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10 CFR 50.90

W3F1-2017-0067

December 6, 2017

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Subject: License Amendment Request to Remove Technical Specification 3/4.3.2 Table 4.3-2 Note 3 Exemption for Testing Relays K114, K305, and K313
Waterford Steam Electric Station, Unit 3 (Waterford 3)
Docket No. 50-382
License No. NPF-38

References:
1. Public Meeting with Entergy Operations, Inc. Regarding a Planned License Amendment Request to Revise Technical Specification 3.3.2, "Engineered Safety Features Actuation System Instrumentation," for Waterford Steam Electric Station, Unit 3 [ADAMS Accession Number ML17318A139].

2. Waterford Unit 3 - Licensee Presentation Slides for November 16, 2017, Category 1 Public Meeting Regarding Engineered Safety Features Actuation System [ADAMS Accession Number ML17318A123].

Dear Sir or Madam:

On November 16, 2017, a Category 1 public meeting was held between the U.S. Nuclear Regulatory Commission (NRC) staff and representatives of Entergy Operations, Inc. (Entergy). The purpose of the meeting was to discuss Entergy's license amendment request (LAR) regarding changes to Technical Specification 3/4.3.2 Table 4.3-2 (Engineered Safety Features Actuation System Instrumentation Surveillance Requirements) Note 3. Reference 1 provided the meeting announcement and Reference 2 provided the meeting presentation information.

As discussed in the public meeting and pursuant to 10 CFR 50.90, Entergy hereby requests an amendment to revise Technical Specification 3/4.3.2 Table 4.3-2 (Engineered Safety Features Actuation System Instrumentation Surveillance Requirements) Note 3 to remove the exemption for testing relays K114, K305, and K313 at power for Waterford Steam Electric Station Unit 3 (Waterford 3). This change is needed to support the Engineered Safety Features Actuation System (ESFAS) single point vulnerability trip hardening modification which will reduce the likelihood of an inadvertent component actuation caused by a single failure.

The proposed change has been evaluated in accordance with 10 CFR 50.91(a)(1) using the criteria in 10 CFR 50.92(c); it was determined that the changes involve no significant hazards consideration. The bases for these determinations are included in Attachment 1.

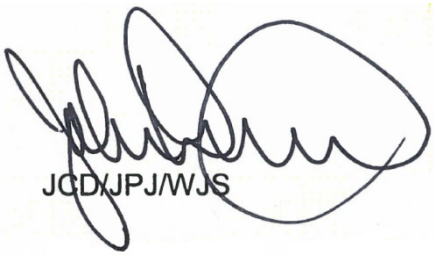
This letter contains no new commitments.

Entergy requests approval of the proposed license amendment by December 5, 2018 to support implementation of the ESFAS single point vulnerability trip hardening modification.

If you have any questions or require additional information, please contact John Jarrell, Regulatory Assurance Manager, at 504-739-6685.

I declare under penalty of perjury that the foregoing is true and correct. Executed on December 6, 2017.

Sincerely,




Attachments:
1. Analysis of Proposed Technical Specification Change
2. Revised (Markup) Technical Specification Page
3. Revised (Clean) Technical Specification Page
4. Cross Reference of Current to Historical Equipment Descriptions and Designations Related to ESFAS SPV Trip Hardening Modification

cc: Mr. Kriss Kennedy, Regional Administrator
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**Attachment 1**

**to**

**W3F1-2017-0067**

**Waterford 3 Steam Electric Station**

**Analysis of Proposed Technical Specification Change**

**(20 Pages)**

**Waterford 3 Steam Electric Station**
**Analysis of Proposed Technical Specification Change**

## 1.0 DESCRIPTION

On November 16, 2017, a Category 1 public meeting was held between the U.S. Nuclear Regulatory Commission (NRC) staff and representatives of Entergy Operations, Inc. (Entergy). The purpose of the meeting was to discuss Entergy's license amendment request (LAR) regarding changes to Technical Specification 3/4.3.2 Table 4.3-2 (Engineered Safety Features Actuation System Instrumentation Surveillance Requirements) Note 3. Reference 7 provided the meeting announcement and Reference 8 provided the meeting presentation information.

As discussed in the public meeting and pursuant to 10 CFR 50.90, Entergy hereby requests an amendment to revise Technical Specification 3/4.3.2 Table 4.3-2 (Engineered Safety Features Actuation System Instrumentation Surveillance Requirements) Note 3 to remove the exemption for testing relays K114, K305, and K313 at power for Waterford Steam Electric Station Unit 3 (Waterford 3). This change is needed to support the Engineered Safety Features Actuation System (ESFAS) single point vulnerability trip hardening modification which will reduce the likelihood of an inadvertent component actuation caused by a single failure.

