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SRP Section: 16 - Technical Specifications
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QUESTIONS for Technical Specification Branch (CTSB)

16-196

LCO 3.3.1, RTS Instrumentation

Justify not including the verification of interlocks P-6 and P-10 in the CHANNEL OPERATIONAL TEST (COT) Surveillance Requirement specified in the APWR GTS, Table 3.3.1-1, High Source Range Neutron Flux, Mode 2.

The APWR GTS, Table 3.3.1-1, High Source Range Neutron Flux, Mode 2, currently specifies a Channel Operational Test (COT) Surveillance Requirement in accordance with SR 3.3.1.7. COT SR 3.3.1.7, which is incorporated in both the APWR GTS and WOG STS, does not include a verification of interlocks P-6 and P-10. However, the WOG STS, Table 3.3.1-1, High Source Range Neutron Flux, Mode 2, specifies Channel Operational Test SR 3.3.1.8 which does include a verification that interlocks P-6 and P-10 are in their required state for existing unit conditions. The reason that the the APWR GTS does not include a COT with provisions for interlock verification is unclear .

The APWR GTS and Bases make no mention of a requirement to verify interlocks. Determine if a Channel Operational Test which includes verification of interlocks is warranted and correct any potential discrepancies. If warranted, then information will need to be added to the APWR GTS and Bases. Include any discussions necessary to ensure a clear understanding of the Channel Operational Test Surveillance Requirement.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and Bases.

16-197

LCO 3.3.1, RTS Instrumentation

Provide a technical justification for why the CHANNEL OPERATIONAL TEST (COT) Surveillance Requirement specified in the APWR GTS, Table 3.3.1-1, High Intermediate Range Neutron Flux, does not include verification of interlocks P-6 and P-10.

The APWR GTS, Table 3.3.1-1, High Intermediate Range Neutron Flux, currently specifies a Channel Operational Test (COT) Surveillance Requirement in accordance with SR 3.3.1.7. COT SR 3.3.1.7, which is incorporated in both the APWR GTS and WOG STS, does not include a verification of interlocks P-6 and P-10. However, the WOG STS, Table 3.3.1-1, High Intermediate Range Neutron Flux, specifies Channel Operational Test SR 3.3.1.8 which does include a verification that interlocks P-6 and P-10 are in their required state for existing unit conditions. It is unclear why the APWR GTS does not include a COT with provisions for interlock verification.

The APWR GTS and Bases make no mention of a requirement to verify interlocks. Determine if a Channel Operational Test which includes verification of interlocks is warranted and correct any potential discrepancies. If warranted, then information will need to be added to the APWR GTS and Bases. Include any discussions necessary to ensure a clear understanding of the Channel Operational Test Surveillance Requirement.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and Bases.

16-198

LCO 3.3.1, RTS Instrumentation

Provide a technical justification for why the CHANNEL OPERATIONAL TEST (COT) Surveillance Requirement specified in the APWR GTS, Table 3.3.1-1, High Power Range Neutron Flux (Low Setpoint), does not include verification of interlocks P-6 and P-10.

The APWR GTS, Table 3.3.1-1, High Power Range Neutron Flux (Low Setpoint), currently specifies a Channel Operational Test (COT) Surveillance Requirement in accordance with SR 3.3.1.7. COT SR 3.3.1.7, which is incorporated in both the APWR GTS and WOG STS, does not include a verification of interlocks P-6 and P-10. However, the WOG STS, Table 3.3.1-1, High Power Range Neutron Flux (Low Setpoint), specifies Channel Operational Test SR 3.3.1.8 which does include a verification that interlocks P-6 and P-10 are in their required state for existing unit conditions. It is unclear why the APWR GTS does not include a COT with provisions for interlock verification.

The APWR GTS and Bases make no mention of a requirement to verify interlocks. Determine if a Channel Operational Test which includes verification of interlocks is warranted and correct any potential discrepancies. If warranted, then information will need to be added to the APWR GTS and Bases. Include any discussions necessary to ensure a clear understanding of the Channel Operational Test Surveillance Requirement.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and Bases.

16-199

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary to clarify and correct a potential discrepancy identified in the APWR DCD, Reactor Trip Functional Logic Diagram, Figure 7.2-2.

The APWR DCD, Reactor Trip Functional Logic Diagram, Figure 7.2-2 (Sheet 2 of 21), appears to have incorrectly referenced Interlock P-7 as one of the two interlocks associated with the “High Source Range Neutron Flux” Function. APWR DCD Section 7.2.1.4.1.1 and Figure 7.2-2 (Sheet 3 of 21) both indicate that P-6 and P-10 are the appropriate interlock references. Verify the overall correctness of Figure 7.2-2 (Sheet 2 of 21). Correct the logic diagram as necessary.

This additional information is needed to ensure the accuracy and completeness of the APWR DCD.

16-200

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary to clarify and correct a potential discrepancy identified in the APWR, Bases, ACTIONS, I.1.

The APWR Bases, ACTIONS, I.1, page B 3.3.1-35 (last paragraph), appears to have incorrectly referenced Required Action H.1. The proper reference is most likely Required Action I.1. Determine the correct reference and make any necessary changes.

This additional information is needed to ensure the accuracy and completeness of the APWR Bases.

16-201

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary to clarify and enhance the High Source Range Neutron Flux Trip Function Bases discussion with respect to Manual Operating Bypass P-6 and Automatic Operating Bypass P-10.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO and APPLICABILITY, High Source Range Neutron Flux, page B 3.3.1-14 (second paragraph), states “[a]bove the P-6 setpoint, the NIS source range detectors are de-energized.” The APWR, DCD, Section 7.2.1.4.1.1, states “[a]n operating bypass may be manually initiated when the neutron flux is above the P-6 setpoint (intermediate range), which will also de-energize the high voltage power supply to the source range neutron flux detector.” The Bases statement implies that de-energization of the source range detectors is a function that automatically occurs once power is above the P-6 setpoint. Automatic de-energization of source range detectors does not occur until neutron flux has exceeded the P-10 threshold value. In order to de-energize the detectors above the P-6 setpoint value, manual initiation of the operating bypass is required.

In addition, the Bases makes no reference to Automatic Operating Bypass P-10. The functional impact of operating bypasses P-6 and P-10 needs to be described in the Bases. Include the applicable discussions and revise the Bases as necessary to ensure a clear understanding of operating bypasses P-6 and P-10 relative to the High Source Range Neutron Flux Trip Function.

The additional information is required to ensure the accuracy, completeness and clear presentation of the applicable Bases information.

16-202

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes needed to explain and correct inconsistencies associated with Reactor Trip Functional Logic in the APWR Bases.

The APWR Bases, ACTIONS, F.1 and F.2, page B 3.3.1-34 (first paragraph), states that "[p]lacing the channel in the tripped condition results in a partial trip condition requiring only one-out-of-two logic for actuation of the two-out-of-four trips." A review of APWR DCD Sections 7.2.1.4.1.3, 7.2.1.4.3.1, 7.2.1.4.3.2, 7.2.1.4.4.1, 7.2.1.4.5 and Figure 7.2-2 (Sheets 3, 4, 5, 6, 7) indicates that all Reactor Trip Functions referenced in Bases Section F.1/F.2 employ two-out-of-four trip logic. On the basis of this review, it appears that placing a channel in the tripped condition actually results in a partial trip condition requiring "one-out-of-three logic for actuation of the two-out-of-four trips", not the one-out-of-two logic currently specified.

The same paragraph in Bases Section F.1/F.2 also states that "the tripped condition is justified because the remaining two operable channels have automatic self-testing (as described for COT), and automatic CHANNEL CHECKS." On the basis of the above referenced review, it appears that the Bases statement should actually specify "three operable channels" instead of "two operable channels." Determine the technically correct information, provide any necessary details, and correct any errors in the APWR Bases and DCD.

The additional information is required to verify and correct potential discrepancies between the APWR Bases and DCD.

16-203

LCO 3.3.1, RTS Instrumentation

Provide a technical justification for why the APWR GTS, Table 3.3.1-1, specifies only three "Required Channels" for Reactor Trip System (RTS) Functions that share channel inputs with control system functions. Provide the additional information and any changes necessary to clarify, explain, and correct potential discrepancies in the APWR GTS, Table 3.3.1-1, and applicable sections of the APWR Bases.

The APWR Bases, BACKGROUND, Protection and Safety Monitoring System, page B 3.3.1-4 (last paragraph), states that “[g]enerally, 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.”

The APWR Bases, BACKGROUND, Protection and Safety Monitoring System, page B 3.3.1-5 (first paragraph), states that “[g]enerally, if a parameter is used for input to the protection circuits and a control function, three channels with a two-out-of-three logic are also sufficient to provide the required reliability and redundancy.” The same paragraph attempts to justify three channels as being sufficient by stating that “[t]he Signal Selection Algorithm (SSA) within the PCMS ensures the control systems can withstand an input failure to the control system without causing erroneous control system operation which would otherwise require the protection function actuation. Since the input failure does not cause an erroneous control system action that challenges the protection function, the input failure is considered a single failure in the RTS and the RTS remains capable of providing its protective function with the remaining two operable channels.” This statement appears to conflict with a similar description in the APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, page B 3.3.1-8 (first paragraph), which states that “[t]hree OPERABLE instrumentation channels in a two-out-of-three configuration are required when one RTS channel is also used as a control system input. The SSA within the control system prevents the possibility of the shared channel failing in such a manner that it creates a transient that requires RTS action. In this case, the RTS will still provide protection, even with random failure of one of the other two protection channels.” The contradiction lies in the fact that the Bases BACKGROUND statement referenced above credits two remaining operable channels in the presence of a single failure in the RTS, while the Bases APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY statement describes a condition with only one remaining operable channel in the presence of both a single failure in the RTS and a random failure of one of the other two protection channels. One operable channel does not provide the required reliability and redundancy.

In contrast, the WOG Bases, BACKGROUND, Signal Process Control and Protection System, page B 3.3.1-5 (third paragraph), states “[g]enerally, 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 provide the required reliability and redundancy. The circuit must be able to withstand both an input failure to the control system, which may then require the protection function actuation, and a single failure in the other channels providing the protection function actuation.”

Provide a technical justification that addresses each of the following specifics with regard to a “Three-Channel versus Four-Channel” operability requirement for RTS Functions that share channel inputs with control system functions. Include any discussions necessary to ensure a clear understanding of the channel operability requirements.

- The apparent contradiction between the above referenced APWR Bases statements. Specifically, the ability of three operable channels in a two-out-of three configuration to provide the required reliability and redundancy in the presence of both an input failure to the control system and a single failure of one of the other two channels providing the protection function actuation.

- The deviation from the above referenced WOG Bases statement requirement of “four channels with a two-out-of-four logic.”

- How the Signal Selection Algorithm (SSA) within the control system prevents the possibility of the shared channel failing in such a manner that it creates a transient requiring RTS action. This concept is not well understood and requires clarification.

- Why it is permissible to allow one channel to be tripped during maintenance or testing in a two-out-of-three logic configuration, when single failure criteria and control system input failures are primary considerations in terms of evaluating reliability and redundancy. Reference APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, page B 3.3.1-8 (first paragraph).

- The APWR GTS, Table 3.3.1-1, Overtemperature ΔT, three-channel operability requirement. The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Overtemperature ΔT, page B 3.3.1-15 (middle paragraph), states that “[t]he pressure and temperature signals are used for other control functions.”

- The APWR GTS, Table 3.3.1-1, Overpower ΔT, three-channel operability requirement. The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Overpower ΔT, page B 3.3.1-16 (second full paragraph), states that “[t]he temperature signals are also used for other control functions.”

- The APWR GTS, Table 3.3.1-1, Low Pressurizer Pressure, three-channel operability requirement. The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Pressurizer Pressure, page B 3.3.1-17 (second paragraph), states that “[t]he Pressurizer Pressure channels are also used to provide input to the Pressurizer Pressure Control System.”

- The APWR GTS, Table 3.3.1-1, High Pressurizer Pressure, three-channel operability requirement. The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Pressurizer Pressure, page B 3.3.1-17 (second paragraph), states that “[t]he Pressurizer Pressure channels are also used to provide input to the Pressurizer Pressure Control System.”

- The APWR GTS, Table 3.3.1-1, High Pressurizer Water Level, three-channel operability requirement. The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, High Pressurizer Water Level, page B 3.3.1-18 (fourth paragraph), states that “[t]he pressurizer level channels are used as inputs to the Pressurizer Level Control System.”

- The APWR GTS, Table 3.3.1-1, Low Steam Generator Water Level, three-channel operability requirement. The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Steam Generator Water Level, page B 3.3.1-20 (first paragraph), states that “[a]dditionally, the level transmitters provide input to the SG Level Control System.”

- The APWR GTS, Table 3.3.1-1, High-High Steam Generator Water Level, three-channel operability requirement. The APWR Bases, APPLICABLE SAFETY

ANALYSES, LCO, and APPLICABILITY, Steam Generator Water Level, page B 3.3.1-20 (first paragraph), states that "[a]dditionally, the level transmitters provide input to the SG Level Control System."

The technical justification and additional information are needed to ensure the accuracy and completeness of the APWR GTS and Bases, including the correct number of Required Channels for RTS Instrumentation Functions that share channel inputs with control system functions.

16-204

LCO 3.3.1, RTS Instrumentation (Done)

Provide the additional information and any changes necessary to explain and correct potential discrepancies associated with Turbine Trip Main Stop Valve Position Logic in the APWR GTS, Table 3.3.1-1, APWR Bases and APWR DCD.

Each main turbine stop valve is equipped with two limit switches that input to the Reactor Trip System (RTS). APWR DCD Figure 7.2-7, Signal Flow for Reactor Trip on Turbine Trip, page 7.2-57), attempts to show the logic tie interface between the two limit switches on each valve and associated RTS Trains A and D. Figure 7.2-2 is confusing in that it is difficult to determine if the two limit switches per valve both input to the A and D Trains or if each individual valve limit switch provides a dedicated input to a specific RTS Train (A or D). RTS Train A routes the limit switch signals to Train B, while RTS Train D retransmits the limit switch signals to Train C. A Reactor trip signal is generated within each train when that train receives signals indicating that all four main turbine stop valves are closed.

The APWR GTS, Table 3.3.1-1, Turbine Trip, Main Turbine Stop Valve Position, Required Channels, specifies "1 per valve." The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Turbine Trip - Main Turbine Stop Valve Position, page B 3.3.1-22 (second paragraph from the bottom), states that "[o]ne channel on each valve must trip to cause a reactor trip." A potential problem may exist if each individual valve limit switch provides a dedicated input to a specific RTS Train (A or D). For example, if the first limit switch on each valve only inputs to RTS Train A and there is a problem with any one of the four limit switches, the four-out-of-four logic will be disabled for both RTS Trains A and B. The only way that a reactor trip can be generated is through RTS Trains C and D. The same logic holds true if the second limit switch on each valve only inputs to RTS Train D. If there is a problem with any one of these four limit switches, the four-out-of-four logic will be disabled for both RTS Trains C and D. The only way that a reactor trip can be generated in this case is through RTS Trains A and B. If only one limit switch per valve is required to be operable in accordance with APWR Table 3.3.1-1, then an operational situation could potentially develop in which the reactor trip function would be completely disabled if a limit switch feeding Train A and another limit switch feeding Train D from a different valve were both inoperable.

If the two limit switches on each valve both input to RTS Trains A and D, then the "1 per valve" operability requirement is not a concern. Determine the correct logic configuration, resolve APWR DCD Figure 7.2-7 ambiguities, and correct any potential discrepancies that may exist in the APWR GTS, Bases and DCD. Include any discussions necessary to ensure a clear understanding of the Turbine Trip Main Stop Valve Position Logic.

The additional information is needed to ensure the accuracy, completeness, and consistency amongst the APWR GTS, Bases and DCD.

16-205

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary to explain why the NOTE in Condition F only applies to High Power Range Neutron Flux instrumentation.

The APWR GTS, Condition F, Required Action, NOTE, states that "[f]or High Power Range Neutron Flux channels only, the inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels." Condition F applies to the following reactor trip functions: Power Range Neutron Flux (Low Setpoint), Overtemperature ΔT, Overpower ΔT, Power Range Neutron Flux Positive Rate, Power Range Neutron Flux Negative Rate, High Pressurizer Pressure, and Low SG Water Level. It is unclear why the NOTE only applies to the High Power Range Neutron Flux channels. The APWR Bases, ACTIONS, F.1 and F.2, page B 3.3.1-34 (second paragraph), references the NOTE but does not discuss its applicability. The comparable NOTE in Condition E of the WOG STS does not place any restrictions on the reactor trip functions.

Determine applicability of the NOTE and correct any potential discrepancies that may exist. Include any discussions necessary to ensure a clear understanding of the NOTE's relevance to each of the reactor trip functions associated with Condition F.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and Bases.

16-206

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary to explain the exclusion of NOTE related information associated with surveillance testing, from Conditions E, F and L of the APWR GTS and Bases.

The APWR GTS, Conditions E, F and L, Required Action Sections, exclude REVIEWER'S NOTE information contained in corresponding sections D, E, K, and N of the WOG STS. The REVIEWER'S NOTE states that "[t]he below Note should be used for plants with installed bypass test capability: One channel may be bypassed for up to 12 hours for surveillance testing." APWR channel instrumentation bypass test capabilities are not well understood. It appears that the NOTE may be relevant. Determine whether or not the NOTE is applicable and correct any potential discrepancies in the APWR GTS and Bases. Include any discussions necessary to ensure a clear understanding of APWR instrumentation bypass test capabilities with respect to surveillance testing.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and Bases.

16-207

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary regarding omission of the term "preamp" from the APWR Bases, SURVEILLANCE REQUIREMENTS, SR 3.3.1.10.

The APWR Bases, SURVEILLANCE REQUIREMENTS, SR 3.3.1.10, page B 3.3.1-48 (last paragraph), states that "[t]he CHANNEL CALIBRATION for the source and intermediate range neutron detectors consists of obtaining the detector plateau or discriminator curves." Similarly, the WOG Bases, SURVEILANCE REQUIREMENTS, SR 3.3.1.11, page B 3.3.1-57 (first paragraph), states that "[t]he CHANNEL CALIBRATION for the source and intermediate range neutron detectors consists of obtaining the detector plateau or preamp discriminator curves." The term "preamp", which has been omitted from the APWR Bases statement, refers to a device that is an integral component of both the source and intermediate range detector circuitry. It describes and gives meaning to the phrase "discriminator curves" and therefore appears to be relevant to the APWR Bases discussion. Determine whether or not application of the term "preamp" is appropriate within the context of the APWR Bases statement and make any necessary corrections.

The additional information is needed to ensure the accuracy and completeness of the APWR Bases.

16-208

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary to explain and correct potential discrepancies associated with NOTE 2 of the APWR GTS, SURVEILLANCE REQUIREMENTS, SR 3.3.1.2.

