NPES NEWSLETTER

A Publication of the Nuclear
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Department of Nuclear Energy
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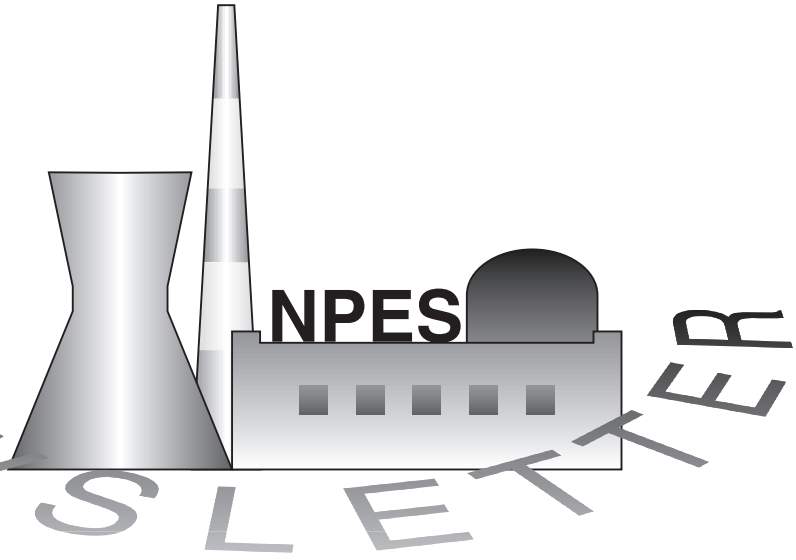

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Calendar

May

May 7-10: Research Co-ordination Meeting on Verification of WWER steam generator tube integrity. Contact: *Peter Trampus*

May 14-17: Specialists Meeting on Irradiation Embrittlement and Mitigation, Glousecter, United Kingdom. Contact: *V.Lyssakov*

May 14-17: Regional Workshop on Application of LBB concept (RER/4/024), Ljubljana, Slovenia. Contact: *Peter Trampus*

May 15-17: Biennial meeting of the Technical Working Group on Control and Instrumentation of Nuclear Power Plants (TWG-NPPCI), Vienna, Austria. Contact: *Ki-Sig Kang*

May 21-25: Regional Management Workshop on Operational and safety issues of NPPs with special focus on management competencies required for the competitive environment (RAS/4/021), Haiyan, China. Contact: *Peter Trampus*

May 29-31: Research Co-ordinating Meeting on Mechanism of Nickel Effect in Radiation Embrittlement of RPV Materials, Sazopol, Bulgaria. Contact: *V.Lyssakov*

June

June 17-20: International Meeting on Nuclear Power in Eastern Europe: Safety, European Integration, Free Electricity Market (RER/4/025), Varna, Bulgaria. Contact: *Mr. B. Gueorguiev*

June 19-22: Specialists Meeting on Optimization of NPP maintenance programmes, Charlotte, NC, USA. Contact: *Peter Trampus*

June 18-22: Regional Workshop on Strategies and Policies in Implementation of Nuclear Power Plant Life Management Programmes, (RER/4/025) Ljubljana, Slovenia. Contact: *V.Lyssakov*

June 25-29: 5th Executive Meeting on Reducing Costs in NPP Construction and Operation (RLA/4/016) Laguna Verde NPP, Mexico. Contact: *B. Gueorguiev*

September

September 3-7: Regional Workshop on Condition monitoring and techniques for assessing lifetime (RER/4/024), Kiev, Ukraine. Contact: *Peter Trampus*

September 10-14: Regional Workshop on Configuration Management throughout Plant Service Life (RER/4/025), Krisko NPP, Slovenia. Contact: *Messrs. A. Kossilov and V. Kotyza*

September 12-14: Research Co-ordinating Meeting on Surveillance Programmes Results Application to RPV Integrity Analysis, Prague, Czech Republic. Contact: *V.Lyssakov.*

September 17-19: Technical Committee Meeting on Master Curve Testing and Results Application, Prague, Czech Republic. *Contact: V.Lyssakov.*

September 24-28: Regional Workshop on Human Resource Management for NPP Operating Organizations, Cernavoda, Romania. Contact: *Tom Mazour.*

September 24-28: Regional Workshop on NPP maintenance and in-service inspection (RAS/4/021), Wuhan, China. Contact: *Peter Trampus.*

October

October 1-4: Advisory Group Meeting on Nuclear Economic Performance Information System (NEPIS), Vienna, Austria. Contact: *Ms. R. Spiegelberg-Planer.*

October 6-8: Specialists Meeting on Risk Informed Aspects of NPP Life Management - Emphasis on Primary Circuit Components Integrity, Budapest, Hungary. Contact: *V.Lyssakov*

October 8-19: Regional Training Course on Optimization of NPP maintenance programmes (RER/4/025), Karlsruhe, Germany. Contact: *Peter Trampus*

October 9-11: Advisory Group Meeting on simulator training for NPP personnel, Vienna, Austria. Contact: *Tom Mazour and Andrei Kossilov.*

October 15-19: Research Co-ordinated Meeting on Information Management Solutions for SAT Applications (SAT-IM), Madrid, Spain. Contact: *Andrei Kossilov*.

October 22-26: Regional Workshop on Experience in the Management of Delayed Nuclear Power Projects (RER/4/025) Mochovce NPP, Slovak Republic. Contact: *Mr. B. Gueorguiev.*

October 23-26: Specialists Meeting on Effective Management of NPP I&C Modernization Projects of Nuclear Power Plants, Garching, Germany. Contact: *Ki-Sig Kang*

October 29 - November 2: Co-ordinated Research Meeting on Scientific Basis and Engineering Solutions for Cost Effective Assessments of Software Based I&C Systems. Vienna, Austria. Contact: *Ki-Sig Kang.*

October 29 - November 2: Workshop on Engineering in a Competitive Environment, Kakrapar Atomic Power Station, India. *Contact: C. R. Clark.*

November

November 5 - 17: Training course on Modernization of Instrumentation and Control for NPP, Karlsruhe, Germany. Contact: *Ki-Sig Kang.*

November 19-23: Regional Workshop on Economics of NPP Performance (RER/4/025), Paks NPP, Hungary. Contact: *R. Spiegelberg-Planer*

December

December 10-14: Regional Workshop on Structural integrity assessment (RER/4/024), Erlangen, Germany. Contact: *Peter Trampus*

Visit us at http://www.iaea.org/programmes/ne/nenp/npes/index.htm

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Main Achievements in 2000

Subprogramme A.1 **Nuclear Power Planning, Implementation and Performance** reflected the growing emphasis on economic competitiveness arising from liberalizing electricity markets around the world mainly through a new project on management of NPP operation in a competitive environment implemented during the biennium. More than 20 documents were published and 6 supporting databases further expanded, containing information, recommendations and guidance formulated under the aegis of the Agency on proven engineering and management practices for achieving improved safety, reliability and economic cost effectiveness of nuclear power plants. All of them were made available in electronic version and distributed widely to the end users in Member States.

These guidance documents developed under the regular budget were used as the basis for providing assistance to the requesting Member States through the TC programme. The extent of their interest in the utilization of Agency guidance is reflected by the steady increase (more than 12% over the last year) in the scope of technical support being provided . Twenty five national and four regional TC projects, two interregional and three regional training courses (over 250 specialists trained in 1999 and 420 in 2000) were supported during the biennium.

Five Co-ordinated Research Projects (three new in 2000) were implemented in identified priority areas of Member States, whose growing interest is reflected in the number of participating institutions (40 in 1999 and 58 in 2000). Innovative approaches such as Internet Virtual Office (200 users in the biennium) permitted a reduction in the number of meetings for implementing the approved programme and provided savings for addressing some additional high priority needs of Member States on Y2K issues, cost of decommissioning & plant life extensions, and on early termination of NPP operations.

Power Reactor Information System (PRIS) was further developed in 2000 with new mapping features and the full database on CD-ROM and Web page. Since August 2000 part of the database is also being made available on the Internet The number of subscribers has grown by more than 25% per year. Two PRIS services, MicroPRIS and PRIS-PC (on-line access through the Internet) are currently distributed to more than 600 users in Member States and international organizations.

