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Nuclear Safety
Program

Activity Report
November 2000

Office of International Nuclear Safety and Cooperation - Dr. James Turner, Director
Improving the Safety of Soviet-Designed Nuclear Power Plants

Host-country plan finalized for developing, implementing emergency operating instructions at Russian plants

Russia

In late October, nuclear specialists defined next steps in the work to implement symptom-based emergency operating instructions (EOIs) at three nuclear power plants in Russia. The three—Balakovo, Kola, and Novovoronezh nuclear power plants (NPPs)—had been selected previously as the pilot sites for EOI development for the VVER-1000, VVER-440/213, and VVER-440/230 reactor models, respectively.

Discussions focused on a plan produced by Rosenergoatom specialists for 1) EOI development and implementation, 2) future activity formulation and prioritization, and 3) EOI analytical validation. Organizations participating in the discussions included Rosenergoatom, the Russian Research Institute for Nuclear Power Plant Operation (VNIIAES), Gidropress, Atomenergoproekt, and the Kurchatov Institute. Representatives of Balakovo, Kola, and Novovoronezh NPPs also took part, as did two U.S. specialists from Pacific Northwest National Laboratory.

During the discussions, Rosenergoatom staff presented the organization's current development plan, priorities, and needs related to EOIs. Spokespersons for the three nuclear power plants reviewed the status of EOI development at each plant. The U.S. team members gave a presentation in which they compared Bulgaria's experience in EOI development and implementation with the Rosenergoatom plan.

The Russian Research Institute for Nuclear Power Plant Operation (VNIIAES) in Moscow was the setting for late-October discussions of a plan to develop emergency operating instructions for three Russian nuclear power plants.

The U.S. team agreed to draft a memorandum of understanding (MOU) to be signed by all meeting participants defining the EOI development plan and roles and responsibilities of all participating parties. The MOU was to include the following terms, tentatively agreed to by all parties:

- Rosenergoatom will be the manager of all Russian activities.
- Rosenergoatom will finance activities required for EOI development, technical validation, and implementation over andabove that financing provided by the U.S. Department of Energy.
- The three nuclear power plants will evaluate the feasibility of restructuring current EOI development contracts to assign all remaining unpaid funds to EOI technical validation.
- Rosenergoatom will define all contracting and subcontracting organizations.
- The U.S. team will provide financial support to assist in funding EOI technical validation, assuming that the three current contracts with the plants for EOI development are restructured as described above.
- The U.S. team will provide technical assistance and mentoring for technical validation, verification and validation, training, regulatory support, and implementation.
- Russian computer codes will be used in conducting the technical validation.

In addition, the U.S. team agreed to initiate a draft statement of work for Rosenergoatom to develop an EOI analytical guideline for the Russian plants. In turn, Rosenergoatom agreed to initiate a draft proposal for development of an EOI analytical guideline by the end of November. Rosenergoatom agreed further to review the analytical scenarios developed during the June 2000 workshop and use them to initiate a draft proposal for analytical validation of the EOIs for the three Russian pilot plants. The U.S. team is considering the possibility of providing a workshop for Gosatomnadzor staff to explain the U.S. methodology for EOI technical validation. (Dennis Meyers, DOE, 301-903-1418; Kent Faris, PNNL, 509-372-4068) V

Training in auditing supports Kalinin safety upgrades

During the first two weeks of November, four Russian specialists received training in the principles and practices of quality assurance auditing. The Russian specialists are participants in the U.S. Department of Energy's effort to transfer control system testing technology to host-country organizations. The course, provided by U.S. contractor Colandrea & Associates in San Diego, California, was designed to demonstrate modern quality assurance auditing practices. The Russian specialists will use their training in determining the quality of nuclear power plant control system equipment being supplied to Kalinin NPP as part of the plant's work to enhance overall safety. (Grigory Trosman, DOE, 301-903-3581; Ron Wright, PNNL, 509-372-4076) V

Training in quality assurance auditing will help these Russian specialists ensure the quality of control system equipment for Kalinin NPP. Shown in class, left to right, are Andrei Legezo and Pavel Polyakov, VNIIAES; Vladimir Visotsky, Kalinin NPP; and Zinaida Zimina, Nizhny Novgorod Atomenergoproekt Institute.

