

ESTIMATING THE DOSE FOR GENERIC SAFETY ISSUE-191 INSULATION REMOVAL

In Staff Requirements Memorandum (SRM)-SECY-10-0113, "Closure Options for Generic Safety Issue [GSI]-191, Assessment of Debris Accumulation on Pressurized-Water Reactor Sump Performance," dated December 23, 2010 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML103570354), the U.S. Nuclear Regulatory Commission staff noted significant differences between the industry-estimated doses for insulation removal associated with GSI-191 activities and reported historical doses for similar activities. As stated in SECY-10-0113, the staff conducted a limited survey of nine licensees who have performed significant insulation replacements associated with steam generator replacement and activities associated with GSI-191. Results of this survey showed an average total reported dose of 19 person-rem. In contrast, during an April 15, 2010, Commission meeting, industry provided the highest estimated dose of future insulation replacements provided at 600 person-rem, with an average dose of 200 person-rem.

At the September 29, 2010, public Commission meeting, industry representatives provided additional information, stating that two high-fiber units (but with a low source term) had recently substantially completed GSI-191 insulation replacement and had experienced 37 person-rem and 76 person-rem. The estimate given for another two-unit plant with considerable work remaining was 36 person-rem to 162 person-rem. The staff did not take issue with the estimates for those units. The staff is sensitive to the dose impacts of this type of work, and supports alternative approaches that can resolve the safety concerns with less radiation exposure.

In SRM-SECY-10-0113, the Commission gave the following direction:

On the subject of occupational dose, the staff should provide the Commission with the best possible estimate of the occupational dose that would be realized if the remaining plants were to undertake plant modifications to remove insulation. Staff should also provide better understanding of the differences between staff and industry estimates.

At this time, the staff is unable to provide a sound and independent estimate of the additional total occupational dose associated with insulation removal to close out GSI-191. The dose values cited by the staff in SECY-10-0113 were historical doses reported by licensees for specific tasks generally associated with closure of containment sump issues of GSI-191. The staff has not yet determined the impact of in-vessel effects and the scope of related modifications.

Among the difficulties in providing a broader dose estimate for GSI-191 insulation removal activities are the following:

- Final scope remains uncertain (e.g., additional modifications may be necessary);
- Installation decisions (e.g., insulation banding versus replacement) affect job dose;
- Radiation fields vary by unit and by location at a unit;
- Unexpected contamination levels can slow work, increasing job dose; and
- Hazardous materials may necessitate additional handling steps within radiation areas.

Additionally, units that have already replaced all insulation necessary to demonstrate operability of the containment sump (thus not among “the remaining plants” in the SRM) may be required to replace additional insulation to resolve in-vessel concerns, incurring additional radiation exposure to workers.

The industry recently provided updated dose estimates (see letter from the Nuclear Energy Institute (NEI) dated March 30, 2012 (ADAMS Accession No. ML12095A319)), based on additional experience gained since the September 29, 2010, Commission meeting. While noting estimating difficulties similar to those identified above, the NEI letter summarizes the issue as follows:

Dose estimates for replacing insulation on a steam generator and associated piping on a unit basis ranged from as low as 17 person-rem to as high as 276 person-rem. The most typical estimate was in range of 50-70 person-rem. Actual dose for this scope of work ranged from 21 to 58 person-rem. Dose estimates were also provided for replacing “All” affected insulation on a per unit basis, and those estimates ranged from 80 to 525 person-rem.

As noted above, actual doses tend to be lower than estimated; however, given the uncertainties in scope and site-specific factors such as source term and hazardous materials, the staff does not have a basis to believe that the industry estimates are unreasonable.