Exercises and Drills

The Emergency Prevention, Preparedness and Response (EPPR) working group of the Arctic Council has been working to improve preparedness and response capabilities to nuclear and radiological emergencies since its inception. EPPR invests in planning and preparing for potential accidents involving the release of radioactive materials to improve the international emergency management system and assure that response capabilities are effective in protecting people and the environment.

Exercises provide the opportunity to validate the components of an emergency management system that are developed to respond in concert during an emergency. In exercises, personnel, from first responders to senior officials, validate their individual training; communications equipment and procedures are tested; and information is analyzed and transmitted in many different ways. Exercises such as the series sponsored by EPPR are the most effective means of:

- assessing and validating policies, plans, procedures, training, equipment, assumptions, and agreements;
- clarifying roles and responsibilities;
- improving coordination and communication not only at the facility but also among response elements including multiple levels of government;
- identifying gaps in resources;
- measuring performance; and
- identifying opportunities for improvement.

In addition to accomplishing these goals, EPPR's exercises incorporate other EPPR initiatives, including the source control series of hazard assessments, significant work on public communications and technical improvements such as the NOSTRADAMUS and TRACE WIN plume model capabilities. The exercises validate the products and ensure the tools are integrated effectively.

It is important to not only have an established emergency system but to also routinely test and validate different aspects of that system in order to maintain effective emergency response capabilities. Lessons learned from the exercise will be evaluated to highlight good practices, make improvements to procedures and processes, where needed, and to develop more effective training and response programs.

Since 2002 EPPR, partnered with the Nuclear Safety Institute of the Russian Academy of Sciences (IBRAE RAN), has planned, developed, and participated in a number of large scale exercises at a diverse group of facilities, including those involved in the decommissioning of nuclear submarines and in the management of spent nuclear fuel and radioactive waste.

Figure 1: Arctic 2008, CS Zvezdochka

These exercises and drills, while validating the plans and procedures in place to support emergency management activities, also provide effective readiness training for the organizations providing responders to the simulated emergencies. Goals of the exercise and drills program include:

- Helping prepare senior managers for the stress of time-critical decision making;
- Providing rescue teams with highly realistic scenarios to improve their preparedness levels;
- Setting the conditions for organizations to cooperatively manage response activities;
- Verifying and validating emergency response plans and procedures;
- Applying practical technological procedures for handling emergency conditions in complex installations; and,
- Generating improvements and lessons learned, especially regarding the interactions between participants in an emergency response across all levels of the response.

One purpose of EPPR's exercises is to validate the integration of results and products from other EPPR projects to include specialized software and public information tools. Communicating to the public and conducting effective communications between participating responders and managers across local, regional, and federal levels is an objective of the exercise series. Exercises also focus upon the identification and categorization of emergency events and the prompt issuance of required notifications and protective actions. All exercises involved interaction of technical experts at the facility,

local, and federal levels, as well as extensive communication and coordination with off-site technical support centers. Hardware and software decision-support systems, some of which have been developed and implemented under other EPPR projects, were extensively employed to support the simulated emergency response. In particular, emergency notifications and information flow between the Situation Crisis Center of Rosatom, the Crisis Center of the Rosenergoatom Concern, as well as their technical support centers, was a high priority throughout all the exercises and drills, and procedures for the notification of IAEA were tested as well. In all exercises, the results or "lessons learned" are studied and used to make improvements to the procedures and practices of the emergency management system, thus serving to reinforce continuous improvement in these systems and their user interfaces. Lessons learned from exercises and drills extend to every element of the emergency response infrastructure, including improving measures for protecting personnel and offsite populations.

