

Online RTS/ESFAS Testing without Risk of Plant Trip

Background

Based on a Westinghouse probabilistic risk analysis and risk-informed assessment, the U.S. Nuclear Regulatory Commission (NRC) approved relaxed times related to reactor trip system and engineered safety features actuation system (RTS/ESFAS) Technical Specifications bypass test times, completion times (CTs) and channel operation test (COT) surveillance frequency.

The Westinghouse assessments and resultant NRC regulation changes apply to Westinghouse nuclear steam supply system (NSSS) designs with the 7300 process protection system (PPS) and nuclear instrumentation system (NIS). To help our customers comply with these revised criteria and realize the benefits, we offer bypass test instrumentation (BTI) whose benefits include:

- A decrease in the surveillance frequency for RTS/ESFAS analog channel COTs from once every 3 months to once every 6 months
- An extension of the CT to restore an inoperable channel in the bypassed condition, from 6 to 72 hours
- An increase in the time that an inoperable channel can be bypassed to allow operable channel testing in the same function from 4 hours to 12 hours without installed bypass test capability
- A routine allowance for testing analog RTS/ESFAS channels in the bypassed condition instead of the tripped condition, from 4 to 12 hours with installed bypass test capability

Description

The Westinghouse BTI comprises the hardware, documentation and licensing necessary to perform routine bypass tests of RTS/ESFAS analog channels and alarms associated with the 7300 PPS and NIS.

7300 Bypass Hardware

The BTI replaces the existing channel test cards in the 7300 system with new ones. The implementation of the new transmitter inputs and reactor temperature detector input test cards requires minor rewiring and allows trip or bypass testing. Internal cabinet wiring is also required to parallel each test card annunciator contact to the existing bypass annunciator for containment spray.

NIS Bypass Hardware

A BTI bypass panel is permanently installed in the rear of each cabinet bay in the NIS. Each comparator that produces a rod stop, permissive or reactor trip has a bypass switch and associated bypass lamp on the panel. Bypassing connections in the NIS are made at the output to the solid-state protection system so that not only will bypassing be effective when cards are removed from a drawer, but an entire drawer can be removed without creating a partial trip. The bypass panel is designed to minimize rewiring in the NIS cabinet.

Bypass Indication

NRC Regulatory Guide 1.47 requires that bypassed protective functions are annunciated in the control room. To accommodate this, a contact of each NIS keylock BYPASS ENABLE switch and each 7300 protection set is routed to a control room annunciator.



Licensing Summary Report

Westinghouse prepares a licensing report for NRC submittal that documents the bypass test system conformance to applicable safety and licensing criteria.

License Amendment Request

Since implementing bypass testing at a plant may require technical specification changes, a license amendment pursuant to 10CFR50.59(c) and 10CFR50.90 may be required. Westinghouse will prepare the required applicability determination and screening documentation for changes recommended that are within Westinghouse scope. A significant hazards evaluation that addresses further NRC criteria will also be provided to support any technical specification changes.

Final Safety Analysis Report (FSAR) and Technical Specification Changes

Westinghouse will provide markups to Chapter 7 of the plant's FSAR to reflect plant changes made for the bypass testing. All technical specification revisions will be provided to reflect the bypass test capability for normal conditions and for conditions with a failed channel.

Benefits

The benefits of bypass testing are complemented by implementing the extended bypass test times, CTs and extended COT surveillance frequency. The benefits include:

- Analog channel online surveillance testing can be performed with the comparator outputs bypassed rather than tripped, reducing the likelihood of unnecessary reactor trips or safeguard actuations due to human error, channel failure or spurious transient in a redundant channel during testing.

- Surveillance testing can be performed on an operable channel when a redundant, inoperable tripped channel can not be restored without having to jumper the channel that has tripped.
- An inoperable reactor trip or safeguards channel can be repaired, or components replaced, with the channel bypassed.
- An operable channel can be routinely tested while tripped.
- The bypass test equipment is integral to the existing racks.

Increasing the time between surveillance test intervals reduces the need for reactor protection system component tests without impacting reliability, as well as the potential for reactor trips and actuation of engineered safety features associated with those tests. The CT extensions provide additional time to complete tests and maintenance while at-power, potentially decreasing the number of forced outages.

Experience

The following nuclear plants have used Westinghouse

BTI:

- Comanche Peak 1 and 2
- Seabrook
- Vogtle 1 and 2
- South Texas 1 and 2