IAEA Activities in the Area of WWER Reactor Nuclear Safety

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Content of the presentation

- History - EBP on WWER and RBMK Safety (1991-1998) and International Conference on Strengthening of Nuclear Safety in Eastern Europe (1999)
- IAEA Safety Topics in the Area of Nuclear Safety
- Present Approach of the IAEA Assistance to WWER countries
- IAEA Safety Services
- Development of the IAEA Safety Standards
- Present WWER Specific IAEA Activities
  - Safety Services
  - Training Courses
  - Development of Technical Documents
  - Technical Meetings
  - Technical Cooperation Projects (regional, national)
  - Extra-budgetary Programmes
  - Coordinated Research Programmes
- Conclusions

EBP on WWER and RBMK Safety (1991-1998)

- Development of the Safety Issue Book for the different types of reactors - WWER-440/230, WWER-440/213, WWER-1000/320, 'small series' of WWER-1000, based on the safety review
- International consensus established on the major safety issues and their safety significance.
- 200 to 3100 experts participated in different years (highest manpower involved in 1994)
- Total income to the EBP from donor countries exceeded 13.6 mil. USD
- 130 technical documents published on WWER reactor safety.
- substantial improvements in the safety of the reactors are feasible; upgrading of SARs stated as one of the most important tasks
- IAEA requested to continue providing nuclear safety assistance in the framework of both its Nuclear Safety Programme and TC projects

EBP on WWER and RBMK Safety (1991-1998)

Areas where assistance was still needed:

- Classification and qualification of components and systems;
- Improvement of I&C;
- Control rod insertion reliability;
- Reactor coolant system integrity;
- Containment integrity;
- Physical and functional separation of safety systems;
- Fire safety;
- Seismic safety;
- Low power and shutdown operation;
- Anticipated transients without scram (ATWS) protection;
- Severe accident analysis and management;
- Operational safety; and
- Safety assessment (Probabilistic Safety Assessment (PSA, SAR).

International Conference (IAEA, EC. NEA) on Strengthening of Nuclear Safety in Eastern Europe,

14-18 June 1999, Vienna

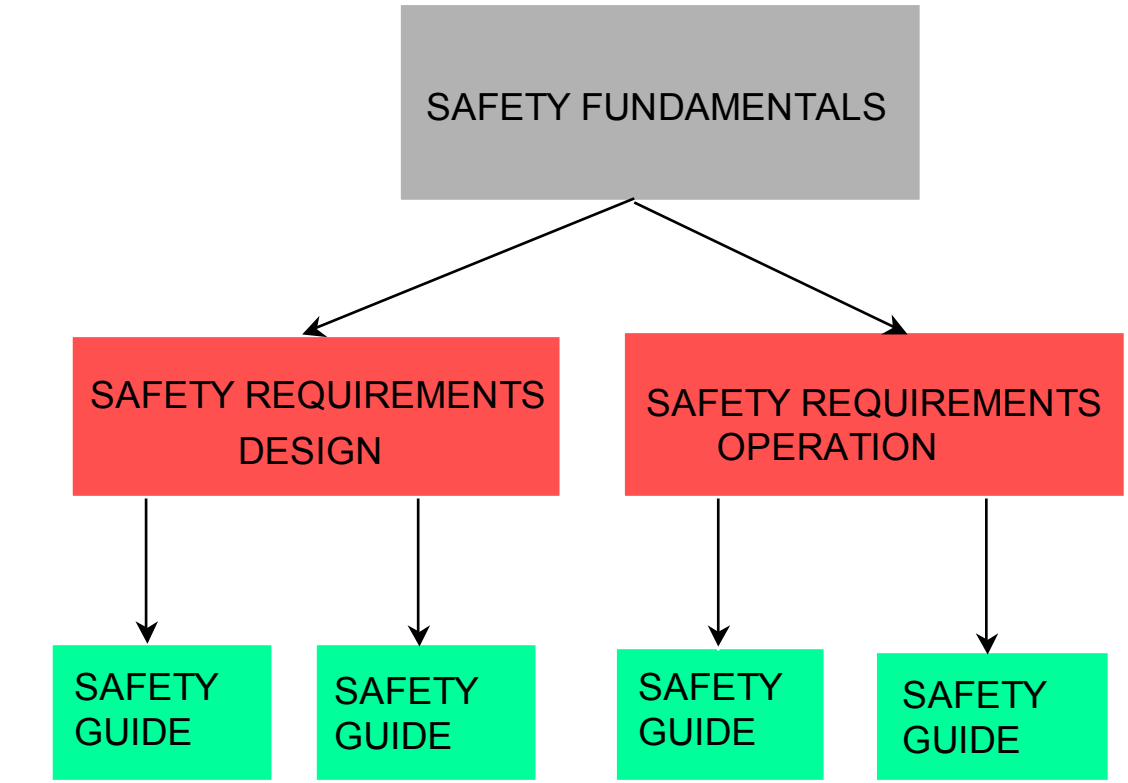
- Follow-up of the EBP to review the results of various international and national programmes aimed at enhancing WWER safety
- Key areas of nuclear safety discussed:
  - regulatory aspects of NPP safety;
  - status of safety improvements; and
  - status of SARs
- Conclusions:
  - considerable progress made, particularly in efforts to strengthen the independence and technical competence of nuclear regulatory authorities
  - operators also demonstrated clear progress in operational safety improvements
  - Implementation of design safety improvements programmes was appreciated, although level achieved in different countries has varied significantly
  - consistency in approaches is advisable and could be reached through a systematic exchange of information among the East European countries (IAEA role)

