3/4.3 INSTRUMENTATION

3/4.3.1 REACTOR TRIP SYSTEM INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.3.1 As a minimum, the Reactor Trip System instrumentation channels and interlocks of Table 3.3-1 shall be OPERABLE.

APPLICABILITY: As shown in Table 3.3-1.

ACTION:

As shown in Table 3.3-1.

SURVEILLANCE REQUIREMENTS

4.3.1.1 Each Reactor Trip System instrumentation channel and interlock and the automatic trip logic shall be demonstrated OPERABLE by the performance of the Reactor Trip System Instrumentation Surveillance Requirements specified in Table 4.3-1.

4.3.1.2 The REACTOR TRIP SYSTEM RESPONSE TIME of each Reactor trip function shall be verified to be within its limit at least once per 18 months. Each verification shall include at least one train such that both trains are verified at least once per 36 months and one channel per function such that all channels are verified at least once every N times 18 months where N is the total number of redundant channels in a specific Reactor trip function as shown in the "Total No. of Channels" column of Table 3.3-1.

SURVEILLANCE REQUIREMENTS

4.3.2.1 Each ESFAS instrumentation channel and interlock and the automatic actuation logic and relays shall be demonstrated OPERABLE by the performance of the ESFAS Instrumentation Surveillance Requirements specified in Table 4.3-2.

4.3.2.2 The ENGINEERED SAFETY FEATURES RESPONSE TIME of each ESFAS function shall be verified to be within the limit at least once per 18 months. Each verification shall include at least one train such that both trains are verified at least once per 36 months and one channel per function such that all channels are verified at least once every N times 18 months where N is the total number of redundant channels in a specific ESFAS function as shown in the "Total No. of Channels" column of Table 3.3-3.

3/4.3.1 and 3/4.3.2 REACTOR TRIP SYSTEM and ENGINEERED SAFETY FEATURES ACTUATION SYSTEM INSTRUMENTATION (continued)

uncertainties of the instrumentation to measure the process variable and the uncertainties in calibrating the instrumentation. In Equation 2.2-1, $Z + R\ S \leq TA$, the interactive effects of the errors in the rack and the sensor, and the "as measured" values of the errors are considered. Z, as specified in Table 3.3-4, in percent span, is the statistical summation of errors assumed in the analysis excluding those associated with the sensor and rack drift and the accuracy of their measurement. TA or Total Allowance is the difference, in percent span; R or Rack Error is the "as measured" deviation, in the percent span, for the affected channel from the specified Trip Setpoint. S or Sensor Error is either the "as measured" deviation of the sensor from its calibration point or the value specified in Table 3.3-4, in percent span, from the analysis assumptions. Use of Equation 2.2-1 allows for a sensor drift factor, an increased rack drift factor, and provides a threshold value for REPORTABLE EVENTS.

The methodology to derive the Trip Setpoints is based upon combining all of the uncertainties in the channels. Inherent to the determination of the Trip Setpoints are the magnitudes of these channel uncertainties. Sensor and rack instrumentation utilized in these channels are expected to be capable of operating within the allowances of these uncertainty magnitudes. Rack drift in excess of the Allowable Value exhibits the behavior that the rack has not met its allowance. Being that there is a small statistical chance that this will happen, an infrequent excessive drift is expected. Rack or sensor drift, in excess of the allowance that is more than occasional, may be indicative of more serious problems and should warrant further investigation.

The verification of response time at the specified frequencies provides assurance that the reactor trip and the engineered safety features actuation associated with each channel is completed within the time limit assumed in the safety analysis. No credit is taken in the analysis for those channels with response times indicated as not applicable (i.e., N.A.).

Response time may be verified by actual response time tests in any series of sequential, overlapping or total channel measurements, or by the summation of allocated sensor, signal processing and actuation logic response times with actual response time tests on the remainder of the channel. Allocations for sensor response times may be obtained from:

(1) Historical records based on acceptable response time tests (hydraulic, noise, or power interrupt tests);

(2) Inplace, onsite, or offsite (e.g., vendor) test measurements; or

(3) Utilizing vendor engineering specifications.

