

Activity Report

September 2000

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

***Physical security
upgrades at
Khmelnyskyy
dedicated in ceremony***

Highlight

In early September, Khmelnyskyy nuclear power plant (NPP) hosted a dedication ceremony to celebrate completion of physical security upgrades for Unit 1. The upgraded equipment, procedures, and personnel training will contribute significantly over the long term to the overall level of plant safety for Khmelnyskyy workers, the general public, and all of Ukraine.

Upgraded equipment and other security features now in place for Khmelnyskyy Unit 1 include

- access control to internal vital areas
- a video surveillance and detection subsystem
- physical barriers and guard booths
- an alarm station with its own main computer, self-contained within Unit 1
- maintenance and training procedures for plant staff
- a state-of-the-art database and badging system for personnel identification.

The upgrades are the result of a cooperative nuclear safety improvement project involving Ukraine and the United States. The participating Ukrainian organizations developed the design documentation for the work and organized its endorsement by Ukrainian nuclear regulatory officials. The Ukrainian contribution also included cable connections and partial manufacturing and installation of metal structures. Through the U.S. Department of Energy's Office of International Nuclear Safety and Cooperation, the U.S. team contributed financial and technical support for the effort.





Access controls at the general entrance to Khmelnytsky's Unit 1 reactor building underwent extensive upgrades to improve security. Previously (left photo), both the waist-high turnstile and open-lattice barrier wall were inadequate to meet either Ukrainian or international

requirements for such features. In addition, the guard booth was constructed of wood and windowed with ordinary glass panes. The upgraded entrance (right photo) features a state-of-the-art portal metal detector; guard booth with steel walls, steel door, and bulletproof windows; a full-height turnstile activated by a proximity card reader; and a full-height barrier wall. The new barrier wall also offers a guard-activated door to provide access for larger equipment and emergency evacuation.

All upgrades underwent a verification review prior to their implementation. Reviewers checked all subsystems and documentation to ensure that they met all requirements specified for commissioning by Ukrainian and international norms and standards. Reviewers included officials of EnergoAtom, the Ukraine Ministry of Fuel and Energy, and the Nuclear Regulatory Department, as well as the Ukrainian general contractor for the project, Transexpo Corporation, and U.S. project leads from the U.S. Department of Energy and Pacific Northwest National Laboratory. Following the verification review, EnergoAtom and the Nuclear Regulatory Department formally approved the upgrades.





A set of unguarded heavy doors (left) was all that formerly protected the entrance to the radiological area within

Khmelnyskyy's reactor building. The same entrance (right) now is equipped with a proximity card reader linked electronically to the full-height turnstile to control access and personnel barrier walls extending from floor to ceiling. Pictured with the new equipment are reviewers from Khmelnytskyy NPP, Transexpo Corporation, and Pacific Northwest National Laboratory on their verification walkthrough in early September.

The upgraded subsystems went into operation on a test basis on September 4. Routine operation began on October 15.

Participating in the early September dedication ceremony were the General Director of Khmelnytskyy NPP, the President of EnergoAtom, and U.S. team members from the U.S. Department of Energy and Pacific Northwest National Laboratory. Representatives of the Ukrainian press and television media also were on hand to cover the dedication.

U.S. Department of Energy project manager Grigory Trosman (left) and EnergoAtom president Yuri Nedashkovsky cut a ceremonial ribbon to dedicate physical security upgrades newly implemented at Khmelnytskyy NPP. Others participating in the ceremony included (background, left to right) Anatoly Boyko, deputy plant manager for physical security,



Khmelnyskyy NPP; Andrei Glukhov, project manager, Pacific Northwest National Laboratory; Volodymyr Mazover, president, Transexpo Corporation; Vitaly Kokhan, director of physical protection, EnergoAtom; Yuri Kuchmij, head of the physical protection department, Khmelnytskyy NPP; and Volodymyr Sofiuk, plant manager, Khmelnytskyy NPP.