Nuclear Economic Performance International System (NEPIS) has been implemented successfully in 12 countries The countries in Latin America requested direct assistance for utilization of NEPIS to assess cost and process management of their NPPs. *Contact: Mr. B. Gueorguiev*

Nuclear Power Programme Planning

Decommissioning costs of WWER-440 nuclear power plants. Objectives of this task are to present decommissioning costs of WWER-440 NPPs in uniform manner (using cost item and cost group system of the Interim technical Document on Nuclear Decommissioning "A Proposed Standardized List of Items for Costing Purposes"), and to provide basis for understanding decommissioning costs differences. Following a Consultants Meeting in late 1999, an Advisory Group Meeting was held in Vienna from 20 to 23 November 2000 to discuss the data collected and the draft technical document. Recognising the incompleteness and partially inconsistency of the data it was decided that their revision is necessary. *Contact: Mr. P.Trampus.*

A technical report on **Economic Evaluation of Bids for Nuclear power Plants, 1999 Edition** was published. The Guidebook on "Economic Evaluation of Bids for Nuclear Power Plants, 1986 Edition" has been widely distributed to Member States to facilitate economic and financial bid evaluation. During the decade since the Guidebook was last revised, substantial experience and feedback have been gained through use of the Guidebook by Member States. Additionally, the bidding approaches, contracting processes and financing arrangements for nuclear power projects have become greatly diversified, and computer technology and software have undergone significant development. Consequently, the IAEA decided to update both the Guidebook and the computer program.
The updated Guidebook contains state-of-the-art information, advice and recommendations on the different principles, methods and guidelines which should be used and applied in the conduct of an economic evaluation of nuclear power plant bids. The new software, BIDEVAL-3, is based on advanced personal computer technology and is more flexible and user friendly than before.
This Guidebook should be useful to managers, engineers, economists and decision makers of electric utilities and governmental organisations in Member States, particularly in developing countries. The Guidebook should also be helpful to suppliers of plant components and systems by providing a common framework for the preparation of bids.
Contact: Mr. M. Condu

NPP Personnel Training and Qualification

Technical Committee Meeting of the **International Working Group on Training and Qualification of NPP Personnel**- IWG-T&Q) was held from 28-30 March 2000 in Vienna. The meeting summarized and discussed recent developments in the field as well as identifying future directions and anticipated training needs. The IWG-T&Q is a very cost effective way to exchange experience and information that are most important to the Member States in this specialized area. The work of the IWG is very practical, because the results of the IWG-T&Q activities including assessment, analysis and sharing of experience directly support decision making and problem solving at nuclear power plants in Member States.
Contact: Mr. T. Mazour

An IAEA Specialists' Meeting on **Maintaining Needed Capabilities with an Aging Workforce and Declining Educational Infrastructure** was hosted by Teollisuuden Voima Oy (TVO) in Olkiluoto, Finland from 5-8 September 2000**.** This meeting explored the challenges, opportunities and currently available options to address this approaching need for the nuclear industry. In the 1960s and 1970s many of the nuclear power plants now in operation were commissioned. As a result, large numbers of personnel were hired and trained to staff these plants. Today however, many of those people are now approaching retirement age and will need to be replaced in the next 5-10 years. This combined with other social and economic factors such as a more diverse workforce, increased attention on cost reduction, competition of the technology-oriented industries for young scientists and engineers, and reductions in nuclear power educational and training opportunities, present a problem for hiring qualified replacement personnel and transferring to them the knowledge needed to operate and maintain these plants. An important part of this meeting was information provided by the host organization, TVO concerning its ongoing efforts to prepare for transfer of knowledge to the next generation. *The proceedings of this meeting are available upon request from Mr. T. Mazour.*

A technical document on **Analysis Phase of Systematic Approach to Training (SAT) for Nuclear Plant Personnel** (IAEA-TECDOC-1170) was published in August 2000. The purpose of this document is to offer examples of and methods used in the Analysis phase of the Systematic Approach to Training for Nuclear Plant personnel. It is intended that this document will provide useful information for anyone who has chosen to use SAT for the training of their nuclear plant personnel. This TECDOC explains the importance of the Analysis phase of SAT; it describes various methods of job analysis in common use and, in the Appendices, gives examples that have been provided by IAEA Member States. References to other publications relating to the Analysis phase are provided. *Contact: Mr. A. Kossilov.*

A technical document on **a Systematic Approach to Human Performance Improvement in Nuclear Power Plants: Training Solutions** (IAEA-TECDOC-1204) was published in March 2001. There has been considerable focus on the technical competencies related to a nuclear power plant and its processes that are needed by NPP personnel, particularly plant operations staff. However, to ensure that NPPs achieve the high standards with respect to safety, operational

performance and economic competitiveness needed in today's environment, it has been recognized that there are other competency areas that are also important, including:

- open communication
- teamwork
- leadership
- situational awareness
- problem resolution
- safety conscious focus
- business focus, and
- professionalism.

These competencies are referred to in some Member States as "soft skills" and in others as "human factor-related competencies."

This document describes a systematic approach to achieving high standards of human performance through integrating training of NPP personnel in all of the competency areas identified above, with other aspects that influence human performance such as plant procedure systems, work control systems, supervision and oversight, personnel selection, and information management. *For additional information, please contact Mr. T. Mazour.*

A technical document on **Assuring the Competence of NPP Contractor Personnel** was prepared in 2000. As mentioned in a number of IAEA documents, contractor personnel provide many essential services to nuclear utilities and individual NPPs during planned outages, for refueling, for major upgrade projects, for specialized maintenance, and for routine non-nuclear services, such as security, administrative support, facilities management, buildings maintenance and catering. A continuing issue of great importance with respect to contractor personnel is how to ensure, in a cost-effective way, that they are competent or appropriately qualified to perform their assigned tasks. Some utilities are finding innovative solutions to this common need. The new technical document offers assistance to utility and NPP managers and other organizations in the form of a framework for assuring the competence of NPP contractor personnel. The primary objective of the document is to help plant management and training professionals to identify the required technical and professional competence of contractor personnel, and to offer methods and tools for its assessment and evaluation. The document also includes examples of national/utilities' experiences (case studies) in the subject area.
Contact: Mr. A. Kossilov.

Quality Assurance

A technical document on **Quality Assurance Standards: Comparison Between IAEA 50-C/SG-Q and ISO 9001:1994** was published as IAEA-TECDOC-1182. The IAEA Safety Standards on Quality Assurance (QA) are mostly used directly or indirectly to establish the nuclear safety requirements at the utility/regulator interface. The industrial ISO 9000 standards are progressively being used to implement the QA requirements at the utility/supplier interface. The interface between both has been growing in significance owing to the impact upon the owners/operators of nuclear facilities and their contractors/suppliers. A clear determination of the technical differences between the IAEA and ISO standards was needed in order to properly comply with the regulatory requirements when ISO standards are applied in nuclear installations. This TECDOC provides guidance on the differences between both standards and supports the practical way of fulfilling nuclear safety requirements. This document was developed with support and development of FORATOM. *Contact: Mr. C. Russell Clark.*

A technical report on **Quality Assurance for Software Important to Safety (IAEA-TRS-397)** was published. Software applications play and increasingly relevant role in nuclear power plant systems. This is particularly true of software important to safety used in both: a) calculations for the design, testing and analysis of nuclear reactor systems (design, engineering and analysis software): and b) monitoring, control and safety functions as an integral part of the reactor systems (monitoring, control and safety system software). Computer technology is advancing at a fast pace offering new possibilities in nuclear reactor design, construction, commissioning, operation, maintenance and decommissioning. These advances are also presenting new issues, which must be considered both by the utility and by the regulatory organization. Refurbishment of aging instrumentation and control systems in nuclear power plants and new safety related application areas have emerged, with direct (e.g., interfaces with safety systems) and indirect (e.g., operator intervention) implication on safety. *Contact: Mr. C. Russell Clark.*

A technical document (IAEA-TECDOC-1169) **Managing Suspect and Counterfeit Items in the Nuclear Industry** was published in August 2000. A suspect item is one in which there is an indication that it may not conform to established specifications or standards. A counterfiet item is a suspect item that is a copy or substitute without legal right or authority to do so or one whose material, performance or characteristics are knowingly misrepresented by the vendor, supplier, distributor or manufacturer. Suspect/counterfeit items (S/CIs) pose immediate and potential threats to the safety of workers, the public and the environment. *Contact: Mr. C. Russell Clark.*

Integrated Management of NPP Operations

A technical document on **Risk Management: a Tool for Improving NPP performance** (IAEA-TECDOC-1209, April 2001). Significant progress has been made in the development and implementation of risk-based technology for nuclear power plant applications in a number of Member States. These applications have

included in-service inspection, in-service testing, technical specifications, and other activities related to regulatory requirements and safety. However, it is now clear that there are equally important uses of risk-based technology outside of the regulatory environment, related to needs of plant owners such as improving the cost-effectiveness and efficiency of the plants. They include: on-line maintenance, graded quality assurance, reliability-centered maintenance, and evaluation of potential plant upgrades and modifications. This work was being co-ordinated with our colleagues in the Nuclear Safety Department who are working on the use of PSA for nuclear safety applications. From 10-13 April 2000, an Advisory Group Meeting (AGM) was held to review the initial draft document. From 4-7 July 2000, a consultants meeting was held to resolve comments received during and subsequent to the AGM. *Scientific Secretary: T. Mazour.*

Nowadays, when the nuclear power plants have reached a high level of reliability and confidence in their safe performance, it is important to prove that they are competitive in all other aspects: high availability, environment preservation and costs. The element which directly influences availability and costs is the outage duration and its extensions. To address these aspects, a technical document on **Good Practices for Optimisation of Outage Duration** has been prepared. Through self evaluations and case study reports of the industry, the main factors influencing the outage duration and adopted optimisation measures have been identified. The report, presently in the final stage, includes the comments and conclusions of meetings held during 1999 and 2000 in which 23 Member States participated.
Contact: Ms. Rejane Spiegelberg-Planer

