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SONGS Steam Generator Replacements

The Nuclear Regulatory Commission (NRC), in its July 2012 Augmented Inspection Team report, confirmed that SCE's replacement steam generator design changes were appropriately reviewed in accordance with the Title 10 Code of Federal Regulations, Section 50.59 requirements, which govern design changes between original and replacement steam generators. The NRC noted that the changes at SONGS are common in replacement steam generators today.

The 10 CFR 50.59 analyses for the SONGS units were completed in November 2008 (Unit 2) and July 2009 (Unit 3). These analyses were performed using a two-step process for assessing design changes: 1) perform a Screening to determine whether the design change affects a design function, method of performing or controlling the function, or an evaluation that demonstrates that intended functions will be accomplished, as described in the final safety analysis report; and 2) if yes, perform a 50.59 Evaluation to determine whether the change meets any of the eight criteria listed in 10 CFR 50.59(c) and therefore requires a license amendment.

The Screening and 50.59 evaluations for the SONGS replacement steam generators covered such matters as changes in materials and dimensions of the replacement steam generators, configuration or orientation of certain internal components; and numbers of tubes. They specifically covered the use of the Inconel 690 alloy for the steam generator tubes, the increased number of tubes, changes in steam flows, and the weight of the replacement steam generators. In particular, those analyses noted that the design changes to the steam generators did not require a license amendment pursuant to 10 CFR 50.59.

Some issues related to replacement of the steam generators did result in changes to the Technical Specifications, which in turn required a license amendment. These included changes to Technical Specification criteria for tube plugging and containment pressure testing. SCE applied for and obtained NRC approval of the required Technical Specification changes. SCE's Screening and 10 CFR 50.59 Evaluations for the replacement steam generators were subject to inspection and review by the NRC, and were inspected and reviewed by the NRC prior to the recent discovery of the tube wear issues with no findings with respect to 10 CFR 50.59.

Background on Steam Generator Replacements

- Steam generators may be replaced pursuant to Nuclear Regulatory Commission regulations, specifically 10 CFR 50.59. Since the early 1980s, more than 50 nuclear units in the United States have installed replacement steam generators. The replacement steam generators typically have numerous design differences from the original steam generators. For example, almost all of the steam generators replaced in the United States have substituted Inconel 690 for Inconel 600 as the alloy for steam generator tubes, because Inconel 690 has better resistance to corrosion cracking. Because the heat transfer properties of the two alloys are different, the tubing geometry in replacement steam generators is also different, e.g., tubes of Inconel 690 may be longer, greater in number, or differently spaced than those of Inconel 600.

- In general, a licensee may make a change to the design of the plant without prior NRC approval if the change would not require a change to the plant's NRC-approved Technical Specifications or if the change would not change the facility "as described in the final safety analysis report." The final safety analysis report is the official description of the nuclear plant and its design basis that was approved by the NRC in initial licensing, as updated throughout the life of the plant. In addition, even if the facility as described in the final safety analysis report is changed, the changes can be made without a license amendment if the specific criteria in 10 CFR 50.59 are met. Since the early 1980s, steam generator replacements have been implemented under 10 CFR 50.59 without a license amendment (except in cases where associated Technical Specification changes were needed or the replacement is associated with another change such as a power uprate for which a license amendment is needed).