Global Instrumentation and Control
OPΔT / OTΔT Operating Margin Recovery Program

Background

Several plants have experienced periodic hot leg temperature (T_{hot}) fluctuations originating in the reactor vessel upper plenum. Typically, the temperature in one hot leg increases about 1°F to 3°F in a fast ramp, remains at a higher temperature for several seconds, and then returns to the original temperature. These temperature oscillations may lead to a reduction in the overpressure delta-T (OPΔT) or overtemperature delta-T (OTΔT) margin, which could manifest itself as a partial turbine runback, an actual turbine runback when more than one channel is affected, or, in the extreme case, as a reactor trip. In some cases, the temperature oscillation leads to rod stepping at 100-percent power during automatic rod control.

The solution to this type of problem involves the modification of the OPΔT and OTΔT protection functions, specifically increasing the K1 and K4 setpoints, reducing the lead/lag compensation on the ΔT, reintroducing the T_{avg}/ΔT filters, or lag compensation on T_{hot} measurements only.

Description

Benefits from this program include the following:

- Recovers up to 3 percent OPΔT and OTΔT margin

- Accommodates temperature fluctuations without turbine runbacks

- Reduces challenges to safety systems

- Minimizes rod stepping (when in automatic rod control)

- Supports more aggressive fuel management through additional operating margin.

Deliverables

The OPΔT and OTΔT protection functions are credited in several non-loss-of-coolant accident (non-LOCA) safety analyses. Westinghouse will establish new OPΔT and OTΔT setpoints and document their impact upon the affected. It will be demonstrated that the conclusions of the FSAR remain valid via 10CFR50.59 safety evaluation. Additionally, the applicable sections of the FSAR and Technical Specifications will be marked up and provided.

Experience

The following plants have implemented the OPΔT/OTΔT margin recovery program, as described above: Farley Units 1&2, Millstone Unit 3, Seabrook, Sequoyah Units 1&2, Shearon Harris, Watts Bar Unit 1, Vogtle Units 1&2, ASCO Units 1&2, Almaraz Units 1&2, Indian Point Unit 2, Beaver Valley Units 1&2, Ginna (T_{hot} filter was implemented), Millstone SPU (T_{hot} filter being implemented).

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