International Atomic Energy Agency
Vienna, Austria

ACCIDENT ANALYSIS AND ITS ASSOCIATED TRAINING PROGRAMME FOR RBMK-1000 KURSK NPP (PHASE II)

CO-AUTHORS AND CONTRIBUTORS (in alphabetical orders)

- CHAKRABORTY S., SWITZERLAND
- CLEMENTE M., GERMANY
- DOLGANOV S., RUSSIA
- FISHER J.E., USA
- JANKOWSKI M.W., IAEA
- KHATIB-RAHBAR M., USA

CO-AUTHORS AND CONTRIBUTORS (in alphabetical orders)

- KNOGLINGER E., IAEA CONSULTANT
- MISAK J., IAEA
- MODRO M., USA
- NEELOV S., RUSSIA
- POTAPOV A.A., RUSSIA
- RADKEVICH V.E., RUSSIA
- ROZHDESTVENSKY M.I., RUSSIA

PHASE I

- April 1998 – September 2001
- Summary of Phase I Presented in the First IAEA Paper

PHASE II

- October 2001 – March 2003
- Objectives
- International Participation and Support
- Work Conduct and Agreement Reached
- Areas of Concentration
- Integrated Training and Accident Analysis System (ITAAS)

PHASE II
Objectives

- Demonstrate and Verify IAEA Accident Analysis Guidelines, and, in Particular Applicability to RBMK
- Develop, Validate, and Install at Kursk NPP Comprehensive Safety and Accident Analysis Capabilities Based on RELAP5-3D Code Including Training Materials

PHASE II
Objectives

- Adapt and Implement Procedural Steps, as Required for Safety Analysis Report (SAR), of Performing Confirmatory, or Audit, Analysis Examples

- Exchange Information, Transfer of Technology, and RELAP5 Technical Support, Assistance, and Training

PHASE II
Objectives

- Jointly Develop a System, or Tool, for Training with a Comprehensive and Integrated Safety Analysis Capability Based on RELAP5 code
- The Order and Procedure for the Use of the System is Determined by Kursk NPP as the Operating Organization

PHASE II
Objectives

- The tool - "Integrated Training and Accident Analysis System (ITAAS)" - Contains Deterministic and Probabilistic Analysis, Training, and Extensive Reference Modules

PHASE II
International Participation and Support

- Extra Budgetary Programme Sponsored by the Governments of the United State and Switzerland
- Significant In-kind Contribution Provided by the Government of Germany

PHASE II
International Participation and Support

- Energy Research, Inc., USA
- GRS, Germany
- IAEA Consultancy
- Idaho National Engineering and Environmental Laboratory, USA

PHASE II
International Participation and Support

- Russian Research Center "Kurchatov Institute", Russia
- Kursk NPP, Russia
- Research and Development Institute for Power Engineering, Russia
- Concern "Rosenergoatom", Russia

PHASE II
Areas of Concentration

- ITAAS Specification and Proposed Modifications
- ITAAS Introduction and Use at Kursk NPP
- Development Tasks

PHASE II

ITAAS SPECIFICATION

PHASE II
ITAAS Specification
Proposed Modifications

- Introducing 2 Versions
  - RBMK-1000 Kursk NPP plant specific
  - Generic, or "tutorial", with a possible application for Leningrad and Smolensk NPPs

PHASE II
ITAAS Specification
Proposed Modifications

- Modular Design and Connectivity Should Include Interfaces for Other Codes, Tools, etc.
- Option to Use Plant Computer Input (On-line Transfer of Data to Code's Input Model)

PHASE II
ITAAS Specification
Proposed Modifications

- Initial Conditions for Any Plant's Computation
- PSA Module with SAPHIRE Code
  - Conversion subroutine for Risk Spectrum

PHASE II
ITAAS Introduction and Use at Kursk NPP

- **Fundamental Aspects of the Introduction and Use of and "Integrated Training and Accident Analysis System" In the Personnel Training System at the Kursk Nuclear Power Plant**

PHASE II
Development Tasks

- Procedures and Guidelines for Accident Analysis
  - GAN review
- Examples of Analyses as Required for SAR
  - 3 Examples from Kursk SAR
  - 2-3 Examples plant specific RELAP5-3D verification calculations

PHASE II
Development Tasks

- RBMK-1000 Kursk NPP Database
  - Independent review by Concern "Rosenergoatom" (REA) and the plant

PHASE II
Development Tasks

- Code Input Model and Engineering Handbook
  - T/H and neutronic models
  - CPS heat transfer model
  - Independent review by REA and the plant

PHASE II
Development Tasks
Confirmation of Analyses

- **Investigation of Transient Based on Plant Procedure for Void Reactivity Measurement RELAP5-3D and ATHLET+Q/C**

PHASE II
Development Tasks
Confirmation of Analyses

- **Withdrawal of a Group of Control Rods for the Following Core States**
  - **"Old" core configuration using fuel with 2.4 % enrichment.**
  - **"New" (after reconstruction), partly new fuel with 2.6 % enrichment and cluster rods**

ATHLET + Q/C

PHASE II
Development Tasks
Confirmation of Analyses

- Benchmark One of the Previous Cases (ATHLET+SADKO)
- Operational Transient for Specific Case of Changing Gas Composition in Reactor Cavity (RELAP5-3D)*
- Stability Analysis (RELAP5-3D)*
- Station Blackout (RELAP5-3D)*

* Depending on funds availability

FINAL TECHNICAL REPORT
PHASE I & II

SYSTEM DELIVERED & TESTED AT THE PLANT

31 MARCH 2003