



International Atomic Energy Agency

GENERAL CONFERENCE

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(GC(XXXVII)/1052)

MEASURES TO STRENGTHEN INTERNATIONAL CO-OPERATION IN MATTERS RELATING TO NUCLEAR SAFETY AND RADIOLOGICAL PROTECTION

(a) Implementation of resolution GC(XXXVI)/RES/582

(i) Agency activities related to the safety of nuclear power plants in Eastern Europe and countries of the former Soviet Union

1. In operative paragraph 5 of resolution GC(XXXV)/RES/553, the General Conference two years ago invited the Director General "to initiate a process for developing a common basis on which the acceptable level of safety of all operating nuclear power plants built to earlier standards can be judged", and in operative paragraph 12, having welcomed with interest "the report by the Director General on the important question of assessing the safety of WWER-440/230 plants", it invited the Director General "to continue his endeavours in the important field of safety assessments of reactors built to earlier safety standards".

2. Last year the Conference, which had before it - in Annex 2 to document GC(XXXVI)/1021 - a report dealing with Agency activities related to the safety of nuclear power plants in Eastern Europe and countries of the former Soviet Union and containing a section on the development of a common basis for safety assessments, urged the Board of Governors and the Director General - inter alia - to continue "the process of developing a common basis on which the acceptable level of safety of all operating nuclear power plants built to earlier standards can be judged".

3. In preparing the attached report in response to resolution GC(XXXVI)/RES/582 adopted by the General Conference last year, the Secretariat took account of the fact that the original scope of the Agency activities in question (the safety of WWER-440/230 plants) has been extended to cover reactors of several generations. As a result, the attached report, which follows on from the report in Annex 2 to document GC(XXXVI)/1021, covers Agency activities related to the safety of all nuclear power plants with thermal reactors of Russian design in Eastern Europe and the former Soviet Union.

4. Apart from some updating and some minor editorial changes, the attached report is identical with a report which the Board, in June, requested the Director General to transmit, updated as necessary, to the General Conference for consideration at its thirty-seventh regular session.

**AGENCY ACTIVITIES RELATED TO THE SAFETY OF NUCLEAR POWER
PLANTS IN EASTERN EUROPE AND COUNTRIES OF THE
FORMER SOVIET UNION**

Introduction

1. In operative paragraph 5 of resolution GC(XXXV)/RES/553, the General Conference two years ago invited the Director General "to initiate a process for developing a common basis on which the acceptable level of safety of all operating nuclear power plants built to earlier standards can be judged", and in operative paragraph 12, having welcomed with interest "the report by the Director General on the important question of assessing the safety of WWER-440/230 plants", it invited the Director General "to continue his endeavours in the important field of safety assessments of reactors built to earlier safety standards".

2. Last year the Conference, which had before it the report contained in Annex 2 to document GC(XXXVI)/1021, urged the Board of Governors and the Director General - *inter alia* - to continue "the process of developing a common basis on which the acceptable level of safety of all operating nuclear power plants built to earlier standards can be judged".

3. From 30 November to 2 December 1992, an advisory group with participants from 21 countries and five international organizations reviewed the progress made under the Agency's nuclear safety programmes for Eastern Europe and countries of the former Soviet Union and advised on future activities and necessary co-ordination. The Agency's Secretariat presented the results achieved to date and reported on planned future activities. Countries operating WWER and RBMK plants commented on the Agency's programmes and indicated what further assistance was required. Representatives of other Member States, the CEC, the World Association of Nuclear Operators (WANO), the World Bank, the European Bank for Reconstruction and Development (EBRD) and the European Investment Bank (EIB) also made comments.

4. In general it was agreed that the Agency's programmes had been very useful in addressing the safety of WWER and RBMK plants and that the planned future activities responded to the assistance requests made by countries of Eastern Europe and of the former Soviet Union.

5. Two Steering Committees have been established to advise the Agency on its programmes related to the safety of WWER plants of all types and RBMK plants.

Development of a Common Basis for Safety Assessments

6. Regulatory structures for nuclear safety - including safety principles and standards - have been established in order to limit the risks that could result from the entry into service of a nuclear power plant by ensuring the safe design and operation of the plant. The problem that needs to be addressed now is how to deal with a *de facto* situation such as the continuing

operation of a nuclear power plant that entered into service some years in the past and whose safety (in terms of both design and operation) is being questioned. In order to deal with such a situation, the development of a common basis for assessment is required. INSAG earlier this year established a working group to address this problem, and the group's activities are being closely co-ordinated with related activities of the Agency's Secretariat.