The hardware changes associated with the ESFAS single point vulnerability trip hardening modification will be implemented in accordance with 10 CFR 50.59. The 50.59 evaluation is dependent upon NRC approval of the Technical Specification 3/4.3.2 Table 4.3-2 Note 3 change because after the modification, relays K114, K305, and K313 will be capable of being tested at power. This amendment request includes information on the ESFAS single point vulnerability trip hardening modification to aid the NRC in evaluating the acceptability of the Technical Specification change.

For this submittal, subgroup relays for Train A (K114A, K305A, K313A) and Train B (K114B, K305B, and K313B) are referred to collectively as K114, K305, and K313 for simplicity. Where used, the simplified designator refers to both trains (e.g. K114 = K114A and K114B).

Entergy intends for all attachments included in this submittal to be used by the NRC for their review.

## 2.0 PROPOSED CHANGE

Technical Specification 3/4.3.2 Table 4.3-2 Note 3 will be changed as follows:

- ESFAS relays K114, K305, and K313 will be removed.

Attachment 2 contains the marked-up Technical Specification page for the proposed change. Attachment 3 contains the clean (revised) Technical Specification page for the proposed change.

Once the ESFAS single point vulnerability modification is implemented, the ESFAS relays K114, K305, and K313 (and the added Main Steam Isolation Signal (MSIS) and Containment Spray Actuation Signal (CSAS) relays) will be tested online so the exemption from testing at power will no longer be needed. The ESFAS relays K114, K305, and K313 (and the added MSIS and CSAS relays) will be controlled via the Surveillance Frequency Control Program. The Waterford 3 Surveillance Frequency Control Program was approved by the NRC via License Amendment 249 [Reference 3]. Specifically, with the removal of the exemption, the MSIS subgroup relays will be covered by Technical Specification Table 4.3-2 Item 4.d and the CSAS subgroup relays will be covered by Technical Specification Table 4.3-2 Item 2.c. The ESFAS relays K114, K305, and K313 (and the added MSIS and CSAS relays) will be initially designated such that each train or logic channel shall be tested at least every 62 days on a staggered test basis under the Surveillance Frequency Control Program.

Attachment 4 contains a cross reference between historical and current equipment descriptions and designations for the equipment related to the ESFAS single point vulnerability trip hardening modification.

## 3.0 BACKGROUND

3.1 Engineered Safety Feature Actuation System Single Point Vulnerability Trip Hardening

The ESFAS is designed to provide initiating signals for components which require automatic actuation following a design basis accident. The safety related function of the ESFAS consists of electrical and mechanical devices and circuitry generating those signals to automatically actuate the appropriate Engineered Safety Features (ESF) systems to mitigate the effects of certain accidents. The actuation systems consist of the sensors, logic, and actuation circuits that monitor selected plant parameters and provide an actuation signal to each individual actuated component in the ESF system if these plant parameters reach preselected setpoints [Reference 2 Section 7.3].

ESFAS actuation subgroup relays associated with Main Steam Isolation Valves (MSIVs) and Main Feedwater Isolation Valves (MFIVs) (relays K305, K313) and Component Cooling Water (CCW) isolation valves (relay K114) were identified as single point vulnerabilities because a single failure of one of these relays could cause an ESFAS actuation with undesirable consequences on the plant. ESFAS actuation subgroup relays K305 and K313 are actuated on the receipt of a MSIS and ESFAS actuation subgroup relay K114 is actuated on receipt of a CSAS. The actuation of these relays would have undesirable consequences on the plant. Following this change, any single failure of the affected actuation subgroup relays will neither cause spurious ESFAS actuation nor prevent a proper ESFAS actuation.

The Main Steam Supply System is designed to convey steam generated in the two Steam Generators (SGs), through the containment vessel in two separate lines, to the high pressure turbine and to other auxiliary equipment for power generation [Reference 2 Section 10.3.1]. Main steam isolation is achieved by actuating the MSIVs. The MSIS provides both main steam isolation and isolation of the main feedwater supply [Reference 2 Section 7.3.1.1.5]. The Condensate and Feedwater Systems are isolated from the SGs by closing the hydraulic/pneumatic operated MFIVs upon receipt of a MSIS. The MFIV valve configuration is similar to that of the MSIV [Reference 2 Section 10.4.7.2].

The Containment Spray System (CSS) is designed to operate only during accident conditions to remove heat from the containment atmosphere. Containment spray is automatically actuated by a CSAS from the ESFAS [Updated Final Safety Analysis Report (UFSAR) Sections 7.3.1.1.3]. The CCW penetrations servicing the Reactor Coolant Pumps (RCP) and Control Element Drive Mechanism coolers are automatically closed on a CSAS [Reference 2 Section 6.2.4.1.1].

