Savannah River Site

Citizens Advisory Board

Recommendation 307

Transferring Materials in L-Basin to Auxiliary Dry-Cask Storage

Background

When the L Reactor facility was decommissioned, its pool was converted to a wet storage facility (L-Basin) for receipts of both domestic and foreign spent/used nuclear fuel assemblies. As of 2012 L-Basin, a 3.4 million gallon "swimming pool", stored an inventory of 13,000 assemblies. The pool's maximum capacity is 15,000.

There is an ongoing consideration for expanding storage capacity in the basin, including adding an external dry cask storage system. Whether stored in a wet or dry environment, the racks into which the assemblies are stacked must be designed around a fixed geometry for spacing the radioactive contents in order to control their criticality. All rack designs must also be seismically qualified in case of earth movement (quakes).

The Savannah River National Laboratory conducted a study on fuel and basin life extension in 2011. The study concluded that the basin's fuel inventory could be safely stored for an additional 50 years, contingent upon the continuation of existing management activities and implementation of several augmented program activities. The management and augmentation activities include periodic examination of the bundled fuel assemblies, assessment of fuel in isolation containers, and structural integrity evaluations of the basin concrete assessment. There must also be a continued control of the basin water chemistry, corrosion evaluation, aging facility management assessments and infrastructure maintenance. These requirements for safely continuing storage of the spent/used radioactive fuels face serious challenges. Perhaps the most vexing challenge is the continual lack of progress toward a federal disposition path. Without a final repository, the spent/used nuclear fuel in the basin has no prospect of being moved off-site. Additionally, all the management and augmentation programs are subject to Congressional funding variability and political dynamics.

Discussion

L-Basin water chemistry is a continuous challenge. The pool is currently invaded by a contamination in the form of a white stringy cobweb-like bacterial colony found growing in one section (about 7%) of the pool. Analysis of a sample showed that the colony contains around 3,000 different varieties of bacteria. Scientists have been unable to determine the source of the mysterious bacteria, including whether it is associated with domestic receipts of spent/used nuclear fuel or whether it was hosted by foreign receipts. Although rare, bacterial colonies have been found in other spent fuel wet storage pools – a Candu (Canadian) pool and the pool at Three Mile Island (TMI), Pennsylvania following the 1979 near meltdown. The bacteria do not seem to grow back when

suctioned out so a mechanical solution may be selected to try and rid the pool of the invading webbing. A 2012 report also indicated that the mysterious and unanticipated bacteria are not currently considered a safety problem.

Regardless, the unpredicted growth of foreign substances in the L-Basin, Canadian and Three Mile Island pools, all of which store assemblies of high level spent/used nuclear fuel, calls into question the validity of the computerized modeling programs which, based on probabilities, project that the storage pools can safely contain its radioactivity and protect the public and environment from exposure under all circumstances, including long-term storage. The basin is an "open system" computer cannot predict the infinite changes possible in an "open system". The models failed to anticipate the basin growth.

Structural integrity of the cooling pool, the radioactive spent/used fuel, and their containers is another constant challenge. Some of the domestic receipts stored in L-Basin have a bizarre history. As an example, a year-long project was implemented in 2012 to stabilize dangerously corroded spent fuel linked to the first U.S. nuclear meltdown. That fuel originated from the1950s Sodium Reactor Experiment that was launched in California. The experiment was conducted in order to determine whether nuclear power could provide household electricity. Beginning in 1959, the sodium-cooled reactor made history by powering homes in Moorpark, CA for two years, but later a coolant blockage accident caused the reactor to malfunction. The malfunction could not be controlled and the U.S. experienced the first nuclear reactor meltdown. The spent/used fuel assemblies from the Sodium Reactor were shipped to the Savannah River Site where they are suspended in the L-Basin cooling pool. The Sodium Reactor assemblies were singled out by a 2011 Defense Nuclear Facilities Safety Board report as urgently requiring attention. The report warned that at least three of the 36 cans of material had ruptured from corrosion.

Alternatives to indefinite suspension in L-Basin include processing in H-Canyon, vitrification in the Defense Waste Processing Facility (DWPF), or transferring older and cooler, or at risk, material to an on-site auxiliary dry cask storage system. Movement of currently stored fuel in L-Basin to an auxiliary dry cask storage system may have inherent, but as yet unknown, disadvantages which should be evaluated. In transferring material from the pool to the cask system, workers may experience harmful exposures due to unanticipated radiation levels and/or container leaks. Additionally, the transfer of used fuel from L-Basin may have operational impacts and costs that should be included in any evaluation of a transfer plan.

The Electric Power Research Institute (EPRI) has published a report that suggests that an accelerated transfer program may not be necessarily advantageous. However, the EPRI perspective may be colored by its industry sponsored status. A government-controlled study should also be conducted to ensure total objectivity.

Recommendations

In order to fully determine the advantage or disadvantage of transferring spent/used nuclear fuel from L-Basin to auxiliary dry-cask storage the Savannah River Site Citizens Advisory Board recommends that:

1. A cost-comparison analysis be developed to determine the true cost, including assumptions, of adding dry cask auxiliary storage to L-Basin and the savings, if any, of supplementing cooling pool storage space with dry-cask storage.
2. A study should be conducted to determine operational impacts specifically relating to SRS programs.
3. DOE should request assistance with the conduct of the recommended studies and evaluation from the National Academy of Science to include presentations to the CAB.

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