The APWR GTS, SURVEILLANCE REQUIREMENTS, SR 3.3.1.2, NOTE 2, states "[a]djust nuclear instrument channel if absolute difference is > 1 percent." The NOTE was apparently added to provide assurance that a safety limit would not be exceeded. The NOTE is not discussed in the Bases, nor is it included in the WOG STS, SR 3.3.1.2. The addition of NOTE 2 introduces a potential conflict between SR 3.3.1.2 and the direction provided by the NOTE itself. SR 3.3.1.2 states "[a]djust power range channel output if calorimetric heat balance calculations results exceed power range channel output by more than +2 percent RTP," while NOTE 2 directs adjustment of the nuclear instrument channel if the absolute difference is > 1 percent. In addition, NOTE 2 directs action. Typically, NOTES are informational and intended to provide guidance only. Determine the validity of the NOTE and whether or not it is actually warranted. Correct any potential discrepancies in the APWR GTS and Bases. Include any discussions necessary to ensure a clear understanding of power range channel adjustments based on heat balance calculation results.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and Bases.

16-209

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary to explain and correct potential discrepancies associated with Allowable Value criteria for the High Power Range Neutron Flux Rate Functions.

The APWR GTS, Table 3.3.1-1, High Power Range Neutron Flux Rate, Positive and Negative Rate Functions, page 3.3.1-14, specify their Allowable Values in terms of "[ ] percent RTP," while the associated APWR Trip Setpoints are specified in terms of "[ ] percent RTP with time constant ≥ [ ] sec." The WOG STS, Table 3.3.1-1, Power Range Neutron Flux Rate, High Positive and Negative Rate Functions, page 3.3.1-15, specify the same "[ ] percent RTP with time constant ≥ [ ] sec" criteria for the Nominal Trip Setpoint Values as well as the Allowable Values. Determine the correct Allowable Value criteria and correct any potential discrepancies in the APWR GTS, Table 3.3.1-1. Include any discussions necessary to ensure a clear understanding of the Allowable Value criteria for the High Power Range Neutron Flux Rate Functions.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS.

16-210

LCO 3.3.1, RTS Instrumentation

Provide a technical justification for why Reactor Trip System (RTS) Response Time Testing has been excluded from the APWR GTS, Table 3.3.1-1, High Power Range Neutron Flux Rate, Positive Rate, Surveillance Requirements.

The APWR GTS, Table 3.3.1-1, Surveillance Requirements, does not specify a Response Time Surveillance Requirement for the High Power Range Neutron Flux Rate (Positive) Function. Response Time Testing in accordance with SR 3.3.1.13 is however specified for the High Power Range Neutron Flux Rate (Negative) Function. In addition, the APWR DCD, Table 7.2-3, page 7.2-2, specifies a Response Time of 0.6 seconds for both the Positive and Negative Rate Functions. Even though Tables 3.3.1-1 in both the WOG STS and the APWR GTS are similar in that neither Table specifies Response Time Testing as a surveillance requirement for the Positive Rate Function, it remains unclear why Response Time Testing would be required for one Rate Function and not the other, especially considering the fact that Response Times have been specified for both Rate Functions.

Determine if Response Time Testing should be specified as a surveillance requirement for the High Power Range Neutron Flux Rate (Positive) Function and correct any potential discrepancies in the APWR GTS and Bases. Provide any additional information and include any discussions necessary to ensure a clear understanding of Response Time Surveillance Requirements with respect to the Power Range Neutron Flux Rate Functions.

The technical justification and additional information are needed to ensure the accuracy and completeness of the APWR GTS and Bases.

16-211

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary to clarify and correct a potential discrepancy identified in the APWR Bases, ACTIONS, Section E.

The APWR Bases, ACTIONS, Section E, page B 3.3.1-32 (last paragraph), appears to have incorrectly referenced Required Action D.3 instead of Required Action E.3. Determine the appropriate reference and make any necessary corrections.

The additional information is needed to ensure the accuracy and completeness of the APWR Bases.

16-212

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary to clarify and explain the Overtemperature ΔT setpoint selection criteria in the APWR GTS and Bases.

The APWR DCD, Section 7.2.1.4.3.1, page 7.2-7, states that "[t]he trip provides protection to prevent a departure from nucleate boiling (DNB) or an exit boiling (hot-leg boiling). Setpoints for the DNB and exit boiling limit are continuously and individually calculated by the RPS using a specific algorithm. Lower value of these two setpoints is used as the Overtemperature ΔT trip setpoint." Selection of the lower setpoint value is confirmed by the presence of a "Low Auctioneer" block in Figure 7.2-2 (sheet 5 of 21) which receives inputs from both the DNB and Exit Boiling circuitry. Information pertaining to the fact that initiation of the Overtemperature ΔT trip is based on the lower of two setpoint values, has not been included in either Note 1 of the APWR GTS, Table 3.3.1-1 (page 3.3.1-20), or the APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Overtemperature ΔT Section (page B 3.3.1-14). This information is relevant and needs to be captured in the APWR GTS and Bases.

The additional information is needed to ensure the accuracy, completeness, and consistency amongst the APWR GTS, Bases and DCD.

16-213

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary to explain and correct inconsistencies in the APWR DCD associated with Protection Trip Functional Assignments applicable to the Overpower ΔT Function.

Reactor Trip initiating signals are grouped according to their protection function. The Overpower ΔT Function has been assigned to Controller Group 1 of the “Nuclear Overpower Protection Trips” in the APWR DCD, Table 7.2-5, page 7.2-26. The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Overpower ΔT, page B 3.3.1-16 (first paragraph), states that “[t]he Overpower ΔT Trip Function ensures that protection is provided to ensure the integrity of the fuel (i.e. no fuel pellet melting and less than 1 percent cladding strain) under all possible overpower conditions.”

It appears that the Overpower ΔT Function has not been properly assigned within the APWR DCD, Section 7.2.1.4 (Reactor Trip Initiating Signals), and APWR DCD, Figure 7.2-2 (Sheet 2 of 21). Instead of being described in DCD Section 7.2.1.4.2 (Nuclear Overpower Protection Trips), the Overpower ΔT Function is described in DCD Section 7.2.1.4.3 (Core Heat Removal Protection Trips). With respect to DCD Figure 7.2-2 (Sheet 2 of 21), the Overpower ΔT Function is once again grouped with the Core Heat Removal Protection Trips instead of the Nuclear Overpower Protection Trips. Determine the correct Protection Trip Functional Assignment for the Overpower ΔT Function and make any necessary corrections to the DCD.

The additional information is needed to ensure the accuracy, completeness, and consistency of the APWR DCD.

16-214

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary to explain and correct potential inconsistencies in the APWR GTS associated with the Overpower ΔT Function surveillance requirements.

The APWR GTS, Table 3.3.1-1, Overpower ΔT, page 3.3.1-16, specifies surveillance requirements SR 3.3.1.3 and SR 3.3.1.6. These two surveillances are not specified for the Overpower ΔT Function in the WOG STS, Table 3.3.1-1. The APWR Bases, SURVEILLANCE REQUIREMENTS, SR 3.3.1.3 and SR 3.3.1.6, both state that “[t]his Surveillance is performed to verify the f(ΔI) input to the Overtemperature ΔT Function.” Neither Bases section makes any reference to the Overpower ΔT Function. Surveillance Requirements SR 3.3.1.3 and SR 3.3.1.6 are specified for the Overtemperaturer ΔT Function in Table 3.3.1-1 of both the APWR GTS and the WOG STS.

It appears that SR 3.3.1.3 and SR 3.3.16 may only be applicable to the Overtemperature ΔT Function. Determine whether or not Surveillance Requirements SR 3.3.1.3 and SR 3.3.1.6 are applicable to the Overpower ΔT Function and make any necessary changes to the APWR GTS and Bases. Include any discussions necessary to ensure a clear understanding of SR 3.3.1.3 and SR 3.3.1.6 with respect to the Overpower ΔT Function.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and Bases.

16-215

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary to explain and correct potential inconsistencies associated with the Low Reactor Coolant Flow Trip Function in the APWR Bases.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Low Reactor Coolant Flow, page B 3.3.1-19 (first paragraph), states that “[a]bove the P-7 setpoint, the reactor trip on low flow in two or more RCS loops is automatically enabled.” This conflicts with the first sentence in the same Bases paragraph which states that “[t]he Low Reactor Coolant Flow Trip Function ensures that protection is provided against violating the DNBR limit due to low flow in one or more RCS loops.” In addition, the APWR DCD, Section 7.2.1.4.3.3, page 7.2-9, states that “[t]his trip protects the reactor in the event of low reactor coolant flow in one or more loops. RT is initiated when two out of four flow sensors indicate low reactor coolant flow in any loop.”

Based on a review of the Low Reactor Coolant Flow Trip Logic in the APWR DCD, Figure 7.2-2 (Sheet 5 of 21), it appears that the reactor will in fact trip on low reactor coolant flow in any one loop. Determine the technically correct information, provide any necessary details, and correct any errors in the APWR Bases. Include any discussions necessary to ensure a clear understanding of the Low Reactor Coolant Flow Trip Logic.

The additional information is needed to ensure the accuracy and completeness of the APWR Bases.

16-216

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary to explain why the NOTE in Condition L excludes instrumentation associated with the Pressurizer Pressure, Pressurizer Level, and Steam Generator Water Level Functions.

The APWR GTS, Condition L, Required Action, NOTE, states that “[e]xcept for Pressurizer Pressure, Pressurizer Level, and SG Water Level, the inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels.” Condition L applies to the following reactor trip functions: Low Pressurizer Pressure, High Pressurizer Water Level, Low Reactor Coolant Flow, Low Reactor Coolant Pump Speed, High-High SG Water Level, Turbine Trip – Turbine Emergency Trip Oil Pressure, and Turbine Trip – Main Turbine Stop Valve Position. It is unclear why the NOTE only applies to the Low Reactor Coolant Flow, Low Reactor Coolant Pump Speed, and Turbine Trip Function channels. The APWR Bases, ACTIONS, L.1 and L.2, page B 3.3.1-36, does not reference the NOTE or provide any discussion associated with its contents. The comparable NOTE in Condition K of the WOG STS does not place any restrictions on the reactor trip functions.

Determine applicability of the NOTE and correct any potential discrepancies that may exist in the APWR GTS and Bases. Include any discussions necessary to ensure a clear understanding of the NOTE's relevance to each of the reactor trip functions associated with Condition L.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and Bases.

16-217

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary to explain and correct inconsistencies in the APWR DCD associated with Protection Trip Functional Assignments applicable to the High Pressurizer Pressure and High Pressurizer Water Level Functions.

Reactor Trip initiating signals are grouped according to their protection function. The High Pressurizer Pressure and High Pressurizer Water Level Functions have been assigned to both the "Primary Over Pressure Protection Trips" and the "Loss of Heat Sink Protection Trip" in the APWR DCD, Table 7.2-5, page 7.2-26. The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, High Pressurizer Pressure, page B 3.3.1-17 (last paragraph), states that "[t]he High Pressurizer Pressure Trip Function ensures that protection is provided against overpressurizing the RCS." The APWR Bases, High Pressurizer Water Level Section, page B 3.3.1-18 (fourth paragraph), states that "[t]he High Pressurizer Water Level Trip Function provides a backup signal for the High Pressurizer Pressure trip." Neither function appears to provide protection against a "Loss of Heat Sink." It therefore seems reasonable to assume that the High Pressurizer Pressure and High Pressurizer Water Level Functions should only be assigned to the "Primary Over Pressure Protection Trips" category.

In addition, the APWR DCD, Section 7.2.1.4 (Reactor Trip Initiating Signals), and APWR DCD, Figure 7.2-2 (Sheet 2 of 21), both reflect the fact that the only Protection Trip Function applicable to the High Pressurizer Pressure and High Pressurizer Water Level Functions, is the "Primary Over Pressure Protection Trip." Determine the correct Protection Trip Functional Assignment and make any necessary corrections to the DCD.

The additional information is needed to ensure the accuracy, completeness, and consistency of the APWR DCD.

16-218

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary to explain, clarify, and correct the potential discrepancies identified in the High-High SG Water Level Function Section of the APWR Bases.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, High-High SG Water Level, page B 3.3.1-21 (second paragraph), states that "[t]his Function also performs the ESFAS functions of generating a P-14 interlock signal, initiating a turbine trip, and initiating feedwater isolation." It appears, based on a review of the APRW DCD, including Figure 7.2-2 (Functional Logic Diagram for Reactor Protection and Control System, sheets 1 -21), that the P-14 interlock does not exist. Determine whether or not the P-14 interlock actually exists and make any necessary corrections to the APWR Bases.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, High-High SG Water Level, page B 3.3.1-21 (third paragraph), states that "[b]elow the P-7 setpoint, this condition will result in ESFAS actuations to trip the turbine and isolate feedwater allowing the operator sufficient time to evaluate plant conditions and take corrective actions." This statement is potentially ambiguous in that although it is technically correct, it can also imply that the ESFAS actuations will only occur below the P-7 setpoint. A review of the APWR DCD, Figure 7.2-2 (Sheet 9 of 21), confirms that the ESFAS actuations are active both above and below the P-7 setpoint. Provide the necessary clarification and ensure that the information is clearly stated in the APWR Bases.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, High-High SG Water Level, page B 3.3.1-21, references to "feedwater isolation" and "isolate feedwater" in the last sentences of both the second and third paragraphs need clarification. It appears that the feedwater isolation referred to is actually a "Main Feedwater Isolation". These statements are potentially ambiguous in that "feedwater isolation" can be interpreted as a Main Feedwater Isolation, an Emergency Feedwater Isolation, or both. Provide the necessary clarification and ensure that the information is clearly stated in the APWR Bases.

The additional information is needed to ensure the accuracy and completeness of the APWR Bases.

16-219

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes needed to explain and correct potential discrepancies associated with the Reactor Trip by Turbine Trip Function, in the APWR Bases.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Turbine Trip - Main Turbine Stop Valve Position, page B 3.3.1-22 (third paragraph), states that "[t]he Main Turbine Stop Valve Position Trip Function anticipates the loss of heat removal capabilities of the secondary system following a turbine trip from a power level below the P-7 setpoint. This action will not actuate a reactor trip."

This statement appears to conflict with the APWR DCD in that the intent of the trip function is to trip the reactor in anticipation of the loss of heat removal capabilities of the secondary system immediately following a turbine trip from a power level above the P-7 setpoint. The APWR DCD, Section 7.2.1.4.8, page 7.2-11, states that "[t]he operating bypass is automatically removed above the P-7 power level." Table 7.2-4 of the DCD (page 7.2-23), specifies removal of the operating bypass for Reactor Trip by Turbine Trip above P-7 as well. In addition, a review of the APWR DCD, Figure 7.2-2 (Sheet 13 of 21), confirms that the Reactor Trip by Turbine Trip is activated above the P-7 setpoint. Determine the validity of the Bases statement and correct any potential discrepancies. Include any necessary discussions to ensure a clear understanding of the trip function with respect to the automatic operating bypass.

The additional information is needed to ensure the accuracy and completeness of the APWR Bases.

16-220

LCO 3.3.1, RTS Instrumentation

Provide a technical justification for specifying Allowable Values in terms of "Channel Uncertainty Allowances" and validate the "Uncertainty Allowance Numbers." Provide the additional information and any necessary changes to explain, resolve, and correct any potential discrepancies or inconsistencies associated with Allowable Value Units and "Channel Uncertainty Allowances" in the APWR GTS, Table 3.3.1-1.

The APWR GTS, Table 3.3.1-1, specifies Allowable Values in terms of "Channel Uncertainty Allowances" instead of specific values with "inequality" and "equal to" criteria. The only exceptions to this are Turbine Trip Functions 13.a and 13.b. In addition, the Allowable Value units for various functions are expressed as "percent of span" (Functions 5, 8a, 8b, 9, 12a, 12b, 15a, 15d), "percent of rated flow" (Function 10), and "percent rated pump speed" (Function 11), in lieu of units that are function specific. These are deviations from NUREG-1431. Technically justify the use of "Channel Uncertainty Allowances", validate the Allowable Values, and make any necessary corrections to the APWR GTS, Table 3.3.1-1. Include any discussions necessary to ensure a clear understanding of the differences between the APWR GTS, Table 3.3.1-1, and the WOG STS, Table 3.3.1-1, with respect to Allowable Value presentation.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS.

16-221

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any necessary changes to explain and correct a potential discrepancy associated with Surveillance Requirement SR 3.3.1.9 in the APWR Bases.

The APWR Bases, SURVEILLANCE REQUIREMENTS, SR 3.3.1.9, page B 3.3.1-47 (last paragraph), states that "[f]or analog measurements, the CHANNEL CALIBRATION confirms the accuracy of the channel from sensor to analog input module." In contrast, the APWR GTS, Definitions, CHANNEL CALIBRATION, page 1.1-2 (second paragraph), states that "[f]or analog measurements, the CHANNEL CALIBRATION confirms the accuracy of the channel from sensor to digital Visual Display Unit (VDU) readout." It is unclear whether or not a digital Visual Display Unit (VDU) readout device is classified as an analog input module. Does a check of the instrument loop from sensor to analog input module encompass all devices in the channel required for channel operability, as stated in the CHANNEL CALIBRATION definition? Determine if the reference to "analog input module" in the APWR Bases is technically correct and make any necessary corrections.

The additional information is needed to ensure the accuracy and completeness of the APWR Bases.

16-222

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary to explain and correct potential discrepancies associated with Condition L in the APWR GTS and Bases.

The APWR Bases, ACTIONS, Condition L.1 and L.2, page B 3.3.1-37 (second paragraph), states that "[t]hese functions do not have to be OPERABLE below the P-7 setpoint because there is insufficient heat production to generate DNB conditions below the P-7 setpoint." Condition L applies to the following reactor trip functions: Low Pressurizer Pressure, High Pressurizer Water Level, Low Reactor Coolant Flow, Low Reactor Coolant Pump Speed, High-High SG Water Level, Turbine Trip on Emergency Trip Oil Pressure, and Turbine Trip on Main Stop Valve Position. It appears that only the Low Pressurizer Pressure, Low Reactor Coolant Flow, and Low Reactor Coolant Pump Speed trip functions provide protection against violating the DNBR limit. Determine the applicability of the Bases statement with respect to the remaining reactor trip functions in Condition L and make any necessary corrections to the APWR Bases (including the section associated with Low Power Reactor Trips Block P-7, page B 3.3.1-25, first paragraph).

The APWR Bases, ACTIONS, Condition L.1 and L.2, page B 3.3.1-37 (second paragraph), states that "[t]he 72 hours allowed to place the channel in the tripped condition is justified because the remaining two operable channels have automatic self-testing (as described for COT), and automatic CHANNEL CHECKS." It appears that the phrase "two operable channels" may not be directly applicable to the Turbine Trip on Main Stop Valve Position Function based on the fact there are only two limit switches per valve that input to the Reactor Trip System (RTS), and the fact that the APWR GTS, Table 3.3.1-1, Main Turbine Stop Valve Position, Required Channels, only specifies “1 per valve.” Determine the applicability of the Bases statement with respect to the Turbine Trip on Main Stop Valve Position Function and make any necessary corrections to the APWR Bases.

