BASES

SURVEILLANCE REQUIREMENTS (continued)

response time provided the parts used for repair are of the same type and value. Specific components identified in the WCAP may replaced without verification testing. One example where response time could be affected is replacing the sensing assembly of a transmitter.

ESF RESPONSE TIME tests are conducted on an [18] month STAGGERED TEST BASIS. Testing of the final actuation devices, which make up the bulk of the response time, is included in the testing of each channel. The final actuation device in one train is tested with each channel. Therefore, staggered testing results in response time verification of these devices every [18] months. The [18] month Frequency is consistent with the typical refueling cycle and is based on unit operating experience, which shows that random failures of instrumentation components causing serious response time degradation, but not channel failure, are infrequent occurrences.

This SR is modified by a Note that clarifies that the turbine driven AFW pump is tested within 24 hours after reaching [1000] psig in the SGs.

SR 3.3.2.11

SR 3.3.2.11 is the performance of a TADOT as described in SR 3.3.2.8, except that it is performed for the P-4 Reactor Trip Interlock, and the Frequency is once per RTB cycle. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable TADOT of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. This Frequency is based on operating experience demonstrating that undetected failure of the P-4 interlock sometimes occurs when the RTB is cycled.

The SR is modified by a Note that excludes verification of setpoints during the TADOT. The Function tested has no associated setpoint.

REFERENCES

1. FSAR, Chapter [6].
2. FSAR, Chapter [7].
3. FSAR, Chapter [15].
4. IEEE-279-1971.

TSTF-411

INSERT 48

The Frequency of 92 days on a STAGGERED TEST BASIS is justified in Reference ~~9~~. 10 (4)

(7) INSERT 49

SR 3.3.2.5 is modified by a Note which applies to the SI Containment Pressure - High Containment Spray Containment Pressure - High High, Phase B Isolation Containment Pressure - High High, Steam Line Isolation Containment Pressure - High High, and CEQ System Containment Pressure - High Functions. This Note requires, during the performance of SR 3.3.2.5, the associated transmitters of these Functions to be exercised by applying either a vacuum or pressure to the appropriate side of the transmitter. Exercising the associated transmitters during the performance of the COT is necessary to ensure Functions 1.c, 2.c, 3.b.(3), 4.c, and 7.c remain OPERABLE between each CHANNEL CALIBRATION.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.2.[redacted]

SR 3.3.2.[redacted] is the performance of a SLAVE RELAY TEST. The SLAVE RELAY TEST is the energizing of the slave relays. Contact operation is verified in one of two ways. Actuation equipment that may be operated in the design mitigation MODE is either allowed to function, or is placed in a condition where the relay contact operation can be verified without operation of the equipment. Actuation equipment that may not be operated in the design mitigation MODE is prevented from operation by the SLAVE RELAY TEST circuit. For this latter case, contact operation is verified by a continuity check of the circuit containing the slave relay. This test is performed every [redacted]. The Frequency is adequate, based on industry operating experience, considering instrument reliability and operating history data.

[redacted]

SR 3.3.2.[redacted] is the performance of a TADOT every [redacted] days. This test is a check of the Loss of [redacted] Undervoltage RCP and AFW Pump Suction Transfer on Suction Pressure - Low Functions. Each Function is tested up to, and including, the master transfer relay coils. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable TADOT of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions.

The test also includes trip devices that provide actuation signals directly to the SSPS. The SR is modified by a Note that excludes verification of setpoints for relays. Relay setpoints require elaborate bench calibration and are verified during CHANNEL CALIBRATION. The Frequency is adequate. It is based on industry operating experience, considering instrument reliability and operating history data.

SR 3.3.2.[redacted]

SR 3.3.2.[redacted] is the performance of a TADOT. This test is a check of the Manual Actuation Functions [redacted] AFW pump start on trip of all MFW pumps. It is performed every [redacted] months. Each Manual Actuation Function is tested up to, and including, the master relay coils. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of

(7) INSERT 50

SR 3.3.2.7

SR 3.3.2.7 is the performance of a CHANNEL CALIBRATION. A CHANNEL CALIBRATION is performed every 184 days. CHANNEL CALIBRATION is a complete check of the instrument loop, including the sensor. The test verifies that the channel responds to a measured parameter within the necessary range and accuracy.

