

MOX: The future of SRS

By Rob Pavey | Staff Writer

Sunday, August 23, 2009

It is a new mission for an old plant, and the world is watching.

Throughout its long history, Savannah River Site produced much of the plutonium for tens of thousands of nuclear bombs manufactured during the Cold War.

The material was born in the site's massive industrial reactor canyons and installed in warheads deployed across the globe.

Today, as the nation continues to dismantle its nuclear arms stockpile, much of that plutonium is returning to its birthplace in South Carolina, where one of the most unusual -- and most expensive -- factories ever devised is rising from the landscape.

Once complete, the Mixed Oxide Fuel Fabrication Facility, or MOX plant, will have 600,000 square feet, 170,000 tons of concrete and three times as much steel as the Eiffel Tower.

Workers will transform 34 metric tons of plutonium taken from about 10,000 dismantled nuclear bombs into something much less sinister, and in fact beneficial: fuel rods that can be sold to utilities for use in commercial nuclear reactors.

"By eliminating surplus nuclear materials, we will never have to worry about those materials being used against us in a nuclear weapon," said Dr. Steven Chu, a Nobel Prize-winning physicist who became President Obama's energy secretary in January.

In addition to providing jobs, MOX is a globally significant project linked to the U.S.-Russian Plutonium Disposition Agreement of 2000, in which each nation agreed to dispose of 34 tons of plutonium.

And it is happening just a few miles from Augusta.

"The men and women building the MOX Facility at Savannah River Site are working day and night to advance our vital national security interests," Dr. Chu said. "This facility will allow us to lead by example by demonstrating our commitment to eliminating surplus weapons plutonium in a transparent and irreversible manner."

Based on its current design, the \$4.86 billion plant will be capable of processing 3.5 metric tons each year by blending small amounts of plutonium with larger volumes of uranium oxide -- a standard ingredient for commercial reactor fuels.

Such a use is a fitting end for materials that have played such a prominent role in national defense, said Thomas D'Agostino, the administrator of the National Nuclear Security Administration, the agency responsible for the nation's nuclear weapons program.

"This is material that protected us in the past, and now it will provide power for us in the future," Mr. D'Agostino said. Fuels produced at the MOX plant will eventually produce enough power to operate 1 million homes for 50 years, he said.

When the National Academy of Sciences began exploring ways to dispose of surplus plutonium more than a decade ago, about 30 ideas emerged, including proposals to bury it beneath the sea or shoot it into space. Only a few were deemed workable -- and one was MOX.

"It boils down to two things: Either you use the material and get the value out of it, or you permanently store it, and there is a cost of security to do that," Mr. D'Agostino said. "If you store it, 100 years from now, you still have the material."

The heavily guarded MOX factory at SRS is actually one of three facilities needed for such an unusual mission. Nearby will be a Pit Disassembly and Conversion Facility, where the nuclear bomb plutonium pits will be disassembled from their secret form and converted into powdered oxide.

The powder will be sent to the MOX plant, where a mixture of 5 percent plutonium oxide will be blended with 95 percent uranium oxide to make commercial nuclear reactor fuel.

The third leg of this project is the Waste Solidification Building, which will convert waste from the other two plants into a form safe enough to transport.

Clay Ramsey, the National Nuclear Security Administration's MOX federal project director, said the plant is expected to become fully operational in 2016, when test fuels will be produced. Delivery of the first MOX fuels to commercial clients is expected by 2018.

Those clients could include Tennessee Valley Authority nuclear plants Sequoyah and Browns Ferry, which have a combined total of five reactors, according to the U.S. Energy Department.

The MOX project at SRS is about 34 percent complete, but Russia is not making similar progress.

"The U.S. and Russian programs have not proceeded at exactly the same pace," said Ken Bromberg, the National Nuclear Security Administration's assistant deputy administrator for fissile materials disposition. "There are many reasons: political disagreements, financial problems in raising the money."

A revised agreement forged two years ago is under review by the Russian Interagency group, and its ratification could jump-start Russia's program.

"We're optimistic that, this fall, the U.S. and Russian governments will sign a revised plutonium disposition agreement that reflects the current political and financial realities for both countries, and that both countries will begin disposing of their plutonium at roughly the same time."

The plutonium already earmarked for MOX is stored in several secure areas, including the Pantex plant in Texas and other highly guarded areas where nuclear bombs are built, serviced and dismantled. Some plutonium is already at Savannah River Site's K Complex, which is also guarded.

Reach Rob Pavey at 868-1222, ext. 119, or rob.pavey@augustachronicle.com.

RELATED STORIES

[Radioactive shipments are tightly protected](#)

[New missions, workers vital for site](#)

[SRS labs take on tough tasks](#)

[Jobs, construction spending will help area](#)

WHAT THEY'RE SAYING

THOMAS D'AGOSTINO

administrator, National Nuclear Security Administration

"It boils down to two things: Either you use the material and get the value out it, or you permanently store it, and there is a cost of security to do that. If you store it, 100 years from now, you still have the material. It still exists, and it is still inconsistent with what the president wants to do. We think Choice A is better than Choice B."