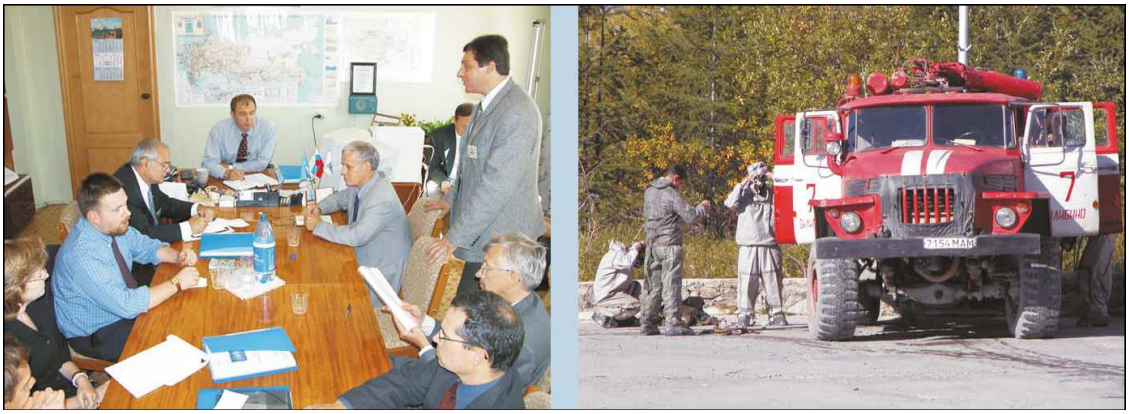

Figure 2 Bilibino NPP Exercise, August 2002

Exercise at Bilibino NPP, August 2002

The Bilibino Exercise scenario was based on a simulated reactor accident that involved a release of radioactive material. Representatives of Minatom (the predecessor of Rosatom), Russian Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet), Gosatomnadzor, the Rosenergoatom Concern, representatives of federal and territorial authorities, the IBRAE RAN Technical Crisis Center (TCC), as well as response specialists of the Bilibino NPP took part in the exercise. Observers were active at Bilibino and at emergency operations centers in Moscow.

During the exercise, a video conference was conducted to facilitate expert-to-expert communication and data exchange between Bilibino and the Crisis Center of Rosenergoatom Concern. The Automated Radiation Monitoring System was tested, resulting in successful data transfer allowing real-time data from fixed radiation monitoring sites to be shared. The NOSTRADAMUS and TRACE WIN software systems for assessing the consequences of radiation accidents was installed at the

Bilibino NPP and specialists were trained on the use of the software and on methods for communication of information to decision makers and crisis centers. During the exercise, emergency preparedness and response experts: developed technical data for the simulated radiation emergency; provided consultations and scientific and technical support; and shared data from real-time radiation monitoring system and platforms for consequence assessment modeling, geo-information systems mapping and modeling, and weather information.

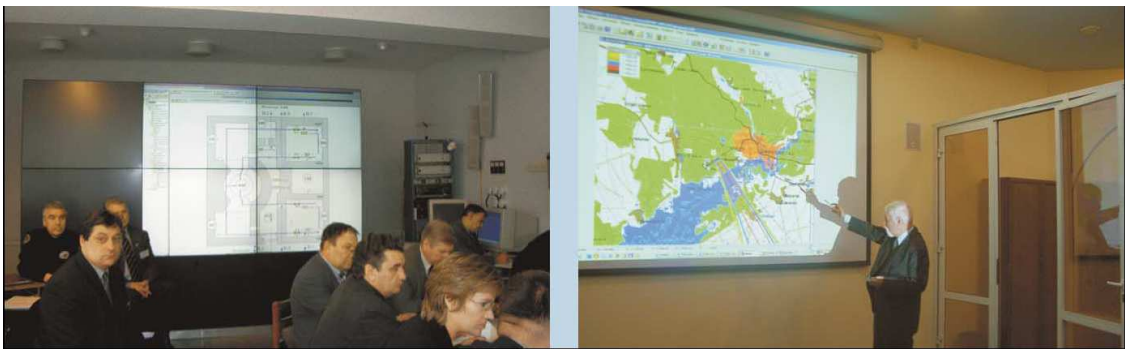

Figure 3 Exercise at NIIAR, December 2003

Tabletop exercise at BOR-60 fast reactor of SSC RF NIIAR, December 2003

The exercise at Scientific and Research Institute of Nuclear Reactors (SSC RF NIIAR) required participants to address the consequences of a simulated pipeline accident at the BOR-60 research reactor. In addition to response personnel from SSC RF NIIAR, participants included representatives of Minatom and its Crisis Center, IBRAE RAN TCC, and the Emergency Technical Centers of St-Petersburg and Novovoronezh.