CHANNEL CALIBRATIONS must be performed consistent with the assumptions of the unit specific setpoint methodology. The difference between the current "as found" values and the previous test "as left" values must be consistent with the drift allowance used in the setpoint methodology.

The Frequency of 184 days is based on the assumption of an 184 day calibration interval in the determination of the magnitude of equipment drift in the setpoint methodology.

~~(7) INSERT 50A~~

, the SI Input from ESFAS Function associated with Turbine Trip and Feedwater Isolation, the

Containment manual isolation [3.a(1), 3.b(1)]

BASES

SURVEILLANCE REQUIREMENTS (continued)

Add Bases synopsis using from DOC L.13

the relay. This clarifies what is an acceptable TADOT of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. In some instances, the test includes actuation of the end device (i.e., pump starts, valve cycles, etc.). The Frequency is adequate, based on industry operating experience and is consistent with the typical refueling cycle. The SR is modified by a Note that excludes verification of setpoints during the TADOT for manual initiation Functions. The manual initiation Functions have no associated setpoints. (4) (7)

(7)

SR 3.3.2.10

SR 3.3.2.10 is the performance of a CHANNEL CALIBRATION. (2)

L.19 A CHANNEL CALIBRATION is performed every 18 months or approximately at every refueling. CHANNEL CALIBRATION is a complete check of the instrument loop, including the sensor. The test verifies that the channel responds to measured parameter within the necessary range and accuracy. (3) (6)

CHANNEL CALIBRATIONS must be performed consistent with the assumptions of the unit specific setpoint methodology. The difference between the current "as found" values and the previous test "as left" values must be consistent with the drift allowance used in the setpoint methodology.

The Frequency of 18 months is based on the assumption of an 18 month calibration interval in the determination of the magnitude of equipment drift in the setpoint methodology. (3)

This SR is modified by a Note stating that this test should include verification that the time constants are adjusted to the prescribed values where applicable. (7) INSERT 51

SR 3.3.2.10 (7)

This SR ensures the individual channel ESF RESPONSE TIMES are less than or equal to the maximum values assumed in the accident analysis. Response Time testing acceptance criteria are included in the Technical Requirements Manual Section 15 (Ref. 8). Individual component response times are not modeled in the analyses. The analyses model the overall or total elapsed time, from the point at which the parameter (4) Table 1.2-7 TSTF-418

4 **INSERT 36A**

However, none of these additional Functions are assumed in the safety analysis, thus they are not require for OPERABILITY of the P-4 interlock.

4 **INSERT 36B**

automatic SI initiation is not required.

4 **INSERT 37**

There are two Pressurizer Pressure, P-11 interlock channels (one per train). Each channel receives input from three Pressurizer Pressure channels. Each P-11 interlock channel actuates to provide the interlock function for its associated ESFAS logic train.

Open pending comment 1335
Note Bases page 3.3.2-36 refers to 2/3 Pressurizer Pressure channels.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Pressure - Negative Rate - High is enabled. This provides protection for an SLB by closure of the MSIVs. With two-out-of-three pressurizer pressure channels above the P-11 setpoint, the Pressurizer Pressure - Low and Steam Line Pressure - Low SI signals and the Steam Line Pressure - Low steam line isolation signal are automatically enabled. The operator can also enable these trips by use of the respective manual reset buttons. When the Steam Line Pressure - Low steam line isolation signal is enabled, the main steam isolation on Steam Line Pressure - Negative Rate - High is disabled. The Trip Setpoint reflects only steady state instrument uncertainties. (4)

This Function must be OPERABLE in MODES 1, 2, and 3 to allow an orderly cooldown and depressurization of the unit without the actuation of SI or main steam isolation. This Function does not have to be OPERABLE in MODE 4, 5, or 6 because system pressure must already be below the P-11 setpoint for the requirements of the heatup and cooldown curves to be met. (4)

STET, this is a basis

Insert 37B is an outcome (4) the basis

move to

INSERT 38
open pending comment
1335

c. Engineered Safety Feature Actuation System Interlocks - T_{avg} - Low Low, P-12

On increasing reactor coolant temperature, the P-12 interlock reinstates SI on High Steam Flow Coincident With Steam Line Pressure - Low or Coincident With T_{avg} - Low Low and provides an arming signal to the Steam Dump System. On decreasing reactor coolant temperature, the P-12 interlock allows the operator to manually block SI on High Steam Flow Coincident With Steam Line Pressure - Low or Coincident with T_{avg} - Low Low. On a decreasing temperature, the P-12 interlock also removes the arming signal to the Steam Dump System to prevent an excessive cooldown of the RCS due to a malfunctioning Steam Dump System. (4)