The APWR Bases, ACTIONS, Condition L.1 and L.2, page B 3.3.1-37 (second paragraph), states that “[t]he 72 hours allowed to place the channel in the tripped condition is justified because the remaining two operable channels have automatic self-testing (as described for COT), and automatic CHANNEL CHECKS.” The APWR GTS, Table 3.3.1-1, does not specify either a Channel Operational Test or a Channel Check for the Reactor Trip on Turbine Trip Functions. It is unclear if the 72-hour Completion Time of Required Action L.1 can be justified for the two Turbine Trip Functions on the basis of automatic testing associated with surveillance requirements that are not specified for these functions. Determine if automatic self-testing (as described for COT) and automatic Channel Checks are actually occurring for the Turbine Trip Functions and whether or not the Bases statement is applicable to these functions. Make any necessary corrections to the APWR Bases.

The APWR Bases, ACTIONS, Condition L.1 and L.2, page B 3.3.1-37 (third paragraph), states that “[a]llowance of this time interval takes into consideration the redundant capability provided by the remaining redundant OPERABLE channel.” It appears that the statement should read “OPERABLE channels” on the basis of the two remaining operable channels (Number of Required Channels is 3 for each of the functions applicable to Condition L). Determine the accuracy of the Bases statement and make any necessary corrections.

The APWR GTS, Condition L, Required Action L.2, Completion Time, specifies 78 hours to Reduce THERMAL POWER. The WOG STS, Condition N, Required Action N.2, Completion Time, specifies 76 hours. Condition N is a dedicated Condition for Turbine Trip Channel Inoperability under NUREG-1431. The 76-hour Completion Time is based on approved Topical Report WCAP-14333-P-A, Revision 1, October 1998. Turbine Trip Channel Actions were moved from Condition N of the WOG STS, to Condition L of the APWR GTS where they were grouped with other Reactor Trip Channel Actions for which the 78-hour Completion Time is justifiable. The APWR Bases does not address the 78-hour Completion Time relative to the Turbine Trip Functions. Technically justify the APWR GTS, Condition L, Required Action L.2, 78-hour Completion Time for the two Turbine Trip Functions and make any necessary corrections to the APWR GTS and Bases.

The APWR GTS, Condition L, Required Action NOTE, states that “the inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels.” The APWR DCD, Section 7.2.1.4.8, Turbine Trip, Main Turbine Stop Valve Position, page 7.2-10, states that “[s]ince there are only two limit switch channels, the duration of this maintenance bypass is limited by the technical specifications.” The 12 hours specified in the NOTE appears lengthy for the Main Turbine Stop Valve Position Function compared to the other Reactor Trip Functions associated with Condition L, which have Three Required Channels in the APWR GTS, Table 3.3.1-1. Although the corresponding NOTE in Condition N of the WOG STS also specifies 12 hours for the Turbine Stop Valve Closure Function, the number of Required Channels in the WOG STS, Table 3.3.1-1, is four as opposed to “1 per valve” in the APWR GTS, Table 3.3.1-1.

Technically justify the Main Turbine Stop Valve Position Limit Switch 12-hour maintenance bypass referenced in the APWR GTS, Condition L, Required Action NOTE and make any necessary corrections to the APWR GTS and Bases.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and Bases.

16-223

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary to explain and correct potential inconsistencies associated with the P-7 interlock in the APWR Bases.

The APWR Bases, Turbine Emergency Trip Oil Pressure, page B 3.3.1-21 (last paragraph), states that "[a]ny turbine trip from a power level below the P-7 setpoint, 50 percent power, will not actuate a reactor trip." The APWR Bases, Lower Reactor Trips Block, P-7, page B 3.3.1-25 (first paragraph), states that "[t]hese reactor trips are only required when operating above the P-7 setpoint (approximately 10 percent power)." These statements appear to conflict with respect to approximate P-7 power levels. Determine the appropriate P-7 power level reference and make any necessary corrections to the APWR Bases.

The additional information is needed to ensure the accuracy and completeness of the APWR Bases.

16-224

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary to explain, clarify, and correct potential inconsistencies associated with Condition C in the APWR GTS and Bases.

The APWR GTS, Condition C, states "[o]ne required Manual Reactor Trip channel inoperable." Condition C appears to have incorrectly referenced the word "channel" as opposed to the word "train" based on the following:

- Required Action C.1 states "[r]estore three trains to OPERABLE status."
- APWR Bases, ACTIONS, Section C, page B 3.3.1-30 (fourth paragraph), states "[t]his action addresses the train orientation for these functions."
- The APWR GTS, Table 3.3.1-1, Manual Reactor Trip Initiation, Required Channels, specifies "3 trains" in all applicable Modes.

Determine the appropriate reference and make any necessary corrections to the APWR GTS and Bases. Include any discussions necessary to ensure a clear understanding of "train" versus "channel" inoperability.

Condition C in the APWR GTS and Bases applies only to the Manual Reactor Trip Function in Modes 3, 4, or 5 with the Rod Control System capable of rod withdrawal or one or more rods not fully inserted. The APWR Bases, ACTIONS, Section C, page B 3.3.1-30 (fourth paragraph), states "[t]his action addresses the train orientation for these functions." It appears that the Bases statement reference to "functions" should be singular instead of plural, and the bulleted "Manual Reactor Trip" reference deleted. Determine the validity of the references and make any necessary corrections to the APWR Bases.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and Bases.

16-225

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary to explain and correct discrepancies associated with the Turbine Inlet Pressure P-13 interlock, in the APWR GTS and Bases.

The APWR GTS, Table 3.3.1-1, Turbine Inlet Pressure P-13, specifies four Required Channels. The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO and APPLICABILITY, Turbine Inlet Pressure P-13, page B 3.3.1-27 (third paragraph), states that "[t]he LCO requires three channels of Turbine Inlet Pressure, P-13 interlock to be OPERABLE in MODE 1." Determine the required number of Operable channels and make any necessary corrections to the APWR GTS and Bases.

The APWR GTS, Table 3.3.1-1, Turbine Inlet Pressure P-13, specifies units of Rated Thermal Power (RTP). The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO and APPLICABILITY, Turbine Inlet Pressure P-13, page B 3.3.1-27 (second paragraph), states that "[t]he Turbine Inlet Pressure, P-13 interlock is actuated when the pressure in the first stage of the high pressure turbine is greater than approximately 10 percent of the rated full power pressure." The WOG STS, Table 3.3.1-1 specifies units of Percent Turbine Power for the Turbine Impulse Pressure P-13 interlock. It appears that the units should be in Percent Turbine Power. Determine the proper units for the Turbine Inlet Pressure P-13 interlock and make any necessary corrections to the APWR GTS and Bases.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and Bases.

16-226

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary to explain and correct potential discrepancies associated with Condition S in the APWR Bases.

The APWR Bases, ACTIONS, S.1, page B 3.3.1-40, states that "Required Action and associated Completion Time for Condition N, Q, or S have not been met." The Bases statement appears to have incorrectly referenced Condition S instead of Condition R. The APWR GTS, Table 3.3.1-1, Condition S, states "[r]equired Action and associated Completion Time for Condition N, Q, or R not met." Determine the correct reference and make any necessary corrections to the APWR Bases.

The APWR Bases, ACTIONS, S.1, page B 3.3.1-40, states that "[p]lacing the unit in MODE 3 from Condition N results in Condition C entry while an RTB is inoperable." The Bases statement appears to have incorrectly referenced Condition C instead of Condition D. The APWR GTS, Table 3.3.1-1, specifies Condition D in MODES 3, 4 and 5 for Reactor Trip Breakers Function 16. Determine the correct reference and make any necessary corrections to the APWR Bases.

The APWR Bases, ACTIONS, S.1, page B 3.3.1-40, states that "[w]ith the unit in MODE 3, ACTION D would apply to any inoperable RTB trip mechanism." The Bases statement appears to have incorrectly referenced the word "ACTION" instead of "Condition." "Condition" D is contained within the ACTIONS section of the LCO. Determine the correct reference and make any necessary corrections to the APWR Bases.

The additional information is needed to ensure the accuracy and completeness of the APWR Bases.

16-227

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary regarding the reference to Reactor Trip Bypass Breakers in the APWR Bases.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO and APPLICABILITY, Automatic Trip Logic, page B 3.3.1-28 (third paragraph), states that "[t]he reactor trip signals generated by the RTS Automatic Trip Logic cause the RTBs and associated bypass breakers to open and shut down the reactor." The "Justification for Deviations between NUREG-1431 Rev. 3.1 and US-APWR Technical Specifications" document (page 12), states that the NOTE associated with Reactor Trip Bypass Breakers was deleted from SR 3.3.1.4 due to the fact that the US-APWR does not have these breakers. The Bases statement appears to have made an incorrect reference to Reactor Trip Bypass Breakers. Validate the Bases statement and make any necessary corrections to the APWR Bases.

The additional information is needed to ensure the accuracy and completeness of the APWR Bases.

16-228

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary to explain and correct potential discrepancies associated with the BACKGROUND section of the APWR Bases.

The APWR Bases, BACKGROUND, page B 3.3.1-2 (bottom paragraph), states that "[t]he Allowable Value specified in Table 3.3.1-1 serves as the LSSS such that a channel is OPERABLE if the channel accuracy is found not to exceed the Allowable Value during CHANNEL CALIBRATION."

In addition, the APWR Bases, BACKGROUND, Allowable Values and RTS Setpoints, page B 3.3.1-5 (bottom paragraph), states that "[t]he Trip Setpoint entered into the digital bistable is more conservative than that specified by the Analytical Limit (LSSS) to account for measurement errors detectable by the CHANNEL CALIBRATION. The Allowable Value serves as the Technical Specification OPERABILITY limit for the purpose of the CHANNEL CALIBRATION."

The APWR Bases statement references to CHANNEL CALIBRATION have replaced references to CHANNEL OPERATIONAL TEST (COT) in corresponding statements of the WOG Bases. The definition for CHANNEL OPERATIONAL TEST in the APWR GTS and WOG STS both state that "[t]he COT shall include adjustments, as necessary, of the required alarm, interlock, and trip setpoints required for channel OPERABILITY such that the setpoints are within the necessary range and accuracy." Neither definition for CHANNEL CALIBRATION in the APWR GTS or the WOG STS discusses setpoints in any way. Determine the correct surveillance reference and make any necessary corrections to the APWR Bases. Include any discussions necessary to ensure a clear understanding of the differences between CHANNEL CALIBRATIONS and CHANNEL OPERATIONAL TESTS with respect to setpoint specifics.

Also, it appears that the accuracy/intent of both APWR Bases statements may have been affected by the following changes made to the original statements in the WOG Bases:

- In the first Bases statement referenced above, "channel accuracy" replaced the word "setpoint" in the WOG Bases, page B 3.3.1-2 (last paragraph). A "setpoint" is a specific number that can be readily compared to an Allowable Value, whereas "channel accuracy" is a measure of closeness or indication of instrumentation performance. Comparisons are typically not drawn between Allowable Values and "channel accuracies."

- In the second Bases statement, "Analytical Limit" replaced the reference to "Allowable Value" in the WOG Bases, page B 3.3.1-6 (first paragraph). An Analytical Limit is the limit of a process variable at which a safety action is initiated to ensure that a Safety Limit is not exceeded. Every setpoint calculated is set conservatively with respect to the Analytical Limit. The statement should convey that the ESFAS Trip Setpoint entered into the digital bistable is more conservative than the Allowable Value (the OPERABILITY limit) to ensure that OPERABILITY is not inadvertently challenged.

Validate the Bases statements and make any necessary changes.

The additional information is needed to ensure the accuracy, completeness, and consistency of the APWR Bases.

16-229

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary to explain and correct potential discrepancies associated with Condition F in the APWR Bases.

The APWR Bases, ACTIONS, Condition F.1 and F.2, page B 3.3.1-34 (first paragraph), states that "[t]he 72 hours allowed to place the channel in the tripped condition is justified because the remaining two operable channels have automatic self-testing (as described for COT), and automatic CHANNEL CHECKS." The APWR GTS, Table 3.3.1-1, does not specify a Channel Check for the High Power Neutron Flux Rate Functions (Positive and Negative). It is unclear if the 72-hour Completion Time of Required Action F.1 can be justified for the two Neutron Flux Rate Functions on the basis of automatic testing associated with a surveillance requirement that is not specified for these functions. Determine if automatic Channel Checks are actually occurring for the High Power Neutron Flux Rate Functions and whether or not the Bases statement is applicable to these functions. Make any necessary corrections to the APWR Bases.

The additional information is needed to ensure the accuracy and completeness of the APWR Bases.

16-230

LCO 3.3.1, RTS Instrumentation

Provide a technical justification that explains how the CHANNEL OPERATIONAL TEST (COT) surveillance requirement specified for Reactor Trip System (RTS) Functions in Table 3.3.1-1, ensures that those functions are adequately tested.

The APWR GTS, Table 3.3.1-1, specifies the performance of a CHANNEL OPERATIONAL TEST surveillance requirement in accordance with SR 3.3.1.7 for RTS Functions 2.a, 2.b, 3.a, 3.b, 4, 5, 6, 7, 8.a, 8.b, 9, 10, 11, 12.a, 12.b, 15.a, 15.c, and 15.d. The Channel Operational Test as originally defined in NUREG -1431, has been revised under the APWR GTS to accommodate aspects of the fully digital MELTAC I&C platform design.

The APWR GTS Channel Operational Test for the Protection and Safety Monitoring System (PSMS), consists of a software memory integrity check. This is an adaptation of the NUREG-1431 definition, which is a verification of channel device operability based on the injection of a simulated or actual signal into the channel as close to the sensor as practicable, including the adjustment of setpoints required for operability. It is unclear how the performance of a software memory integrity check is equivalent to verifying the operability of all devices in the channel required for channel operability, and the adjustment of setpoints. Does a software memory integrity check satisfy the same or similar requirements for digital equipment that a Channel Operational Test is required to satisfy for analog equipment? Are the two functionally equivalent?

Provide a technical justification that explains how a software memory integrity check satisfies the requirements of a Channel Operational Test for each of the above referenced RTS Functions. Include any discussions necessary to ensure a clear understanding of Channel Operational Test criteria and how that criteria applies to the digital Protection and Safety Monitoring System.

The technical justification is needed to ensure that Reactor Trip Functions are being properly surveilled under the MELTEC digital I&C platform design, and that Channel Operational Test criteria can be applied to digital, as well as analog equipment.

16-231

LCO 3.3.1, RTS Instrumentation

Provide a technical justification that explains how the ACTUATION LOGIC TEST surveillance requirement specified for Reactor Trip System (RTS) Functions in Table 3.3.1-1, ensures that those functions are adequately tested.

The APWR GTS, Table 3.3.1-1, specifies performance of an ACTUATION LOGIC TEST surveillance requirement in accordance with SR 3.3.1.5 for RTS Functions 14, 15.b, and 18. The Actuation Logic Test as originally defined in NUREG -1431, has been revised under the APWR GTS to accommodate aspects of the fully digital MELTAC I&C platform design.

The APWR GTS Actuation Logic Test for the Protection and Safety Monitoring System (PSMS), consists of a software memory integrity check. This is an adaptation of the NUREG-1431 definition, which is a verification of required output logic for a given combination of input signals in conjunction with each possible interlock logic state required for operability of a logic circuit, including at a minimum, a continuity check of output devices. It is unclear how the performance of a software memory integrity check is equivalent to a comprehensive test of the logic and a continuity check of output devices. Does a software memory integrity check satisfy the same or similar requirements for digital equipment that an Actuation Logic Test is required to satisfy for analog equipment? Are the two functionally equivalent?

Provide a technical justification that explains how a software memory integrity check satisfies the requirements of an Actuation Logic Test for each of the above referenced RTS Functions. Include any discussions necessary to ensure a clear understanding of Actuation Logic Test criteria and how that criteria applies to the digital Protection and Safety Monitoring System.

The technical justification is needed to ensure that Reactor Trip Functions are being properly surveilled under the MELTEC digital I&C platform design, and that Actuation Logic Test criteria can be applied to digital, as well as analog equipment.

16-232

LCO 3.3.1, RTS Instrumentation

Provide a technical justification that explains how the CHANNEL CALIBRATION surveillance requirements specified for Reactor Trip System (RTS) Functions in Table 3.3.1-1, ensure that those functions are adequately tested.

The APWR GTS, Table 3.3.1-1, specifies performance of a CHANNEL CALIBRATION surveillance requirement in accordance with SR 3.3.1.9, SR 3.3.1.10, and SR 3.3.1.11 for RTS Functions 2.a, 2.b, 3.a, 3.b, 4, 5, 6, 7, 8.a, 8.b, 9, 10, 11, 12.a, 12.b, 13.a, 13.b, 15.a, 15.c, and 15.d. The Channel Calibration as originally defined in NUREG -1431, has been revised under the APWR GTS to accommodate aspects of the fully digital MELTAC I&C platform design.

The APWR GTS extends the application of a Channel Calibration to binary measurements. Under this application, a Channel Calibration confirms the accuracy of the channel's state change. This is an adaptation of the NUREG-1431 definition, which consists of an adjustment, as necessary, of the channel output such that it responds within the necessary range and accuracy to known values of the parameter that the channel monitors. It is unclear how confirming the accuracy of a channel's state change meets the intent of the NUREG-1431 definition for a Channel Calibration. Are the two functionally equivalent? Can Channel Calibration criteria be applied to binary measurements?

Provide a technical justification that explains how confirming the accuracy of a channel's state change constitutes performance of a Channel Calibration. Include any discussions necessary to ensure a clear understanding of Channel Calibration criteria as it relates to binary measurements. Describe how analog and binary Channel Calibration surveillance requirements are integrated to ensure that each of the above referenced RTS Functions are adequately tested.

The technical justification is needed to ensure that Reactor Trip Functions are being properly surveilled under the MELTEC digital I&C platform design, and that Channel Calibration criteria can be applied to binary, as well as analog measurements.

16-233

LCO 3.3.1, RTS Instrumentation

Provide a technical justification that explains how the TRIP ACTUATING DEVICE OPERATIONAL TEST (TADOT) surveillance requirement specified for Reactor Trip System (RTS) Functions in Table 3.3.1-1, ensures that those functions are adequately tested.

The APWR GTS, Table 3.3.1-1, specifies performance of a TRIP ACTUATING DEVICE OPERATIONAL TEST surveillance requirement in accordance with SR 3.3.1.4 and SR 3.3.1.12 for RTS Functions 1, 13.a, 13.b, and 17. The Trip Actuating Device Operational Test as originally defined in NUREG -1431, has been revised under the APWR GTS to accommodate aspects of the fully digital MELTAC I&C platform design.