The IAEA **Nuclear Economic Performance International System - NEPIS,** which aims to achieve the necessary optimisation of economic and technical performance, is now being implemented in about 12 nuclear countries. The data base considered in its first phase the functional operational and maintenance (O&M) costs. The Electric Utility Cost Group (EUCG), USA, worked in co-operation with the IAEA to set up the data base. Currently, the international database contains cost data from 1998 to 2000. The development of a group of economic and operational indicators is under way to correlate operational and economic performance factors.
Contact: Ms. Rejane Spiegelberg-Planer

The **CRP on Outage Coding System** successfully concluded its work, whose main objective was to develop and implement a standardized and internationally accepted outage coding system for nuclear power plants. The final report is in final preparation by the CRP participants and should be issued in the first quarter of 2001. The results of the work were presented during the Advisory Group Meeting to assess the Power Reactor Information System, its products and publications. The development of a standardized and internationally accepted nuclear power plant outage coding will satisfy the needs of a broad set of nuclear power plant operators and provide a tool for experience feedback and international benchmarking analysis, to be used in developing guidelines and improvements to nuclear power plant operations.
Contact: Ms. Rejane Spiegelberg-Planer.

The annual publication **Operating Experience with Nuclear Power Stations in Member States in 1999** was issued. The report on the annual operating experience on operating nuclear power plant in the Agency's Member States is a direct output from the Agency's Power Reactor Information System (PRIS), whose database contains all operating experience data published in the Agency's operating experience annual reports since 1971 and basic information on power reactors, including design data.
Contact: Ms. Rejane Spiegelberg-Planer.

The IAEA released the PRIS on CD-ROM, a version on the **Power Reactor Information System (PRIS)** including mapping features and the full database. In addition, PRIS data was also released to the public through the PRIS web page (http://www.iaea.or.at/programmes/a2/) at the end of August 2000. The new PRIS web page provides basic and availability data (performance indicators) of nuclear power plants worldwide and information on all PRIS products and publications.
Currently, the other two PRIS services to the Agency's Member States, MicroPRIS and PRIS-PC (the connection to PRIS through the Internet) are distributed to more than 600 users in the Agency's Member States and international organizations.
Contact: Ms. Rejane Spiegelberg-Planer.

This second edition of the Country Nuclear Power Profiles published on CD-ROM covers the changes in the new environment in the electricity as well as in the nuclear sector. In general, the information is updated to 1999. For the preparation of this edition, the IAEA received contributions from all 31 countries with operating power plants by the end of 1999 as well as Italy and the Islamic Republic of Iran. The document's descriptive and statistical overview of the overall economic, energy, and electricity situation in each country, and its nuclear power framework is intended to serve as an integrated source of key background information about nuclear power programmes in the world. During 2001 the Country Nuclear Power Profiles will be updated with 2000 data.
Contact: Ms. Rejane Spiegelberg-Planer.

IAEA TECDOC-1123: Strategies For Competitive Nuclear Power Plants was published. The objective of this document is to assist the management of NPP organizations in identifying and implementing appropriate measures to remain competitive in a rapidly changing business environment. Restructuring of the electricity business heralds significant changes in nuclear operations. The organization of the entire

electric industry will be different as the vertically integrated monopolies that formerly provided electricity are replaced by separate companies, specializing in specific functions. Among them will likely be generating companies including a limited number of highly proficient nuclear operating companies. Producing electricity as a commodity in a competitive market will call for price-driven performance. The safety-focus of nuclear operations is the constant that will carry over into the competitive electricity business. Given the new challenges facing nuclear utilities, there is great need for experiences gained in this environment to be shared among Member States. *Contact: Mr. T. Mazour.*

NPP Life Management

Development of a new module of the **International Database on Life Management of NPPs - International Database on NPP Containment** -was started. The consultants meeting with the aim to develop the Database structure was held providing recommendations for further elaboration of the Database filing structure and its requirements.
Contact: Mr. V. Lyssakov.

Several presentations on the IAEA activities in the area of PLIM were prepared and presented both at IAEA and other International events. At the IAEA SPM and Regional Workshop papers on the IAEA activities in the field of NPP life management were presented. *Contact: Mr. V. Lyssakov.*

A specialists meeting on **"Methodology and Supporting Research for Pressurised Thermal Shock Evaluation"** was held in Rockville, United States on 18-20 July 2000.
The purpose of the meeting was to provide an international forum for discussion of recent results from regulatory, operation, and research organizations that address the latest improvements for pressurised thermal shock (PTS) assessments. Reported improvements were relevant to better understanding of PTS phenomena, further development or validation of analysis methods, better understanding of margins against failure, evolving regulatory approaches, or observations from operating experience.
The topics for consideration within these areas included aspects of methodology for PTS evaluation, current practices and future developments, regulatory approaches, approaches to structural integrity assessment including fracture mechanics, PTS screening criteria, thermal hydraulic aspects, selection of transients for PTS risk analysis, investigations of cladding effect, aspects of fracture toughness, chemistry and microstructural factors. The meeting produced a number of recommendations concluding that there was the necessity of integrating PTS analysis results on an interdisciplinary basis – including the major disciplines of probabilistic risk assessment including risk criteria assessment, thermal hydraulics, and probabilistic fracture mechanics.
Contact: Mr. V. Lyssakov

1st RCM on **Mechanism of Nickel Effect in Radiation Embrittlement of RPV Steels**, 10-12 April 2000, Vienna, Austria

The meeting adopted the work matrix and the scope of the CRP and specified materials distribution.
Contact Mr. V. Lyssakov.

1st RCM on **Surveillance Programmes Results Application to RPV Integrity Assessment**, 19-21 June 2000, Vienna, Austria. The meeting considered time-schedule of the Project and national inputs in accordance with the adopted work matrix and the scope of the CRP and specified testing materials. *Contact: Mr. V. Lyssakov*

The approaches to Plant Life Management in different countries are not necessarily consistent and the overall situation is complex. An optimized and harmonized approach would be desirable. Therefore the work has been carried out during the year on a **Guide on NPP Life Management** aimed to provide Member States with a consolidated approach to PLIM Programmes development. The objective of the technical document is to provide guidance on the approach to policies and the development and implementation of Plant Life Management programmes. The end users will be decision makers on Plant Life Management and those who influence them in NPP utilities, e.g. chief executive officers, plant managers, senior managers in plant design and consulting companies, operating companies and the regulators involved in Plant Life Management. The document will also be a source of useful background information for government, government departments and general public. As a result of planned activities a draft document was prepared and reviewed. The document is expected to be submitted for publication in 2001. *Scientific Secretary: Mr. V. Lyssakov.*

Consultants Meeting to prepare the scope and work matrix for a new IAEA co-ordinated research project on **Evaluation of radiation damage of reactor pressure vessel using the IAEA Database on RPV materials** was held from 12 to 14 December 2000, in Vienna, at the IAEA Headquarters. The scope of the CRP will address the problem of the RPV integrity assessment and reliable calculations of its remaining irradiation lifetime.
The meeting elaborated the proposal for the new CRP with the main objectives as follows:
-further extension of the IAEA Database on RPV materials by collection of additional surveillance and research data on radiation embrittlement and re-embrittlement of WWER-440 RPV materials
- analysis of radiation damage data of WWER-440 RPV materials using this Database
- elaboration of predictive embrittlement formulae depending on material chemical composition, neutron fluence (and possibly neutron flux)

- development of a methodology for evaluation of surveillance data of specific operating unit
- development of the IAEA guidelines for prediction of radiation embrittlement and re-embrittlement of operating RPVs of WWER-440 type.

It is expected that after commencement the project will be implemented in four phases which will cover both collection and analysis of experimental data together with their evaluation for RPV integrity assessment. Anticipated dates for the commencement of the new CRP - end of 2001. *Contact: Mr. V. Lyssakov.*

NPP Control and Instrumentation

Integrated Information Presentation in Control Rooms and Technical Offices at NPP. The overall need for modernization of the information, instrumentation, safety, and control systems in nuclear power plants offers the opportunity to develop and implement new computer systems, networks, and displays that will effectively access and present the full range of information required by all categories of plant staff to assist them in operating the plant efficiently and safely. The technical report completed in October 2000 provides guidance on the approaches to the information integration at NPP and describes best experience of Member States in implementing projects aimed at that goal. The information in the report can also be used to help avoid the pitfalls that can occur when implementing new systems with respect to the information they need and produce. A Specialists Meeting on the subject was organized from 9 to 12 May 2000 in Stockholm, Sweden in order to provide a forum for the discussion of the problem for specialists around the world. The opportunity of the meeting was used to present the IAEA draft report on the subject and to obtain advice from the meeting participants on possible improvements of the report. The papers presented at the specialists meeting were also utilized as an input material for the report.
Scientific Secretary: Mr. Ki-Sig Kang.