Ukraine

Progress reviewed for Zaporizhzhya safe-shutdown analysis

U.S. specialists from Brookhaven and Pacific Northwest national laboratories met in early November with the Ukrainian working group involved in the safe-shutdown analysis for Zaporizhzhya Unit 5. Kyiv Institute Energoproject is performing the analysis.

During the meeting, the U.S. team members provided additional training to working group members on the details of performing the deterministic analysis portion of the overall analysis. The meeting also encompassed a review of the group's draft report, ***Fire Compartments and Cells***. Issues associated with the performance of probabilistic analysis also were discussed. Criteria for defining fire compartments and fire cells were discussed to help resolve issues resulting from this portion of the analysis. Based on the report review and discussions, the working group was able to minimize the number of fire compartments that will have to be analyzed. The group already has identified several fire barrier deficiencies and unsealed penetrations. The deterministic analysis will determine if the deficient fire barriers present safe-shutdown vulnerabilities.

The U.S. team provided Energoproject specialists with a copy of the draft Level 1 probabilistic risk assessment for Zaporizhzhya Unit 5. The report will assist them in conducting the deterministic and probabilistic portions of the project. Portions of the report were reviewed to help the working group to understand what data would be needed to perform the safe-shutdown analysis.

Working group members also received training on the application of probabilistic data to the project tasks along with use of computer modeling techniques. The group discussed the relative merits of using the REVEAL or SAPHIRE computer codes to assist in the analysis. Members determined the SAPHIRE program would be easier and more cost-effective to use for the analysis because the models for Unit 5 already are built.

Energoproject staff gave a presentation on the Access database they developed to support the deterministic analysis. The working group planned to complete entering data into the database later in November. Completion of each fire compartment analysis should be completed in about four months. If this schedule is maintained, the project will be on track to complete the deterministic analysis portion by June 2001. (Grigory Trosman, DOE, 301-903-3581; Andrew Minister, PNNL, 509-376-4938) V

Khmelnytskyy safety assessment progress reviewed

U.S. and host-country staff involved in the in-depth safety assessment for Khmelnytskyy NPP held their monthly project review in Neteshin in mid-November. Representatives of Kyiv Institute Energoproject (the Ukrainian technical support organization) and Data Systems & Solutions (the U.S. technical assistance contractor) participated in the review.

The project's U.S. technical coordinator from Argonne National Laboratory reviewed the status and technical quality of the current data collection task. It appears it will take a month longer than projected for this task to be completed. In addition, the group agreed on the scope of task orders related to the plant-specific probabilistic risk assessment. That assessment will be prepared using elements from deliverables now being finalized by the in-depth safety assessment project under way at Zaporizhzhya NPP, the lead plant for Ukraine's nuclear power facilities with VVER-1000 reactors. (Walter Pasedag, DOE, 301-903-3628; Charles Dickerman, ANL, 630-252-4622) V

Bulgaria

Simulator modification completed at Kozloduy

A turnover meeting on November 16 marked completion of a collaborative project to modify the full-scope simulator for Kozloduy Unit 6. The modifications, begun in July 1999 and completed in late September 2000, involved upgrading the simulator's hardware to reflect the actual configuration of the plant as well as software to support the new hardware and system changes. The U.S. contractor for the project, GSE Power Systems, Inc., had worked directly with plant management to design the original simulator for Unit 6. However, even before the simulator was completed, the physical structure of Unit 6 underwent substantial changes, necessitating modifications to the simulator.

On September 27, GSE, its Bulgarian subcontractor, Risk Engineering, Ltd., and technical specialists from Kozloduy NPP approved the U.S.-supported software modifications and documentation as well as hardware modifications subsidized by the plant. The modified simulator was declared ready for training and has entered the one-year warrantee period. U.S. team members from Pacific Northwest National Laboratory

participated with the contractor and plant representatives in the mid-November turnover at Kozloduy NPP. (John Yoder, DOE, 301-903-5650; Ken Erickson, PNNL, 509-372-4063) V

Lithuania

Ignalina specialists continue work on safety training course for plant workers

In early November, a training specialist from Human Performance Analysis Corporation worked with training and technical specialists at Ignalina NPP. The group is adapting previously developed instructional materials for a training course on general employee safety to make them specific to Ignalina NPP. Training specialists from Ignalina expect to implement the course in early 2001. (John Yoder, DOE, 301-903-5650; Don Draper, PNNL, 509-372-4079) V