International Conference (IAEA, EC. NEA) on Strengthening of Nuclear Safety in Eastern Europe,

14-18 June 1999, Vienna

Areas where assistance at least in some countries is still needed:

- further strengthening of regulatory bodies
- analysis of operating experience feedback
- engineering solutions and implementation of safety modifications
- development of unit-specific safety analysis reports in accordance with best international practices
- improvements in quality of PSA studies
- implementation of the results of the SARs as well as follow-up Periodic Safety Reviews



Basic objectives, concepts and principles to ensure safety

Requirements which must be satisfied to ensure safety for particular activities or application areas

Recommendations, on the basis of international experience, of measures to ensure the observance of safety requirements

Practical examples and detailed methods for the application of the Safety Standards; detailed Technical Reports

Present Approach of the IAEA Assistance to Countries Operating WWER Reactors

- Broad variety of different tasks due to membership of the IAEA
- Specific WWER activities either under specific sponsorship (EBPs) or TC regional projects, or TC national projects
- IAEA assistance based on the Integrated Strategy for Assisting Member States in Establishing and Strengthening their Nuclear Safety; the central element is the country specific nuclear safety profile and action plan
- The assistance includes:
  - independent peer design safety review services;
  - providing a forum for exchange of information on specific issues (organizing technical meetings, workshops, etc);
  - organizing CRPs on selected issues of interest;
  - further developing/updating guidance documents;
  - providing operational safety services;
  - preparing of overview reports on the safety of WWER reactors; and
  - organizing training courses, seminars, fellowships, scientific visits.

IAEA documents related to safety analysis and accident management

DIVISION OF NUCLEAR INSTALLATION SAFETY

SAFETY SERVICES

DSRS Design Safety Review Service
SSRS Seismic Safety Review Service
FSRS Fire Safety Review Service
AMAT Ageing Management Advisory Team
SWSRS Software Safety Review Service

These Services, initiated in 1989, provide advice on selected engineering safety aspects of nuclear power plants in siting, design, construction and operation.

INSARR
Integrated Safety Assessment of Research Reactors

INSARR missions are an IAEA safety service offered to assist Member States in ensuring and enhancing the operational safety of research reactors.

IRS
Incident Reporting System

The IRS is a global network for the collection, analysis and dissemination of information on safety relevant events that have occured at NPPs.

