# 3.0 Armenia

One of two reactors at the Armenia nuclear power plant is in operation. The reactors were shut down after a major earthquake in 1988. There are no plans to restart reactor Unit 1. Unit 2, a VVER-440/230 reactor, resumed operation in 1995. It produced 25 percent of the electricity generated in Armenia in 1998. Armenia began working with the United States on cooperative safety projects in May 1996.


*The Nuclear Power Plant in Armenia Participating in the Cooperative Effort to Improve Nuclear Safety*

**Reactor Type in Armenia**

- One VVER-440/230 reactor

## Key Accomplishments

### 3.0 Armenia

- Instructors presented a pilot training course for control room operators.
- Workers replaced a flammable plastic floor covering with a nonflammable floor coating.
- The plant installed new fire doors.
- Workers constructed a seismic-resistant, spray-pond cooling system to reject heat from the reactor.

# 3.1 Personnel Training

Training specialists from the United States and the International Atomic Energy Agency are working with instructors at the Armenia plant to improve personnel training. Instructors are using the Systematic Approach to Training to develop pilot courses. This approach provides a standard framework for identifying training needs, analyzing jobs and their specific tasks, developing course materials based on these analyses, and using teaching methods that combine classroom instruction with the hands-on use of equipment.

**► Activities Completed**

In November 1998, Armenia instructors presented a training course for the plant's control room operators.

**► Work in Progress**

U.S. and international specialists are working with Armenia instructors to develop a course for radiation protection technicians. The instructors will present the course in 1999.

# 3.2 Fire Safety

The United States is providing equipment and training to reduce the risk of fire at the Armenia plant. U.S. contractor Burns & Roe Enterprises, Inc., is coordinating the fire safety projects.

**► Activities Completed**

The United States provided 140 fire doors for Armenia, made by the Russian company Atomremmash. The plant received the doors in July 1998. Workers completed installation of all single fire doors in December 1998. Double doors will be installed in 1999.

Workers applied a nonflammable floor coating in key safety-related areas of the plant after removing a flammable plastic floor covering. They completed the project in September 1998. Keeler and Long, Inc., manufactured the coating. The United Armenian Fund, an Armenian-American charitable organization, arranged for its delivery, along with the delivery of a large floor-sanding machine for surface preparation. U.S. specialists trained plant personnel to apply the material.

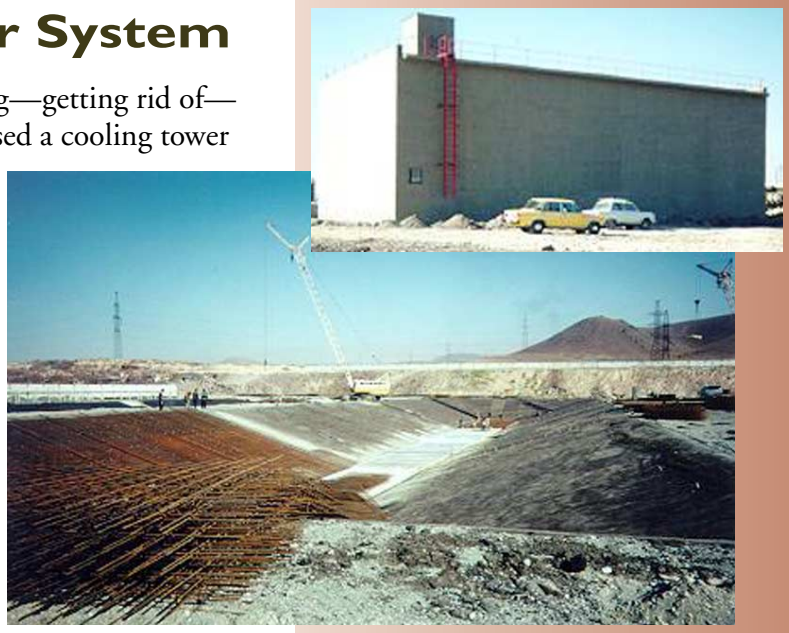
**► Work in Progress**

In October 1998, plant workers received fire detectors and electrical cable to begin installation of a U.S.-provided fire detection and alarm system. Moscow-based ZAO Cerberus manufactured the system, which was designed by the Russian organization Atomenergoproekt.