Misplaced,

or tripped

Since T_{avg} is used as an indication of bulk RCS temperature, this Function meets redundancy requirements with one OPERABLE channel in each loop. In three loop units, these channels are used in two-out-of-three logic. In four loop units, they are used in two-out-of-four logic. (4)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

- Prevent opening of the MFW isolation valves if they were closed on SI or SG Water Level - High High. (4)

Each of the above Functions is interlocked with P-4 to avert or reduce the continued cooldown of the RCS following a reactor trip. An excessive cooldown of the RCS following a reactor trip could cause an insertion of positive reactivity with a subsequent increase in generated power. To avoid such a situation, the noted Functions have been interlocked with P-4 as part of the design of the unit control and protection system.

None of the noted Functions serves a mitigation function in the unit licensing basis safety analyses. Only the turbine trip Function is explicitly assumed since it is an immediate consequence of the reactor trip Function. Neither turbine trip, nor any of the other four Functions associated with the reactor trip signal, is required to show that the unit licensing basis safety analysis acceptance criteria are not exceeded.

INSERT 36A — move to; provide equivalent basis for Cook (4); Is turbine trip implicitly assumed?

The RTB position switches that provide input to the P-4 interlock only function to energize or de-energize or open or close contacts. Therefore, this Function has no adjustable trip setpoint with which to associate a Trip Setpoint and Allowable Value. (2)

This Function must be OPERABLE in MODES 1, 2, and 3 when the reactor may be critical or approaching criticality. This Function does not have to be OPERABLE in MODE 4, 5, or 6 because the main turbine, the MFW System, and the Steam Dump System are not in operation. (9)

b. Engineered Safety Feature Actuation System Interlocks - Pressurizer Pressure, P-11

Open pending comment (1335) — INSERT 37

The P-11 interlock permits a normal unit cooldown and depressurization without actuation of SI or main steamline isolation. With two-out-of-three pressurizer pressure channels (discussed previously) less than the P-11 setpoint, the operator can manually block the Pressurizer Pressure - Low and Steam Line Pressure - Low SI signals and the Steam Line Pressure - Low steam line isolation signal (previously discussed). When the Steam Line Pressure - Low steam line isolation signal is manually blocked, a main steam isolation signal on Steam Line (4) (4)

7 INSERT 35

7. Containment Air Recirculation/Hydrogen Skimmer (CEQ) System

The CEQ System functions to assist in cooling the containment atmosphere and limiting pressure and temperature in containment to less than design values. Limiting pressure and temperature reduces the release of fission product radioactivity from the containment to the environment in the event of a DBA.

CEQ Actuation is accomplished by Manual Initiation, Automatic Actuation Logic and Actuation Relays, and by Containment Pressure - High channels (the same channels that actuate SI, Function 1.c).

a. CEQ - Manual Initiation

The CEQ Manual Initiation Function is designed with one manual switch in each train. One switch (channel) in a train must be placed in the actuate position for the associated components in the train to receive an CEQ initiation signal. The LCO requires one channel per train to be OPERABLE. The operator can initiate CEQ at any time by using either of two switches in the control room. This action will cause actuation of components in the same manner as any of the automatic actuation signals.

The LCO for the Manual Initiation Function ensures the proper amount of redundancy is maintained to ensure the operator has manual CEQ System initiation capability.

b. CEQ - Automatic Actuation Logic and Actuation Relays

The CEQ Automatic Actuation Logic and Actuation Relays Function includes two trains. The actuation of the logic in any train will actuate the associated components in the same train. This LCO requires two trains to be OPERABLE. Actuation logic consists of all circuitry housed within the actuation subsystems, including the initiating relay contacts responsible for actuating the CEQ System.

c. CEQ - Containment Pressure - High

This signal provides protection against the following accidents:

- SLB inside containment; and
- LOCA.

The CEQ Containment Pressure - High Function design includes three channels. This LCO requires three channels to be OPERABLE. Three OPERABLE channels are sufficient to satisfy protective requirements with a two-out-of-three logic.