The APWR GTS Trip Actuating Device Operational Test does not include provisions for adjustment of the trip actuating device so that it actuates at the required setpoint, and is therefore typically applicable only to binary devices that are not subject to drift. This is an adaptation of the NUREG-1431 definition which states that “[t]he TADOT shall include adjustment, as necessary, of the trip actuating device.” It is unclear why the requirement to perform adjustments has been excluded from the TADOT. Has the intent of the surveillance requirement been compromised for certain functions due to the elimination of previously required adjustments? If, as stated in the APWR GTS definition, a TADOT is typically applicable only to binary devices that are not subject to drift, is there a potential for adjustable binary and non-binary trip actuating devices subject to drift, to have their requirements for adjustments overlooked due to being excluded from a surveillance requirement that previously ensured actuation at a required setpoint through periodic adjustment?

Provide a technical justification that explains how a TADOT without provisions for performing adjustments of trip actuating devices, ensures that each of the above referenced RTS Functions are adequately tested and that device operability is not compromised. Include any discussions necessary to ensure a clear understanding of Trip Actuating Device Operational Test criteria and how that criteria applies to RTS trip actuating devices.

The technical justification is needed to ensure that Reactor Trip Functions are being properly surveilled under the MELTEC digital I&C platform design, and that Trip Actuating Device Operational Test criteria is being properly applied.

16-234

LCO 3.3.1, RTS Instrumentation

Provide a technical justification that explains how the surveillance requirement specified by Table 3.3.1-1 for the ECCS Actuation Reactor Trip Function, ensures that the function is adequately tested.

The APWR GTS, Table 3.3.1-1, Surveillance Requirements, specifies performance of an ACTUATION LOGIC TEST in accordance with SR 3.3.1.5 for the ECCS Actuation Reactor Trip Function. The Actuation Logic Test as originally defined in NUREG -1431, has been revised under the APWR GTS to accommodate aspects of the fully digital MELTAC I&C platform design. The APWR GTS Actuation Logic Test for the Protection and Safety Monitoring System (PSMS), consists of a software memory integrity check. This is an adaptation of the NUREG-1431 definition, which is a verification of required output logic for a given combination of input signals in conjunction with each possible interlock logic state required for operability of a logic circuit, including at a minimum, a continuity check of output devices. Does an Actuation Logic Test consisting of a software memory integrity check provide adequate assurance that a trip signal will be initiated from each RPS train upon actuation of its respective ECCS train?

In addition, NUREG-1431 specifies the performance of a Trip Actuating Device Operational Test (TADOT) instead of an Actuation Logic Test for the corresponding Reactor Trip Function in the WOG STS. The TADOT consists of operating the trip actuating device and verifying the operability of all devices in the channel required for trip actuating device operability. Does the performance of a software memory integrity check in lieu of a TADOT ensure that ECCS Actuation Reactor Trip Function surveillance requirements are met?

Provide a technical justification that explains how the performance of an Actuation Logic Test satisfies ECCS Actuation Reactor Trip Function surveillance requirements. Include any discussions necessary to ensure a clear understanding of Actuation Logic Test criteria.

The technical justification is needed to ensure that the Reactor Trip Function is being properly surveilled under the MELTEC digital I&C platform design.

16-235

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary to explain, clarify, and correct potential discrepancies associated with the APWR Bases, SURVEILLANCE REQUIREMENTS, SR 3.3.1.4.

The APWR Bases, SURVEILLANCE REQUIREMENTS, SR 3.3.1.4, page B 3.3.1-44 (last paragraph), states that “[t]he RTB train test shall include separate verification of the undervoltage, shunt trip mechanisms, and the Manual Reactor Trip hardwired switches.” The same paragraph also states that “[t]he Manual Reactor Trip Test shall actuate both mechanisms.” Although the two mechanisms are independently verified with respect to one another, it is unclear whether or not the two mechanisms are independently verified during performance of the Manual Reactor Trip Test.

Corresponding WOG Bases Surveillance Requirement, SR 3.3.1.14, page B 3.3.1-58 (third paragraph), specifically states that “[t]he test shall independently verify the OPERABILITY of the undervoltage and shunt trip mechanisms for the Manual Reactor Trip Function for the Reactor Trip Breakers.” Determine the testing requirements for RTB undervoltage and shunt trip mechanisms during performance of the Manual Reactor Trip Test. Provide the necessary clarification and ensure that the information is clearly stated in the APWR Bases.

The additional information is needed to ensure the accuracy and completeness of the APWR Bases.

16-236

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary to explain and correct potential discrepancies associated with the Overtemperature ΔT and Overpower ΔT protection setpoint equations in the APWR DCD and GTS.

The APWR GTS, Table 3.3.1-1, and the APWR DCD, Section 7.2.1.4.3, Overtemperature ΔT and Overpower ΔT Function protection setpoint equations do not include either the ΔT_Q term or the T-average $1/(1+T_6S)$ Laplace Transform term specified in the same equations for Overtemperature ΔT and Overpower ΔT in the WOG STS, Table 3.3.1-1. Determine whether or not the two terms are applicable to the Overtemperature ΔT and Overpower ΔT protection setpoint equations and make any necessary corrections to the APWR GTS and DCD. Include any discussions necessary to ensure a clear understanding of the algorithm with respect to each term.

The additional information is needed to ensure the accuracy and completeness of the APWR Bases and DCD.

16-237

LCO 3.3.1, RTS Instrumentation

Provide the additional information necessary to validate Turbine Trip Function 13.a and 13.b Allowable Value and Trip Setpoint numbers in the APWR GTS, Table 3.3.1-1.

The Allowable Value and Trip Setpoint numbers specified for Turbine Trip Functions 13.a and 13.b in the APWR GTS, Table 3.3.1-1, do not appear to be referenced in the APWR DCD, either in Reactor Trip Setpoint Table 7.2-3 or Transient and Accident Analyses Table 15.0-4. Validate the Turbine Trip Function Allowable Value and Trip Setpoint numbers and include this information in the appropriate references.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and DCD.

16-238

LCO 3.3.1, RTS Instrumentation

Provide the additional information and any changes necessary to explain and correct a potential discrepancy identified in the APPLICABLE SAFETY ANALYSES, LCO and APPLICABILITY section of the APWR Bases.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, page B 3.3.1-7 (bottom paragraph), states that “[a] channel is OPERABLE provided the “as-found” accuracy value does not exceed its associated Allowable Value.” The comparable statement in the WOG Bases, page B 3.3.1-8 (bottom paragraph), states that “[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 …”

it appears that the accuracy/intent of the APWR Bases statement may have been affected by use of the phrase “as-found accuracy value” as opposed to “trip setpoint as-found value” in the WOG Bases. A “setpoint” is a specific number that can be readily compared to an Allowable Value, whereas an “accuracy value” is a measure of closeness or indication of instrumentation performance. Comparisons are typically not drawn between Allowable Values and “accuracy values”. Validate the Bases statement and make any necessary changes.

The additional information is needed to ensure the accuracy, completeness, and consistency of the APWR Bases.

16-239

LCO 3.3.2, ESFAS Instrumentation

Provide a technical justification for why the APWR GTS, Table 3.3.2-1, specifies only three "Required Channels" for Engineered Safety Feature Actuation System (ESFAS) Functions that share channel inputs with control system functions. Provide the additional information and any changes necessary to explain, clarify, and correct potential discrepancies in the APWR GTS, Table 3.3.2-1, and applicable sections of the APWR Bases.

The APWR Bases, BACKGROUND, Signal Processing Equipment, page B 3.3.2-2 (last paragraph), states that "[g]enerally, 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."

The APWR Bases, BACKGROUND, Signal Processing Equipment, page B 3.3.2-3 (first paragraph), states that "[g]enerally, if a parameter is used for input to the protection circuits and a control function, three channels with a two-out-of-three logic are also sufficient to provide the required reliability and redundancy." The same paragraph attempts to justify three channels as being sufficient by stating that "[t]he Signal Selection Algorithm (SSA) within the PCMS ensures the control systems can withstand an input failure to the control system without causing erroneous control system operation which would otherwise require the protection function actuation. Since the input failure does not cause an erroneous control system action that challenges the protection function, the input failure is considered a single failure in the RTS and the RTS remains capable of providing its protective function with the remaining two operable channels."

In contrast, the WOG Bases, BACKGROUND, Signal Processing Equipment, page B 3.3.2-3 (first paragraph), states "[g]enerally, 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 provide the required reliability and redundancy. The circuit must be able to withstand both an input failure to the control system, which may then require the protection function actuation, and a single failure in the other channels providing the protection function actuation."

Provide a technical justification that addresses each of the following specifics with regard to a "Three-Channel versus Four-Channel" operability requirement for ESFAS Instrumentation Functions that share channel inputs with control system functions. Include any discussions necessary to ensure a clear understanding of the channel operability requirements.

- The ability of three operable channels in a two-out-of three configuration to provide the required reliability and redundancy in the presence of both an input failure to the control system and a single failure of one of the other two channels providing the protection function actuation.

- The deviation from the above referenced WOG Bases statement requirement of “four channels with a two-out-of-four logic.”

- How the Signal Selection Algorithm (SSA) within the control system prevents the possibility of the shared channel failing in such a manner that it creates a transient requiring ESFAS action. This concept is not well understood and requires clarification.

- Why it is permissible to allow one channel to be tripped during maintenance or testing in a two-out-of-three logic configuration, when single failure criteria and control system input failures are primary considerations in terms of evaluating reliability and redundancy. Reference APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, page B 3.3.2-6 (first paragraph).

- The APWR GTS, Table 3.3.2-1, ECCS Actuation - Low Pressurizer Pressure, three-channel operability requirement. The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, ECCS Actuation - Low Pressurizer Pressure, page B 3.3.2-9 (third paragraph), states that “[p]ressurizer Pressure provides both control and protection functions: input to the Pressurizer Pressure Control System, reactor trip, and ECCS.”

- The APWR GTS, Table 3.3.2-1, Main Feedwater Control Valve Closure - Low Tavg, three-channel operability requirement. The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Main Feedwater Isolation - Low Tavg, page B 3.3.2-22 (first paragraph), states that “[t]he Tavg channels provide control inputs interfaced from the PSMS to the PCMS through an SSA.”

- The APWR GTS, Table 3.3.2-1, Main Feedwater Isolation - High-High SG Water Level, three-channel operability requirement. The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Main Feedwater Isolation - High-High Steam Generator Water Level, page B 3.3.2-23 (last paragraph), states that “[t]he ESFAS SG water level instruments provide input to the SG Water Level Control System.”

- The APWR GTS, Table 3.3.2-1, Emergency Feedwater Actuation - Low SG Water Level, three-channel operability requirement. The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Emergency Feedwater Actuation - Low Steam Generator Water Level, page B 3.3.2-25 (third paragraph), states that “[l]ow SG Water Level provides input to the SG Level Control System.”

- The APWR GTS, Table 3.3.2-1, Emergency Feedwater Isolation - High SG Water Level, three-channel operability requirement. The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Emergency Feedwater Isolation - High Steam Generator Water Level coincident with P-4 signal and no Low Main Steam Line Pressure, page B 3.3.2-28 (first paragraph), states that “[t]he ESFAS SG water level instruments provide input to the SG Water Level Control System.”

- The APWR GTS, Table 3.3.2-1, CVCS Isolation - High Pressurizer Water Level, three-channel operability requirement. The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, CVCS Isolation - High Pressurizer Water Level, page B 3.3.2-29 (next to last paragraph), states that "[p]ressurizer Water Level provides input to the Pressurizer Level Control System."

- The APWR GTS, Table 3.3.2-1, Turbine Trip - High-High SG Water Level, three-channel operability requirement. The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, High-High Steam Generator Water Level, page B 3.3.2-31 (first paragraph), states that "[t]he PSMS SG water level instruments provide input to the SG Water Level Control System."

The technical justification and additional information are needed to ensure the accuracy and completeness of the APWR GTS and Bases, including the correct number of Required Channels for ESFAS Instrumentation Functions that share channel inputs with control system functions.

16-240

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to explain and correct a potential discrepancy identified in the BACKGROUND Section of the APWR Bases.

The APWR Bases, BACKGROUND, Signal Processing Equipment, page B 3.3.2-3 (first paragraph), states that "[s]ince the input failure does not cause an erroneous control system action that challenges the protection function, the input failure is considered a single failure in the RTS and the RTS remains capable of providing its protective function with the remaining two operable channels." It appears that the two references to "RTS" should actually be to "ESFAS" since the Bases discussion is associated with ESFAS instrumentation channel operability requirements. Validate the Bases statement and make any necessary corrections.

The additional information is needed to ensure the accuracy and completeness of the APWR Bases.

16-241

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to explain and correct potential discrepancies associated with footnote (b) in the APWR GTS, Table 3.3.1-2.

The APWR GTS, Table 3.3.1-2, Functions 1.e, 4.d(1) and 4.d(2) , do not specify footnote (b) for the Allowable Values. Footnote (b) is specified for the associated APWR GTS, Trip Setpoints, and also for the Allowable Values and Trip Setpoints of the comparable functions in the WOG STS. In addition, footnote (b) is located inside the brackets of the APWR GTS, Trip Setpoints for each of these functions. Footnote (b) is located outside of the bracketed values for each of the comparable functions in the WOG STS. Determine footnote applicability regarding the Allowable Values and ensure proper footnote placement. Make any necessary changes to the APWR GTS, Table 3.3.1-2.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS.

16-242

LCO 3.3.2, ESFAS Instrumentation

Provide a technical justification for specifying Allowable Values in terms of “Channel Uncertainty Allowances” and validate the “Uncertainty Allowance Numbers.” Provide the additional information and any changes necessary to explain, resolve, and correct any potential discrepancies or inconsistencies associated with “Channel Uncertainty Allowances” and Allowable Value/Trip Setpoint units in the APWR GTS, Table 3.3.2-1.

The APWR GTS, Table 3.3.2-1, specifies Allowable Values in terms of “Channel Uncertainty Allowances” instead of specific values with “inequality” and “equal to” criteria. In addition, the Allowable Value units are expressed as “percent of span” for Functions 1.c, 1.d, 1.e, 2.c, 4.c, 4.d(1), 4.d(2), 5A.a, 5B.c, 6.c, 6.e, 7.c, 7.d, 8.c, 9.c, 11.b, 12.e, 13.c(1), 13.c(2), 13.c(3), and the Trip Setpoint units are expressed as “percent of span” for Functions 5B.c, 6.c, 7.c, 8.c, 9.c, in lieu of units that are function specific. These are deviations from NUREG-1431. Technically justify the use of “Channel Uncertainty Allowances”, validate the Allowable Values, and determine appropriate units for the referenced function Allowable Values and Trip Setpoints. Make any necessary corrections to the APWR GTS, Table 3.3.2-1. Include any discussions necessary to ensure a clear understanding of the differences between the APWR GTS, Table 3.3.2-1, and the WOG STS, Table 3.3.2-1, with respect to Allowable Value presentation.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS.

16-243

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to enhance the ECCS Actuation - Low Main Steam Line Pressure Function Bases discussion regarding instrumentation uncertainties.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABLITY, 1.e, ECCS Actuation - Low Main Steam Line Pressure, page B 3.3.2-10, does not provide a discussion about transmitter locations and the potential effect of adverse environmental instrumentation uncertainties (in addition to steady state uncertainties) on the trip setpoint. The APWR GTS, Table 3.3.1-2, Functions 1.c and 1.d, and comparable Function 1.e in the WOG STS, Table 3.3.1-2, include this discussion in their associated Bases sections. This is relevant information which should be captured in the Bases.

Include any discussions necessary to ensure a clear understanding of the instrumentation uncertainties reflected in the trip setpoint for the Low Main Steam Line Pressure ECCS Actuation Function.

The additional information is needed to ensure the accuracy, completeness, and consistency of the APWR Bases.

16-244

LCO 3.3.2, ESFAS Instrumentation

Provide a technical justification for why the Containment Spray - High-3 Containment Pressure Function requires only three Operable channels when four are available, and why associated Required Action E.1 does not provide direction to bypass the inoperable fourth channel.

The APWR GTS, Table 3.3.2-1, 2.c, Containment Spray - High-3 Containment Pressure, specifies 3 Required Channels. Comparable Function 2.c in the WOG STS, Table 3.3.2-1, specifies 4 Required Channels. The WOG Bases, Condition E, page B 3.3.2-42 (first paragraph), states that "a two-out-of-three design would require tripping a failed channel. This is undesirable because a single failure would then cause spurious containment spray initiation. Spurious spray actuation is undesirable because of the cleanup problems presented. Therefore, these channels are designed with a two-out-of four logic so that a failed channel may be bypassed and still satisfy the single failure criterion. Furthermore, with one channel bypassed, a single instrumentation channel failure will not spuriously initiate containment spray. To avoid the inadvertent actuation of containment spray and Phase B containment isolation, the inoperable channel should not be placed in the tripped condition. Instead it is bypassed."

The APWR GTS, Required Action E.1, provides direction to restore the required number of OPERABLE channels within 72 hours, instead of bypassing the inoperable channel as directed by Required Action E.1 of the WOG STS. The APWR Bases, Condition E, page B 3.3.2-42 (second paragraph from the bottom), states that "[r]estoring the channel to OPERABLE status within 72 hours is sufficient because of the low probability of an event occurring during this interval and because the remaining two OPERABLE channels have automatic self-testing (as described for COT), and automatic CHANNEL CHECKS."

Technically justify the deviation from NUREG-1431 regarding the Required Number of Operable Channels and the direction provided by Required Action E.1 for the Containment Spray - High-3 Containment Pressure Function 2.c in the APWR GTS. Include any discussions necessary to ensure a clear understanding of the Operability requirements, single failure criterion, and spurious containment spray initiation considerations in the APWR Bases.

The technical justification and additional information are needed to ensure the accuracy and completeness of the APWR GTS and Bases.

16-245

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to explain and correct potential discrepancies associated with the Containment Isolation Phase A Function in the APWR Bases.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Containment Isolation, pages B 3.3.2-14 and B 3.3.2-15, appear to have conflicting statements regarding the Manual Phase A Containment Isolation Function. Page B 3.3.2-14, second paragraph from the bottom, states that "[m]anual Phase A Containment Isolation is accomplished by four switches in the main control room." Page B 3.3.1-15, second paragraph from the bottom, states that "[m]anual Phase A Containment Isolation is actuated by two switches in the main control room."

The APWR GTS, Table 3.3.1-14, Function 3.a(1), Required Channels, specifies Trains A and D. In addition, the APWR DCD, Section 7.3.1.5.4, page 7.3-9, states that there are "only two ESFAS trains for Containment Isolation Phase A, A and D." The Bases statement describing the four switches on page B 3.3.2-14 appears to be incorrect. Determine the validity of the Bases statements and make any necessary corrections. Include any discussions necessary to ensure a clear understanding of the Containment Isolation Phase A Manual Initiation logic.

The additional information is needed to ensure the accuracy, completeness, and consistency of the APWR Bases.