Lithuania Nuclear Safety Advisory Committee holds quarterly meeting

An international group, formed to support the Lithuanian government's oversight of Ignalina NPP and the nation's nuclear regulatory agency, VATESI, held its quarterly meeting in Vilnius, Lithuania, in late October. Committee members from Japan, Sweden, Germany, Finland, France, the United Kingdom, Lithuania, and the United States participated. Lithuanian organizations represented included Ignalina NPP, VATESI, and the Ministry of Economy. Technical experts representing the U.S. Nuclear Regulatory Commission, the European Bank for Reconstruction and Development, the Finnish regulatory agency STUK, the European Commission, and the Danish Energy Agency also were present for the meeting. The committee's periodic meetings encourage continued progress on safety improvements at Ignalina Unit 2. The group also considers safety issues that may require early shutdown and decommissioning of Ignalina Unit 1. (Dennis Meyers, DOE, 301-903-1418; Lief Erickson, PNNL, 509-372-4097) V

Cross-Cutting Activities

Computer code validation work reviewed

In mid-October, a U.S. team member from Argonne National Laboratory reviewed work completed to validate the RELAP5 computer code for application to safety analyses of VVER and RBMK reactors. The Russian International Nuclear Safety Center (RINSC) in Moscow hosted the meetings related to the code assessment projects.

Participants discussed the need for test data for completing the validation matrix. The Electrogorsk Research and Engineering Center has completed a VVER integral test facility and offered its use in support of the code validation project. RINSC specialists and representatives of the Kyiv National Taras Shevchenko University of Kyiv also discussed availability of the RELAP5-3D

code at RINSC for the university's use in neutron kinetics code assessment. Technical issues for remote access to the code were resolved. (Walter Pasedag, DOE, 301-903-3628; Jordi Roglans-Ribas, ANL, 630-252-3283) V

Planned Activities

• Indicates the event is new or has changed in some way since the previous report was issued.

November 27-December 8 – Kola NPP, Russia
Training. Representatives from VNIIAES, the Balakovo and Novovoronezh training centers, and participating Russian nuclear power plants will work with training specialists from Human Performance Analysis Corporation and Sonalysts, Inc., to begin transferring a simulator instructor training program to Kola NPP. A U.S. team member from Pacific Northwest National Laboratory also will participate. (John Yoder, DOE, 301-903-5650; Al Ankrum, PNNL, 509-372-4095)

• November 27-December 8 – Armenia NPP, Armenia
Training. Armenia NPP training and technical specialists will continue collaboration with a U.S. specialist from Sonalysts, Inc., on transferring a training program for chemistry department shift supervisors to the plant. (John Yoder, DOE, 301-903-5650; Don Draper, PNNL, 509-372-4079)

• December 4-15 – Kozloduy NPP, Bulgaria
Training. Specialists from VNIIAES and Sonalysts, Inc., will work with training and technical specialists from Kozloduy NPP to continue developing a training program for emergency operating instruction trainers at Kozloduy. Work during this session will concentrate on instructional plans and materials specific to Kozloduy's Electroproduction 2 (EP2), which consists of Units 5 and 6, both with VVER-1000 reactors. (John Yoder, DOE, 301-903-5650; Don Draper, PNNL, 509-372-4079)

December 5-6 – Moscow, Russia
Engineering and Technology. Representatives from Brookhaven and Pacific Northwest national laboratories, Bechtel National, and Engineering Planning and Management, Inc., will meet with members of the working group for the Smolensk safe-shutdown analysis. Participants will discuss project task reports, safe-shutdown vulnerabilities identified through the project, and plans for future application of the analysis process to other nuclear power plants in Russia. Russian organizations expected to be represented at the meetings are Atomenergoproekt, VNIIAES, Rosenergoatom, Gosatomnadzor, and Smolensk NPP. (Grigory Trosman, DOE, 301-903-6899; Andy Minister, PNNL, 509-376-6663)

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• **December 4-15 – Khmelnytskyy NPP Ukraine** (rescheduled from December 7-15)
Management and Operational Safety. The quality assurance program at Khmelnytskyy NPP will undergo a comprehensive audit. Audit team members will include quality assurance personnel from Khmelnytskyy and specialists from EnergoAtom and the Nuclear Power Plant Operational Support Institute. The audit is designed to assess Khmelnytskyy NPP compliance with Ukrainian and international standards for quality assurance. (Dennis Meyers, DOE, 301-903-1418; Lief Erickson, PNNL, 509-372-4097)