IRSRR
Incident Reporting System for Research Reactors

The IRSRR is a system designed to collect, analyse and disseminate information on unusual events that have occured at research reactors.

OSART
Operational Safety Review Team

The purpose of the OSART programme, established in 1982, is to assist Member States in enhancing the operational safety of nuclear power plants by promoting performance based assessment processes and providing recommendations and assistance derived from these assessments.

PROSPER
Peer Review of Operational Safety Performance Experience

An IAEA operational safety service (derived from the former ASSET service) to peer review self-assessments by NPPs of their operational safety performance and its trends based on operating experience.

SCEP
Safety Culture Enhancement Programme

A service intended to support senior utility managers in enhancing the management of safety and safety culture. It provides training to increase the understanding of safety culture issues, to perform a self-assessment and to develop improvement initiatives.

IRRT
International Regulatory Review Team

Launched in 1989, the IRRT programme provides advice and assistance to Member States to strengthen and enhance the effectiveness of their nuclear safety regulatory body.

IPSART
International Probabilistic Safety Assessment Review Team

IPERS (now called IPSART) was established in 1988 to make international expertise available for reviewing probabilistic safety assessments (PSAs).

RAMP
Review of Accident Management Programmes

An IAEA service to assist Member States in the preparation, development and implementation of accident management programmes for NPPs.

INES
International Nuclear Event Scale Information Service

INES is a scale aimed at putting into perspective incidents and accidents in NPPs and other nuclear installations by explaining in simple terms their significance and relative importance to the public.

Development of IAEA Safety Standards

- Comprehensive set of safety standards in the field of nuclear safety, radiation safety, radioactive waste safety and radioactive materials transport safety
- At present, the complete set of standards is being updated to reflect contemporary means of achieving a high level of safety.
- Standards do not distinguish among different reactor designs; examples often provided based on experience from PWRs, but no distinction between PWRs and WWERs
- 37 standards related to NNP safety (regulatory activities, siting, design, modifications, operation, fuel handling, personnel) under development, 9 already published, 3 under publication, the rest to be published 2002-2004

Safety Services 2001-2002

- IRRT
  - Performed already in all WWER countries, except Armenia and Russia
  - In 2001 there were missions to CR, Ukraine, in 2002 planned to Armenia, follow-up Slovakia and Hungary
- OSART
  - around 10 missions/seminars per year
  - 2001: 4 out of 5 missions in WWER NPPs
- ESRS -3 WWER missions in 2001 (Armenia, Temelin), similarly next year
- IPSART - 3 WWER missions in 2001(Novovoronezh, Zaporozhe, Mochovce)
- PROSPER - 1 mission in Armenia, several training activities in 2001
- SCEP - several seminars to support safety culture enhancement programmes

Training courses

- Training activities important for sustainable technical competence in nuclear safety
- Most commonly, training activities are implemented within the framework of TC projects and EBPs
- Each year, over 60 various training courses and another training activities (workshops) organized in the field of nuclear safety
- The main topics: safety of design and operation of NPPs, safety assessment methods (deterministic, probabilistic) and regulatory control
- Example: Basic Professional Training Course on Nuclear Safety; in 2001 and 2002 the course was held in Saclay
- Examples of more specialized training: two-week courses on regulatory control of NPPs, on safety assessment of NPPs and on operational safety.

Technical meetings 2002

- TM on Use of CFD codes for safety analysis of reactor systems, including containment, 11-15 November 2002, Vienna
- TM on Safety analysis for research reactors, 3-7 June 2002, Vienna
- TM to Develop guidance document on the development and review of EOPs, 27-31 May 2002, Vienna
- TM to Develop a technical document on the status of safety analysis related to lifetime extension of existing NPPs, 9-13 September 2002, Madrid, Spain
- TM to Prepare a technical document on use of PSA in the regulatory framework, 23-27 September 2002, Vienna
- TM on Enhancing safety and performance of nuclear plants using insights from IAEA project on Safety aspects of NPP ageing, 24-26 June 2002, Vienna
- TM to Compile information on major safety issues identified by PSRs and on associated corrective actions and safety improvements, 2Q 2002, Vienna
- TM on Early termination of NPPs, 2Q 2002, Barseback, Sweden
- TM on Advancing the management of safety and safety culture, 2Q 2002, Vienna
- TM on Development of guidance on integrated safety assessment methodology for fuel cycle installations, 4Q 2002, Vienna