16-246

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information necessary to validate the Main Feedwater Isolation - Low Tavg Function, Allowable Value and Trip Setpoint numbers in the APWR GTS, Table 3.3.2-1.

The Allowable Value and Trip Setpoint numbers specified for Main Feedwater Isolation - Low Tavg Function 5A.a in the APWR GTS, Table 3.3.2-1, do not appear to be referenced in the APWR DCD, either in ESFAS Setpoint Table 7.3-4 (page 7.3-26), or Transient and Accident Analyses Table 15.0-4 (page 15.0-32). Validate the Main Feedwater Isolation - Low Tavg Function Allowable Value and Trip Setpoint numbers and include this information in the appropriate references.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and DCD.

16-247

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary regarding the application of footnote (i) in the APWR GTS, Table 3.3.2-1 and Bases.

The APWR GTS, Table 3.3.2-1, footnote (i), states “[e]xcept when all MFIVs, MFRVs, MFBRVs, and SGWFCVs are closed.” The footnote does not appear to be directly applicable to the Main Feedwater Isolation - Low Tavg Function (5A.a), for all of the valves referenced in the footnote. A review of the APWR DCD, Functional Logic Diagram, Figure 7.2-2 (sheet 10 of 21), indicates that the Main Feedwater Isolation - Low Tavg Function only isolates the Main Feedwater Regulating Valves (MFRVs). This is also supported by the APWR Bases, Main Feedwater Control Valve Closure, page B 3.3.2-21 (last paragraph), which states”[t]his function is actuated when Tavg is less than the low setpoint coincident with reactor trip, and closes all the Main Feedwater Control Valves.” Determine footnote (i) applicability with respect to Function 5A.a and make any necessary corrections in the APWR GTS, Table 3.3.2-1. Include any discussions necessary to ensure a clear understanding of footnote applicability in the Bases.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and Bases.

16-248

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to accurately describe ESFAS Function 5A in the APWR GTS, Table 3.3.2-1, and Bases Section 5A, consistent with the APWR DCD.

The APWR GTS, Table 3.3.2-1, and APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, page B 3.3.2-21 (subsection title line and last two paragraphs), both describe Function 5A as a “Main Feedwater Control Valve Closure.” The APWR DCD, Section 7.3.1.5.8, and associated Functional Logic Diagram, Figure 7.2-2 (sheet 10 of 21), consistently refer to the isolation as a “Main Feedwater Regulation Valve Closure.” In addition, the APWR GTS, Table 3.3.2-1, footnote (i), utilizes the acronym “MFRVs” which stands for Main Feedwater Regulation Valves. Determine the appropriate ESFAS functional description and make any necessary corrections to ensure consistency with the APWR DCD.

The additional information is needed to ensure the accuracy, completeness, and consistency amongst the APWR GTS, Bases and DCD.

16-249

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to explain and correct a potential discrepancy associated with the Main Feedwater Isolation - High-High Steam Generator Water Level Function (5B.c) in the APWR GTS, Table 3.3.2-1.

The APWR GTS, Table 3.3.2-1, Main Feedwater Isolation - High-High Steam Generator Water Level Function (5B.c), actuates a trip of all Main Feedwater (MFW) Pumps, closure of all MFW Isolation Valves, and closure of all Steam Generator Water Filling Control Valves upon deactivation of Pressurizer Pressure Interlock P-11. Below the P-11 interlock these isolation actuations may be manually bypassed. The APWR GTS, Table 3.3.2-1, does not specify a footnote for mode three of Function 5B.c indicating that the specific equipment referenced is capable of being automatically actuated above P-11 after having been manually bypassed below the interlock (similar to footnote (a) for Functions 1.d, 1.e, 4.d(1) and footnote (f) for Function 4.d(2)). A review of the APWR DCD, Functional Logic Diagram, Figure 7.2-2 (sheet 10 of 21), and APWR DCD, Section 7.3.1.5.8.2 and Table 7.2-4, confirms the details associated with operating bypass Interlock P-11 relative to Function 5B.c.

Determine whether or not an additional footnote is warranted for Function 5B.c and make any necessary corrections to the APWR GTS, Table 3.3.2-1. If a new footnote is incorporated, include any discussions necessary to ensure a clear understanding of footnote applicability and intent in the Bases.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and Bases.

16-250

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to explain and correct potential discrepancies associated with footnote (a) in the APWR GTS, Table 3.3.2-1.

Two separate and distinct reference comments have been assigned to footnote (a) in the APWR GTS, Table 3.3.2-1. Footnote (a) as it applies to Functions 1.d, 1.e, and 4.d(1), states “[a]bove the P-11 (Pressurizer Pressure) interlock.” Footnote (a) as it applies to Functions 13.a, 13.b, 13.c(1), 13.c(2), and 13.c(3), states “[d]uring movement of irradiated fuel assemblies within containment.” Footnotes within the same Tech Spec Table should remain dedicated in order to avoid confusion and potential misinterpretation by Operations personnel. Determine appropriate footnote designations and make the necessary corrections.

The APWR GTS, Table 3.3.2-1, page 3.3.2-20, specifies footnote (a) in Mode 4 for each of the Main Control Room Isolation Functions. The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, page B 3.3.2-21, fifth paragraph, states that “[t]he MCR Isolation Functions must be OPERABLE in MODES 1, 2, 3, 4, and during movement of irradiated fuel assemblies.” There is a potential that the movement of irradiated fuel assemblies could occur outside of Modes 1 through 4. It appears that footnote (a) should actually be applied as a separate Mode Condition similar to the presentation in the WOG STS, LCO 3.3.7, Control Room Emergency Filtration (CREFS) Actuation Instrumentation, Table 3.3.7-1. Determine the proper placement of the footnote and make any necessary changes.

The APWR GTS, Table 3.3.2-1, page 3.3.2-20, does not specify footnote (a) as a Mode Condition for any of the Containment Purge Isolation Functions. The WOG STS however, specifies footnote (a) as an applicable Mode for each of the Containment Purge and Exhaust Isolation Functions in LCO 3.3.6, Table 3.3.6-1 (Note that LCO 3.3.6 is actually part of LCO 3.3.2 in the APWR GTS). It appears that footnote (a) may be applicable to the Containment Purge Isolation Functions as a separate Mode Condition, considering that the potential exists for an accident that could release significant fission product radioactivity into the containment in Conditions other than Modes 1 through 4. Determine if footnote (a) should be applied to the Containment Purge Isolation Function and explain the deviation from the WOG STS. Make any necessary corrections to the APWR GTS, Table 3.3.2-1. If a new footnote is incorporated, include any discussions necessary to ensure a clear understanding of footnote applicability and intent in the Bases.

The additional information is needed to ensure the accuracy, completeness, and integrity of the APWR GTS.

16-251

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information necessary to validate the Emergency Feedwater Actuation - Loss of Offsite Power Signal Function, Allowable Value and Trip Setpoint numbers in the APWR GTS, Table 3.3.2-1.

The Allowable Value and Trip Setpoint numbers (including the time delay) specified for Emergency Feedwater Actuation - Loss of Offsite Power Signal Function 6.d in the APWR GTS, Table 3.3.2-1, do not appear to be referenced in the APWR DCD, either in ESFAS Setpoint Table 7.3-4 (page 7.3-26), or Transient and Accident Analyses Table 15.0-4 (page 15.0-32). Validate the Emergency Feedwater Actuation - Loss of Offsite Power Signal Function Allowable Value and Trip Setpoint numbers and include this information in the appropriate references.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and DCD.

16-252

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to explain and correct potential discrepancies associated with the Main Feedwater Isolation Function in the APWR Bases.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, 5B, Main Feedwater Isolation, page B 3.3.2-22 (last paragraph), states that “[t]he Function is actuated when the level in any SG exceeds the high setpoint, …” It appears that the Bases statement should actually specify “High-High” setpoint as opposed to just “High” setpoint, on the basis that the remaining references to Function 5B.c in the APWR GTS, Bases and DCD all cite “High-High Steam Generator Water Level.” Determine the correct setpoint description and make any necessary corrections to the APWR Bases.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, 5B, Main Feedwater Isolation, page B 3.3.2-23 (first full paragraph), states that “[t]his Function is actuated by High-High SG Water Level or by an ECCS Actuation signal.” The Bases statement does not include the fact that the Function is also actuated by Manual Initiation. Explain the apparent omission and make any necessary corrections to the APWR Bases.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, 5B.c, Main Feedwater Isolation - High-High Steam Generator Water Level (P-14), page B 3.3.2-23 (last underlined subsection title), implies that there is a P-14 interlock signal that is an integral part of the isolation logic associated with this function. The Bases discussion does not provide any information regarding interlocks. It appears, based on a review of the APWR DCD, including Functional Logic Diagram Figure 7.2-2 (sheet 12 of 21) and Sections 7.3.1.5.8 and 7.3.1.6.3, that the P-14 interlock does not exist and that the P-11 interlock is actually part of the Main Feedwater Isolation - High-High Steam Generator Water Level Logic. Validate the interlock logic associated with Function 5B.c and make any necessary corrections to the APWR Bases. Provide the changes needed to ensure that all relevant interlock information is clearly described in the Bases.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, 5B.b, Main Feedwater Isolation - Actuation Logic and Actuation Outputs, page B 3.3.2-23, second paragraph from the bottom, does not provide any information regarding Mode applicability or the conditional requirements established in accordance with footnote (i) in Table 3.3.2-1 of the APWR GTS. This information is relevant and needs to be included in the APWR Bases. Provide the missing Bases information.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, 5B.d, Main Feedwater Isolation - ECCS Actuation, page B 3.3.2-24, third paragraph, states that “except when all MFIVs, MFRVs, and associated bypass valves are closed when the MFW System is in operation.” The reference to Steam Generator Water Filling Control Valves (SGWFCVs) in the APWR GTS, Table 3.3.2-1, footnote (i), appears to have been omitted from the Bases statement. It is unclear why the SGWFCVs have not been included in the Bases discussion. Also, the information contained in this paragraph is applicable to Main Feedwater Isolation Functions 5B.a, 5B.b, and 5B.c. As such, the paragraph should stand-alone, independent of Section 5B.d. The comparable paragraph in the WOG Bases, page B 3.3.2-28, has been formatted as a stand-alone paragraph. Explain the apparent omission of the SGWFCVs, determine if the paragraph should be relocated, and make any necessary corrections to the APWR Bases.

The additional information is needed to ensure the accuracy and completeness of the APWR Bases.

16-253

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to explain, clarify and correct potential discrepancies identified in the Emergency Feedwater Actuation Function Sections of the APWR Bases.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, 6.e, Emergency Feedwater Actuation - Loss of Offsite Power, page B 3.3.2-26 (third paragraph), states that “[t]he LCO requires two OPERABLE undervoltage devices on each Class 1E bus corresponding to each OPERABLE EFW train.” The APWR GTS, Table 3.3.2-1, 6.e, LOOP Signal, Required Channels, specifies “3 per bus for each EFW train.” An apparent conflict exists between Table 3.3.2-1 and the Bases regarding the Required Number of Operable channels. The APWR DCD, Section 7.3.1.1 (page 7.3-2), states that “[e]ach ESFAS train monitors three under voltage inputs, using 2-out-3 logic, to detect a loss of power condition for its respective train, and generates a LOOP signal.” This would tend to imply that three Operable channels are probably required in order ensure adequate redundancy and enhanced reliability. Determine the required number of Operable channels and make any necessary corrections.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, 6.e, Emergency Feedwater Actuation - Loss of Offsite Power, page B 3.3.2-26 (third paragraph), states that “[l]oss of power to a Class 1E bus will actuate its respective EFW train to ensure that at least two SGs contain enough water to serve as the heat sink for reactor decay heat and sensible heat removal following the reactor trip.” This statement is somewhat confusing considering that the APWR Emergency Feedwater Actuation System “has four trains, with two motor driven pumps and two turbine driven pumps” as stated in the last paragraph on page B 3.3.2-24 of the Bases. Loss of power to a single Class 1E bus whose pump is motor driven pump will not result in successful actuation of that bus’s EFW train as indicated above. The comparable statement in the WOG Bases, page B 3.3.2-30 (third paragraph), states that “[l]oss of power to either service bus will start the turbine driven AFW pumps …” It appears that the APWR Bases statement on page B 3.3.2-26 is accurate for the Class 1E bus whose pump is turbine driven, and at least partially accurate for a complete Loss of Offsite Power in which all of the Class 1E buses are completely de-energized (i.e. turbine driven pumps will be started, ensuring enough water for two SGs minimum). Provide the necessary clarification and ensure that the information is clearly stated in the APWR Bases.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, page B 3.3.2-26 (last paragraph), states that “[f]unctions 6.a through 6.d must be OPERABLE in MODES 1, 2, and 3 to ensure that the SGs remain the heat sink for the reactor.” The comparable statement in the WOG Bases, page B 3.3.2-30 (last paragraph), states that “[f]unctions 6.a through 6.e must be OPERABLE in MODES 1, 2, and 3 to ensure that the SGs remain the heat sink for the reactor.” The APWR GTS, Table 3.3.2-1, specifies MODES 1, 2, and 3 for Function 6.e as well. It appears that the Bases statement should incorporate functional references 6.a through 6.e. Determine the correct information and make any necessary corrections to the APWR Bases.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, page B 3.3.2-27, 6.f, Emergency Feedwater Action - Trip of All Main Feedwater Pumps, page B 3.3.2-27 (second paragraph), states that “[i]n MODES 3, 4, and 5, the RCPs and MFW pumps may be normally shut down, and thus neither pump trip is indicative of a condition requiring automatic EFW initiation.” Neither the APWR DCD or the APWR GTS specify an Emergency Feedwater Actuation on RCP Undervoltage. It appears that the reference to RCPs in the Bases statement may be invalid. Determine the correct information and make any necessary corrections to the APWR Bases.

Correct the following typographical/editorial errors identified in the Emergency Feedwater Actuation Function Sections of the APWR Bases:

- Page B 3.3.2-26, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Second Paragraph: The phrase “ensure that at least two SG contains enough water,” should read “ensure that at least two SGs contain enough water...”

- Page B 3.3.2-27, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Second Paragraph: The phrase “[t]his ensures that at least two SG is provided with water,” should read “[t]his ensures that at least two SGs are provided with water...”

- Page B 3.3.2-27, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Subsection “f” Underlined Function Description: The word “Action” should be “Actuation”.

The additional information is needed to ensure the accuracy and completeness of the APWR Bases.

16-254

LCO 3.3.2, ESFAS Instrumentation

Provide a technical justification for why it is acceptable from a plant safety standpoint, to rely on manual transfer of the Emergency Feedwater Pump Suctions from the normal to an alternate source of water following receipt of a low-low level alarm, as a means of ensuring that the Steam Generators remain available as a secondary side heat sink for the reactor.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Emergency Feedwater Actuation, page B 3.3.2-24 (bottom paragraph), states that “[i]f the water level of EFW pit reached low-low level, operators are given an alarm in the main control room. Then the EFW pumps will be stopped or the water source will be switched to the Demineralized Water Storage Tank manually to keep the sufficient EFW if necessary.” The comparable statement in the WOG Bases, page B 3.3.2-29 (first paragraph), states that “[a] low level in the CST will automatically realign the pump suctions to the Essential Service Water (ESW) System (safety related).” Automatic transfer of the Auxiliary Feedwater Pump Suctions on Low Suction Pressure is an ESFAS Instrumentation Function specified in the WOG STS, Table 3.3.2-1. This function has been excluded from the APWR GTS.

Reliance on the manual transfer of Emergency Feedwater Pump water sources following receipt of a low-low level alarm, is a deviation from the WOG STS which automatically realigns Auxiliary Feedwater Pump Suctions to a safety related water source. Provide a technical justification for the deviation. Include any discussions necessary to ensure a clear understanding of ESF actuation signal requirements with regard to the Emergency Feedwater Actuation Function.

The technical justification is needed to ensure the accuracy and completeness of the APWR GTS, Section 3.3.2, ESFAS Instrumentation.

16-255

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to explain and correct inconsistencies between the APWR GTS and Bases regarding to the Main Steam Line Isolation Function.

Footnote (h), which is specified for each of the Main Steam Line Isolation Functions (4.a, 4.b, 4.c, 4.d(1), 4.d(2)) in the APWR GTS, Table 3.3.2-1, states “[e]xcept when all MSIVs are closed.” The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Sections 4.b (page B 3.3.2-18, last paragraph) and 4.d(1) (page B 3.3.20, first paragraph), both state “unless all MSIVs are closed and de-activated.” An apparent contradiction exists between footnote (h) and the two Bases statements in terms of whether or not the MSIVs are required to be de-activated in addition to being closed. The corresponding Bases statements for Main Steam Line Isolation Functions 4.c (page B 3.3.2-19, second paragraph) and 4.d(2) (page B 3.3.2-21, first paragraph), both state “unless all MSIVs are closed.” Determine if MSIV de-activation is required and make any necessary corrections to the APWR GTS and Bases.

The additional information is needed to ensure the accuracy, completeness, and consistency of the APWR GTS and Bases.

16-256

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to explain and correct potential discrepancies associated with Emergency Feedwater Isolation Functions 7.c and 7.d in the APWR GTS, Table 3.3.2-1, and Bases.

The APWR GTS, Table 3.3.2-1, does not specify footnote (a) for MODE 3 of Emergency Feedwater Isolation Functions 7.c and 7.d. Footnote (a) states “[a]bove the P-11 (Pressurizer Pressure) interlock.” A review of the APWR DCD, Section 7.3.1.5.10, and associated Functional Logic Diagram, Figure 7.2-2 (sheet 8 of 21), confirm that the P-11 Pressurizer Pressure ESAFAS Interlock is an integral part of the isolation logic for these two functions. In addition, the APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Sections 7.c and 7.d (page B 3.3.28), do not include any discussions or provide any information regarding the P-11 interlock. Determine whether or not footnote (a) is warranted and make any necessary corrections to the APWR GTS. Provide the changes needed to ensure that all relevant P-11 interlock information is clearly described in the Bases sections for Functions 7.c and 7.d.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and Bases.

16-257

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to explain and correct potential discrepancies associated with CVCS Isolation Function 8.c in the APWR GTS, Table 3.3.2-1, and Bases.

The APWR GTS, Table 3.3.2-1, does not specify footnote (a) for MODE 3 of CVCS Isolation Function 8.c. Footnote (a) states "[a]bove the P-11 (Pressurizer Pressure) interlock." A review of the APWR DCD, Section 7.3.1.5.11, and associated Functional Logic Diagram, Figure 7.2-2 (sheet 6 of 21), confirms that the P-11 Pressurizer Pressure ESAFAS Interlock is an integral part of the isolation logic for this function. In addition, the APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Section 8.c (page B 3.3.28), does not include any discussions or provide any information regarding the P-11 interlock. Determine whether or not footnote (a) is warranted and make any necessary corrections to the APWR GTS. Provide the changes needed to ensure that all relevant P-11 interlock information is clearly described in the Bases section for Function 8.c.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and Bases.

