NRC task force to do 90-day review, station blackout among issues

A 90-day review by an NRC task force of the ongoing accident at Japan's Fukushima I nuclear power plant will consider how lessons learned on issues ranging from backup power to spent fuel pools might apply to US nuclear units, a senior NRC official told a Senate committee this week.

Issues related to station blackout will be part of the 90-day review, Bill Borchardt, NRC executive director for operations, told the Senate Energy and Natural Resources Committee during a public briefing March 29. He indicated that one of the station blackout issues to be examined is how long backup batteries should be operable.

Committee Chairman Jeff Bingaman, a New Mexico Democrat, said he had convened a briefing rather than a hearing so presenters would not have to file their testimony with the committee 72 hours in advance because "things are changing quickly at Fukushima."

Fukushima I, also known as Fukushima Daiichi, lost the offsite power it needs to operate the plant's cooling system after a massive earthquake struck northeast Japan March 11. A tsunami that battered the plant about an hour later took out its emergency diesel generators, leaving batteries as the plant's only source of power. The batteries were depleted after eight hours, resulting in station blackout.

"Eleven US reactors are designed to cope with a station blackout lasting eight hours, as were the reactors in Japan," David Lochbaum, director of the nuclear safety project at the Union of Concerned Scientists, told the committee. Lochbaum said that 93 of the 104 operating power reactors in the US have batteries that would last "for only four hours."

Unless the life of onsite batteries is long enough to last until power from another source is restored, any US reactor in a station blackout should pursue three parallel paths to safety, Lochbaum said. Operators should work to restore offsite power and emergency diesel generators and to acquire additional batteries or temporary generators, Lochbaum said. All of that should be done as soon as possible, he said. Lochbaum suggested after the briefing that batteries should be operable for at least 48 to 72 hours.

In 1988, the NRC adopted a station blackout rule requiring nuclear power plant to prepare for an extended loss of power. Plants installed additional generators or increased their reliability and established procedures for dealing with a loss of power, according to NRC.

NRC regulations requires US plants to assess whether another power source would be available before the batteries run out during a station blackout, according to Ken Canavan, director of the Plant Technology group in the Electric Power Research Institute's nuclear sector. Canavan said in a March 22 interview that plants are required by the rule to determine their "coping time," that is, "how long can you exist without AC power," based on site-specific information such as "where you are on the grid, how reliable your grid is and how reliable your onsite AC power is."

US nuclear plants calculate the probability of hazards exceeding the design basis using a risk-informed approach, and then decide how to mitigate problems, Canavan said. Options include acquiring additional AC power sources, either from the grid or diesel generators, and extending the coping time, "given the likelihood" of the beyond design basis accidents, he said.

Anthony Pietrangelo, senior vice president and chief nuclear officer at the Nuclear Energy Institute, told reporters during a conference call March 15 that batteries at US plants last from four to 12 hours.

In the wake of a blackout that affected several states and nuclear plants in 2003, the NRC issued a generic letter, GL 2006-02, in February 2006 requesting information from power reactor licensees about how grid reliability affects plant operations.

The length of time nuclear power plants must provide backup power depends on the site, Borchardt said at the Senate briefing, noting that sites dealt with the problem differently. "Some installed gas turbines as backup power, others have batteries that lasted for different time periods. Typically, it would be four to eight hours," he said.

Borchardt told reporters after he briefed the committee that it would be "premature" to say now if the time period needs to be expanded but that question will be part of the 90-day review.

Borchardt and Peter Lyons, who is DOE acting assistant secretary for nuclear energy and a former NRC commissioner, repeatedly told the committee that US power reactors are safe and that information now available about Fukushima I suggest that the plant is in, as Lyons put it, "a slow recovery."

In response to questions from committee members, both said the passive safety systems of small modular reactors would be even safer than the current generation of reactors. In the event of a loss of offsite power, SMR valves would operate on stored air or battery power, Borchardt said.

Lyons said research is under way on new fuel cladding material that would not produce hydrogen. Such a development could help reduce the risk of a hydrogen explosion, he said.

Spent fuel pools

According to an update March 30 by the Japan Atomic Industrial Forum, the country's nuclear power industry group, some of the fuel in pools at Fukushima I has likely been damaged. "Damaged [is] suspected" to fuel integrity in the unit 3 spent fuel pool, and a hydrogen explosion occurred in the unit 4 pool, where fuel is "possibly damaged," JAIF said. The condition of fuel in the pools at unit 1 and unit 2 is "unknown," the group said. Pool cooling capability was recovered last week at the unit 5 and unit 6 pools.

Lochbaum said during a conference call with reporters March 28 that while the US nuclear power industry adopted "fairly comprehensive emergency training guidelines" following the 1979 partial core melt accident at Three Mile Island-2, "nothing was done on the spent fuel side."

He told the Senate committee March 29 that only spent fuel that has been out of the core less than five years should be in the spent fuel pool. All irradiated fuel older than that should be moved into dry storage, he said. Reducing the amount of spent fuel in the pool would reduce the pool's heat load, he said.

"If cooling of the spent fuel pool was interrupted or water inventory was lost from the pool, the lower heat load would give workers more time to recover cooling and/or water inventory before overheating caused fuel damage," Lochbaum said. He added that if the irradiated fuel in the storage pool became damaged, "the amount of radioactivity released from the smaller amount of spent fuel would be significantly less than that released from a nearly full pool."

Existing dry storage systems are designed to accommodate spent fuel that has been out of the core for at least five years, Lochbaum said.—*Elaine Hiruo, Yanmei Xie and Derek Sands, Washington*