STEVEN CHU

secretary, U.S. Department of Energy

"The men and women building the MOX facility at the Savannah River Site are working day and night to advance our vital national security interests. By eliminating surplus nuclear materials, we will never have to worry about those materials being used against us in a nuclear weapon. The MOX facility is also a critical part of President Obama's effort to renew U.S. leadership on the nuclear security challenges of the 21st century. This facility will allow us to lead by example by demonstrating our commitment to eliminating surplus weapons plutonium in a transparent and irreversible manner."

PRESIDENT OBAMA

In a July 6 joint statement with Russian President Dmitry Medvedev on Nuclear Cooperation: "Both sides remain committed to executing the agreement between the government of the United States of America and the Government of the Russian Federation ... to dispose of 34 metric tons each of weapons-grade plutonium in the United States and Russia."

WHAT IS SRS?

- One of eight facilities that make up the nation's Nuclear Weapons Complex - in which programs managed by the National Nuclear Security Administration ensure proper surveillance, maintenance, refurbishment, manufacture and dismantlement of the U.S. nuclear weapons stockpile, and perform research and development .

- During its half-century of operations, Savannah River Site's five nuclear plants produced much of the plutonium and tritium for tens of thousands of nuclear warheads. SRS now has the MOX facility, where plutonium from dismantled bombs will be converted to commercial nuclear reactor fuels.

- SRS is the nation's sole source of tritium, a radioactive form of hydrogen that is a critical component of nuclear bombs. Tritium has a half-life of 12.5 years and must be replenished periodically. Every warhead in the U.S. arsenal has one thing in common: Its tritium reservoir is maintained and recharged at SRS.

- Cleanup of huge volumes of nuclear waste is expected to continue for years at SRS and at the Hanford Site in Washington, where similar

manufacturing work occurred. The remaining SRS waste include s 36 million gallons of radioactive liquids in underground tanks . Contractors hope to clean up and close 22 of the remaining 49 tanks within eight years.

- SRS is home to the Defense Waste Processing Facility, which stabilizes high-level radioactive wastes by bonding them in borosilicate glass. Since the facility began operations in March 1996, more than 10 millions pounds of radioactive glass have been produced .

- SRS is the home of Savannah River National Laboratory, a research facility that ranks with Los Alamos and other world-renowned research centers. In addition to research into nuclear waste cleanup technology, its scientists are immersed in projects ranging from solar and geothermal energy to hydrogen research.

PLUTONIUM FACTS AND HISTORY

- Plutonium is created from uranium in nuclear reactors. When uranium-238 absorbs a neutron, it becomes uranium-239, which decays to plutonium-239 -- used in nuclear bombs.

- The majority of plutonium was produced for nuclear weapons in specifically designed government reactors at SRS and Hanford. Between 1944 and 1988, the U.S. built and operated these "production reactors" at high-security government facilities.

- The reactors made plutonium by bombarding special fuel rods containing uranium with neutrons. Once the maximum amount of plutonium was produced, workers removed the extremely radioactive fuel rods (now called "spent fuel") from the reactors.

- Early workers used strong acid to dissolve the fuel rods and force plutonium to settle out. The process was very expensive and at the time made plutonium about the most expensive material on Earth.

- This processing left behind more than 100 million gallons of exceedingly hazardous acids and radioactive waste. Part of the legacy of nuclear weapons production is dealing with these high-level wastes.

Source: u.s. environmental protection agency

SOME FACTS ABOUT NUCLEAR WEAPONS AND THE MOX PROJECT:

- The design of the MOX plant is based on a similar project in France, where the MELOX and LaHague facilities provide MOX fuels to more than 30 commercial nuclear power plants in many countries.

- Once complete, the plant will include three times as much reinforcing steel as the Eiffel Tower, 170,000 cubic yards of concrete, 3.6 million feet of cables, 85 miles of piping, 1,000 tons of heating and air conditioning equipment and 23,000 electronic instruments.

- The plant's exterior will consist of a pair of 42-inch-thick concrete walls reinforced with a mesh of 2-inch steel bars. Between those walls is a cavity filled with boulders. The resulting fortified wall is built to withstand the impact of almost any attack.

- Environmental groups have questioned the suitability of the fuels for commercial use and criticized the project because no contracts exist with buyers of MOX. Contract discussions are under way, however, with the Tennessee Valley Authority and three other utilities.

- The Strategic Arms Reduction Follow-On Treaty being negotiated this year will set an even lower level for nuclear weapons and likely will increase the volume of plutonium to be declared surplus -- and lengthen the MOX plant's mission, and its jobs.

- Including contractors, current employment at the MOX construction site is 2,506.