16-258

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to explain and correct potential discrepancies associated with Turbine Trip Function 9.c in the APWR GTS, Table 3.3.2-1, and Bases.

The APWR GTS, Table 3.3.2-1, Turbine Trip - High-High SG Water Level (P-14), implies that there is a P-14 interlock signal that is an integral part of the isolation logic associated with this function. The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Turbine Trip, page B 3.3.2-30 (second complete paragraph), states that "[t]he Turbine Trip Function is actuated by High-High Steam Generator Water Level (P-14)…" The Bases discussion provides no additional information regarding the interlock. It appears, based on a review of the APWR DCD, Section 7.3.1.11 and Figure 7.3-4, that the P-14 interlock does not exist. Validate the interlock logic associated with the Turbine Trip Function and make any necessary corrections to the APWR GTS and Bases. Include any discussions necessary to ensure a clear understanding of the trip logic.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and Bases.

16-259

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to explain and correct a potential discrepancy between the APWR GTS and DCD regarding the Reactor Coolant Pump (RCP) Trip Function.

The APWR GTS, Table 3.3.2-1, includes a function for Reactor Coolant Pump Trip. Although RCPs trip upon receipt of an ECCS actuation signal coincident with the P-4 interlock, as described in the APWR DCD, Section 7.3.1.5.1 (Emergency Core Cooling), the RCP Trip Function does not appear to be explicitly described in Chapter 7 of the APWR DCD as a dedicated ESFAS Instrumentation Function. The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Reactor Coolant Pump Trip, page B 3.3.2-31, states that "[t]MI Action Plan Item II requires automatic trip of reactor coolant pumps (RCPs) following a loss-of-coolant-accident (LOCA)." Determine if a stand-alone description of the RCP Trip Function should be included in the DCD, on the basis that the function is specified in Table 3.3.2-1 of the APWR GTS as a required ESFAS Instrumentation Function. Make any necessary changes to the DCD. Include any discussions necessary to ensure a clear understanding of ESFAS Instrumentation requirements relative to the RCP Trip Function.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and DCD.

16-260

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information necessary to validate the P-4 Reactor Trip ESFAS Interlock Allowable Value in the APWR GTS, Table 3.3.2-1.

The Allowable Value specified for the P-4 Interlock, Function 11.a in the APWR GTS, Table 3.3.2-1, does not appear to be referenced in the APWR DCD, either in ESFAS Setpoint Table 7.3-4 (page 7.3-26), or ESF Permissive, Bypass and Interlock Table 7.2-4 (page 7.2-24). Validate the P-4 Interlock Allowable Value and include this information in the appropriate references.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and DCD.

16-261

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to explain and correct a potential discrepancy identified in Section11.a of the APWR Bases.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, 11.a, Engineered Safety Feature Actuation System Interlocks, page B 3.3.2-32 (fourth bullet), states “[e]FW isolation with coincident High SG Water Level and Low Main Steam Line Pressure.” It appears that the Bases statement should read “[e]FW isolation with coincident High SG Water Level and No Low Main Steam Line Pressure.” A review of the APWR DCD, Section 7.3.1.5.10, and associated Functional Logic Diagram, Figure 7.2-2 (sheet 8 of 21), confirm that a “No Low Main Steam Line Pressure” condition is the actual requirement. In addition, the descriptions for Function 7.c in the APWR GTS, Table 3.3.2-1, and the APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, page B 3.3.2-28, both specify “No Low Main Steam Line Pressure.” Validate the Bases statement and make any necessary corrections.

The additional information is needed to ensure the accuracy and completeness of the APWR Bases.

16-262

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to explain and correct a potential discrepancy identified in Table 7.2-4 of the APWR DCD.

The APWR DCD, Table 7.2-4 (RT and ESF Permissives, Bypasses and Interlocks), page 7.2-24, lists the individual functions associated the P-11 Pressurizer Pressure Interlock, both above and below the Activation/De-activation Setpoint. It appears that the operating bypass associated with the “Main Steam Line Isolation - Low Main Steam Line Pressure Function” has been omitted from table. Validate the P-11 Functions listed in Table 7.2-4 and make any necessary corrections.

The additional information is needed to ensure the accuracy, completeness, and consistency of the APWR DCD.

16-263

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to explain and correct potential discrepancies associated with the Containment Purge Isolation Function in the APWR Bases.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Sections 12.b (page B 3.3.2-35, fourth paragraph) and 12.d (page B 3.3.36, first paragraph), both state that “all four Containment Purge Isolation trains are actuated when any two-out-of-four…" It appears that the references to "four trains" may be incorrect. These statements conflict with Bases statements in Sections 12 and 12.c (page B 3.3.2-35, first and fifth paragraphs), which state that Containment Purge Isolation components are distributed between only two trains. The APWR GTS, Table 3.3.2-1 specifies "Trains A and D" as the Required Channels for Actuation Logic and Actuation Outputs Function 12.c. In addition, The APWR DCD, Section 7.3.1.5.6 (page 7.3-10), states that "[f]or any single containment penetration, isolation can be accomplished by either two redundant trains. There are only two ESFAS trains for containment purge isolation, A and D." Validate the correct number of Containment Purge Isolation trains and make any necessary corrections. Include any discussions necessary to ensure a clear understanding Containment Purge Isolation train logic.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Section 12.c, Containment Purge Isolation - Actuation Logic and Actuation Outputs, page B 3.3.2-35 (fifth paragraph), states that "[c]ontainment Purge Isolation valves are distributed to Trains A and B." The reference to Train B appears to be incorrect. The APWR GTS, Table 3.3.2-1 specifies "Trains A and D" as the Required Channels for Actuation Logic and Actuation Outputs Function 12.c. In addition, The APWR DCD, Section 7.3.1.5.6 (page 7.3-10), states that "[f]or any single containment penetration, isolation can be accomplished by either two redundant trains. There are only two ESFAS trains for containment purge isolation, A and D." Validate the reference to Train B in the Bases statement and make any necessary corrections.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Section 12.c, Containment Purge Isolation - Actuation Logic and Actuation Outputs, page B 3.3.2-35 (fifth paragraph), states "[b]oth trains must be OPERABLE." The Bases statement does not provide any information regarding Mode applicability. This information is relevant, adds value, and needs to be included in the APWR Bases. Provide the necessary Mode information.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Section 12.e, Containment Purge Isolation - Containment Radiation, page B 3.3.2-36 (fourth paragraph), states "Containment Ventilation Isolation Instrumentation…" The use of the word "Ventilation" is inconsistent with the description provided throughout the APWR GTS, Bases, and DCD which states "Containment Purge Isolation Instrumentation." Determine the proper terminology and make any necessary changes.

The additional information is needed to ensure the accuracy, completeness, and consistency of the APWR Bases.

16-264

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to accurately describe ESFAS Function 12.e in the APWR GTS, Table 3.3.2-1, and Bases Section 12.e, consistent with the APWR DCD.

The APWR GTS, Table 3.3.2-1, and APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, page B 3.3.2-36 (subsection title line), both describe

Function 12.e as “Containment Radiation.” The APWR DCD, Section 7.3.1.5.6, and associated Functional Logic Diagram, Figure 7.2-2 (sheet 12 of 21), consistently refer to the isolation as “High Containment High Range Area Radiation.” Determine the appropriate ESFAS functional description and make any necessary corrections to ensure consistency with the APWR DCD.

The additional information is needed to ensure the accuracy, completeness, and consistency amongst the APWR GTS, Bases and DCD.

16-265

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to enhance the Bases discussion associated with Main Control Room Isolation Function 13.c.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Function 13.c, Main Control Room Radiation (page B 3.3.2-38), discussion associated with High Main Control Room (MCR) Outside Air Intake Radiation instrumentation is vague. The Bases discussion does not provide any information regarding the types of radiation monitors, the monitor interfaces to RPS trains A and D, or the RPS train interfaces to each of the four ESFAS trains. This information, which is succinctly described in the APWR DCD, Section 7.3.1.5.7, is relevant and needs to be included in the Bases. Enhance the Bases discussion of Section 13.c consistent with the APWR DCD.

The additional information is needed to ensure the accuracy and completeness of the APWR Bases.

16-266

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to explain and correct a potential discrepancy identified in Section M.1 of the APWR Bases.

The APWR Bases, ACTIONS, M.1, page B 3.3.2-47 (last paragraph, first sentence), states that “[i]f one Actuation Logic and Actuation Outputs train is inoperable, or one Main Control Room Radiation channel is inoperable in one or more Functions, 7 days are permitted to restore it to OPERABLE status.” The Manual Initiation Function (13.a) appears to have been omitted from the Bases statement. Condition M applies to each of the Main Control Room (MCR) Isolation Functions, including the Manual Initiation. It is unclear why there is no reference to “Manual Initiation train” in the Bases discussion. Validate the Bases statement and make any necessary corrections.

The additional information is needed to ensure the accuracy and completeness of the APWR Bases.

16-267

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to explain, clarify, and correct potential discrepancies associated with Condition N in the APWR GTS and Bases.

The APWR GTS, Condition N, Required Action N.1.2, states "[e]nter applicable Conditions and Required Actions for one CREFS train made inoperable by inoperable CREFS actuation instrumentation." The APWR Bases, ACTIONS, Condition N, page B 3.3.2-48 (first paragraph), states that "[c]ondition N applies to the failure of two MCR Isolation Actuation Logic and Actuation Output trains, two Main Control Room Radiation channels, or two Manual Initiation trains." It is unclear how Required Action N.1.2 can provide direction for the inoperability of only one CREF train, when entry into Condition N would seem to imply that there is a potential for two CREF trains to be inoperable as a direct result of the inoperability of two Main Control Room Isolation trains. Explain how inoperable Main Control Room Isolation train instrumentation impacts CREF train OPERABILITY. Validate Required Action N.1.2 and make any necessary changes.

The APWR GTS, Condition N, Required Action N.2, NOTE, states that "[t]his alternative is not available for failure of the Automatic Actuation Logic and Actuation Outputs." The APWR Bases, ACTIONS, Section N, page B 3.3.2-48 (second paragraph), states "[t]he Required Actions are modified by a Note that excludes this alternative for failure of the Actuation Logic and Actuation Outputs, since failure of this Function affects normal and emergency modes." The referenced Note is not included in the WOG STS, LCO 3.3.7, Condition B, Required Action B.2. It is unclear why the Note would apply to the failure of Function 13.b in the APWR GTS and not apply to failure of the comparable "Automatic Actuation Logic and Actuation Relays" Function in Table 3.3.7-1 of the WOG STS. Clarify the Note, explain the deviation from the WOG STS, and make any necessary changes. Include any discussions necessary to ensure a clear understanding of the Note's intent and ensure that the information is clearly stated in the Bases.

The APWR GTS, Condition N, Required Action N.2, NOTE, states "failure of the Automatic Actuation Logic and Actuation Outputs." The APWR Bases, ACTIONS, Section N, page B 3.3.2-48 (second paragraph), states "failure of the Actuation Logic and Actuation Outputs…" It appears that the qualifier "Automatic" should either be included in the Bases reference to "Actuation Logic and Actuation Outputs" or be removed from the Note in order to ensure accuracy and consistency between the two. Validate the Bases statement and make any necessary changes.

The APWR GTS, Condition N, Required Action N.2, Note placement and width are incorrect. Reformat the Note in accordance with the Tech Spec Writers Guide TSF-GG-05-01, Section 2.1.4.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and Bases.

16-268

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to explain and correct a potential discrepancy associated with the Block Turbine Bypass and Cooldown Valves Function.

The APWR DCD, Section 7.3.1.5.12, describes a “Block Turbine Bypass and Cooldown Valves” Function that is not included in the APWR GTS, Table 3.3.2-1, or the Bases. A description of the function’s Manual Override capability is presented in Section 7.3.1.6.4, and the Functional Logic is shown in Figure 7.2-2 (sheet 10 of 21). The function appears to provide Excessive Cooldown Protection. Section 7.3.1.5.12 of the DCD states that “[t]here are two ESFAS trains for block turbine bypass and cooldown valves, train A and train D.” It is unclear why the function is described in the DCD and not included in Table 3.3.2-1 of the APWR GTS. Determine if the Block Turbine Bypass and Cooldown Valves Function is required ESFAS instrumentation and make any necessary changes to the APWR GTS, Bases, and DCD.

The additional information is needed to ensure the accuracy, completeness, and consistency amongst the APWR GTS, Bases and DCD.

16-269

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to explain and correct potential discrepancies associated with Automatic Operating Bypasses in the APWR DCD.

The APWR DCD, Section 7.3.1.6.2, Automatic Operating Bypasses, page 7.3-15, top two bulleted items appear to be incorrect. The first bulleted description states that the “[h]igh Main Steam Line Pressure Negative Rate initiating signal for main steam line isolation is automatically bypassed when the P-11 interlock clears (when pressurizer pressure is below the setpoint). This operating bypass is automatically removed when the P-11 is present (when pressurizer pressure is above the setpoint.” A review of the APWR DCD, Section 7.3.1.5.2, and associated Functional Logic Diagram, Figure 7.2-2 (sheet 9 of 21), indicate that the High Main Steam Line Pressure Negative Rate initiating signal for Main Steam Line Isolation is “Manually Permitted” when the P-11 pressurizer pressure interlock is below the setpoint and automatically bypassed when the P-11 pressurizer pressure interlock is above the setpoint. The High Main Steam Line Pressure Negative Rate Trip is only active when the low Main Steam Line Pressure Trip is inactive. Validate the logic and make any necessary corrections to the APWR DCD.

The second bulleted description states that “[w]hen the P-4 interlock is present (RTB open) the Low Tavg initiating signal for main feedwater isolation (for closing all main feedwater valves) is automatically bypassed. This operating bypass is automatically removed when the P-4 interlock clears (RTB closed).” A review of the APWR DCD, Section 7.3.1.5.8.1, and associated Functional Logic Diagram, Figure 7.2-2 (sheet 10 of 21), indicate that when the P-4 interlock is present (RTB open), the operating bypass is automatically removed, and when the P-4 interlock clears (RTB closed) the Low Tavg initiating signal for main feedwater isolation (for closing all main feedwater valves) is automatically bypassed. Validate the logic and make any necessary corrections to the APWR DCD.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and Bases.

16-270

LCO 3.3.2, ESFAS Instrumentation

Provide a technical justification that explains how the CHANNEL OPERATIONAL TEST (COT) surveillance requirement specified for Engineered Safety Feature Actuation System (ESFAS) Instrumentation Functions in Table 3.3.2-1, ensures that those functions are adequately tested.

The APWR GTS, Table 3.3.2-1, specifies the performance of a CHANNEL OPERATIONAL TEST surveillance requirement in accordance with SR 3.3.2.3 for ESFAS Functions 1.c, 1.d, 1.e, 2.c, 4.c, 4.d(1), 4.d(2), 5A.a, 5B.c, 6.c, 7.c, 7.d, 8.c, 9.c, 11.b, 12.e, 13.c(1), 13.c(2), and 13.c(3). The Channel Operational Test as originally defined in NUREG -1431, has been revised under the APWR GTS to accommodate aspects of the fully digital MELTAC I&C platform design.

The APWR GTS Channel Operational Test for the Protection and Safety Monitoring System (PSMS), consists of a software memory integrity check. This is an adaptation of the NUREG-1431 definition, which is a verification of channel device operability based on the injection of a simulated or actual signal into the channel as close to the sensor as practicable, including the adjustment of setpoints required for operability. It is unclear how the performance of a software memory integrity check is equivalent to verifying the operability of all devices in the channel required for channel operability, and the adjustment of setpoints. Does a software memory integrity check satisfy the same or similar requirements for digital equipment that a Channel Operational Test is required to satisfy for analog equipment? Are the two functionally equivalent?

Provide a technical justification that explains how a software memory integrity check satisfies the requirements of a Channel Operational Test for each of the above referenced ESFAS Functions. Include any discussions necessary to ensure a clear understanding of Channel Operational Test criteria and how that criteria applies to the digital Protection and Safety Monitoring System.

The technical justification is needed to ensure that ESFAS Instrumentation Functions are being properly surveilled under the MELTEC digital I&C platform design, and that Channel Operational Test criteria can be applied to digital, as well as analog equipment.

16-271

LCO 3.3.2, ESFAS Instrumentation

Provide a technical justification that explains how the ACTUATION LOGIC TEST surveillance requirement specified for Engineered Safety Feature Actuation System (ESFAS) Instrumentation Functions in Table 3.3.2-1, ensures that those functions are adequately tested.

The APWR GTS, Table 3.3.2-1, specifies performance of an ACTUATION LOGIC TEST surveillance requirement in accordance with SR 3.3.2.2 for ESFAS Functions 1.b, 2.b, 3.a(2), 3.b(2), 4.b, 5B.b, 6.b, 7.b, 8.b, 9.a, 12.c, and 13.b. The Actuation Logic Test as originally defined in NUREG -1431, has been revised under the APWR GTS to accommodate aspects of the fully digital MELTAC I&C platform design.

The APWR GTS Actuation Logic Test for the Protection and Safety Monitoring System (PSMS), consists of a software memory integrity check. This is an adaptation of the NUREG-1431 definition, which is a verification of required output logic for a given combination of input signals in conjunction with each possible interlock logic state required for operability of a logic circuit, including at a minimum, a continuity check of output devices. It is unclear how the performance of a software memory integrity check is equivalent to a comprehensive test of the logic and a continuity check of output devices. Does a software memory integrity check satisfy the same or similar requirements for digital equipment that an Actuation Logic Test is required to satisfy for analog equipment? Are the two functionally equivalent?

Provide a technical justification that explains how a software memory integrity check satisfies the requirements of an Actuation Logic Test for each of the above referenced ESFAS Functions. Include any discussions necessary to ensure a clear understanding of Actuation Logic Test criteria and how that criteria applies to the digital Protection and Safety Monitoring System.

The technical justification is needed to ensure that ESFAS Instrumentation Functions are being properly surveilled under the MELTEC digital I&C platform design, and that Actuation Logic Test criteria can be applied to digital, as well as analog equipment.

16-272

LCO 3.3.2, ESFAS Instrumentation

Provide a technical justification that explains how the CHANNEL CALIBRATION surveillance requirements specified for Engineered Safety Feature Actuation System (ESFAS) Instrumentation Functions in Table 3.3.2-1, ensure that those functions are adequately tested.

The APWR GTS, Table 3.3.2-1, specifies performance of a CHANNEL CALIBRATION surveillance requirement in accordance with SR 3.3.2.7 for ESFAS Functions 1.c, 1.d, 1.e, 2.c, 4.c, 4.d(1), 4.d(2), 5A.a, 5B.c, 6.c, 6.e, 7.c, 7.d, 8.c, 9.c, 11.b, 13.e, 13.c(1), 13.c(2), and 13.c(3). The Channel Calibration as originally defined in NUREG -1431, has been revised under the APWR GTS to accommodate aspects of the fully digital MELTAC I&C platform design.