During the exercise, response personnel focused on the following actions: notification of response organizations, personnel and ensuing initiation of actions by involved organizations at NIIAR, local government, and headquarters level. Information of the results of assessment and forecast of radiation conditions was communicated between NIIAR, Situation Crisis Center of the Ministry of Atomic Energy of Russia and Technical Support Center of IBRAE RAN using telephone and satellite communication channels, including VTC sessions, demonstrating that communication channels were operational and effective. The Expert Team assessed the radiological consequences of the emergency based on available data of the radiation situation and a short-term forecast was made. Radiation exposure doses for the NIIAR personnel and the population of Dimitrovgrad city were estimated. The emergency management team recommended activation of the “Plan of measures on protection of the personnel in case of emergency at SCC NIIAR”, to protect the population and environment.

Prior to the exercise, a specialized system to transfer key technological parameters from the BOR-60 research reactor to the emergency crisis center in Dimitrovgrad were established, and this data link was a key focus for the exercise. In addition, upgrades

were accomplished to enable more effective transfer of the Automated Radiation Monitoring System data to the Minatom crisis center.

Figure 4 FSUE Atomflot - July 2005

Exercise "Arctic-2005" at FSUE "Atomflot," July 2005

Exercise Arctic 2005 was conducted at the Federal State Unitary Enterprise (FSUE) "Atomflot" facility in July 2005. This facility carries out maintenance for Russian nuclear icebreakers. The scenario centered on the consequences of a radioactive release caused by a crane accident. In addition to responders from FSUE Atomflot, participants included representatives of the Murmansk Shipping Company, Rosmorrechflot, Rosatom and its Crisis Center and Emergency Training Center in St-Petersburg, IBRAE RAN TCC, the Siberian Chemical Combine, Emergency Response Teams from SevRAO and PA Mayak. The exercise was observed by EPPR representatives.

Arctic 2005 was the first large scale exercise conducted to address the consequences of an accident at a maintenance facility involving spent nuclear fuel management. One primary focus was validating emergency plans and procedures for the notifications required for such an emergency event. Emergency rescue teams at the facility practiced their response activities, while the Emergency Situations Commission (a senior management body) focused on the operation, staffing and functions of their group. In addition, prior to the exercise, a software system for the assessment of the radiological consequences of accidents was installed at the facility and training was conducted for the system operators. This system was successfully tested during the exercise.

Figure 5: "Arctic 2008" CS Zvezdochka

Exercise "Arctic-2008" at the Center for Shipbuilding (CS) Zvezdochka in July 2008

Exercise Arctic 2008 was the second in the series of Arctic exercises that focused on the maintenance operations of nuclear-powered seagoing vessels. The exercise scenario tested the response to an accident involving spent nuclear fuel being removed from a nuclear submarine at this coastal unloading facility.

Development of the Scenario: Identification of hazards at the On-Shore Defueling Facility

Under EPPR's Source Control work, risks at the FSUE "CS "Zvezdochka" facility were identified and systematically evaluated. Various initial events and possible accident evolution scenarios were examined with the most significant ones selected for further quantitative risk assessment. Scenarios evaluated for the On-Shore Defueling Facility were: fall of reloading container loaded with spent fuel assemblies (SFA); fall of a guiding device onto TK-18 container; and impact of an aircraft crash on the Spent Nuclear Fuel (SNF) defueling facility.