4

INSERT 32

Three undervoltage relays with time delays are provided for each 4.16 kV emergency bus to detect a loss of bus voltage. The relays are combined in a two-out-of-three logic to generate a loss of voltage signal (i.e., the required number of channels required to trip to generate a loss of voltage signal is two per bus). A Loss of Voltage signal on T11A (Unit 1) and T21A (Unit 2) (Train B) or T11D (Unit 1) and T21D (Unit 2) (Train A) will start the associated motor driven feedwater pump. A Loss of Voltage signal on T11A and T11B (Unit 1) and T21A and T21B (Unit 2) (Train B) or T11C and T11D (Unit 1) and T21C and T21D (Unit 2) (Train A) will actuate the valves associated with the motor driven feedwater pumps on both trains.

4

INSERT 33

A bus undervoltage signal is generated by one out of two undervoltage relays (channels) per reactor coolant pump bus, however the LCO requires only one per bus to be OPERABLE. While not assumed in the accident analysis,

4

INSERT 34 (Unit 1 only)

Each turbine driven MFW pump is equipped with a low and high pressure steam stop valve. Each stop valve contains a limit switch, which actuates when the associated stop valve is closed. Both of the stop valve limit switches associated with a turbine driven MFW provide input into one of the two channels and both limit switches must actuate for the channel to indicate a turbine driven MFW pump has tripped. Since the unit includes two turbine driven MFW pumps, both channels must trip to start the motor driven auxiliary feedwater pumps (i.e., a two-out-of-two logic configuration). The LCO requires both channels to be OPERABLE. This Function does not meet the single failure criteria, however this is acceptable since the SG Water Level - Low Low Function is credited to start the AFW System in the design basis accidents and transients that result in a loss of MFW.

Attachment 1, Volume 8, Rev. 0, Page 381 of 818

4 INSERT 25

The SI Input from ESFAS ensures that the ESFAS automatic actuation logic will actuate Turbine Trip and Feedwater Isolation upon any signal that initiates SI. Actuation of Turbine Trip and Feedwater Isolation on an SI signal ensures that, if an event that results in an SI could also result in excessive feedwater flow, the main turbine and all main feedwater pumps will be tripped and MFW will be isolated. The SI Input from ESFAS signal directly inputs to the Turbine Trip and Feedwater Isolation actuation logic. There are two trains of SI Input from ESFAS arranged in a one-out-of-two logic.

Awkward

4 INSERT 26

In MODE 3 when all MFIVs or MFRVs are closed and de-activated or isolated by a closed manual valve and

4 INSERT 27

An emergency water source is provided from the Essential Service Water System. Transfer is accomplished by a remotely operated, motor-operated valve and a manual valve.

4 INSERT 28

The Auxiliary Feedwater - Automatic Actuation Logic and Actuation Relays (Solid State Protection System) Function design includes two trains. The actuation of the logic in any train will actuate the turbine driven AFW pump and valves or the associated motor driven AFW pump and valves, as applicable. Each AFW Function, except the Loss of Voltage and Trip of all Main Feedwater Functions, input into this logic arrangement.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

b. Auxiliary Feedwater - Automatic Actuation Logic and Actuation Relays (Balance of Plant ESFAS)

INSERT 29 → Automatic actuation logic and actuation relays consist of the same features and operate in the same manner as described for ESFAS Function 1.b. (4)

c. Auxiliary Feedwater - Steam Generator Water Level - Low Low

SG Water Level - Low Low provides protection against a loss of heat sink. A feed line break, inside or outside of containment, or a loss of MFW, would result in a loss of SG water level. SG Water Level - Low Low provides input to the SG Level Control System. Therefore, the actuation logic must be able to withstand both an input failure to the control system which may then require a protection function actuation and a single failure in the other channels providing the protection function actuation. Thus, four OPERABLE channels are required to satisfy the requirements with two-out-of-four logic. For units that have dedicated protection and control channels, only three protection channels are necessary to satisfy the protective requirements. For other units that have only three channels, a median signal selector is provided or justification is provided in Reference 7. (4)

With the transmitters (d/p cells) located inside containment and thus possibly experiencing adverse environmental conditions (feed line break), the Trip Setpoint reflects the inclusion of both steady state and adverse environmental instrument uncertainties. (2) (7)

d. Auxiliary Feedwater - Safety Injection

An SI signal starts the motor driven and turbine driven AFW pumps. The AFW initiation functions are the same as the requirements for their SI function. Therefore, the requirements are not repeated in Table 3.3.2-1. Instead, Function 1, SI, is referenced for all initiating functions and requirements. (4) (7)

e. Auxiliary Feedwater - Loss of Offsite Power

A loss of offsite power to the service buses will be accompanied by a loss of reactor coolant pumping power and the subsequent (4)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

room and either switch can initiate action to immediately close all MSIVs. The LCO requires two channels to be OPERABLE.

b. Steam Line Isolation - Automatic Actuation Logic and Actuation Relays

Automatic actuation logic and actuation relays consist of the same features and operate in the same manner as described for ESFAS Function 1.b.