***Normative Documents
Workshop Held
in Moscow***



The potential for U.S.-Ukrainian collaboration to enhance the level of physical protection at Ukraine's nuclear power plants first was discussed in 1998 (see August 1998 Activity Report). Those preliminary discussions led to onsite reviews at Zaporizhzhya and Khmelnytsky NPPs in early 1999 to identify and prioritize areas of need. The cooperative reviews, which involved representatives of EnergoAtom, Ukraine's Ministry of Fuel and Energy, Zaporizhzhya and Khmelnytsky NPPs, and the U.S. team, provided justification for establishing the two plants as pilot sites and setting up the first project at each—an upgraded system for identifying and badging plant personnel (see March 1999 Activity Report). The reviews also provided the impetus for a U.S. Congress-mandated assessment of physical security issues at nuclear power plants in Armenia, Kazakhstan, Russia, and Ukraine participating in the U.S. Department of Energy's international work to improve the safety of Soviet-designed reactors (see May 1999 Activity Report).

During the dedication ceremony, the Ukrainian officials expressed their satisfaction with the successful completion of the project. They also demonstrated a strong commitment to continue with prioritized security upgrades at Khmelnytsky Unit 1 and to extend the upgrade projects to Ukraine's other nuclear power plants. Ukrainian and U.S. team members now are discussing additional upgrade work to be done if funding becomes available. (Grigory Trosman, DOE, 301-903-3581; Andrei Glukhov, PNNL, 509-375-3961) √

Russia

Representatives of the Russian Institute for Nuclear Power Plant Operations, General Energy Technologies (VNIIAES/GET); Rosenergoatom (REA); Gosatomnadzor (GAN); the Novovoronezh Training Center; Balakovo, Kursk, and Novovoronezh NPPs; and the United States met at VNIIAES in Moscow to identify the scope of the normative documents needed for Russian simulator standards and incorporation into training programs.

Participants presented material that would be helpful in the development of the documents. The Russian participants developed a document outline, and the representatives from GAN and REA reviewed the outline, presented their opinions on regulations, and approved the format/outline. The U.S. representative from Pacific Northwest National Laboratory provided a perspective on U.S. simulator normative documents and discussed lessons learned in the United States related to the development and implementation of such documents.

The normative documents, once implemented, will provide a standard for simulator development and usage that will provide consistency across Russian organizations involved in development and use of simulators for training. This activity will ensure

***Transfer of simulator
instructor training
course continues***

that the simulators used to train nuclear power plant operators meet a minimum standard. (John Yoder, DOE, 301-903-5650; Ken Erickson, PNNL, 509-372-4063) v

A workshop was held September 25 through October 7 at Kola NPP to continue the transfer of the simulator instructor training course developed for use in Ukraine to Russian organizations involved in the training of simulator instructors. Training experts from the U.S. firms Sonalysts, Inc., and Human Performance Analysis Corporation led the workshop for participants from VNIIAES and from Russian nuclear power plants and training centers. This activity focused on assisting in the development of improved training methods for simulator instructors and improved training expertise within Russia.

The U.S. participants shared insights and lessons learned from experiences in the United States and Ukraine in the development and transfer of training materials related to simulator instructor training. The Russian participants also shared their insights into the development of effective training materials for simulator instructors in their country. The Russian participants will be involved in the development of any additional materials and will be responsible for the coordination of a final working visit, which also will take place at the Kola NPP.

The workshop, which was the second in a series of three working sessions, continued work initiated during the first session held in May. The training specialists from Sonalysts and Human Performance Analysis Corporation presented the results of their review of work completed since the May workshop and led discussions during the September sessions. Plans for the third and final working session, which will include pilot program implementation, also were discussed. (John Yoder, DOE, 301-903-5650; Al Ankrum, PNNL, 509-372-4095) v

***Safety Concept Working
Group for Leningrad NPP
meets***

A member of the U.S. team traveled to St. Petersburg and Sosnovy Bor, Russia, to meet with the Safety Concept Working Group associated with the Leningrad NPP in-depth safety assessment. While in Russia, the U.S. team member also visited Leningrad NPP to provide technical assistance in the areas of engineering assessment and regulatory compliance.

The main objectives of the Safety Concept Working Group meeting were to define the technical content of safety concept reports and to identify sources of reference material for writing eight of the safety concept report subchapters. Participants also identified agencies or institutions that should be involved in the writing or review of specific subchapters.

