26-09-86	27-09-89	28-10-89	Y	26-09-86			N
India	29-09-86	28-01-88	28-02-88	Y	29-09-86	28-01-88	28-02-88	Y
Indonesia	26-09-86	12-11-93	13-12-93	Y	26-09-86	12-11-93	13-12-93	Y
Iran, Islamic Rep.	26-09-86			Y	26-09-86			N
Iraq	12-08-87	21-07-88	21-08-88	Y	12-08-87	21-07-88	21-08-88	N
Ireland	26-09-86	13-09-91	14-10-91	Y	26-09-86	13-09-91	14-10-91	Y
Israel	26-09-86	25-05-89	25-06-89	Y	26-09-86	25-05-89	25-06-89	Y
Italy	26-09-86	08-02-90	11-03-90	Y	26-09-86	25-10-90	25-11-90	Y

	EARLY NOTIFICATION CONVENTION				ASSISTANCE CONVENTION			
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Jamaica				Y/U				Y/U
Japan	06-03-87	09-06-87	10-07-87	Y	06-03-87	09-06-87	10-07-87	Y
Jordan	02-10-86	11-12-87	11-01-88	Y	02-10-86	11-12-87	11-01-88	Y
Kazakhstan				Y				Y
Kenya				Y				Y
Korea, Republic of		08-06-90	09-07-90	Y		08-06-90	09-07-90	Y
Kuwait				Y				N
Kyrgyzstan[2]				Y				Y
Latvia[2]		28-12-92	28-01-93	Y		28-12-92	28-01-93	Y
Lebanon	26-09-86			Y/U	26-09-86			Y/U
Liberia				Y/U				Y/U
Libyan Arab Jamahiriya				Y/U		27-06-90	28-07-90	Y/U
Liechtenstein	26-09-86	19-04-94	20-05-94	Y	26-09-86	19-04-94	20-05-94	N
Lithuania		16-11-94	17-12-94	Y				Y
Luxembourg	29-09-86			Y				N
Madagascar				Y/U				Y/U
Malawi[2]				Y				Y
Maldives[2]				Y				N
Malta[2]				Y				Y
Malaysia	01-09-87	01-09-87	02-10-87	Y	01-09-87	01-09-87	02-10-87	Y
Mali	02-10-86			Y/U	02-10-86			Y/U
Mauritius		17-08-92	17-09-92	Y		17-08-92	17-09-92	Y
Mexico	26-09-86	10-05-88	10-06-88	Y	26-09-86	10-05-88	10-06-88	Y
Monaco	26-09-86	19-07-89	19-08-89	Y	26-09-86	19-07-89	19-08-89	Y
Mongolia	08-01-87	11-06-87	12-07-87	Y	08-01-87	11-06-87	12-07-87	N
Morocco	26-09-86	07-10-93	07-11-93	Y/U	26-09-86	07-10-93	07-11-93	Y/U
Mozambique[2]				Y/U				Y/U
Myanmar				Y/U				Y/U
Namibia				Y/U				Y/U

	EARLY NOTIFICATION CONVENTION				ASSISTANCE CONVENTION			
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Netherlands	26-09-86	23-09-91	24-10-91	Y	26-09-86	23-09-91	24-10-91	Y
New Zealand		11-03-87	11-04-87	Y		11-03-87	11-04-87	Y
Nicaragua		11-11-93	12-12-93	Y/U		11-11-93	12-12-93	Y/U
Niger	26-09-86			Y	26-09-86			N
Nigeria	21-01-87	10-08-90	10-09-90	Y	21-01-87	10-08-90	10-09-90	N
Norway	26-09-86	26-09-86	27-10-86	Y	26-09-86	26-09-86	26-02-87	Y
Pakistan		11-09-89	12-10-89	Y		11-09-89	12-10-89	Y
Panama	26-09-86			Y/U	26-09-86			Y/U
Papa New Guinea[2]				Y				Y
Paraguay	02-10-86			Y	02-10-86			Y
Peru		17-07-95	17-08-95	Y		17-07-95	17-08-95	Y
Philippines				Y				Y
Poland	26-09-86	24-03-88	24-04-88	Y	26-09-86	24-03-88	24-04-88	Y
Portugal	26-09-86	30-04-93	31-05-93	Y	26-09-86			N
Qatar				Y				N
Romania		12-06-90	13-07-90	Y		12-06-90	13-07-90	Y
Russian Federation	26-09-86	23-12-86	24-01-87	Y	26-09-86	23-12-86	26-02-87	Y
Saudi Arabia		03-11-89	04-12-89	Y		03-11-89	04-12-89	Y
Senegal	15-06-87			Y	15-06-87			N
Sierra Leone	25-03-87			Y/U	25-03-87			Y/U
Singapore				Y				Y
Slovak Republic		10-02-93	01-01-93	Y		10-02-93	01-01-93	Y
Slovenia		07-07-92	25-06-91	Y		07-07-92	25-06-91	Y
South Africa	10-08-87	10-08-87	10-09-87	Y	10-08-87	10-08-87	10-09-87	Y
Spain	26-09-86	13-09-89	14-10-89	Y	26-09-86	13-09-89	14-10-89	Y
Sri Lanka		11-01-91	11-02-91	Y		11-01-91	11-02-91	Y
Sudan	26-09-86			Y	26-09-86			Y
Sweden	26-09-86	27-02-87	30-03-87	Y	26-09-86	24-06-92	25-07-92	Y
Switzerland	26-09-86	31-05-88	01-07-88	Y	26-09-86	31-05-88	01-07-88	Y
Syrian Arab Republic	02-07-87			Y	02-07-87			Y

	EARLY NOTIFICATION CONVENTION				ASSISTANCE CONVENTION			
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Tanzania				Y				Y
Thailand	25-09-87	21-03-89	21-04-89	Y	25-09-87	21-03-89	21-04-89	N
Tunisia	24-02-87	24-02-89	27-03-89	Y	24-02-87	24-02-89	27-03-89	N
Turkey	26-09-86	03-01-91	03-02-91	Y	26-09-86	03-01-91	03-02-91	Y
Turkmenistan[2]				Y/U				Y/U
Uganda				Y/U				Y/U
Ukraine	26-09-86	26-01-87	26-02-87	Y	26-09-86	26-01-87	26-02-87	Y
United Arab Emirates		02-10-87	02-11-87	Y/U		02-10-87	02-11-87	Y/U
United Kingdom	26-09-86	09-02-90	12-03-90	Y	26-09-86	09-02-90	12-03-90	Y
United States	26-09-86	19-09-88	20-10-88	Y	26-09-86	19-09-88	20-10-88	Y
Uruguay		21-12-89	21-01-90	Y		21-12-89	21-01-90	Y
Uzbekistan				Y/U				Y/U
Venezuela				Y/U				Y/U
Viet Nam		29-09-87	30-10-87	Y		29-09-87	30-10-87	Y
Western Samoa[2]				Y				Y
Yemen				Y/U				Y/U
Yugoslavia	27-05-87	08-02-89	11-03-89	Y		09-04-91	10-05-91	N
Zaire	30-09-86			Y/U	30-09-86			Y/U
Zambia				Y/U				Y/U
Zimbabwe	26-09-86			Y/U	26-09-86			Y/U
FAO		19-10-90	19-11-90	Y		19-10-90	19-11-90	Y
WHO		10-08-88	10-09-88	Y		10-08-88	10-09-88	Y
WMO		17-04-90	18-05-90	Y		17-04-90	18-05-90	N
CEC				Y				Y
ILO				Y				Y
IMO				Y				Y
UN-DHA				Y				N
UNEP				Y				N
UNESCO				Y				N