## 3.3 Nuclear Service-Water System

Nuclear power plants must have a system for rejecting—getting rid of—residual heat from the reactor. Armenia's reactor has used a cooling tower to reject the heat, but the tower is vulnerable to earthquake damage.

U.S. and Armenian specialists worked together to construct a less vulnerable system—a spray-pond cooling system to reject the heat from the plant's safety-related equipment. The system is seismically protected.



*Three seismically hardened spray ponds will replace the cooling towers at the Armenia nuclear power plant. Pumps in pump houses (inset) will circulate cooling water between safety-related equipment in the plant and the spray pond.*

► **Activities Completed**

The Armenia plant's deputy director and the construction manager participated in quality assurance training in June 1998. Along with training sessions at the Burns & Roe offices in New Jersey, the two observed quality assurance practices firsthand by visiting a Burns & Roe construction site and the Indian Point nuclear power plant in New York.

Intersigma, a Czech company, manufactured six main water pumps for the service water system. After performing qualification testing, the company delivered the pumps to the plant in October 1998. Workers installed three of the pumps in December 1998 and completed the remaining U.S.-funded activities, including installation of the spray system piping and construction of the three cooling ponds, the pump houses, and the cable tunnels. Burns & Roe coordinated U.S. contributions to the project.

► **Work in Progress**

Early in 1999, Russian suppliers will deliver electrical cabling, the control system, and a coating material for the spray pond surface, enabling workers to complete the final construction tasks. During the outage scheduled for October 1999, workers will tie the new spray-pond cooling system into the plant, perform system tests, and commission it for operation.

## 3.4 Auxiliary Feedwater System

With U.S. support, Armenia will install a seismic-resistant emergency feedwater system. The system will provide emergency cooling water to the reactor's steam generators in case of equipment failure or earthquake damage.

► **Work in Progress**

The United States is providing a diesel-driven pump for use in the backup feedwater system. The United States also is providing a small diesel generator to operate pumping system valves in case of a loss of electricity. The

equipment will be delivered and installed early in 1999. Burns & Roe is coordinating U.S. participation in the project.

## 3.5 Steam-Isolation Valves

In a nuclear power plant, main steam-isolation valves are designed to isolate the reactor's steam line if a break occurs. Immediate isolation of the ruptured steam line keeps the reactor vessel from overcooling while it is at high pressure—a condition that could damage the vessel and cause leaks. The valves at the Armenia plant, however, cannot close quickly enough to prevent overcooling.

► **Work in Progress**

The United States is providing seven fast-closing, main steam-isolation valves. Burns & Roe is coordinating U.S. participation in the valve replacement project. Hopkinson, Ltd., of England, the manufacturer, will deliver the valves early in 1999. TACIS, a European Union assistance program, is providing steam generator relief valves for the plant. Both types of valves will be installed during the plant's summer 1999 outage.

## 3.6 Safety Parameter Display System

U.S., Armenian, and Russian specialists are developing a safety parameter display system for the Armenia plant. A safety parameter display system gives plant operators the information they need to control a nuclear plant in the event of an accident. The system automatically displays critical safety information at workstations in the control room and other locations in the plant. Information on the status of key conditions, such as reactor core cooling and radioactive material confinement, is displayed in a clear format on a computer screen. The system enables operators to assess plant conditions rapidly and take quick corrective actions.

In November 1998, Armenia plant staff worked with U.S. specialists from Burns & Roe and Science Applications International Corporation to develop specifications for the safety parameter display system. The system will be nearly identical in design to one now operating at Russia's Novovoronezh plant. Specialists from Science Applications and ConSyst, a Russian organization, designed the system for Novovoronezh Unit 3.

Science Applications specialists will develop the final design for the Armenia system, with support from ConSyst. The project team will assemble and test the system at Science Applications facilities in the United States. Installation at the Armenia plant is scheduled for fall 1999.