Manual and automatic initiation of steam line isolation must be OPERABLE in MODES 1, 2, and 3 when there is sufficient energy in the RCS and SGs to have an SLB or other accident. This could result in the release of significant quantities of energy and cause a cooldown of the primary system. The Steam Line Isolation Function is required in MODES 2 and 3 unless all MSIVs are closed and de-activated. In MODES 4, 5, and 6, there is insufficient energy in the RCS and SGs to experience an SLB or other accident releasing significant quantities of energy.

c. Steam Line Isolation - Containment Pressure - High 2

This Function actuates closure of the MSIVs in the event of a LOCA or an SLB inside containment to maintain at least one unfaulted SG as a heat sink for the reactor, and to limit the mass and energy release to containment. The transmitters (d/p cells) are located outside containment with the sensing line (high pressure side of the transmitter) located inside containment. Containment Pressure - High 2 provides no input to any control functions. Thus, three OPERABLE channels are sufficient to satisfy protective requirements with a two-out-of-three logic. However, for enhanced reliability, this Function was designed with four channels and a two-out-of-four logic. The transmitters and electronics are located outside of containment. Thus, they will not experience any adverse environmental conditions, and the Trip Setpoint reflects only steady state instrument uncertainties.

Containment Pressure - High 2 must be OPERABLE in MODES 1, 2, and 3, when there is sufficient energy in the primary and secondary side to pressurize the containment following a pipe break. This would cause a significant increase in the containment pressure, thus allowing detection and

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Manual and automatic initiation of Phase A Containment Isolation must be OPERABLE in MODES 1, 2, and 3, when there is a potential for an accident to occur. Manual initiation is also required in MODE 4 even though automatic actuation is not required. In this MODE, adequate time is available to manually actuate required components in the event of a DBA, but because of the large number of components actuated on a Phase A Containment Isolation, actuation is simplified by the use of the manual actuation push buttons. Automatic actuation logic and actuation relays must be OPERABLE in MODE 4 to support system level manual initiation. In MODES 5 and 6, there is insufficient energy in the primary or secondary systems to pressurize the containment to require Phase A Containment Isolation. There also is adequate time for the operator to evaluate unit conditions and manually actuate individual isolation valves in response to abnormal or accident conditions. (4) (4)

(3) Phase A Isolation - Safety Injection ESFAS (7)

Phase A Containment Isolation is also initiated by all Functions that initiate SI. The Phase A Containment Isolation requirements for these Functions are the same as the requirements for their SI function. Therefore, the requirements are not repeated in Table 3.3.2-1. Instead, Function 1, SI, is referenced for all initiating Functions and requirements.

hold pending comment #1125

INSERT 20 (7)

b. Containment Isolation - Phase B Isolation

Phase B Containment Isolation is accomplished by Manual Initiation, Automatic Actuation Logic and Actuation Relays, and by Containment Pressure channels (the same channels that actuate Containment Spray, Function 2). The Containment Pressure trip of Phase B Containment Isolation is energized to trip in order to minimize the potential of spurious trips that may damage the RCPs. (2)

(4)

(1) Phase B Isolation - Manual Initiation

(2) Phase B Isolation - Automatic Actuation Logic and Actuation Relays

B 3.3.2

(4) INSERT 12

and aligns the valves associated with the Spray Additive System

(4) INSERT 13

a level indicating a sufficient volume has been transferred to containment, the operator aligns

Is this a credited manual action accepted by NRC staff?