The risk assessment revealed that an accident involving the fall of a reloading container loaded with spent nuclear fuel on the mooring line was one of the most significant accidents potentially probable during the reloading process. The probability of this accident happening is highly unlikely and would occur only in the case of a simultaneous rupture of two cables used in the lifting crane. (Each of the cables by itself will hold the container from falling.) The scenario developed for the exercise involves transporting SFA from the decommissioned submarine reactor compartment to the transport container loading building inside the reloading container. The reloading container is lifted and transported by a portal crane with a maximum lifting height of 17 m. When the reloading container holding a single SFA falls onto the pier, the impact deforms the container, leading to loss of air tightness of the fuel elements and the (simulated) release of the radionuclides into the environment.

Exercise participants included representatives of Rossudostroenie (Rosprom), the "Rosatom" State Corporation, IBRAE RAN, Belomorsk Naval Base, and the Main Department of Russia's Ministry of Emergency Situations (EMERCOM) in the Archangelsk Region. EPPR observers include representatives from the emergency response organizations of Sweden, Finland, and Norway, as well as United State representatives at Zvezdochka and in Moscow.

Arctic 2008 generated valuable lessons learned. In particular, emergency rescue teams of the facility needed better equipment to monitor radiation and protect workers and the public, so this became a priority to address in a new project: "Modernization of Equipment at CS Zvezdochka," which is now underway under EPPR's sponsorship. As a result of the lessons learned, radiation monitoring sensors have also been installed to help ensure accurate radiation surveillance of the surrounding areas.

Fig. 6. "Arctic 2010" participants evacuate an injured worker from the accident area

Exercise "Arctic 2010," NERPA Shipyards, July 2010

The "Arctic 2010" exercise, hosted by the Russian Federation at the Nerpa Shipyard facility in Snezhnogorsk, Russia was a realistic simulation of a potential facility/site emergency. This exercise tested facility responders and gave EPPR observers the valuable opportunity to witness an effective program response. In addition, EPPR countries exercised communication channels that would be used in case of a real and more severe accident. Arctic 2010 was the third exercise in the EPPR-sponsored emergency response exercise series and was conducted at the Nerpa Shipyard in the Murmansk Region, Russian Federation. The scenario involved a simulated leak of radioactive material during the dismantlement of a submarine reactor compartment. During the exercise, response forces demonstrated high levels of preparedness as evidenced by their timely and appropriate mitigation actions. The extent of the simulated plume also required the coordination of several municipal and regional authorities.

There were 200 participants, including international observers. EPPR participated in the exercise both on scene at the Shipyard and in Moscow at the Technical Crisis Center of Nuclear Safety Institute of the Russian Federation (IBRAE). Video teleconference sessions were conducted between the incident site and the regional and federal emergency management centers. Additionally, the event exercised notification and coordination between the IAEA, Rosatom, and four of the eight Arctic nations.

The EPPR representatives who observed the exercise benefited from a firsthand glimpse of a collective response during a radiation worst-case scenario. The exercise was a valuable experience because the lessons learned will be used to further improve preparedness and demonstrates the facilities commitment to protecting its workers and the public.

Relevance of EPPR's Exercises

EPPR's exercises have tested the emergency response systems in place to address emergencies involving nuclear power plant operation, decommissioning activities, the handling of special nuclear fuel, and radioactive waste management. Lessons learned are used to improve facility safety, enhance emergency response forces and resources, and increase preparedness for possible accidents. EPPR observers gained knowledge of each facility's capabilities and a good demonstration of the Russian Federation's system for response. Addressing lessons learned is an important outcome of an exercise program. For example, the upgrades to the Emergency Rescue Team equipment made as a result of the lessons learned during the exercises conducted at nuclear facilities will significantly improve the efficiency, accuracy, and reliability of field measurements of radiation related to potential accidents, as well as enhance team member safety. Together with improvements made in consequence modeling capabilities and new experience, knowledge and equipment will provide enhanced capabilities to identify radiation hazards and protect workers, the public, and the environment, and improve preparedness to respond to potential radiological emergencies in the Arctic region. Conducting exercises and drills will continue to ensure improvements in the emergency preparedness area as well as sustainability of EPPR's cooperative efforts.