The U.S. representative also met with staff from Leningrad NPP and the subcontractor, All-Russian Planning and Design, Research, and Technological Association, to review progress on



Ukrainian nuclear industry agrees to implement event analysis, reporting, and lessons learned processes

Rivne completes work plans and project guidelines for hazards analysis



work related to system description and development, engineering assessment database development, plant level compliance, and system level compliance. (Walter Pasedag, DOE, 301-903-3628; Sam McKay, PNNL, 509-372-4059) v

Ukraine

During a late-August meeting held at the Crimea Institute of Science and Engineering (Crimea Center), representatives from the five nuclear power plants in Ukraine, EnergoAtom, Ukrainian subcontractors, Novator-Kyiv, and the Crimea Center reviewed progress on pilot implementation of event analysis procedures and database at Zaporizhzhya NPP. A U.S. participant from Pacific Northwest National Laboratory also attended the meeting. Participants agreed on actions to fully implement event analysis, reporting, and lessons learned (EARLL) processes at all the nuclear plants in Ukraine. The knowledge gained from effective root-cause determinations and reporting of lessons learned from minor problems helps prevent the escalation of minor problems into serious accidents. Implementation of the EARLL processes and database at all nuclear plants in Ukraine will facilitate sharing of information among the plants. During the meeting, the EnergoAtom representative reviewed the project history and led a discussion of future work, and the representative from Zaporizhzhya NPP summarized the pilot work that had been undertaken at that plant. Representatives from Novator-Kyiv demonstrated the capabilities of the pilot EARLL database, and Crimea Center representatives summarized the results obtained from use of the pilot procedures to analyze a Zaporizhzhya Unit 2 turbine trip event. The U.S. team representative provided perspective on the use of EARLL processes in the United States. (Dennis Meyers, DOE, 301-903-1418; Lief Erickson, PNNL, 509-372-4097) v

On September 1, Ukrainian specialists from the Safety Analysis Laboratory of the International Chornobyl Center (SAL/ICC) completed work plans and project guidelines for the data collection and screening activities that will support analyses of both "internal" hazards (e.g., fires, internal floods) and "external" hazards (e.g., earthquakes, external floods) for the in-depth safety assessment (ISA) project at Rivne NPP.

The completed work plans and project guidelines provide the basis for the data collection and screening phase of the Rivne ISA internal hazards and external hazards activities. Rivne plant staff will be trained by specialists from SAL/ICC to participate in these activities. (Walter Pasedag, DOE, 301-903-3628; Charles Dickerman, ANL, 630-252-4622) v

***International
committee reviews safety
assessment methodology
for Khmelnytsky***

***Armenia NPP inspected
for seismic safety***

***Slavutych Laboratory
hosts thermohydraulics
code training***



On September 6 and 7, an international peer review committee convened at the Office of Data Systems and Solutions in Prague to review a methodology developed for performing the in-depth safety assessment (ISA) at Khmelnytsky NPP. The review committee, which included representatives from Brookhaven National Laboratory (the meeting coordinator), Engineering Technologies and Development (Ukraine), Fortum Engineering (Finland), Gesellschaft fuer Anlagen- und Reaktorsicherheit mbH (Germany), and SCIEN TECH (United Kingdom), agreed with the basic project concept of using analysis elements from a similar “lead-plant” to reduce the effort required for developing the Khmelnytsky-specific ISA. The committee provided comments to guide implementation of the concept. (Walter Pasedag, DOE, 301-903-3628; Charles Dickerman, ANL, 630-252-4622) v

Armenia

In early September, a team of U.S. specialists guided Armenia plant staff through an intermediate seismic walk-down of Unit 2. Although few serious deficiencies were found during the walk-down, many systems will require further analysis to fully assess their seismic reliability according to the U.S. team member from Argonne National Laboratory. The September seismic walk-down cannot be considered a final inspection for the plant, since a final safe-shutdown equipment list will not be available until spring 2001. It is likely, however, that the September walk-down covered the majority of components that would be included in a final safe-shutdown equipment list.

The U.S. team recommended that the necessary testing, analysis, and design of upgrades should begin as soon as possible so that corrective actions can be taken during the next plant outage in spring 2001. The U.S. team reported its observations to an International Atomic Energy Agency review team and to the Armenia Nuclear Regulatory Authority. (Dennis Meyers, DOE, 301-903-1418; Mark Petri, ANL, 630-252-3719) v

Cross-Cutting Activities

From August 12 through September 2, trainers from Idaho National Engineering and Environmental Laboratory conducted RELAP5/MOD3.2 computer code training at the Slavutych Laboratory for International Research and Technology. Participants included three staff members from the Slavutych Laboratory, five from Ukraine, six from Armenia, and two from Leningrad NPP in Russia. The purpose of the workshop was to introduce the participants to reactor safety analysis using the RELAP5/MOD3.2 code.