A technical document on **Management of Ageing of I&C Equipment in Nuclear Power Plants** was published in June 2000 **as IAEA-TECDOC-1147**. Activities concerning NPP ageing have been in progress at the IAEA over ten years. Work in the field of safety aspects of plant ageing started in 1985 and since then the IAEA has organized a number of meetings in the field of ageing management aimed at exchanging information and documenting experiences, practices, and research. The IAEA has published recommendations on data collection and record keeping for ageing management and a report on the safety aspects of NPP ageing. In 1989, the IAEA initiated work on pilot studies on management of ageing of I&C cables, in 1993, the IAEA organized a specialist meeting on ageing, maintenance, and modernization of I&C systems.
The published report is solely concerned with the ageing management of I&C systems. It draws together experience from various nuclear utilities across the world, examining ageing of specific components and also ageing management techniques. This information is distilled into a suggested ageing management strategy and several practical steps are suggested. I&C ageing management is a developing field and, as yet, there is no one accepted and definitive solution. However, the increasing severity of the problem and on-going work justifies the production of this report, which documents the best current practices. Replacement and upgrading of equipment will form a part of any ageing management strategy.
Based on the I&C ageing research completed to date, four typical I&C components were selected as examples to be discussed in this report. The ageing characteristics of these components are described here and the current practice for their ageing management is identified to illustrate how I&C equipment may age, the consequences of the ageing, and how ageing may be managed by testing of the I&C equipment. The material provided in this report will be useful not only to the nuclear power industry, but also to other power production facilities and industrial processes.
Contact: Mr. Ki-Sig Kang.

Support to Technical Co-operation Activities

INT/4/139:
Interregional Training Course on **Qualification of Nuclear Power Plant Personnel and the Role of Management** held twice in 2000. The first course was conducted in Karlsruhe, Germany from 8-26 May 2000 and the second in Ulsan, Republic of Korea, from 13 November - 1 December 2000. The principal objective of this course is to provide participants with tools that they can use to improve human performance in their organizations. *Technical Officers: Mr. T. Mazour and Mr. A. Kossilov.*

INT/4/040: Interregional Training Course on **Management for Excellence in Nuclear Power Plant Performance.** The course was held at Saclay, France from 19-30 June 2000. The purpose of the course was to transfer experience concerning successful NPP operation in more competitive energy markets in all geographical regions. The main message from this experience was that in order to succeed in these conditions it is necessary to have an integrated approach to management of safety, operations and economics. The course syllabus was developed with close cooperation between the Departments of Nuclear Energy and Nuclear Safety. Emphasis was placed on the practical application of management principles and methods in operating nuclear power plants. As participants were senior managers with considerable experience, this course was not focused on theoretical knowledge, but rather on application of theories to real situations. Lectures were kept to a minimum. Emphasis was placed rather on interactive learning through exercises, demonstrations of facilities and equipment, and discussions. Participants brought with them information about management practices in their organizations. This information was

used as the basis for discussions and for practical orientation of lectures/presentations. The participants evaluated the course very positively. They indicated that they had learned a great deal that could be applied to improving their organization's performance, particularly in the more competitive conditions that their plants are now operating in, or are preparing to face.
Technical Officer: Mr. M. Rao.

RLA/4/016:
Reducing Costs in NPP Construction and Operation. The main task of the project is oriented to the NPP Cost and Process Management issues contributing to lowering the production costs of electricity generation and to enhancing public acceptance of nuclear power.
At two Executive meetings held in 2000 the senior managers of the NPPs in the region exchanged information on the current status of nuclear power programmes development in the Latin America region:
The third Executive meeting was held in Havana, Cuba, from 10 to 14 July 2000.. The special focus was given on the issue on "Management Strategies regarding Competitiveness, Safety, Public Information and Business Plan". Two main facts were highlighted: NPPs with adequate safety levels are also cost efficient in their performance, and safety and efficiency are not the result of a single programme, but the integration of all activities.
The 4th Executive meeting was held at NPP Embalse, Argentina, from 27 November to 1 December 2000 and With the finalization of the two documents on Cost and Process management Group the objective of the first phase of the project were successfully completed. The project objectives and work plan for 2001 were approved. Next, 5th Executive meeting is planned to be held in Mexico, 25 to 29 June 2001 and will be hosted by NPP Laguna Verde.
Technical Officer: Mr. B. Gueorguiev.

Within the RLA/4/016 work plan for the second part of 2000:

- Two **Specialist Meetings for Development of Cost Management Systems for Nuclear Power Plants** were held in Brazil and Mexico . The meetings provided a forum for exchange of information and discussions on the assessment of performance of nuclear plants including economic aspects of plant operation and maintenance. The expert group discussed in details the development and implementation of methodology for cost management, collected functional cost data for 1998 and 1999 using the IAEA Nuclear Economic Performance Information System (NEPIS), and initiated benchmarking cost analysis to identify major cost areas. The results of the cost management group would be integrated to the work done in the scope of the same project in the Process Management Group. The Process Management Group proceeds its work to develop a process system catalog based on the system used by Trillo NPP (Spain), which includes the mapping, and prioritizing plant processes. *Implemeting Officer: Ms. R. Spiegelberg-Planer.*
- A Regional workshop on "NPP Instrumentation and Control Maintenance", held during 4-8 December 2000 at NPP Laguna Verde, Mexico was attended by 25 participants. The workshop provided practical examples of current best practices and the latest information about new technologies in subject areas. *Implementing Officer: Mr. A. Kossilov*

RAS/4/015:
Management Workshop on **Operational and Safety Issues of NPPs** was held in Pusan, Republic of Korea, from 15 to 19 May 2000, hosted by KEPCO. Two new regional project proposals for 2001-04 were introduced. One of them entitled 'Management of Change for Competitive Nuclear Power Performance' will be managed by NPES. The objective of this project is to strengthen capabilities of utility/NPP managers to maximize returns from NPPs through application of international best practices on management for excellence in NPP construction and operation, and through enhanced regional co-operation.
Technical Officer: Mr. P. Trampus.

RER/4/011: on "Improving NPP Operation Management" was successfully completed at the end of 2000.
The following group activities were held:
Regional Workshop on **Impact of Privatization and Market Deregulation on NPP Operation,**. was held from 6-10 March 2000 in Paks, Hungary. The principal objective of the workshop was to share lessons learned with respect to NPP operation in more competitive markets, including issues dealing with privatization of operating organizations.
Implementing Officer: Mr. T. Mazour.

Regional Training Course on **Strengthening Nuclear Power Project Management** was held in Madrid, Spain, from 3 to 14 April, hosted by CIEMAT and Empresarios Agrupados. The purpose of the course was to provide a good understanding of the scope of nuclear power project management with emphasis on good practices and lessons learned from world-wide experience and related tools and techniques. It was not restricted to new NPP projects only, but included all major activities at operational NPPs that should be treated as projects for their successful completion. Members States operating NPPs have a permanent and high interest in attending training events dedicated to nuclear power project management with a focus on project management issues at operating plants.
Implementing Officer: Mr. P. Trampus.

Regional Workshop on **Good Practices in National Approaches to NPP Life Management** was held in Ljubljana, Slovenia on 22-26 May 2000.
The purpose of the workshop was to present and exchange experience on the main issues and practical measures related to the development and implementation of NPP Life Management

Programmes. The emphasis was made on operational aspects as distinct from safety. The workshop reached a common conclusion that plant life management is the interactive integration of ageing management and economic planning, aiming to optimise plant operation and maintenance and to provide the equipment for the successful operation during the whole plant operation period maintaining the acceptable safety level and at the same time maximising profit from the sale of electricity. *Implementing Officert: Mr. V. Lyssakov*

Regional Europe Training Course on **Modernization of Instrumentation and Control in Nuclear Power Plants** was held in Karlsruhe, Germany from October 9 to 27, 2000. The purpose of the course was to transfer the experience concerning the instrumentation and control of nuclear power plants (NPP I&C) of Member States in geographical regions. The course had the fundamental character of experience transfer. Emphasis was placed on the practical application of NPP I&C modernization principles and methods in operating nuclear power plants. During the course participants visited GKN Neckarwestheim NPP, Siemens KWU to see the modernization I&C, KWU Erlangen, to demonstrate the engineering system SPACE tool, Simulator Training Center Essen and Monitoring Station of the plant service & television remote control Karlsruhe.
Implementing Officer: Mr. A. Kossilov.

RER/4/020:
Regional Workshop on **In-service Inspection Effectiveness Improvement through Inspection Qualification** was held in Kozloduy, Bulgaria, from 21 to 25 February, hosted by Kozloduy NPP. The interim results of the pilot qualification process were presented, discussed and forthcoming tasks were determined. Most of the recipient countries in Europe follow or decided to follow the IAEA qualification methodology in their own qualification regulation and activity. Assistance through the Pilot Study is, therefore, very important to the Member States.
Technical Officer: Mr. P. Trampus.