7. Prior to this (in October 1992) an initial report on the subject drafted in the light of information on national practices in various Member States and of the experience gained during the first phase of the Agency's programme on the safety of WWER-440/230 plants had been reviewed by a technical committee.* Work is continuing, and it is expected that the report will be finalized in 1994.

Safety of WWER-440/230 Plants

8. Following the identification of design and operational deficiencies and their prioritization in terms of their importance to safety, the programme has focused on helping Member States with operating WWER-440/230 plants to ensure that proposed modifications respond to safety concerns.

9. The Secretariat has compiled the recommendations made by regulatory authorities and plant operators regarding safety issues identified through the Agency's programme and through national and other international programmes and information on the status of implementation of backfitting programmes in Bulgaria, the former Czechoslovakia and Russia. The document in question (to be issued as an IAEA-TECDOC) gives a very comprehensive picture of the scope and status of various WWER-440/230 reconstruction programmes.

10. Follow-up missions to assess the status of implementation of programme recommendations are being conducted; they have included ASSET missions and seismic safety missions to Bohunice and Kozloduy. Members of the Agency's Secretariat have visited Kozloduy to observe the functioning of the safety review mechanism established by the Bulgarian regulatory authority for the commissioning of Kozloduy Unit 2, and a formal follow-up safety review mission to Kozloduy took place in April 1993.

* Related work is in an advanced stage on a document, entitled "Periodic safety review of operational nuclear power plants", which will provide guidance on implementation of the systematic review approach agreed upon in September 1991 at the International Conference on the Safety of Nuclear Power.

11. The objective of a follow-up mission to Novovoronezh (Units 3 and 4) at the end of June 1993 was to give advice on the actions taken in response to an Agency technical report on the safety of the WWER-440/230 plants within the framework of the Russian backfitting concept, which focuses on restoring and strengthening preventive features and improving mitigation capabilities. At the request of the Russian side, an in-depth review was carried out with regard to component integrity and emergency operating procedures. It was noted that the plant management had done well in addressing previously identified safety issues; about 80 percent of the operational issues had been or were close to being resolved. In the design area, the team concluded that all issues will have been fully addressed by 1996; external technical and financial assistance is necessary in this connection. In its recommendations the team emphasized the need to implement as soon as possible the short-term or compensatory measures already defined and provided advice regarding the backfitting concept.

12. Work is continuing on the development of a plant analyser to be provided by the United States to Bulgaria.

13. The Agency has organized peer reviews of the probabilistic safety assessments (PSAs) under way for the Kola and Bohunice nuclear power plants.

14. The recently established nuclear regulatory authority of the Slovak Republic has requested the Agency to assist in a review of the safety approach underlying the fundamental reconstruction of Bohunice Units 1 and 2.

15. Status reports on generic safety issues are continuing to be prepared with a view to providing an overview of options available for resolving safety concerns. In this context, a methodological study on fire hazards (with a trial of the methodology at Bohunice) is being completed and a report on the technical basis for confinement function improvement is currently under review. Also, the Secretariat has completed technical work on the development of guidelines for the application of the "leak-before-break" concept, and a status report on the applicability of the "leak-before-break" concept is to be issued as an IAEA-TECDOC.

16. In order to assess the safety of reactor pressure vessels with regard to embrittlement, the Agency convened a meeting in May 1993 to review the measures being taken at various nuclear power plants and their effectiveness (a status report on this subject was issued in 1992 as IAEA-TECDOC-659).

Safety of WWER-440/213 Plants

17. A safety assessment of WWER-440/213 plants is being carried out within the framework of a regional technical co-operation project (RER/9/004) involving Bulgaria, the Czech Republic, Hungary, Poland, the Slovak Republic and Ukraine.

18. A status report on the safety assessment is at present being reviewed by all participating countries and organizations. Technical documents on selected topics - such as plant design and the design basis, design verification and operational aspects - are being

finalized with a view to their being issued as IAEA-TECDOCs. About 30 supporting documents in the form of "project working materials" have been prepared and distributed.

19. Computer hardware and software for the simulation of accidents (including accidents involving core damage and vessel and containment failure) are being finalized and will be used at Bohunice.

Safety of WWER-1000 Plants

20. A WWER-1000 programme has been established as an extrabudgetary Agency activity, the main objectives being to identify design and operational problems that can threaten plant safety and to help countries with operating WWER-1000 plants to establish programmes for resolving such problems.

21. The programme includes a review of studies being conducted under national and other international programmes, safety review missions to selected plant sites in order to examine design and operational features of the plants, meetings on safety issues, and the provision of assistance with safety reviews (particularly accident analysis) and of training.