The workshop was designed for new RELAP5 users and included both lectures and hands-on exercises. The exercises progressed from developing simple models with a few components to using VVER plant models to perform design basis accident simulations and analyses. Lectures addressed code features, modeling guidelines, and quality assurance and documentation of input models and analyses. The trainers provided instruction and led exercises in configuration control and modification of the RELAP5 code for the participants from the Slavutych Laboratory. The trainers also provided the RELAP5/MOD3.2 code to participants whose organizations had not previously received the code. (Dennis Meyers, DOE, 301-903-1418; Mark Petri, ANL, 630-252-3719) v

Planned Activities

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

• **New date to be determined: rescheduled from September 11-22 - Kozloduy NPP, Bulgaria**

Training. Specialists from VNIIAES and Sonalysts, Inc., will work with training and technical specialists from Kozloduy NPP to complete plans and instructional materials for a training program for emergency operating instruction trainers at the plant. During the second week, the specialists will implement the course for trainers at Kozloduy Units 1 through 4 (all VVER-440/230 reactors). (John Yoder, DOE, 301-903-5650; Don Draper, PNNL, 509-372-4079)

• **New date to be determined: rescheduled from September 11-22 - 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 Khmelnytsky 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)

• **October 16-21 - Kyiv, Ukraine**

Training. Ukraine's Engineering and Technical Center for the Training of Nuclear Industry Personnel hosted a workshop for simulator instructors from Khmelnytsky, Rivne, South Ukraine, and Zaporizhzhya NPPs. Specialists from the Engineering and Technical Center collaborated with U.S. training specialists from Sonalysts, Inc., and Human Performance Analysis Corporation to begin developing training materials for simulator instructors responsible for training nuclear power plant personnel in Ukraine on the use of emergency operating instructions. (John Yoder, DOE, 301-903-5650; Al Ankrum, PNNL, 509-372-4095)



- **October 16-27 – Armenia NPP, Armenia**

Training. Training specialists will finalize and implement a plant-specific training program for control room turbine operators at Armenia NPP. Program trainees will include plant personnel familiar with the job position. Observers from the International Atomic Energy Agency (joint sponsor of this training program) and Human Performance Analysis Corporation will evaluate the implementation activities and provide feedback to the training program developers. (John Yoder, DOE, 301-903-5650; Don Draper, PNNL, 509-372-4079)

- **October 30-November 6 – Kozloduy NPP, Bulgaria**

Training. A U.S. training specialist from Human Performance Analysis Corporation will present the management and supervisory skills training program to Kozloduy management personnel. The course, implemented previously at the plant, since has been expanded at the request of Kozloduy management and training personnel to include additional materials on leadership. The U.S. team member also will review modifications to the safety culture course being made by Kozloduy NPP personnel with the intent to implement the modified course later in 2000. (John Yoder, DOE, 301-903-5650; Don Draper, PNNL, 509-372-4079)

- **November 6-9 – Kyiv, Ukraine**

Engineering and Technology. Specialists from Brookhaven and Pacific Northwest national laboratories will meet at Energoproekt offices with members of the Ukrainian team involved in the Zaporizhzhya safe-shutdown study. U.S. team members will provide technical support and review progress on the deterministic analysis portion of the study. (Grigory Trosmann, DOE, 301-903-3581; Andy Minister, PNNL, 509-376-4938)

- **December 11-15 – Moscow, Russia**

Management and Operational Safety. VNIIAES will host a second workshop focused on the normative document for simulator standards and training in Russia. Representatives of VNIIAES/General Energy Technologies, Rosenergoatom, Gosatomnadzor, the Novovoronezh Training Center, and Balakovo, Kursk, and Novovoronezh NPPs are expected to participate. A U.S. team member from Pacific Northwest National Laboratory also will attend. Participants plan to finalize a draft of the document during the workshop, then submit it to Gosatomnadzor for consideration. Gosatomnadzor approval is targeted for early 2001. (John Yoder, DOE, 301-903-5650; Ken Erickson, PNNL, 509-372-4063)



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.