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

manually by Containment Pressure - High 3 or Containment Pressure - High High.

a. Containment Spray - Manual Initiation

The operator can initiate containment spray at any time from the control room by simultaneously turning two containment spray actuation switches in the same train. Because an inadvertent actuation of containment spray could have such serious consequences, two switches must be turned simultaneously to initiate containment spray. There are two sets of two switches each in the control room. Simultaneously turning one two switches in either set will actuate containment spray in both trains in the same manner as the automatic actuation signal. Two Manual Initiation switches in each train are required to be OPERABLE to ensure no single failure disables the Manual Initiation Function. Note that Manual Initiation of containment spray also actuates Phase B containment isolation.

b. Containment Spray - Automatic Actuation Logic and Actuation Relays

Automatic actuation logic and actuation relays consist of the same features and operate in the same manner as described for ESFAS Function 1.b.

Manual and automatic initiation of containment spray must be OPERABLE in MODES 1, 2, and 3 when there is a potential for an accident to occur, and sufficient energy in the primary or secondary systems to pose a threat to containment integrity due to overpressure conditions. Manual initiation is also required in MODE 4, even though automatic actuation is not required. In this MODE, adequate time is available to manually actuate required components in the event of a DBA. However, because of the large number of components actuated on a containment spray, actuation is simplified by the use of the manual actuation push buttons. Automatic actuation logic and actuation relays must be OPERABLE in MODE 4 to support system level manual initiation. In MODES 5 and 6, there is insufficient energy in the primary and secondary systems to result in containment overpressure. In MODES 5 and 6, there is also adequate time for the operators to evaluate unit

(4) **INSERT 7**

The Safety Injection Containment Pressure - High Function design includes three channels. This LCO requires three channels to be OPERABLE.

(4) **INSERT 8**

~~MODE 4, the ECCS equipment~~ (LCO 3.5.3) is not required to operate on an automatic actuation signal and in

(4) **INSERT 9**

The Safety Injection Pressurizer Pressure - Low Function design includes three channels arranged in a two-out-of three logic. This LCO requires three channels to be OPERABLE.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The LCO requires all instrumentation performing an ESFAS Function to be OPERABLE. A channel is OPERABLE with a trip setpoint value outside its calibration tolerance band provided the trip setpoint "as-found" value does not exceed its associated Allowable Value and provided the trip setpoint "as-left" value is adjusted to a value within the calibration tolerance band of the Nominal Trip Setpoint. A trip setpoint may be set more conservative than the Nominal Trip Setpoint as necessary in response to [redacted] conditions. Failure of any instrument renders the affected channel(s) inoperable and reduces the reliability of the affected Functions.

The LCO generally requires OPERABILITY of four or three channels in each instrumentation function and two channels in each logic and manual initiation function. The two-out-of-three and the two-out-of-four configurations allow one channel to be tripped during maintenance or testing without causing an ESFAS initiation. Two logic or manual initiation channels are required to ensure no single random failure disables the ESFAS.

The required channels of ESFAS instrumentation provide unit protection in the event of any of the analyzed accidents. ESFAS protection functions are as follows:

1. <u>Safety Injection</u>

Safety Injection (SI) provides two primary functions:

1. Primary side water addition to ensure maintenance or recovery of reactor vessel water level (coverage of the active fuel for heat removal, clad integrity, and for limiting peak clad temperature to < 2200°F), and

2. Boration to ensure recovery and maintenance of SDM (k_{eff} < 1.0).

These functions are necessary to mitigate the effects of [redacted] both inside and outside of containment. The SI signal is also used to initiate other Functions such as:

- Phase A Isolation;
- Containment Purge Isolation;

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

- Reactor Trip,
- Turbine Trip,
- Feedwater Isolation,
- Start of motor driven auxiliary feedwater (AFW) pumps,
- Control room ventilation isolation, and
- Enabling automatic switchover of Emergency Core Cooling Systems (ECCS) suction to containment sump.

These other functions ensure:

- Isolation of nonessential systems through containment penetrations,
- Trip of the turbine and reactor to limit power generation,
- Isolation of main feedwater (MFW) to limit secondary side mass losses,
- Start of AFW to ensure secondary side cooling capability,
- Isolation of the control room to ensure habitability, and
- Enabling ECCS suction from the refueling water storage tank (RWST) switchover on low low RWST level to ensure continued cooling via use of the containment sump.

a. Safety Injection - Manual Initiation

The LCO requires one channel per train to be OPERABLE. The operator can initiate SI at any time by using either of two switches in the control room. This action will cause actuation of all components in the same manner as any of the automatic actuation signals.