The APWR GTS extends the application of a Channel Calibration to binary measurements. Under this application, a Channel Calibration confirms the accuracy of the channel's state change. This is an adaptation of the NUREG-1431 definition, which consists of an adjustment, as necessary, of the channel output such that it responds within the necessary range and accuracy to known values of the parameter that the channel monitors. It is unclear how confirming the accuracy of a channel's state change meets the intent of the NUREG-1431 definition for a Channel Calibration. Are the two functionally equivalent? Can Channel Calibration criteria be applied to binary measurements?

Provide a technical justification that explains how confirming the accuracy of a channel's state change constitutes performance of a Channel Calibration. Include any discussions necessary to ensure a clear understanding of Channel Calibration criteria as it relates to binary measurements. Describe how analog and binary Channel Calibration surveillance requirements are integrated to ensure that each of the above referenced ESFAS Functions are adequately tested.

The technical justification is needed to ensure that ESFAS Instrumentation Functions are being properly surveilled under the MELTEC digital I&C platform design, and that Channel Calibration criteria can be applied to binary, as well as analog measurements.

16-273

LCO 3.3.2, ESFAS Instrumentation

Provide a technical justification that explains how the TRIP ACTUATING DEVICE OPERATIONAL TEST (TADOT) surveillance requirement specified for Engineered Safety Feature Actuation System (ESFAS) Instrumentation Functions in Table 3.3.2-1, ensures that those functions are adequately tested.

The APWR GTS, Table 3.3.2-1, specifies performance of a TRIP ACTUATING DEVICE OPERATIONAL TEST surveillance requirement in accordance with SR 3.3.2.4, SR 3.3.2.5, SR 3.3.2.6, and SR 3.3.2.9 for ESFAS Functions 1.a, 1.b, 2.a, 2.b, 3.a(1), 3.a(2), 3.b(2), 4.a, 4.b, 5B.a, 5B.b, 6.a, 6.b, 6.e, 6.f, 7.a, 7.b, 8.a, 8.b, 9.a, 11.a, 12.c, 13.a, and 13.b. The Trip Actuating Device Operational Test as originally defined in NUREG -1431, has been revised under the APWR GTS to accommodate aspects of the fully digital MELTAC I&C platform design.

The APWR GTS Trip Actuating Device Operational Test does not include provisions for adjustment of the trip actuating device so that it actuates at the required setpoint, and is therefore typically applicable only to binary devices that are not subject to drift. This is an adaptation of the NUREG-1431 definition which states that "[t]he TADOT shall include adjustment, as necessary, of the trip actuating device." It is unclear why the requirement to perform adjustments has been excluded from the TADOT. Has the intent of the surveillance requirement been compromised for certain functions due to the elimination of previously required adjustments? If, as stated in the APWR GTS definition, a TADOT is typically applicable only to binary devices that are not subject to drift, is there a potential for adjustable binary and non-binary trip actuating devices subject to drift, to have their requirements for adjustments overlooked due to being excluded from a surveillance requirement that previously ensured actuation at a required setpoint through periodic adjustment?

Provide a technical justification that explains how a TADOT without provisions for performing adjustments of trip actuating devices, ensures that each of the above referenced ESFAS Functions are adequately tested and that device operability is not compromised. Include any discussions necessary to ensure a clear understanding of Trip Actuating Device Operational Test criteria and how that criteria applies to ESFAS trip actuating devices.

The technical justification is needed to ensure that ESFAS Instrumentation Functions are being properly surveilled under the MELTEC digital I&C platform design, and that Trip Actuating Device Operational Test criteria is being properly applied.

16-274

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to explain and correct potential discrepancies associated with the BACKGROUND section of the APWR Bases.

The APWR Bases, BACKGROUND, page B 3.3.2-1 (bottom paragraph), states that "[t]he Allowable Value is considered a limiting value such that a channel is OPERABLE if the channel accuracy is found not to exceed the Allowable Value during CHANNEL CALIBRATION."

In addition, the APWR Bases, BACKGROUND, Allowable Values and ESFAS Setpoints, page B 3.3.2-3 (bottom paragraph), states that "[t]he ESFAS Trip Setpoint entered into the digital bistable is more conservative than that specified by the Analytical Limit to account for measurement errors detectable by the CHANNEL CALIBRATION. The Allowable Value serves as the Technical Specification OPERABILITY limit for the purpose of the CHANNEL CALIBRATION."

The APWR Bases statement references to CHANNEL CALIBRATION have replaced references to CHANNEL OPERATIONAL TEST (COT) in corresponding statements of the WOG Bases. The definition for CHANNEL OPERATIONAL TEST in the APWR GTS and WOG STS both state that "[t]he COT shall include adjustments, as necessary, of the required alarm, interlock, and trip setpoints required for channel OPERABILITY such that the setpoints are within the necessary range and accuracy." Neither definition for CHANNEL CALIBRATION in the APWR GTS or the WOG STS discusses setpoints in any way. Determine the correct surveillance reference and make any necessary corrections to the APWR Bases. Include any discussions necessary to ensure a clear understanding of the differences between CHANNEL CALIBRATIONS and CHANNEL OPERATIONAL TESTS with respect to setpoint specifics.

Also, it appears that the accuracy/intent of both APWR Bases statements may have been affected by the following changes made to the original statements in the WOG Bases:

- In the first Bases statement referenced above, “channel accuracy” replaced the word “setpoint” in the WOG Bases, page B 3.3.2-1 (bottom paragraph). A “setpoint” is a specific number that can be readily compared to an Allowable Value, whereas “channel accuracy” is a measure of closeness or indication of instrumentation performance. Comparisons are typically not drawn between Allowable Values and “channel accuracies.”

- In the second Bases statement, “Analytical Limit” replaced the reference to “Allowable Value” in the WOG Bases, page B 3.3.2-3 (third paragraph). An Analytical Limit is the limit of a process variable at which a safety action is initiated to ensure that a Safety Limit is not exceeded. Every setpoint calculated is set conservatively with respect to the Analytical Limit. The statement should convey that the ESFAS Trip Setpoint entered into the digital bistable is more conservative than the Allowable Value (the OPERABILITY limit) to ensure that OPERABILITY is not inadvertently challenged.

Validate the Bases statements and make any necessary changes.

The additional information is needed to ensure the accuracy, completeness, and consistency of the APWR Bases.

16-275

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to explain and correct a potential discrepancy identified in the APPLICABLE SAFETY ANALYSES, LCO and APPLICABILITY section of the APWR Bases.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, page B 3.3.2-5 (bottom paragraph), states that “[a] channel is OPERABLE provided the “as-found” accuracy value does not exceed its associated Allowable Value.” The comparable statement in the WOG Bases, page B 3.3.2-6 (first paragraph), states that “[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 …”

it appears that the accuracy/intent of the APWR Bases statement may have been affected by use of the phrase “as-found accuracy value” as opposed to “trip setpoint as-found value” in the WOG Bases. A “setpoint” is a specific number that can be readily compared to an Allowable Value, whereas an “accuracy value” is a measure of closeness or indication of instrumentation performance. Comparisons are typically not drawn between Allowable Values and “accuracy values”. Validate the Bases statement and make any necessary changes.

The additional information is needed to ensure the accuracy, completeness, and consistency of the APWR Bases.

16-276

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to explain and correct a potential discrepancy associated with Surveillance Requirement SR 3.3.2.3 in the APWR Bases.

The APWR Bases, SURVEILLANCE REQUIREMENTS, SR 3.3.2.3, page B 3.3.2-52 (next to last paragraph), states that “[t]he RPS is self-tested on an automatic basis from the digital side of all input modules to the digital side of all output modules” and that “[t]he COT is a check of the RPS software memory integrity to ensure there is no change to the internal RPS software that would impact its functional operation …” It appears that the references to “RPS” should actually be to “ESFAS”, similar to the Bases discussion for SR 3.3.2.2 on page B 3.3.2-52. Determine the correct reference and make any necessary changes.

The additional information is needed to ensure the accuracy, completeness, and consistency of the APWR Bases.

16-277

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to explain and correct a potential discrepancy associated with Function 6.f in the APWR GTS, Table 3.3.2-1.

The APWR GTS, Table 3.3.2-1, Surveillance Requirements, does not specify performance of a CHANNEL CALIBRATION for Function 6.f, Emergency Feedwater Actuation - Trip of all Main Feedwater Pumps. A CHANNEL CALIBRATION is however, specified for comparable Function 6.g in the WOG STS, Table 3.3.2-1. It is unclear why the same Surveillance Requirement would not be applicable to both functions. Determine whether or not the performance of a CHANNEL CALIBRATION is required for Function 6.f and make any necessary corrections. Include any discussions necessary to ensure a clear understanding of CHANNEL CALIBRATION requirements associated with ESFAS instrumentation.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS.

16-278

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to explain and correct a potential discrepancy associated with Function 12.e in the APWR GTS, Table 3.3.2-1.

The APWR GTS, Table 3.3.2-1, Surveillance Requirements, does not specify performance of an ACTUATION LOGIC TEST for Function 12.e, Containment Purge Isolation - Containment Radiation. An ACTUATION LOGIC TEST is however, specified for comparable Function 3 in the WOG STS, LCO 3.3.6, Table 3.3.6-1. It is unclear why the same Surveillance Requirement would not be applicable to both functions. Determine whether or not the performance of an ACTUATION LOGIC TEST is required for Function 12.e and make any necessary corrections. Include any discussions necessary to ensure a clear understanding of ACTUATION LOGIC TEST requirements associated with ESFAS instrumentation.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS.

16-279

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to explain and correct a potential discrepancy associated with Function 13.b in the APWR GTS, Table 3.3.2-1.

The APWR GTS, Table 3.3.2-1, Surveillance Requirements, does not specify performance of a “31-day STAGGERED TEST BASIS Frequency” ACTUATION LOGIC TEST for Function 13.b, Main Control Room Isolation - Actuation Logic and Actuation Outputs. Table 3.3.2-1 does however, specify a “92-day STAGGERED TEST BASIS Frequency” ACTUATION LOGIC TEST for Function 13.b. Both “31-day and 92-day STAGGERED TEST BASIS Frequency” ACTUATION LOGIC TESTS are specified for comparable Function 2 in the WOG STS, LCO 3.3.7, Table 3.3.7-1. It is unclear why the same Surveillance Requirements would not be applicable to both functions. Determine whether or not the performance of a “31-day STAGGERED TEST BASIS Frequency” ACTUATION LOGIC TEST is required for Function 13.b in addition to the 92-day Surveillance currently specified, and make any necessary corrections. Include any discussions necessary to ensure a clear understanding of ACTUATION LOGIC TEST requirement differences between Function 2 in the WOG STS, LCO 3.3.7, Table 3.3.7-1, and Function 13.b in the APWR GTS, Table 3.3.2-1.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS.

16-280

LCO 3.3.2, ESFAS Instrumentation

Provide the additional information and any changes necessary to clarify and explain why the word “Automatic” is not included in the “Actuation Logic and Actuation Outputs” functional description in the APWR GTS and Bases.

The description “Actuation Logic and Actuation Outputs” is used throughout the APWR GTS, Table 3.3.2-1, and Bases to describe functions comprised of “Actuation logic consisting of all circuitry housed within the actuation subsystems, including the actuation output devices responsible for actuating the ESF equipment.” The comparable functions specified in the WOG STS, Table 3.3.2-1, and Bases, are termed “Automatic Actuation Logic and Actuation Relays.” Explain why the qualifier “Automatic” is not used to describe the “Actuation Logic and Actuation Outputs” Functions specified in the APWR GTS and Bases. Include any discussions necessary to ensure a clear understanding of the differences between the APWR GTS and the WOG STS regarding use of the word “Automatic” in the above referenced functional descriptions.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and Bases.

16-281

LCO 3.3.3, PAM Instrumentation

Provide the additional information and any changes necessary to regarding the application of NOTE 1 in the ACTIONS Section of the APWR GTS and Bases.

The APWR GTS, ACTIONS, NOTE 1, states “[l]co 3.0.4 not applicable.” The APWR Bases, ACTIONS, page B 3.3.3-8 (next to last paragraph), states that “[t]his exception is acceptable due to the passive function of the instruments, the operator’s ability to respond to an accident using alternate instruments and methods, and low probability of an event requiring these instruments.” This Note is not included in the ACTIONS Section of the WOG STS. It is unclear why the requirements of LCO 3.0.4 regarding Mode change restrictions would not be the same for both the APWR GTS and the WOG STS. The APWR Bases discussion does not provide adequate justification for the exclusion of LCO 3.0.4. Determine whether or not the Note is valid, provide a justification, and make any necessary corrections.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and Bases.

16-282

LCO 3.3.3, PAM Instrumentation

Provide the additional information necessary to clarify and explain how CONDITION C is to be implemented with respect to PAM Functions 2, 3, 10 and 16 in the APWR GTS, Table 3.3.3-1.

The APWR GTS, LCO 3.3.3, Condition “C” states that with “One or more Functions with two required channels inoperable,” perform Required Action C.1 to “Restore one channel to OPERABLE status” within 7 days. The APWR GTS, Table 3.3.3-1, “Required Channels” column, only specifies “1 per loop” for Functions 2 and 3, and “1 per steam generator” for Functions 10 and 16. Comparable functions in the WOG STS, Table 3.3.3-1, specify either “2 per loop” or “2 per steam generator” in the “Required Channels” column. It is unclear how to implement Condition C (two required channels inoperable) when the “Required Channels” column for the referenced functions only specifies “1 per loop” or ”1 per steam generator.” Explain how to implement Condition C for Table 3.3.3-1 Functions whose “Required Channels” are less than two, and ensure that this information is included in the Bases discussion.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and Bases.

16-283

LCO 3.3.3, PAM Instrumentation

Provide the additional information and any changes necessary to explain and correct potential discrepancies identified in the LCO Section of the APWR Bases.

The APWR Bases, LCO, Emergency Feedwater Flow, page B 3.3.3-6 (last sentence), states that "[r]edundant monitoring capability is provided by two independent trains of instrumentation for each SG." The APWR GTS, Table 3.3.3-1, Function 16, Emergency Feedwater Flow, only
specifies "1 per SG" in the "Required Channels" column. There appears to be a contradiction between the APWR GTS and Bases regarding the required number of Operable channels for the Emergency Feedwater Flow Function. In addition, the Bases statement specifies "trains" of instrumentation as opposed to "channels" which are specified in Table 3.3.3-1. Resolve the apparent discrepancies and make any necessary corrections. Include any discussions necessary to ensure a clear understanding of the differences between "trains" and "channels" with respect to APWR PAM Instrumentation.

The additional information is needed to ensure the accuracy, completeness, and consistency of the APWR GTS and Bases.

16-284

LCO 3.3.3, PAM Instrumentation

Provide the analysis that established the complete list of required instrumentation for Post Accident Monitoring LCO 3.3.3.

The increased use of digital instrumentation systems in advanced nuclear power plant designs resulted in revision 4 to Regulatory Guide 1.97. Reg Guide 1.97 (Rev 4), which endorses IEEE Standard 497-2002 (IEEE Standard Criteria for Accident Monitoring Instrumentation for Nuclear Power Generating Stations), represents an ongoing evolution in the nuclear industry's thinking and approaches with regard to Accident Monitoring Systems for the Nation's nuclear power plants. Among the differences between Revision 3 (upon which NUREG-1431 Accident Monitoring Instrumentation selection criteria is based) and Revision 4 of Reg Guide 1.97, are the "variable type definitions and associated criteria." The WOG Bases, BACKGROUND, page B 3.3.3-1 (fourth paragraph), states that "[t]he instrument channels required to be OPERABLE by this LCO include two classes of parameters identified during unit specific implementation of Regulatory Guide 1.97 as Type A and Category I variables." The APWR Bases, BACKGROUND, page B 3.3.3-1 (fourth paragraph), states that "[t]he instrument channels required to be OPERABLE by this LCO include parameters based on IEEE 497-2002, which is endorsed by Regulatory Guide 1.97, identified as Type A, B and C variables."

Provide the analysis used to determine the complete list of Accident Monitoring variables and their associated types, in order to ensure that the instrumentation contained in the APWR GTS, Table 3.3.3-1, includes the entire population of instruments required to address the requirements of GDC 13, 19 and 64, the guidance included in IEEE 497-2002, and the selection criteria in Revision 4 of Reg Guide 1.97.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and Bases.

16-285

LCO 3.3.4, Remote Shutdown Console (RSC)

Provide the additional information and any changes necessary to explain and correct potential discrepancies identified in the APPLICABLE SAFETY ANALYSES section of the APWR Bases.

The APWR Bases, APPLICABLE SAFETY ANALYSES, page B 3.3.4-1 (third paragraph), includes a reference to "(Ref. 4)." The reference appears to be misplaced and is not understood. Validate the reference to "(Ref. 4)" and make any necessary corrections.

The APWR Bases, APPLICABLE SAFETY ANALYSES, page B 3.3.4-1 (fourth paragraph), states that "[t]he criteria governing the design and specific system requirements of the Remote Shutdown System are located in 10 CFR 50, Appendix A, GDC 10 (Ref. 1)." It appears that the Bases reference to "Remote Shutdown System" should actually be to "Remote Shutdown Console." LCO 3.3.4 is titled "Remote Shutdown Console." With the exception of the Bases statement, all other references in the APWR GTS, Bases, and DCD (Section 7.4, Systems Required for Safe Shutdown) are to "Remote Shutdown Console." Determine the correct reference and make any necessary changes.

The APWR Bases, APPLICABLE SAFETY ANALYSES, page B 3.3.4-1 (fifth paragraph), states that "[t]he RSC satisfies Criterion 4 of 10 CFR 50.36(d)(2)(ii) (Ref. 2)." 10 CFR 50.36, "Technical Specifications," has been amended by redesignating paragraph (d) as paragraph (c), in order to resolve administrative issues. Correct the 10 CFR 50.36 reference in the Bases statement.

The additional information is needed to ensure the accuracy and completeness of the APWR Bases.

16-286

LCO 3.3.5, LOP Class 1E GTG Start Instrumentation

Provide the additional information and any changes necessary to explain and correct a potential discrepancy associated with the BACKGROUND Section of the APWR Bases.

The APWR Bases, BACKGROUND, Allowable Values and LOP Class 1E GTG Start Instrumentation Setpoints, page B 3.3.5-1, appears to have excluded relevant information contained in the comparable WOG Bases section on page B 3.3.5-2 (first paragraph), regarding Trip Setpoint selection and basis. Determine if the information should be included in the APWR Bases and make any necessary corrections.

The additional information is needed to ensure the accuracy and completeness of the APWR Bases.

16-287

LCO 3.3.5, LOP Class 1E GTG Start Instrumentation

Provide the additional information and any changes necessary to explain and correct potential discrepancies identified in the APPLICABLE SAFETY ANALYSES section of the APWR Bases.