Extra-budgetary Programmes

- Significant tool for identifying and resolving safety issues
- Extrabudgetary funds at present more typically used for RBMKs (two EBPs ongoing) rather than for WWER reactors
- Only on active EBP on the Safety of Nuclear Installations in Asia (China), partially also devoted to WWERs
- Extrabudgetary funds also provided to support activities of WWER regulators in the framework of the Co-operation Forum of the Nuclear Safety Authorities of the Countries Operating WWER Type of reactors
- Significant portion of funding is provided to specific national TC projects oriented on WWER safety (e.g. for Armenia)

Coordinated Research Programmes

CRPs active at present or planned to begin in 2002 (some WWER Specific):

- Round-robin Exercise on WWER-440 RPV Metal Irradiation, Embrittlement and Annealing (1996-2004);
- Development and Application of Indicators to Monitor NPP Safety Performance (1999-2003);
- Seismic Evaluation of Existing NPPs (follow-up of CRP on Seismic Analysis of WWER-type NPPs) - completion 2002;
- Assessment of the Interfaces between Neutronic, Thermal-Hydraulic, Structural and Radiological Aspects in Accident Analyses (starting in 2002 up to 2005) - with specific application for WWER-440 reactors;
- Safety Significance of Near Field Earthquakes (2002-2004) .

Regional TC projects

Regional projects for Europe related to WWER safety or to the regulatory supervision of the WWER NPPs:

- RER/9/061 Enhancement of Nuclear Safety Regulatory Authority Effectiveness
- RER/9/066 Strengthening Management of Operational Safety at NPPs and Utility Organizations
- RER/9/068 Harmonization of PSA Methodologies
- RER/9/069 WWER-1000 DB Documentation Management Systems
- RER/9/070 Strengthening Safety Assessment Capabilities of NPPs.

Regional projects offer an opportunity to operators and regulators to share views and harmonize approaches

A number of workshops/technical meetings are also organized in the framework of regional projects

National TC projects

- Regional projects more typical for WWER issues at present
- No relevant TC project for Czech Republic, Hungary and Slovakia
- Intensive work is still ongoing for Armenian NPP (Seismic Safety Re-evaluation , Centre for Technical Support and Safety Analysis, Ageing Control , Accident Analysis); seismic re-evaluation is also subject of one project for Bulgaria
- Further strengthening of the nuclear safety authorities is reflected in the projects for Bulgaria and Ukraine
- Two national projects for Russia: Safety Review of NPPs and Development of a Regulatory Basis for NPP Licence Renewal/Extension of NPP Operation.
- IAEA support also to new countries joining WWER operators

Future orientation of IAEA activities

- Maintaining a high level of safety of existing installations (NPPs, research reactors, installations of the fuel cycle)
- Maintaining national/international competence in nuclear safety
- Increasing openness and transparency on safety matters in order to maintain public confidence in the nuclear energy option
- Demonstrating a higher safety level in new reactor designs, evolutionary or innovative concepts

Conclusions

- IAEA in cooperation with developed countries contributed to significant progress in increasing WWER safety
- Remaining issues identified within the framework of the EBP on WWER and RBMK Safety
- Addressing safety issues is continuously monitored by means of IAEA safety services, technical meetings and technical cooperation projects
- CRPs, EBPs and TC projects essential tools to promote reactor safety research; proactive approach of WWER countries needed
- IAEA contributes to harmonization of approaches and dissemination of the level reached in advanced countries to the whole nuclear community
- No convincing reasons for treatment WWER reactors as completely separated category of reactors
- IAEA will perform its future activities in accordance with country based needs