Regional Workshop on **Internal and External Inspection of the Reactor Pressure Vessel** was held in Zagreb, Croatia, from 13 to 16 June, hosted by INETEC Institute for Nuclear Technology. There was a thorough analysis and discussion of the status and features of the WWER specific in-service inspection system, which allow to inspect reactor pressure vessels from both internal and external surface. It was concluded that, by establishing complementary systems for inside and outside inspections of the reactor pressure vessels in WWER plants with appropriate performance level and maximum coverage of areas to be inspected, the in-service inspection strategy could be optimized.
Technical Officer: Mr. P. Trampus.

Regional Workshop on **Evaluation of NDT Results for Remaining Lifetime Assessment** was held in Brno, Czech Republic, from 26 to 30 June, hosted by Dukovany NPP and the Training and Education Center of CEZ. Key issues on remaining lifetime assessment as well as technical feasibility of operating nuclear power units beyond their design lifetime were thoroughly discussed. All WWER operating countries in Europe region have strong intention to operate their plants beyond the lifetime considered by the designer. Life management strategies and systematically organized actions, however, supporting this intention are not always technically sound and timely prepared. The importance of the topic underlines need for continuation of the dialog with WWER operating countries in this area.
Technical Officer: Mr. P. Trampus.

Regional Workshop on **Steam Generator Tube Integrity** was held in Udomlya, Russian Federation, from 27 to 30 November 2000, hosted by Kalinin NPP of Rosenergoatom. The following topics were presented by experts and thoroughly discussed: steam generator heat exchanger tube degradation mechanisms, mitigation measures both recommended and already done (modifications on water chemistry, system design changes, condenser re-tubing, chemical cleaning), strategy and scope of in-service inspection, flaw statistics, capabilities of various eddy current testing methods and techniques, plugging criteria and technologies. Since degradation of heat exchanger tubes of WWER steam generators is still an issue, which hardly affects tube integrity, further attention to this topic was strongly recommended. A forthcoming workshop on steam generator is planned to be held in Ukraine in early 2002.
Technical Officer: Mr. P. Trampus

Activities in 2001

Nuclear Power Programme Planning

Guidance on Integrated Approach to Nuclear Power Programme Planning. A number of activities related to integrated approach to nuclear power programme planning are being developed to give guidance for the developing Member States wishing to embark on a nuclear power programme. As recommended by the Consultants' Meeting 11-15 October 1999, the Agency is going to revisit and update previous guidebooks to make them compatible with the new framework in the power supply sector. As a first step, it will be identified the elements that characterize the new environment (such as: planning strategies, privatisation, nuclear & non-nuclear regulatory interfaces, financing approaches,

environmental issues) in order to define the areas which need updating. A high level document with this new framework for power and nuclear power planning will be developed. The experts will identify also the elements that need further detailed analysis. Two meetings are planned on the subject in 2001. *Scientific Secretaries Mr. M. Rao and Mr. M. Condu*

A technical document on "**Cost drivers for the assessment of NPP life extension**" is under preparation. The objective of this technical document is two-fold:

i) To provide an understanding of the various cost elements and drivers in NPP life extension.
ii) To present cost data collected through a questionnaire sent to IAEA Member States and to discuss and identify the basis of the available cost estimates of different activities. This will allow users to draw their own conclusions for input into the economic assessment.

The document addresses the following issues: 1) major transformations occurring in the electricity sector leading to increased competition. 2) the process to decide on PLEX, focusing on a systematic approach of estimating its costs. 3) the national and regulatory approaches on NPP PLEX in countries answering the questionnaire. 4) PLEX cost data reported. The costed PLEX scope is presented for each of the NPPs reported. In addition, cost ranges will be shown for all reported reactors. 5) discussion of the results
The draft of the document was reviewed in two meetings held in 2000: an AGM held in September and a consultancy meeting held in December. The document will be completed in 2001. *Scientific Secretary Mr. M. Condu*

Develop a **Computer model for the economic assessment of NPP life extension:** Currently, nuclear power generating assets face increased competition as the electricity business moves toward deregulation. However, today with the exception perhaps of hydroelectric, well-managed nuclear plants, with their low fuel costs and steadily declining operation and maintenance costs are often among the least expensive base load power to operate. The decision to extend the life of a NPP is quite complex, involving a number of political, technical and economic issues. The economic viability is a cornerstone of the decision-making process on for PLEX. What level of nuclear performance will be required to become and remain competitive; what will the market price of electricity and other energy products be; what will be a sufficient return on investment and at what level of risk; what's the value of a NPP at auction; how much can one bid and still make a profit; and what generation alternatives should be considered are within some the key issues to be addressed in order to assess the economic viability of PLEX in a liberalized market. The objective of the task would be to develop a PC based computer model to assist Member States with the assessment of economic effectiveness of PLEX in the framework of deregulated/privatised electricity markets. The first consultants meeting for this task is tentatively planned for 15-19 October 2001. *Scientific secretary: Mr. M. Condu*

Quality Assurance

Comparison of IAEA and ISO 9001:2000 Standard. Develop a TECDOC to proceed to the next level of comparison by taking the ISO 9001:2000 Series, and complete a comparison similar to the ISO 9001:1994 project. At the consultants meeting in 1999 it was agreed to proceed with the comparison/linkage between the IAEA 50-C/SG-Q and ISO 9001:1994 on the grounds that several years would be needed before the next version ISO-9001:2000 would be adopted and effectively implemented. The new ISO standard was issued in December 2000 and a work plan is being developed **with FORATOM** to proceed with the new comparison in 2001. **A Consultancy meeting is scheduled for September 2001.** *For comment and/or information, please contact Mr.C. Russell Clark.*

Quality Requirements in Decommissioning Nuclear Power Plants. Prepare a technical report on management measures to ensure fulfilment of quality and business requirements in decommissioning of NPPs. As the nuclear industry ages and competition forces the shutdown of NPPs , decommissioning will become a priority concern within the industry. It is important to establish a programme of Quality Assurance standards and requirements during this phase. Guidance for NPPs facing decommissioning will be an important factor to ensure a safe and effective process. Through this technical document, lessons learned and good practice information from NPPs already experienced in developing QA Programmes for decommissioned sites will be utilized and provided. The technical report is scheduled to be available in 2002. *Scientific Secretaries: Mr. C. R. Clark and Mr. B. Gueorguiev.*

NPP Personnel Training and Qualification

Develop a technical document on **Effective Use of NPP Control Room Simulators**. The overall objective of this task is to develop a technical document that can be used by NPP and utility managers and trainers to improve the use of NPP control room simulators in the training of their personnel. Through this technical document, lessons learned and good practice information with respect to integration of control room simulators into NPP personnel training programmes will be collected, organized and disseminated. This document will address the full spectrum of control room simulators that are currently being used in the industry: full-scope plant-referenced simulators, multifunctional simulators, analytical simulators, and desktop, part task simulators. The document should provide specific examples of training plans and exercise guides for control room simulator training. An Advisory Group Meeting is planned to review an initial draft document in Vienna from 9-11 October 2000.

The technical document is planned to be available in 2002. *Scientific Secretaries: Mr. T. Mazour and Mr. A. Kossilov.*

Develop a technical document on **Human Resource Management (HRM).** The objective of HRM is to ensure that the organization maintains adequate numbers of competent and motivated personnel to achieve the organization's mission. This issue is particularly critical in a period when the nuclear industry is becoming less attractive for young people, and as many of the staff of existing NPPs approach retirement age. Among the topics planned to be included in this document are:

1. establishment and maintenance of a formal human resources policy
2. personnel performance assessment
3. career development
4. establishing and maintaining a positive work environment
5. partnerships with educational and training organizations
6. use of job rotation
7. preservation of knowledge important to anorganization's continued success
8. supervising outsourced activities

In April 2001 the Agency plans to hold a consultants meeting to assist it in developing an initial draft document on this topic. The document is expected to be available in 2002. *Scientific Secretary: Mr. T. Mazour*

Provide an Internet forum for exchange of information related to training and qualification of NPP personnel. In 1999 the IAEA published IAEA-TECDOC-1063, IAEA World Survey of NPP Personnel Training. While this information was found to be useful to Member States, by its nature some of it was out of date before it was published. It is intended that this internet forum would not only provide a mechanism to maintain information such as that found in IAEA-TECDOC-1063 up-to-date, but also other useful information such as:

- A calendar of IAEA training related events
- Access to related publications of the IAEA
- Links to other related web sites

Contact Mr. T. Mazour or Mr. A. Kossilov for further information.