• **December 6 – Kyiv, Ukraine** (rescheduled from December 12)
Plant Safety Assessment. The management committee for Design Document System Management will review a draft plan to develop and implement configuration management and design basis documentation at Ukraine's four nuclear power plants with VVER reactors. Representatives of Khmelnytskyy, Rivne, South Ukraine, and Zaporizhzhya NPPs will participate with specialists from EnergoAtom, the Nuclear Power Plant Operational Support Institute, Kyiv Energoproject, and Kharkiv Energoproject. A U.S. team member from Pacific Northwest National Laboratory also will attend. (Walt Pasedag, DOE, 301-903-3628; Lief Erickson, PNNL, 509-372-4097)

• **December 7-8 – Trnava, Slovakia**
Simulators. Specialists from Slovakia's Nuclear Power Plant Research Institute (VUJE) and U.S. team members from the U.S. Department of Energy and Pacific Northwest National Laboratory will review work under way to upgrade a full-scope training simulator at the Trnava training center. The simulator replicates Bohunice's Units 3 and 4, which are VVER-440/213 reactors. (John Yoder, DOE, 301-903-5650; Ken Erickson, PNNL, 509-372-4063; Al Ankrum, PNNL, 509-372-4095)

December 7-8 – Moscow, Russia
Engineering and Technology. VNIIAES will host a workshop on fire safety analysis methods at Russian nuclear power plants. Representatives from each of the Russian plants, Rosenergoatom, the All-Russian Research Institute for Fire Protection (VNIIPO), Gosatomnadzor, and other Russian organizations with an interest in fire protection at the nuclear power plants are expected to attend the workshop. Representatives from countries supporting fire hazards analysis of the Soviet-designed nuclear power plants also have been invited to attend and participate. The results of the Smolensk safe-shutdown analysis project will be presented. In addition, representatives from the other nuclear power plants will give presentations on the fire safety issues at their plants. (Grigory Trosman, DOE, 301-903-6899; Andy Minister, PNNL, 509-376-6663)

• December 11-15 – Moscow, Russia
Simulators. VNIIAES will host and conduct a second workshop focused on the normative document for simulator standards and training in Russia. The workshop will include participants from VNIIAES, the Novovoronezh Training Center, and Balakovo, Kursk, and Novovoronezh NPPs. A specialist from Pacific Northwest National Laboratory also will participate. The group will continue discussions on the development and format of a normative document for simulators, topics to be covered in normative simulator documents, and issues related to normative documents for full-scope and multifunctional simulators. (John Yoder, DOE, 301-903-5650; Ken Erickson, PNNL, 509-372-4063)

January 2001 – Kyiv, Ukraine
Training. Work will begin on a project to transfer a pilot training program for control room turbine operators to Rivne, South Ukraine, and Zaporizhzhya NPPs. Specialists from the Khmelnytskyy plant, the Engineering and Technical Center for the Training of Nuclear Industry Personnel, and Sonalysts, Inc., will provide technical assistance. (John Yoder, DOE, 301-903-5650; Don Draper, PNNL, 509-372-4079)

• February 2001 – Kozloduy NPP, Bulgaria
Training. Kozloduy training and technical specialists will implement pilot training programs for the plant's emergency operating instruction trainers. Trainers from both Kozloduy EP1 (Units 1 through 4, the VVER-440/230 reactors) and EP2 (Units 5 and 6, the VVER-1000 reactors) will participate in the course implementations. (John Yoder, DOE, 301-903-5650; Don Draper, PNNL, 509-372-4079)

• February 12-14 – London, United Kingdom
Engineering and Technology; Plant Safety Assessment. U.S. and Russian specialists involved with the Smolensk safe-shutdown analysis will describe their work at the ***Fire & Safety 2001*** conference in London. Ukrainian staff performing the Zaporizhzhya safe-shutdown analysis also will attend this international conference, which is hosted by Nuclear Engineering International. The theme of the 2001 event is "Fire Protection and Prevention at Nuclear Facilities." (Grigory Trosman, DOE, 301-903-6899; Andy Minister, PNNL, 509-376-6663)

The Activity Report is prepared for the U.S. Department of Energy Office of International Nuclear Safety and Cooperation by Pacific Northwest National Laboratory under Contract DE-AC06-76RL01830.

IG0011014