22. A meeting on steam generator integrity was held in May 1993 and one on the applicability of the "leak-before-break" concept is scheduled for October 1993. A safety review mission to Zaporozhe is planned for later in 1993. A seismic benchmark study has been initiated for this type of nuclear power plant.

23. It is expected that a major reconstruction programme for WWER-1000 plants which is being developed in Russia will be submitted for review by the Agency later this year and that insights from this programme will have a major impact on the Agency's WWER-1000 programme.

24. An Agency team has started to carry out a peer review of the PSA under way for Kozloduy Unit 5, and the Secretariat has been requested by the Czech Government to assist with the safety review under way at Temelin (particularly with regard to nuclear fuel and to instrumentation and control).

Safety of RBMK Plants

25. The main purpose of the Agency's extrabudgetary "International Programme on Safety Assessment of RBMK Reactors", the launching of which was announced in June 1992, is to establish an international consensus on required safety improvements. The results of the programme should also provide a technical basis for decisions on measures to improve safety and on financial matters relating to the implementation of such measures. The RBMK plants at Smolensk and Ignalina are serving as reference plants for the programme.

26. From 27 October to 5 November 1992, at a meeting on the "Safety Assessment of Proposed Improvements of RBMK NPPs", a group of consultants reviewed the results of safety evaluations already performed and the technical basis for safety improvements

implemented at and planned for RBMK plants in the following areas: core monitoring and control; pressure boundary integrity; accident mitigation (including mitigation through safety systems and confinement); and electric power supply (including the supply of emergency power).

27. Safety modifications proposed for the three generations of RBMK plants in those areas have been analysed, and significant differences between the 15 operational RBMK units - even between units belonging to the same generation - have been noted. In general, it is considered that modifications already implemented or being proposed will lead to an increase in the safety level of RBMK plants (IAEA-TECDOC-694 has been issued on this subject).

28. The above-mentioned group of consultants has identified areas where further analysis is required - for example, accident sequences which can challenge pressure tube integrity and lead to multiple tube failures.

29. There have been ASSET missions this year to Ignalina, Leningrad and Smolensk.

30. Following a review carried out by the Agency in 1992, a progress review meeting was held at Smolensk in June 1993. The focus was on Smolensk Unit 3 plant-specific safety issues, including - in addition to the issues covered in 1992 - fire protection, support and safety systems, instrumentation and control, seismic safety and operational safety. The meeting participants found that Smolensk Unit 3 already incorporated a number of the improvements identified as being necessary on the basis of analyses of the Chernobyl accident and other safety studies. In a comprehensive report prepared during the meeting (to be issued as an IAEA-TECDOC), additional safety concerns were identified and a number of recommendations made.

International Co-operation and Training

31. A co-ordination mechanism established by the 24 OECD countries (the G-24) has been in place since the beginning of 1992. The Agency is participating in a technical advisory capacity.

32. The Agency is assisting the G-24 to establish a database on nuclear safety assistance to countries of Eastern Europe and of the former Soviet Union which should serve as a management tool for co-ordination of the assistance projects. In addition, the Agency is to help with the collection and updating of data - particularly data from national projects.

33. A data collection sheet has been developed by the G-24 secretariat assisted by the Agency's Secretariat, which has provided the G-24 secretariat with data on its WWER and RBMK safety programmes and related technical co-operation projects and will review the G-24 database with regard to its technical content.

34. The Agency is participating as technical advisor in two working groups established by the G-24 - the "Kozloduy Working Group" and the "Training Working Group".

35. A programme of training workshops and expert missions initiated for Eastern Europe in 1992 by the Agency in co-operation with the Argonne National Laboratory within the framework of the WWER-440/230 programme for the purpose of addressing deficiencies in safety-related areas (for example, safety inspections, emergency preparedness, accident management and preventive maintenance) is being extended to include Lithuania, Russia and Ukraine.

36. A regional technical co-operation project (RER/9/005) is being conducted in support of PSAs for WWER plants in Eastern Europe and countries of the former Soviet Union. The objectives of the project are to train experts from the countries in question in PSA techniques, to establish channels for the exchange of PSA information and data, to review PSAs which are under way or have been completed, and to promote the use of plant-specific PSAs as an aid to decision-making in the area of nuclear power plant safety. As part of the project, workshops and expert missions are addressing various aspects of PSA methodology and utilization, including data processing, thermohydraulic analysis, the optimization of technical specifications and the treatment of external/fire hazards. Among the documents which have been prepared is a generic list of accident-initiating events for consideration in PSAs of WWER plants.

37. Within the framework of the activities referred to in paragraphs 34 and 35, training will be provided to regulators, operators and scientific personnel from institutes in Eastern Europe and countries of the former Soviet Union.