Cooperation among European Nuclear Training Centers. In 2001 the Agency initiated support for an effort to improve cooperation among the nuclear training centers in the European Region. The main objective of this cooperation is to improve the quality and cost-effectiveness of these training center activities through avoiding duplication of effort. In April 2001(under TC Regional Project RER/4/025) a Technical Meeting to plan this cooperation was hosted by the Paks NPP Maintenance Training Center in Hungary. It was attended by 18 persons representing nuclear training centers in 12 IAEA Member States. The participants in this meeting developed a detailed implementation plan for the next 12 months including: training center dossiers; a data base of available training tools, collection and sharing of benchmarking information, and posting of both planned experience/staff exchanges and the reports of completed exchanges. A progress review and planning meeting is tentatively planned for April 2002. This effort is being supported jointly by the NPES Regular Budget and the Technical Cooperation Department. *Contacts: Tom Mazour or Andrei Kossilov.*

A Co-ordinated Research Programme (CRP) on **Information Management Solutions for SAT Applications (SAT-IM)** was launched in 1999 as a part of the IAEA activities on NPP training and qualification. This CRP is to realistically address the pressing need of Member States of the IAEA to compile lessons learned, and to develop guidance for Member States in the area of maintaining and upgrading the management information contained in their SAT (Systematic Approach to Training) programmes. The focus of the project is to take advantage of the capabilities available in computer based information management systems in order to improve operational efficiency and increase safety performance. The first research coordinated meeting was held at Paks NPP, Hungary, the second one is scheduled for October 2001 in Madrid.
Scientific Secretary: Mr. A. Kossilov.

Integrated Management of NPP Operations

To continue improving the features made available in the Country Nuclear Power Profiles and enable better sharing of resources throughout the nuclear power plant operators, the Agency will open a forum for discussion and dissemination of **Methodologies for Inventory Management in nuclear power plants** in the Internet. It is planned to convene Internet meetings to start exchange of information in this area in 2001. Inventory management is one of the key issues to consider in the optimisation of nuclear power plant safety and economic performance. Inventory management can be done at the plant, utility level or regional level. Some utilities have developed pooled inventory management programmes for pooling of emergency spare parts for nuclear power plants. Others have developed programmes to procure and store emergency spare parts, which represent major costs in nuclear power plant maintenance. Usually, the emergency spare parts are generally large motors, pumps, and rotating stock, which can be either safety or non safety-related. *Scientific Secretary: Ms. R. Spiegelberg-Planer.*

The main objective of **the Power Reactor Information System** project is to foster continuous improvements in the operating performance of nuclear power plants through assessment and dissemination of utilities experience and practices by collection, assessment and dissemination of information on the operating performance of nuclear power plants and

analysis of subject areas affecting plant performance. In 2001, PRIS will continue to distribute its products to the Member States - MicroPRIS, PRIS-PC and PRIS on CD-ROM, and through its Internet page at http://www.iaea.or.at/programmes/a2/. Additional data on performance indicators should be included in PRIS and broader the scope of PRIS with the development of new tables to collect data on the use of nuclear power plants for non-electrical applications and on decommissioning of nuclear power plants. *Scientific Secretary: Ms. R. Spiegelberg-Planer.*

Implementation of the **Nuclear Economic Performance Information System (NEPIS)** worldwide will continue in 2001 with the main activities being followed and implemented through an Internet Forum using the IAEA Virtual Office Business Collaborator. An advisory Group Meeting is planned to be held from 1 to 4 October 2001 at the IAEA Headquarters. The meeting should discuss bench marking analysis using NEPIS data and the development of a methodology to correlate technical and economic performance. The later is also subject of a Coordinated Research Project on national approaches to correlate performance and O&M budget, whose results should add upon. *Scientific Secretary: Ms. R. Spiegelberg-Planer.*

The annual updates of the **Country Nuclear Power Profiles** will start in 2001. The profiles, now released only on CD-ROM, provide an integrated source of key background information about nuclear power programmes descriptive and statistical overview of the overall economic, energy, and electricity situation in each country, and its nuclear power framework. The annual updates should also cover the changes in the nuclear sector and update the statistical data on energy and economic situation as well as on the status and trends of nuclear power.
Scientific Secretary: Ms. R. Spiegelberg-Planer.

NPP Control and Instrumentation

Biennial meeting of the International Working Group on Control and Instrumentation of Nuclear Power Plants (IWG-NPPCI), May 2001, Vienna, Austria. The meeting will address recent national results in implementation of NPP Control and instrumentation programmes and international events. The meeting will identify and initiate the activities enabling to make the best use of the available and emerging technologies to meet the plant operational and safety needs in an economic manner. The IWG will also review terms of reference and scope of activities in accordance with the MSs demands. The target users of this information are R&D organizations, designers and decision makers. *Scientific Secretary: Ki-Sig Kang*

Specialists Meeting **on Effective Management of NPP I&C Modernization Projects** is planned to be organized in Garching, Germany on 26-29 September 2001. The demands for modernization to the existing I&C systems in NPPs are increasing to enhance safety and improve availability and reduce the operation and maintenance costs. However, modernization of I&C system brings with several challenges. The meeting will consider the determination of which systems to modernize, what technology to use, how to implement new systems so that it will work together with older systems in a different technology.
Scientific Secretary, Mr. Ki-Sig Kang

Internet forum for exchange of experience on the impact modern technology on NPP I&C systems.
Modern I&C technologies on NPP I&C systems offer significant opportunities to improve the access and presentation of information to the user. This internet forum would not only provide a mechanism to exchange new information such as modernization experience, cost/benefit analysis and modern information, but also other useful information such as:

- A calendar of modern I&C guideline
- Access to related publications of the I&C techmnology events
- Links to other related web sites

Contact Mr. Ki-Sig Kang for more information.

NPP Life Management

Specialists' Meeting on **Irradiation Effects and Mitigation** is planned to be organized in Gloucester, United Kingdom on 14-17 May 2001. The main objective of the meeting is to exchange information on recent results, research and utility experience in radiation damage of RPV steels, surveillance programmes and topics of annealing and re-embrittlement with the aim to provide guidance and recommendations for further optimisation of surveillance and annealing programmes as well as directions for future studies in the subject area. *Contact: Mr. V. Lyssakov .*

Second Research Co-ordination Meeting (RCM) on **Mechanism of Nickel Effect in Radiation Embrittlement of RPV Steels** is planned to be held in Sazopol, Bulgaria from 26 to 29 of May 2001.
The meeting will consider and co-ordinate first results of material testing mostly for non-irradiated specimens.
Scientific Secretary: Mr. V. Lyssakov.

Second Research Co-ordination Meeting on **Surveillance Programmes Result Application to Reactor Pressure Vessel Integrity Assessment** is planned to be held in Prague, Czech Republic, from 12 to 14 September 2001. The meeting will consider and co-ordinate first results of material testing, some results from studies of material properties at micro-structural level and future activities in accordance with the existing work matrix for both irradiated and non-irradiated specimens. *Scientific Secretary: Mr. V. Lyssakov.*

First Research Co-ordination Meeting on **Verification of WWER steam generator tube integrity** is planned to be held at IAEA Headquarters, Vienna, from 7 to 10

May 2001. The meeting will serve to discuss the inspection scope and methods which will basically cover comparison of non-destructive (eddy current) testing results with destructive (mechanical, microstructural, microanalytical) testing results on the same steam generator tube samples with special attention to operational history data.
Scientific Secretary: Mr. P. Trampus

SPM on **"Master Curve Testing and Results Application",** 17-19 September 2001, Prague, Czech Republic *(Mr. V. Lyssakov)*
The objective is to provide international forum for information exchange on the recent results in applications of the Master Curve approach in RPV integrity assessment including use of small size surveillance specimens and multi-temperature approach. The meeting will review and discuss recent results in RPV material testing by the use of the Master Curve approach and results application to surveillance programmes and RPV integrity assessment.
The target users of this information are R&D organizations, designers, engineers and regulatory authorities involved in the RPV integrity assessment.

SPM on **"Risk informed aspects on NPP life management - emphasis on integrity of primary circuit components",** 8-10 October 2001, Budapest, Hungary. The objective is to provide international forum for information exchange on the recent results in applications of reliability based structural integrity analysis with the emphasis on key component integrity using the experience from inspection and operation statistics. The meeting will review and discuss recent results in NPP components structural integrity assessment using probabilistic methods of assessment based on inspection and operating experiences.
The target users of this information are R&D organizations, designers and engineers and regulatory authorities involved in the RPV integrity assessment.
(Mr. V. Lyssakov)

SPM on **Optimization of NPP maintenance programme** will be held in Charlotte, NC, USA, 19-22 June 2001. A systematic evaluation approach to establishing what maintenance tasks are to be performed on which systems, structures and components and at what periodicity can lead to optimize the use of resources (maintenance costs, personnel doses, equipment and tools, competent personnel) allocated for maintenance and availability of plant. In addition, a systematic method of prioritizing which systems should be worked on and what combination of systems can be worked on at the same time. This approach can be used in establishing a preventive maintenance programme and for the optimization of the ongoing maintenance programmes. The process seeks to make the best use of condition based maintenance where unnecessarily costly maintenance actions and associated maintenance error induced failures can be avoided. If a probabilistic risk assessment has been performed, its result can be used to help to define the important systems and components.
The purpose of the meeting is to provide international forum for exchanging information to identify approaches and methodologies in the Member States on how maintenance programme optimization contributes to NPP performance improvement and service life optimization. *Contact: Mr. P. Trampus*