3/4.3.1 and 3/4.3.2 REACTOR TRIP SYSTEM and ENGINEERED SAFETY FEATURES ACTUATION SYSTEM INSTRUMENTATION (continued)

WCAP-13632-P-A, Revision 2, "Elimination of Pressure Sensor Response Time Testing Requirements," provides the basis and methodology for using allocated sensor response times in the overall verification of the channel response time for specific sensors identified in WCAP-13632-P-A, Revision 2. Response time verification for other sensor types not covered by WCAP-13632-P-A, Revision 2, must be demonstrated by test.

In consideration of other response time test procedures used at Seabrook Station the Resistance Temperature Detectors (RTDs) are not encompassed by this analysis as presented and will continue to be periodically tested.

For those sensors covered by WCAP-13632-P-A, Revision 2, the following actions must be implemented:

(a) A hydraulic response time test must be performed prior to installation of a new transmitter/switch or following refurbishment of the transmitter/switch (e.g., sensor cell or variable damping components) to determine an initial sensor-specific response time value;

(b) For transmitters and switches that use capillary tubes, a response time test must be performed after initial installation and after any maintenance or modification activity that could damage the capillary tubes;

(c) If variable damping is used*, a method to assure that the potentiometer is at the required setting and cannot be inadvertently changed must be implemented, or a hydraulic response time test of the sensor must be performed following each calibration; and

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* Seabrook Station currently has no pressure transmitters with variable damping installed in any RPS or ESFAS application for which RTT is required; therefore, no Seabrook Station procedure changes or enhanced administrative controls are required. If in the future, a pressure transmitter with variable damping capability is used, then either procedure changes will be implemented and/or appropriate administrative controls will be established to assure the variable damping potentiometer cannot be inadvertently changed. Examples of such administrative controls may include use of pressure transmitters that are factory set and hermetically sealed to prohibit tampering or in situ application of a tamper seal (or sealant) on the potentiometer to secure and give a visual indication of the potentiometer position.

3/4.3.1 and 3/4.3.2 REACTOR TRIP SYSTEM and ENGINEERED SAFETY FEATURES ACTUATION SYSTEM INSTRUMENTATION (continued)

(d) Performing periodic drift monitoring for Model 1151, 1152, 1153 and 1154 Rosemount pressure and differential pressure transmitters, for which response time testing elimination is implemented, in accordance with the guidance contained in Rosemount Technical Bulletin No. 4 and continue to remain in full compliance with any prior commitments to NRC Bulletin 90-01, Supplement 1, "Loss of Fill-Oil in Transmitters Manufactured by Rosemount." Seabrook Station may complete the following actions as an alternative to performing periodic drift monitoring of Rosemount transmitters:

(1) Assure that operators and technicians are aware of the Rosemount transmitter loss of fill-oil issue and will make provisions to assure that technicians monitor for sensor response time degradation during the performance of calibrations and functional tests of these transmitters; and

(2) Review and revise surveillance testing procedures, if necessary, to assure that calibrations will be performed using equipment designed to provide a step function or fast ramp in the process variable and that calibrations and functional tests are being performed in a manner that allows simultaneous monitoring of both the input and output response of the transmitter under test, thus allowing, with reasonable assurance, the recognition of significant response time degradation.

WCAP-14036-P-A, Revision 1, "Elimination of Periodic Protection Channel Response Time Tests," provides the basis and methodology for using allocated signal processing and actuation logic response times in the overall verification of the protection system channel response time.