The APWR Bases, APPLICABLE SAFETY ANALYSES, page B 3.3.5-2 (second paragraph), states that unit protection is provided “in the event of any of the analyzed accidents discussed in Reference 2, in which a loss of offsite power is assumed.” Reference 2 on page B 3.3.5-7 is “MUAP-07004-P (Proprietary) and MUAP-07004-NP (Non-Proprietary), Safety I&C System Description and Design Process.” It appears that “Reference 2” may be incorrect on the basis that analyzed accidents are typically discussed in the FSAR, Chapter 15, Transient and Accident Analysis. Determine the correct reference and make any necessary changes.

The APWR Bases, APPLICABLE SAFETY ANALYSES, page B 3.3.5-2 (fourth paragraph), states that “[t]he LOP Class 1E GTG start instrumentation channels satisfy Criterion 3 of 10 CFR 50.36(d)(2)(ii) (Ref. 4).” 10 CFR 50.36, “Technical Specifications,” has been amended by redesignating paragraph (d) as paragraph (c), in order to resolve administrative issues. Correct the 10 CFR 50.36 reference in the Bases statement.

The APWR Bases, APPLICABLE SAFETY ANALYSES, page B 3.3.5-2 (first paragraph), contains the following editorial errors:

- The last part of the second sentence ending in “System (ESFAS)” appears to have carried over into the Bases Section title column. The sentence should read “[i]ts design basis is that of the ESF Actuation System (ESFAS).
- The second sentence is missing both a period and paragraph break after “(ESFAS).”

Correct the editorial discrepancies.

The additional information is needed to ensure the accuracy and completeness of the APWR Bases.

16-288

LCO 3.3.5, LOP Class 1E GTG Start Instrumentation

Provide the additional information and any changes necessary to explain and correct potential discrepancies associated with SURVEILLANCE REQUIREMENT SR 3.3.5.3 in the APWR GTS.

The APWR Bases, BACKGROUND, page B 3.3.5-1 (second paragraph), states that three undervoltage relays "are combined in a two-out-of-three logic to generate an LOP signal if the voltage is below 70 percent for a short time or below 90 percent for a long time." There are four LOP start signals, one for each 6.9 kV Class 1E bus. The APWR GTS, SURVEILLANCE REQUIREMENTS, SR 3.3.5.3, page 3.3.5-2, appears to have incorrectly specified Allowable Values for both the 70 percent (Loss of Voltage) and 90 percent (Degraded Voltage) LOP signal initiation values. In addition, the "Loss of Voltage Nominal Trip Setpoint" value of 4727 volts (the same value specified in Table 3.3.2-1, Function 6.e) is approximately 68.5 percent of 6.9kV, which is less than the Allowable Value of 4830 volts specified in SR 3.3.5.3. It appears that the Loss of Voltage Nominal Trip Setpoint value exceeds the Loss of Voltage Allowable Value specified in the surveillance requirement. Validate each of the Allowable Values, Nominal Trip Setpoints, and time delays specified in SR 3.3.5.3 and make any necessary corrections.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS.

16-289

LCO 3.3.5, LOP Class 1E GTG Start Instrumentation

Provide the additional information and any changes necessary to explain and correct a potential discrepancy associated with Condition B of the APWR GTS.

The APWR GTS, ACTIONS, Condition B, page 3.3.5-1, states "[o]ne or more Functions with two channels per required bus inoperable." The APWR Bases, ACTIONS, B.1, page B 3.3.5-4 (first paragraph), states that "[c]ondition B applies when more than one loss of voltage or more than one degraded voltage channel per required Class 1E 6.9 kV bus are inoperable." A potential conflict exists between Condition B and the Bases statement when three channels per bus are inoperable. Required Action B.1, which states "[r]estore all but one channel per bus to OPERABLE status," is applicable with two or three inoperable channels, whereas Condition B is not. It appears that Condition B should actually read "[o]ne or more Functions with two or more channels per required bus inoperable," similar to the comparable statement in Condition B of the WOG STS, page 3.3.5-1. Validate the Condition statement and make any necessary corrections.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS.

16-290

LCO 3.3.5, LOP Class 1E GTG Start Instrumentation

Provide a technical justification that explains how the TRIP ACTUATING DEVICE OPERATIONAL TEST (TADOT) surveillance requirement specified for the LOP Class 1E GTG Start Instrumentation, ensures that the undervoltage relays are adequately tested.

The APWR GTS, SURVEILLANCE REQUIREMENTS, specifies performance of a TRIP ACTUATING DEVICE OPERATIONAL TEST surveillance requirement in accordance with SR 3.3.5.2 for the LOP undervoltage relays. The Trip Actuating Device Operational Test as originally defined in NUREG -1431, has been revised under the APWR GTS to accommodate aspects of the fully digital MELTAC I&C platform design.

The APWR GTS Trip Actuating Device Operational Test does not include provisions for adjustment of the trip actuating device so that it actuates at the required setpoint. This is a change from the NUREG-1431 definition which states that "[t]he TADOT shall include adjustment, as necessary, of the trip actuating device." The TADOT specified in accordance with SR 3.3.5.2 for both the APWR GTS and WOG STS, has a 31-day Surveillance Frequency.

The WOG Bases, SURVEILLANCE REQUIREMENTS, SR 3.3.5.2, page B 3.3.5-6 (first paragraph), states that "[f]or these tests, the relay trip setpoints are verified and adjusted as necessary." The APWR Bases, SURVEILLANCE REQUIREMENTS, SR 3.3.5.2, page B 3.3.5-5 (third paragraph), states that "[f]or these tests, the undervoltage relay is confirmed to actuate for gross loss of voltage conditions. Undervoltage trip setpoints and time delays are verified during CHANNEL CALIBRATION, SR 3.3.5.3." APWR SR 3.3.5.3 has a 24-month Frequency. Under the WOG STS, undervoltage relay trip setpoints are checked and any necessary adjustments made every 31 days during performance of a TADOT. Under the APWR GTS, undervoltage relay trip setpoints are verified and any necessary adjustments made every 24 months during performance of a CHANNEL CALIBRATION. Has the surveillance requirement for verifying undervoltage relay trip setpoints and making the necessary adjustments every 31-days been compromised by extending the surveillance interval to 24 months?

Provide a technical justification that explains how a 24-month CHANNEL CALIBRATION that incorporates surveillance requirements previously specified under a 31-day TADOT, provides adequate assurance that the LOP undervoltage trip relays are being properly surveilled

The technical justification is needed to ensure that LOP Class 1E GTG Start Instrumentation is being adequately tested under the MELTEC digital I&C platform design.

16-291

LCO 3.3.6, Diverse Actuation System (DAS) Instrumentation

Provide the additional information and any changes necessary to explain and correct potential discrepancies identified in various sections of the APWR Diverse Actuation System (DAS) Instrumentation Bases.

The APWR Bases, BACKGROUND, pages B 3.3.6-4 (bottom paragraph), states that "[o]utput signals from each DAAC channel are combined in a two-out-of-two logic …" It appears that the reference to "DAAC channel" should actually be to "DAAC subsystem." The second paragraph on the same Bases page states that "[t]o prevent spurious actuation, two subsystems of DAAC, each performing the same functions, are provided in a two out of two configuration." The APWR DCD, Section 7.8.1.2, page 7.8-4 (fifth paragraph), states that "[t]he DAS actuation signals from both DAAC subsystems are configured at their destination using 2-out-of-2 voting to execute actuation of RT and ESF systems." Determine the correct reference and make any necessary changes.

The APWR Bases, BACKGROUND, pages B 3.3.6-4, B 3.3.6-5 and B 3.3.6-6 contain the following editorial and formatting errors:

- The word "devise" is misspelled once on page B 3.3.6-4 (bottom paragraph) and twice on page B 3.3.6-5 (first paragraph). The correct spelling should be "device". In addition, it appears that "device" should be plural in all three cases and that the Bases should read "Rod Drive Motor-Generator set trip devices."

- The word "BASES" incorrectly appears above the formatting line in the lower left-hand corner of pages B 3.3.6-4 and B 3.3.6-5, and is missing from its normal location above the formatting line in the upper left-hand corner of pages B 3.3.6-5 and B 3.3.6-6.

Correct the spelling and formatting errors. Determine if the word "device" should be plural in each of the Bases statements and make any necessary changes.

The APWR Bases, BACKGROUND, Rod Drive Motor-Generator Sets, page B 3.3.6-5 (second paragraph), states that "[t]he DAS interface to the Rod Drive Motor-Generator sets is via hardwired circuit. This interface may be tested, with no reactor trip, as described above." The reference to "above" is somewhat confusing in that the discussion associated with testing DAS instrumentation at power is actually provided in a different section of the Bases. Provide the necessary clarification regarding the location of the referenced information.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, page B 3.3.6-5 (sixth paragraph), states that "[t]he DAS satisfy Criterion 4 of 10 CFR 50.36(d)(2)(ii) (Ref. 5)." 10 CFR 50.36, "Technical Specifications," has been amended by redesignating paragraph (d) as paragraph (c), in order to resolve administrative issues. Correct the 10 CFR 50.36 reference in the Bases statement.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, AND APPLICABILITY, page B 3.3.6-5 (bottom paragraph), states that "[a] trip setpoint may be set more conservative than the Trip Setpoint as necessary in response to plant conditions." Comparing a "trip setpoint" to the "Trip Setpoint" makes the Bases statement somewhat ambiguous. Although it appears that "Trip Setpoint" should be replaced by "Nominal Trip Setpoint" as specified in Table 3.3.6-1, use of the term "Nominal Trip Setpoint" is questionable considering that "Trip Setpoint" is used consistently throughout Instrumentation Tables 3.3.1-1 and 3.3.2-1 (Note: The use of "Nominal Trip Setpoint" versus "Trip Setpoint" in Table 3.3.6-1 is being evaluated under a separate RAI). Provide the changes necessary to clarify the intent of the Bases statement.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, page B 3.3.6-6 (first paragraph), states that "[t]he DAS Reactor Trip Function is required to be OPERABLE in MODES 1, 2 and 3 with the pressurizer pressure > P-11." The APWR GTS, Table 3.3.6-1, specifies that all Functions included in the Table are required to be OPERABLE in MODES 1, 2 and 3 with the pressurizer pressure > P-11. Validate the Bases statement and make any necessary changes.

The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, Functions Low Pressurizer (page B 3.3.6-6, fourth paragraph), High Pressurizer Pressure (page B 3.3.6-6, last paragraph), and Low Steam Generator Water Level (page B 3.3.6-7, first paragraph), do not include a discussion associated with the P-4 interlock. These functions are automatically blocked when status signals are received indicating that the minimum combination of Reactor Trip Breakers have actuated for the Reactor Trip Function. A review of the APWR DCD, Functional Logic Diagram, Figure 7.2-2 (sheet 14 of 21), confirms the P-4 Interlock logic. This information is relevant and needs to be included in the Bases.

The APWR Bases, SURVEILLANCE REQUIREMENTS, SR 3.3.6.1, page B 3.3.6-9, (bottom paragraph), states that "[t]he Frequency of 31 days is justified because channel failure is rare." There is no supporting statement or discussion regarding the frequency of channel failure rates that provides a basis for the 31-day frequency. Provide the additional information necessary to justify the specified surveillance Frequency.

The additional information is needed to ensure the accuracy and completeness of the APWR Bases.

16-292

LCO 3.3.6, Diverse Actuation System (DAS) Instrumentation

Provide a technical justification for specifying Allowable Values in terms of "Channel Uncertainty Allowances" and validate the "Uncertainty Allowance Numbers." Provide the additional information and any changes necessary to explain, resolve, and correct any potential discrepancies or inconsistencies associated with "Channel Uncertainty Allowances" and Allowable Value/Trip Setpoint units in the APWR GTS, Table 3.3.6-1.

The APWR GTS, Table 3.3.6-1, specifies Allowable Values in terms of "Channel Uncertainty Allowances" instead of specific values with "inequality" and "equal to" criteria. In addition, the Allowable Value units are expressed as "percent of span" for Functions 1.c, 1.d, 1.e, and the Trip Setpoint units are expressed as "percent of span" for Function 1.e, in lieu of units that are function specific. These are deviations from NUREG-1431. Technically justify the use of "Channel Uncertainty Allowances," validate the Allowable Values, and determine the appropriate units for the Trip Setpoint and

Allowable Values referenced above. Make any necessary corrections to the APWR GTS, Table 3.3.6-1. Include any discussions necessary to ensure a clear understanding of the differences between the APWR GTS, Table 3.3.6-1, and the WOG STS, Tables 3.3.1-1 and 3.3.2-1, regarding Allowable Value presentation.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS.

16-293

LCO 3.3.6, Diverse Actuation System (DAS) Instrumentation

Provide the additional information and any changes necessary to explain and correct a potential discrepancy associated with Function 6.e in the APWR GTS and Bases.

The APWR GTS, Table 3.3.6-1, specifies Function 6.a as "Pressurizer Safety Depressurization Valves - Manual Control." The APWR Bases, APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY, page B 3.3.6-8 (third paragraph), refers to Function 6.a as "Pressurizer Safety Depressurization Valves - Manual Initiation." Determine the correct Functional description and make any necessary changes to the APWR GTS and Bases. Include any discussions necessary to ensure a clear understanding of the differences between "Manual Control" and "Manual Initiation."

The additional information is needed to ensure the accuracy, completeness, and consistency of the APWR GTS and Bases.

16-294

LCO 3.3.6, Diverse Actuation System (DAS) Instrumentation

Provide the additional information and any changes necessary to explain and correct a potential discrepancy associated with the APWR GTS, Table 3.3.6-1.

The APWR GTS, Table 3.3.6-1, specifies "Nominal Trip Setpoint" as opposed to "Trip Setpoint" for the last column of the Table. Although this is consistent with the WOG STS, Tables 3.3.1-1 and 3.3.2-1, it is inconsistent with the APWR GTS, Tables 3.3.1-1 and 3.3.2-1, which both specify "Trip Setpoint" for the final column. Determine the correct reference and make any necessary changes to ensure consistency amongst Tables 3.3.1-1, 3.3.2-1, and 3.3.6.1 of the APWR GTS.

The additional information is needed to ensure the accuracy, completeness, and consistency of the APWR GTS.

16-295

LCO 3.3.6, Diverse Actuation System (DAS) Instrumentation

Provide the additional information and any changes necessary to explain and correct a potential discrepancy associated with Condition A Completion Times in the APWR GTS.

The APWR GTS, ACTION, Condition A, Completion Time, page 3.3.6-1, states "[w]ithin the following 6 hours" for Required Action A.2.1, and "[w]ithin the following 12 hours" for Required Action A.2.2. It is unclear why the 6 hour and 12 hour Completion Times are preceded by the verbiage "[w]ithin the following." This approach is a deviation from the WOG STS and does not appear anywhere else in the APWR GTS. Determine if use of the phrase "[w]ithin the following" is warranted for the Completion Times specified and make any necessary corrections.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS.

16-296

LCO 3.3.6, Diverse Actuation System (DAS) Instrumentation

Provide the additional information and any changes necessary to explain and correct a potential discrepancy associated with DAS Instrumentation Interlock P-11 in the APWR GTS, Table 3.3.6-1.

The APWR GTS, Table 3.3.6-1, does not include a dedicated Function for DAS Interlock P-11, similar to the Reactor Trip System Interlocks (Function 15) in Table 3.3.1-1, and the ESFAS Interlocks (Function 11) in Table 3.3.2-1. All Functions specified in Table 3.3.6-1 are required to be OPERABLE in MODES 1, 2 and 3 with pressurizer pressure > P-11. It appears that Table 3.3.6-1 should include a Function for the P-11 Interlock on the basis that applicable Interlock Functions are specified in Tables 3.3.1-1 and 3.3.2-1. Determine if the P-11 Interlock should be included in Table 3.3.6-1 and make any necessary changes to the APWR GTS and Bases.

The additional information is needed to ensure the accuracy and completeness of the APWR GTS and Bases.

16-297

3.3 Instrumentation, General Comment

Provide the additional information and changes necessary to enhance the APWR Bases, REFERENCES, for INSTRUMENTATION Sections B 3.3.1, B 3.3.2, B 3.3.3, B 3.3.4, B 3.3.5, B 3.3.6. Acceptable guidance on the inclusion of references can be found in TSTF-GG-05-01, "Writer's Guide for Plant-Specific Improved Technical Specifications," Section 4.2.8.

In the APWR Bases, B 3.3.1, REFERENCES, page B 3.3.1-51, insert "FSAR," before "Chapter 7" for Reference 2, and replace "Chapter 7" by "Section (7.x.y)" to identify the specific location of the item referred to in the FSAR.

In the APWR Bases, B 3.3.1, REFERENCES, page B 3.3.1-51, insert "FSAR," before "Chapter 15" for Reference 3, and replace "Chapter 15" by "Section (15.x.y)" to identify the specific location of the item referred to in the FSAR.

In the APWR Bases, B 3.3.1, REFERENCES, page B 3.3.1-51, insert "FSAR," before "Chapter 6" for Reference 9, and replace "Chapter 6" by "Section (6.x.y)" to identify the specific location of the item referred to in the FSAR.

In the APWR Bases, B 3.3.2, REFERENCES, page B 3.3.2-57, insert "FSAR," before "Chapter 7" for Reference 2, and replace "Chapter 7" by "Section (7.x.y)" to identify the specific location of the item referred to in the FSAR.

In the APWR Bases, B 3.3.2, REFERENCES, page B 3.3.2-57, insert "FSAR," before "Chapter 15" for Reference 3, and replace "Chapter 15" by "Section (15.x.y)" to identify the specific location of the item referred to in the FSAR.

In the APWR Bases, B 3.3.2, REFERENCES, page B 3.3.2-57, insert "FSAR," before "Chapter 8" for Reference 8, and replace "Chapter 8" by "Section (8.x.y)" to identify the specific location of the item referred to in the FSAR.

In the APWR Bases, B 3.3.2, REFERENCES, page B 3.3.2-57, insert "FSAR," before "Chapter 6" for Reference 10, and replace "Chapter 6" by "Section (6.x.y)" to identify the specific location of the item referred to in the FSAR.

In the APWR Bases, B 3.3.3, REFERENCES, page B 3.3.3-12, insert "FSAR," before "Chapter 7" for Reference 4, and replace "Chapter 7" by "Section (7.x.y)" to identify the specific location of the item referred to in the FSAR.

In the APWR Bases, B 3.3.4, REFERENCES, page B 3.3.4-4, insert "FSAR," before "Chapter 7" for Reference 4, and replace "Chapter 7" by "Section (7.x.y)" to identify the specific location of the item referred to in the FSAR.

In the APWR Bases, B 3.3.5, REFERENCES, page B 3.3.5-7, insert "FSAR," before "Chapter 8" for Reference 1, and replace "Chapter 8" by "Section (8.x.y)" to identify the specific location of the item referred to in the FSAR.

In the APWR Bases, B 3.3.6, REFERENCES, page B 3.3.6-12, insert "FSAR," before "Chapter 7" for Reference 3, and replace "Chapter 7" by "Section (7.x.y)" to identify the specific location of the item referred to in the FSAR.

The additional information is needed to ensure the accuracy and completeness of the APWR Bases.