Develop a technical document on **Effects of Neutron Irradiation in RPV Weldments and Steels**. The overall objective is to revisit and update earlier IAEA publication with similar title with the purpose of providing the state of the art publication on the recent investigations and methodologies in monitoring and ameliorating technologies for irradiation embrittlement as well as provide the most modern approaches to the understanding of irradiation damage mechanisms.
Two consultants meetings are planned to review initial draft document in Vienna during the year. The technical document is planned to be available in 2002.
Scientific Secretary: Mr. V. Lyssakov

The work on the development of the **International Database on NPP Containment** will continue in 2001. Two consultants meeting will be held during the year with the aim to finalise Database structure and filing system and to provide the requirements for database developers. The first meeting willtake place from 24 to 26 April 2001 with the aim to finalize the Database structure and define the future Database software architecture. *(Mr. V. Lyssakov)*

Support to Technical Co-operation Activities

List of TC projects to be implemented in 2001-02 and supported by NPES:

Regional East Asia and the Pacific:
Management of changes for competitive nuclear power performance *(TO: Mr. P. Trampus)*

Regional Europe:
Improvment of primary circuit component integrity *(TO: Mr. P. Trampus)*
Optimisation of NPP performance and service life *(TO: Mr. B. Gueorguiev)*

Regional Latin America:
Reducing costs in NPP construction and operation *(TO: Mr. B. Gueorguiev)*

Armenia:
Strengthening in-service inspection through modern NDT methods *(TO: Mr. P. Trampus)*

Brazil:
Monitoring and diagnostic techniques for nuclear reactors *(TO: Mr. P. Trampus)*
Modernisation of NPP control room and operator support systems *(TO: Mr.K.S. Kang)*

Systematic Approach to Training (SAT) for Angra NPPs*(TO: Mr. T. Mazour)*
Structural integrity analysis of nuclear reactor components *(TO: Mr. V. Lyssakov)*

Bulgaria:
Re-training personnel involved in decommissioning Kozloduy NPP *(TO: Mr. T. Mazour)*
Upgrading reactor pressure vesselsurveillance programme for Kozloduy NPP *(TO: Mr. V. Lyssakov)*
Planning and management of decommissioning Kozloduy NPP units 1 & 2 *(TO: Mr. P. Trampus)*
Development of WWER-440 full scope replica control room simulator for Kozloduy NPP *(TO: Mr. A. Kossilov)*

China
Development of managers and management systems for the Qinshan NPP *(TO: Mr. T. Mazour)*

Czech Republic:
Evaluation of radiation damage attenuation in WWER reactor pressure vessel and core internals
(TO: Mr. V. Lyssakov)

Egypt:
Human resourcedevelopment for nuclear power project preparation and project management *(TO: Mr. Rao)*

Islamic Republic of Iran:
Strengthening owner's function for Busher NPP project *(TO: Mr. B. Gueorguiev)*

Kazakhstan:
NPP siting in Kazakhstan *(TO: Mt. A. Kossilov)*

Mexico:
Modelling radiation induced degradation in reactors *(TO: Mr. V. Lyssakov)*
Structural integrity program of reactor pressure vessel and internals from Laguna Verde NPS*(TO: Mr. V. Lyssakov)*

Morocco:
Pre-contract activities for the first nuclear power plant *(TO: Mr. M. Condu)*
Feasibility of small/medium size reactors for electricity production. *(TO: Mr. M. Condu)*

Republic of Korea:
Upgrading technical capabilities of nuclear power training *(TO: Mr. P. Trampus)*

Romania:
Technical support for the improvement of Cernavoda NPPoperation management *(TO: Mr. R. Clark)*
Predictive maintenance for safety relatedcomponents of Cernavoda NPP *(TO: Mr. K.S. Kang)*

Russian Federation:
Fracture toughness of WWER pressure vessel materials *(TO: Mr. P. Trampus)*

Turkey:
Public awarenessof nuclear energy and comparative energy studies *(TO: Mr. Rao)*
Establishment of materials testing and characterisation laboratory *(TO: Mr. P. Trampus)*

Ukraine:
In-service inspection and plugging of WWER-1000 steam generators *(TO: Mr. P. Trampus)*
Support for decommissioning of Chernobyl NPP *(TO: Mr. P. Trampus)*

Activities in the framework of Regional TC projects

RAS/4/021 on "Management of change for competitive nuclear power performance" is the follow up project of RAS/4/015 and 'sister' project of RAS/9/025. The basic objectives of the project is to strengthen the capabilities of utility/NPP managers to maximize returns from NPPs trough application of international best practices on management for excellence in NPP construction and operation, and through enhanced regional co-operation. *Technical Officer: P. Trampus*

Main activities under the project are:

Joint Management Workshop with special focus on management competencies required for the competitive environment, Hayian, China, 21-25 May. *Implementing Officer: P. Trampus*
The objective of the workshop is to exchange information on current operational and safety issues of NPPs, and to emphasise the challange facing management in the competitive environment and the competencies required to overcome them.

Regional Workshop on NPP maintenance and in-service inspection, Wuhan, China, 24-28 September. *Implementing Officer: P. Trampus*
The purpose of the workshop is to familiarize participants with and to exchange experiences on engineering and managerial aspects of NPP maintenance and ISI.

Regional Training Course on Mechanical equipment, Ulsan, Korea, 8 October - 2 November. *Implementing Officer: P. Trampus*
The purpose of the course is familiarize the participants with principles of major equipment of NPP for maintenance activity.

RER/4/024 on "Improvement of primary circuit component integrity" is the continuation of the TC regional project RER/4/020 with an extended scope. The main objetives of the project are to collect and analyse elements of ensuring structural integrity of the primary circuit components at NPPs in the region to be able to increase the reliability of structural integrity assessment, and to improve long term integrity of

primary circuit components as essential input for lifetime evaluation. *Technical Officer: Peter Trampus*

Main activities under the project are:

Regional Workshop on Qualification of ISI systems with special regard to the Technical Justification, Brno, Czech Republic, 12-16 March. *Implementing Officer: P. Trampus*
The main objective of the workshop is to present and discuss the results of the pilot qualification process (Pilot Study) to evaluate the application of the IAEA inspection qualification guidelines to a real plant components with special regard to Technical Justification.

Regional Workshop on Application of LBB concept, Ljubljana, Slovenia, 14-17 May. *Implementing Officer: P. Trampus.*
The purpose of the workshop is to familiarize participants with and to exchange experiences on technical applications of the leak-before-break (LBB) methodology and its impact on primary piping integrity.

Regional Workshop on Condition monitoring methods and techniques for assessing lifetime. Kiev, Ukraine, 3-7 September. *Implementing Officer: P. Trampus*
The purpose of the workshop is to present and discuss various condition monitoring methods and techniques applied in ensuring structural integrity of primary circuit components, and condition based maintenance as part of entire life management strategy.

Regional Workshop on Structural integrity assessment, Erlangen, Germany. *Implementing Officer: P. Trampus*
The main objective of the workshop is to familiarize participants with the structural integrity assessment methodologies applied for primary circuit components and its relation to safety assessment as well as lifetime evaluation.

RER/4/025 on "Optimization of NPP Performance and ServiceLife" is a newly established regional project for Europe. Group activities will address the major issues of interest, which include ensuring long-term operation of NPPs; management strategies, tools, and techniques for sustained improvement of performance and service life; management of change; management of interfaces and human resource management. *Technical Officer; Mr. B. Gueorguiev.*

The project work plan for 2001 includes:
Technical Meeting on **Cooperation Among European Nuclear Training Centers,** hosted by NPP Paks, Hungary (see page 11 for more details).