Table 8-1 of WCAP-14036-P-A, Revision 1, presents bounding generic system response time allocations. These bounding response times were used in the response times evaluated for each protection function at Seabrook Station. Current response time testing procedures require dividing the Solid State Protection System (SSPS) response times instead of applying the SSPS response time as a total string value. Future procedure changes may negate this redistribution if overall channel response time conforms to the WCAP-14036-P-A, Revision 1 methodology and remains compliant with accident analysis. The following current exceptions to WCAP-14036-P-A, Revision 1 time allocations apply to Seabrook Station:

3/4.3.1 and 3/4.3.2 REACTOR TRIP SYSTEM and ENGINEERED SAFETY FEATURES ACTUATION SYSTEM INSTRUMENTATION (continued)

1. Seabrook Station procedures include the master and slave relays of the SSPS when response time testing the final actuated device. Since response times of the final actuated devices are not exempted from response time tests, these components of the SSPS will continue to be tested along with their applicable final actuated equipment. For the SSPS portion of the protection functions, only the analyzed FMEA value for the input relay and a conservative value for the SSPS logic has been applied.

2. In consideration of other response time test procedures used at Seabrook the following functions are not encompassed by this analysis as presented in WCAP-14036-P-A, Revision 1 and will continue to be periodically tested. These functions are:

    - Reactor Trip on Reactor Coolant Pump Undervoltage
    - Reactor Trip on Reactor Coolant Pump Underfrequency
    - Diesel Generator Start on Loss of Offsite Power
    - Control Building Air Emergency Fan/Filter Actuation on Control Room High Radiation

The allocations for sensor, signal conditioning and actuation logic response times must be verified prior to placing the component in operational service and re-verified following maintenance that may adversely affect response time. In general, electrical repair work does not impact response time provided the parts used for repair are of the same type and value. Specific components identified in WCAP-14036-P-A, Revision 1 may be replaced without verification testing. One example where response time could be affected is replacing the sensing assembly of a transmitter.

The Seabrook Station sensor functions to which the basis and methodology of WCAP-13632-P-A, Revision 2 has been applied are:

- Steam Generator Water Level
- Pressurizer Pressure
- Steamline Pressure
- Containment Pressure
- Reactor Coolant Flow

The Seabrook Station systems to which the basis and methodology of WCAP-14036-P-A, Revision 1 has been applied are:

- Process Protection System
- Nuclear Instrumentation System
- Logic System

3/4.3.1 and 3/4.3.2 REACTOR TRIP SYSTEM and ENGINEERED SAFETY FEATURES ACTUATION SYSTEM INSTRUMENTATION (continued)

At the end of the injection phase of a LOCA, the RWST will be nearly empty. Continued cooling must be provided by the ECCS to remove decay heat. The source of water for the ECCS pumps is automatically switched to the containment recirculation sumps. The low head residual heat removal (RHR) pumps and containment spray pumps draw the water from the containment recirculation sumps, the RHR pumps pump the water through the RHR heat exchangers, inject the water back into the RCS, and upon manual alignment supply the cooled water to the other ECCS pumps. Switchover from the RWST to the containment recirculation sumps must occur before the RWST empties to prevent damage to the ECCS pumps and a loss of core cooling capability. For similar reasons, switchover must not occur before there is sufficient water in the containment sump to provide sufficient net positive suction head (NPSH) to support ECCS pump operation. Furthermore, early switchover must not occur to ensure that sufficient borated water is injected from the RWST. This ensures the reactor remains shut down in the recirculation mode. To satisfy these requirements, the RWST Level Low-Low Allowable Value/Trip Setpoint has both upper and lower limits. The lower limit ensures switchover occurs before the RWST empties to prevent ECCS pump damage while the upper limit ensures the reactor remains shut down and that there is adequate water inventory in the containment recirculation sumps to provide ECCS pump suction.

The Engineered Safety Features Actuation System senses selected plant parameters and determines whether or not predetermined limits are being exceeded. If they are, the signals are combined into logic matrices sensitive to combinations indicative of various accidents, events, and transients. Once the required logic combination is completed, the system sends actuation signals to those Engineered Safety Features components whose aggregate function best serves the requirements of the condition. As an example, the following actions may be initiated by the Engineered Safety Features Actuation System to mitigate the consequences of a steam line break or loss-of-coolant accident: (1) Safety