The LCO for the Manual Initiation Function ensures the proper amount of redundancy is maintained in the manual ESFAS actuation circuitry to ensure the operator has manual ESFAS initiation capability.

(4) INSERT 3

- Trip main feedwater pumps;
- Actuate Essential Service Water (ESW) System for Units 1 and Unit 2;
- Actuate Component Cooling Water (CCW) System; and
- Actuate Engineered Safety Features (ESF) Ventilation System.

(4) INSERT 4

The Safety Injection Manual Initiation Function is designed with two manual panel switches in each train. One switch (channel) in a train must be placed in the actuate position for the associated components in the train to receive an SI initiation signal.

Attachment 1, Volume 8, Rev. 0, Page 340 of 818

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Each channel consists of one push button and the interconnecting wiring to the actuation logic cabinet. Each push button actuates both trains. This configuration does not allow testing at power. (4)

b. Safety Injection - Automatic Actuation Logic and Actuation Relays (4)

This LCO requires two trains to be OPERABLE. Actuation logic consists of all circuitry housed within the actuation subsystems, including the initiating relay contacts responsible for actuating the ESF equipment.

Manual and automatic initiation of SI must be OPERABLE in MODES 1, 2, and 3. In these MODES, there is sufficient energy in the primary and secondary systems to warrant automatic initiation of ESF systems. Manual initiation is also required in MODE 4 even though automatic actuation is not required. In this MODE, adequate time is available to manually actuate required components in the event of a DBA, but because of the large number of components actuated on a SI, actuation is simplified by the use of the manual actuation push buttons. Automatic actuation logic and actuation relays must be OPERABLE in MODE 4 to support system level manual initiation. (4) (6)

These Functions are not required to be OPERABLE in MODES 5 and 6 because there is adequate time for the operator to evaluate unit conditions and respond by manually starting individual systems, pumps, and other equipment to mitigate the consequences of an abnormal condition or accident. Unit pressure and temperature are very low and many ESF components are administratively locked out or otherwise prevented from actuating to prevent inadvertent overpressurization of unit systems. (4)

c. Safety Injection - Containment Pressure - High (4)

This signal provides protection against the following accidents:

- SLB inside containment,
- LOCA, and (1)

BASES

BACKGROUND (continued)

Field Transmitters or Sensors

To meet the design demands for redundancy and reliability, more than one, and often as many as four, field transmitters or sensors are used to measure unit parameters. In many cases, field transmitters or sensors that input to the ESFAS are shared with the Reactor Trip System (RTS). In some cases, the same channels also provide control system inputs. To account for calibration tolerances and instrument drift, which are assumed to occur between calibrations, statistical allowances are provided in the Trip Setpoint and Allowable Values. The OPERABILITY of each transmitter or sensor is determined by either "as-found" calibration data evaluated during the CHANNEL CALIBRATION or by qualitative assessment of field transmitter or sensor, as related to the channel behavior observed during performance of the CHANNEL CHECK.

Signal Processing Equipment Control and Protection System (1)

Generally, three or four channels of process control equipment are used for the signal processing of unit parameters measured by the field instruments. The process control equipment provides signal conditioning, comparable output signals for instruments located on the main control board, and comparison of measured input signals with setpoints established by safety analyses. These setpoints are defined in FSAR (3) INSERT 1 Chapter [6] (Ref. 1), Chapter [7] (Ref. 2), and Chapter [15] (Ref. 3). If the measured value of a unit parameter exceeds the predetermined setpoint, an output from a bistable is forwarded to the SSPS for decision evaluation. Channel separation is maintained up to and through the input bays. However, not all unit parameters require four channels of sensor measurement and signal processing. Some unit parameters provide input only to the SSPS, while others provide input to the SSPS, the main control board, the unit computer, and one or more control systems.

Be more specific.

What is needed is references to the basis for the setpoints, not just where to find the setpoint values

Generally, if a parameter is used only for input to the protection circuits, three channels with a two-out-of-three logic are sufficient to provide the required reliability and redundancy. If one channel fails in a direction that would not result in a partial Function trip, the Function is still OPERABLE with a two-out-of-two logic. If one channel fails such that a partial Function trip occurs, a trip will not occur and the Function is still OPERABLE with a one-out-of- two logic.

Generally, if a parameter is used for input to the SSPS and a control function, four channels with a two-out-of-four logic are sufficient to