Regional Workshop on **Strategies and Policie in Implementation of NPP Life Management Programmes** will be held in Ljubljana, Slovenia on 18 -22 June 2001.
The purpose of the workshop will be to present and exchange experience on the main issues and practical measures related to the development and implementation of NPP Life Management Programmes. The emphasis will made on operational, regulatory, political and social aspects as distinct from safety. The workshop will consider questions of plant life management as the interactive integration of ageing management and economic planning, aiming to optimise plant operation and maintenance including pre-shut down period and decommissioning while providing the equipment for the successful operation during the whole plant operation period maintaining the acceptable safety level and at the same time maximising profit from the sale of electricity. *Implementing Officer: Mr. V. Lyssakov.*

Regional Workshop on "Economics of NPP Performance" 19-23 November 2001, Paks NPP, Hungary. *Implementing Officer; R. Spiegelberg-Planer*

Regional Workshop on "Managing Human Resources during Organizational Transition", September 2001, Cernavoda NPP, Romania. *Implementing Officer; Mr. T. Mazour*

Regional Workshop on "Configuration Management throughout Plant Service Life", 10-14 September 2001, Krisko NPP, Slovenia. *Implementing Officers: Messrs. A. Kossilov and V. Kotyza*

Regional Workshop on "Experience in the Management of Delayed Nuclear Power Projects", 22-26 October 2001, Mochovce NPP, Slovak Republic. *Implementing Officer; Mr. B. Gueorguiev*

Support for participating in an International Meeting on "Nuclear Power in Eastern Europe: Safety, European Integration, Free Electricity Market", 17-20 June 2001, Varna, Bulgaria. *Implementing Officer: Mr. B. Gueorguiev*

Regional Training Courses on:
- "Optimization of NPP Maintenance", 8-19 October, Karlsruhe, Germany. *Implementing Officer; Mr. P. Trampus*
- "Modernization of NPP Instrumentation and Control Systems", 5-16 November, Karlsruhe, Germany. *Implementing Officer: Mr. K. Kang*

RLA/4/016 on Reducing Costs in NPP Construction and Operation The project work plan proceeds in 2001 with its second phase on the Costs and Processes Management Groups with focus on analysis of selected pilot processes on operation and maintenance. A report on this selected pilot case shall be prepared as the result of phase II. A specific training of experts on the NEPIS and IDEF3 will be provided. Two Executive meetings (5th in Mexico, 25-29 June and 6th in November in Brazil) will monitor project implementation. *Technical Officer: Mr. B. Gueorguiev*

Planned Activities for 2002-2003

The title of Subprogramme A.1. has been changed to **"Engineering and Management Support for Competitive Nuclear Power"** to reflect, more appropriately, the issues addressed.

The main issues in Member States required to be addressed by the subprogramme are:
- further improving NPP performance and competitiveness without compromising safety;
- optimizing plant service life and decommissioning of ageing NPPs; improving training and qualification of nuclear power personnel;
- preserving knowledge and competence in the nuclear power sector as the nuclear work force ages;
- strengthening national nuclear power infrastructure in developing Member States considering the introduction of nuclear power through the use of small and medium sized reactors (SMRs), and those with economies in transition continuing their nuclear power programmes; and
- implementing quality assurance and quality management programmes in accordance with Agency standards.

The objective is to increase Member State capabilities in utilizing the best engineering and management practices for:
- improving NPP performance and competitiveness
- optimizing plant service life and decommissioning and
- strengthening nuclear power infrastructure

Outcomes expected to be induced by the use of the Sub-programme outputs are:
- Increased capabilities in Member States to: improve NPP performance and competitiveness and to optimize NPP service life;
- Strengthened nuclear power infrastructure and implement quality assurance and quality management programmes in accordance with Agency standards; and
- Enhanced the effectiveness of training and qualification of nuclear power personnel through the application of Agency guidance on SAT (Systematic Approach to Training) methodology

Programme changes and trends:
In the past, the subprogramme focus was on developing guidance on improving nuclear power programme planning and implementation, NPP performance and service life, and the SAT methodology. The focus of activities in 2002–2003 is shifted from integrated programme planning to strengthening national nuclear power infrastructures. Activities related to decommissioning decisions are included in the new project on guidance on engineering and management practices for optimization of NPP service life including decommissioning. Activities related to performance based quality assurance (QA) programmes, project management and economic analyses are incorporated into all the projects. A high priority is accorded to activities that support NPP life management/extension and decommissioning as well as improving NPP overall performance. Relevant activities under an extra-budgetary project on innovative reactors and nuclear fuel cycles would be included as appropriate.

The Sub-programme consists of the following projects:
Project A.1.01: Support to Member States in strengthening national nuclear power infrastructure
Project A.1.02: Guidance on proven practices for improving nuclear power plant performance and competitiveness
Project A.1.03: Guidance on engineering and management practices for optimization of nuclear power plant service life including decommissioning
Recurrent Project A.1.04: Maintenance of databases to support optimization of nuclear power plant performance, service life and infrastructure. Contact: Mr. B. Gueorguiev

Recent Publications

1997

IAEA-TECDOC-919: ***Management of Procurement Activities in a Nuclear Installation*****,** January 1997

IAEA-TECDOC-922: ***Performance Analysis of WWER-440/230 Nuclear Power Plants*****,** January 1997

IAEA-TECDOC-928: ***Good Practices for Cost Effective Maintenance of Nuclear Power Plants***, February 1997

RDS-2/17: ***Nuclear Power Reactors in the World*** (April 1997 edition)

IAEA-TECDOC-952: ***Advanced Control Systems to Improve Nuclear Power Plant Reliability and efficiency,*** July 1997

STI/PUB/1051: ***Operating Experience with Nuclear Power Stations in Member States in 1996***

1998

IAEA-TECDOC-995: ***Selection , Specification, Design and Use of Various Nuclear Power Plant Training Simulators*****,** January 1998

IAEA-TECDOC-1016: ***Modernization of Instrumentation and Control in Nuclear Power Plants,***
May 1998

IAEA-TECDOC-1024: ***Selection, Competency Development and Assessment of Nuclear Power Plant Managers***, June 1998

STI/PUB/1050: ***Choosing the Nuclear Power Option: Factors to be Considered***

RDS-2/18: ***Nuclear Power Reactors in the World (April 1998 edition)***

Country Nuclear Power Profiles, March 1998

STI/PUB/1070: ***Operating Experience with Nuclear Power Stations in Member States in 1997***

IAEA-TECDOC-1052: ***Nuclear Power Plant Organization and Staffing for Improved Performance: Lessons Learned,*** November 1998

IAEA-TECDOC-1057: ***Experience in the Use of Systematic Approach to Training (SAT) for Nuclear Power Plant Personnel,*** December 1998

IAEA-TECDOC-1058: ***Good Practices with Respect to the Development and Use of Nuclear Power Plant Procedures***, December 1998

Safety Report Series No. 6: ***Safety Issues for Advanced Protection, Control and Human-Machine Interface Systems in Operating Nuclear Power Plants***, 1998 (prepared jointly with NSNI)

1999

IAEA-TECDOC-1063: ***IAEA World Survey on Nuclear Power Plant Personnel Training,*** January 1999

IAEA-TECDOC-1066: ***Specification of Requirements for Upgrades Using Digital Instrument and Control Systems,*** January 1999

IAEA-TECDOC-1078: ***Technical Support for Nuclear Power Operations,*** April 1999

RDS-2/19: ***Nuclear Power Reactors in the World*** *(April 1999 edition)*

IAEA-TRS-384: ***Verification and Validation of Software Related to Nuclear Power Plant Instrumentation and Control,*** 1999

IAEA-TRS-387: ***Modern Instrumentation and Control for Nuclear Power Plants, A Guide Book,*** 1999

STI/PUB/1087: ***Operating Experience with Nuclear Power Stations in Member States in 1998***

IAEA-TECDOC-1090: ***Quality Assurance within Regulatory Bodies,*** June 1999

IAEA-TECDOC-1095: ***The Impact of the Year 2000 Issue on Electricity Grid Performance and Nuclear Power Plant Operation in Bulgaria, the Russian Federation and Slovakia,*** June 1999

IAEA-TECDOC-1098: ***Evaluating and Improving Nuclear Power Plant Performance,*** July 1999

IAEA-TECDOC-1110: ***Management of Delayed Nuclear Power Plant Projects***, September 1999

EUR-18718: NDT ***Methods for Monitoring Degradation. Proceedings of Joint EC/IAEA Specialists' Meeting, Petten, The Netherlands, 10-12 March 1999***

IAEA-TECDOC-1123: ***Strategies for Competitive Nuclear Power Plants***, November 1999

IAEA-I2-SP-908.8: ***Proceedings of the Specialists' Meeting on Evaluating the Effectiveness of Training for Nuclear Facility personnel, Richland/Pasco, Washington, USA, 22-25 June 1999***

2000

Human-Machine Interface for Off Normal and Emergency Situations in Nuclear Power Plants. Proceedings of IAEA Specialists Meeting, Taejon, Korea, 26-28 October 1999, **KAERI/TR-1456/2000, IAEA-J4-SP-1123,** 2000

IAEA-TRS-397: ***Quality Assurance for Software Important to Safety,*** 2000

RDS-2/20: ***Nuclear Power Reactors in the World*** *(April 2000 edition)*

IAEA-TECDOC-1140: ***Effective Handling of Software Anomalies in Computer Based Systems at Nuclear Power Plants,*** March 2000

IAEA-TRS-396*: Economic Evaluation of Bids for Nuclear Power Plants, 1999 Edition*, April 2000

IAEA-TECDOC-1147: ***Management of Ageing of I&C Equipment in Nuclear Power Plants***, June 2000

IAEA-TECDOC-1170*: Analysis Phase of Systematic Approach to Training (SAT) for Nuclear Plant Personnel***,** August 2000

IAEA-TECDOC-1182*: Quality Assurance Standards Comparison Between IAEA 50-C/SG-Q and ISO 9001:1994,* 2000

2001

IAEA-TECDOC-1204*: A Systematic Approach to Human Performance Improvement in Nuclear Power Plants: Training Solutions*, March 2001

IAEA-TECDOC-1209*: Risk Management: A Tool for Improving Nuclear Power Plant performance*, April 2001

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