

Double, Bubble, Toil and Trouble: Hope Creek's Cobalt Stew

Posted: 04 Apr 2010 09:36 PM PDT

By Roger Witherspoon

Nuclear safety experts warn that a proposal to increase profits at the Hope Creek nuclear power plant by adding cobalt fuel rods to its 100-ton uranium fuel mix could jeopardize the structural integrity of its entire spent fuel pool and should be changed or scrapped.

In addition, the presence of Cobalt could complicate the delicate balancing of heat within the reactor core which is essential to ensuring the even burning of the nuclear fuel.

The U.S. Nuclear Regulatory Commission is weighing a proposal from PSEG to replace an unspecified number of the 564 standard, bundles of uranium fuel rods with 12-foot-long bundles of Cobalt-59. If all works properly, the fission process would change Cobalt-59 into Cobalt-60, a radioactive element that is sought commercially for use in medical imaging and heavy duty X-ray equipment to check highway and building construction welds.

The problem, however, is that the process of removing the Cobalt-60 from the highly radioactive fuel bundles would take place under water in the 40-foot deep Spent Fuel Pool containing hundreds of tons of highly radioactive waste removed from the reactor after previous refueling outages. It is here that the high energy gamma rays produced by the Cobalt-60 become problematic.

“There are basically three types of radiation,” explained David Lochbaum, a former NRC reactor operator instructor and director of nuclear safety for the Union of Concerned Scientists. “Beta is a low energy source which you can stop with a sheet of paper. Alpha rays are a little bigger and you need a little lead or water to block it. But Cobalt-60 gives off a high energy gamma ray that takes a lot more water and shielding.

“Their operating plan takes that into account by stating that the Cobalt-60 bundles cannot get closer than four feet from the wall of the spent fuel pool. The problem is that the transfer machine is on the wall itself and the Cobalt-60 will have to be along the wall to be transferred. I don't know how they could have missed that.”

Hope Creek spokesman Joe Delmar declined to comment on specific criticisms of the Cobalt plan. He said, however, that PSEG has reached an agreement with GE-Hitachi to provide Cobalt-60 for processing into use for medical purposes.

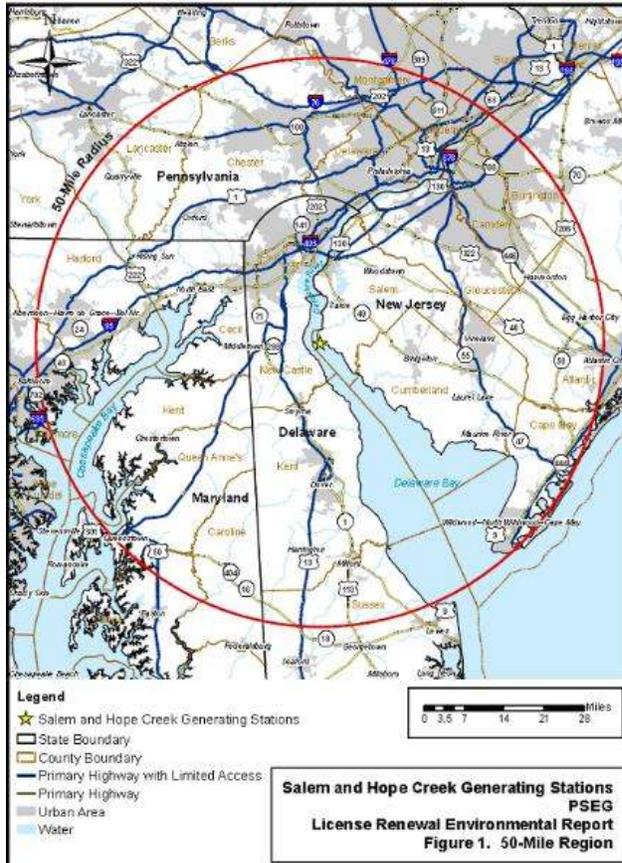
“We have this pilot program where they would be the marketers and distributors, and we would be the producers,” Delmar said.

Norm Cohen, coordinator of the anti-nuclear, UNPLUG Salem campaign, said “I don't think they should be putting Cobalt in there at all. Salem has consistently had problems with the workers, a safety culture, and human errors.

“Producing highly radioactive and dangerous cobalt-60 and weakening safety margins at the same time just

adds one more potential nuclear threat to South Jersey by PSEG and the NRC.”

A failure of the spent fuel pool wall is among the worst case scenarios in nuclear emergency planning. The breach and loss of water would allow the hundreds of tons of irradiated fuel rods to heat up and burn in an exothermic fire and Chernobyl-type meltdown. Such an event would affect a projected population of more than 663,400 residents of southern New Jersey, northern Delaware and Maryland, and eastern Pennsylvania living within 50 miles of the plant.



Hope Creek has a boiling water reactor which normally uses 564 bundles of uranium fuel rods, each group weighing about 700 pounds. At any given time, heat-producing fission occurs in only one third of these fuel bundles while boron control rods keep the other bundles inert. Continuous fission in a single set of fuel rods could overheat and break the thin zirconium covering on the fuel rods, triggering excess fission and heat.

The result, explained Lochbaum, who trained reactor operators for the NRC, is a witches cauldron with superheated, radioactive water on the bottom, water and bubbles in the center, and steam at the top. It is the role of plant operators to maintain an even balance of heat, water, bubbles and steam throughout the huge reactor by performing a sort of nuclear contra dance with the control rods, inserting them completely or partially in different sets of bundles in a geometric pattern.

As the reactor reaches its maximum temperature and electric production, operators delicately raise and lower temperatures at selective, “limiting” fuel bundles. The PSEG proposal says that bundles containing Cobalt-60 cannot be in the critical position where they are used to control the temperature of the entire reactor.

But, says Lochbaum, the Hope Creek plan shows “you have taken the uranium fuel pellets out and put something else in, and there is not a lot of data as to how the reactor core will react. And it is important to know

what the operating parameters are before putting the Cobalt in there.

“We agree with the concept. But PSEG hasn’t shown how they can safely do it.”

Cobalt-60 had been produced primarily at the Chalk River reactor in Canada. “It was an old reactor,” said Lochbaum, “and they were building another to replace it. But the new reactor has never been able to operate it because it has design flaws. They spent a lot of money on the new reactor, but were never able to get it past its qualifying tests.

“So eventually they shut Chalk River and stopped on the replacement. So now they have no means of producing Cobalt-60. Hope Creek wants to step into the empty marketplace.”