The proposed activity installs permissive relays to create a parallel 2 out of 2 logic scheme. A key component in the design is utilizing both trip legs of ESFAS. As shown on UFSAR figures 7.2-17 and 7.3-5, there are two separate “trip legs” within the Auxiliary Relay Cabinets (ARC). The left half of the figures consists of components physically mounted in ARC bays 1, 2, 7, and 8. The right half is a separate trip leg, consisting of components mounted in bays 5, 6, 3, and 4. Additional immunity from inadvertent actuation will be provided by combining the existing actuation relay and permissive relays from different actuation groups (trip legs). The negative return to the ESFAS ARC power supplies is “split” on the bottom, such that loss of a power supply pair, opening of a power supply breaker, or shorting across a subgroup relay on one trip leg will actuate the components on that leg, but will not impact the other leg as shown in UFSAR figures 7.2-17 and 7.3-5. This was done to provide some immunity to component failures such

that a complete train actuation will not occur unless both trip legs are de-energized. In cases where two components are required to effect an actuation function, such as starting of a High Pressure Safety Injection (HPSI) pump and opening of the cold leg HPSI header isolation valves on a SIAS, the intent is to assign the pump to one trip leg and the valves to the other, so that relay or associated component failures in a single trip leg will not cause a full ESFAS function actuation. The subgroup relays (K305, K313, and K114) identified as single point vulnerable were not configured in this manner. De-energization of a single subgroup relay would actuate all of the associated components, and the configuration of these components is such that the full effect of their actuation will be manifested without the need to actuate any components associated with another relay. This makes the associated components (e.g. MSIVs) susceptible to actuation upon a single failure.

The proposed change incorporates permissive relays K105, K205, and K404 for MSIS components actuated by relays K305 and K313, and incorporates permissive relays K208, K405 and K406 for CSAS components actuated by relay K114. This change provides similar immunity to inadvertent actuation as that already provided to other ESFAS components by virtue of the “valve group” and “pump group” ESFAS design feature. By using 4 relays, 2 from each group, an OR feature (“parallel” logic) for parallel 2 out of 2 logic is created thereby eliminating the possibility that a single relay failure can prevent ESF actuation when necessary.

The following table lists the subgroup relays that have been selected for trip hardening along with the components that are actuated when the associated relay is deenergized:

Subgroup Actuation Relays and Affected Components

| Actuation Relay | Subgroup | ESF Component | ESF Description |
|---|---|---|---|
| K305A | MSIS<br>MSIS<br>MSIS<br>MSIS | MS-124A<br>FW-184A<br>FW -173A<br>FW-166A | Main Steam Isolation Valve 1<br>SG1 Main Feedwater Isolation Valve<br>SG1 Main Feedwater Regulating Valve<br>SG1 Startup Feedwater Regulating Valve |
| K313A | MSIS<br>MSIS<br>MSIS<br>MSIS | MS-124B<br>FW-184B<br>FW -173B<br>FW-166B | Main Steam Isolation Valve 2<br>SG2 Main Feedwater Isolation Valve<br>SG2 Main Feedwater Regulating Valve<br>SG2 Startup Feedwater Regulating Valve |
| K114A | CSAS | CC-710 | CCW Return Header Inside Containment Isolation Valve |
| K305B | MSIS<br>MSIS<br>MSIS<br>MSIS | MS-124A<br>FW-184A<br>FW -173A<br>FW-166A | Main Steam Isolation Valve 1<br>SG1 Main Feedwater Isolation Valve<br>SG1 Main Feedwater Regulating Valve<br>SG1 Startup Feedwater Regulating Valve |
| K313B | MSIS<br>MSIS<br>MSIS<br>MSIS | MS-124B<br>FW-184B<br>FW -173B<br>FW-166B | Main Steam Isolation Valve 2<br>SG2 Main Feedwater Isolation Valve<br>SG2 Main Feedwater Regulating Valve<br>SG2 Startup Feedwater Regulating Valve |
| K114B | CSAS<br>CSAS | CC-713<br>CC-641 | CCW Return Header Outside Containment Isolation Valve<br>CCW to Containment Outside Containment Isolation Valve |

With the exception of the trip hardening of the cited relays to improve reliability, the ESFAS functionality remains identical to that described in the UFSAR. Since all hardware required for safety is located in the Train A and Train B ARCs, there is no change to the qualification envelope or environment. All of the devices being used are qualified for their intended purpose. From an actuation logic perspective, the permissive relay coil is connected in parallel with the existing primary relay coil, therefore, there is no net change to response time from either the MSIS function or CSAS functions as defined in Technical Requirements Manual Table 3.3-5. The proposed design remains in compliance with the General Design Criteria (GDC), Institute of Electrical and Electronics Engineers (IEEE) Standard 279-1971, "Criteria for Protection Systems for Nuclear Power Generating Stations," IEEE Standard 338-1971, "Criteria for the Periodic Surveillance Testing of Nuclear Power Generating Station Safety Systems," and Regulatory Guide (RG) 1.22, "Periodic Testing of Protection System Actuation Functions" [Reference 9] as described in UFSAR 7.3.2.

3.2 Technical Specification 3/4.3.2 Table 4.3-2 Note 3 History

The existing Technical Specification 3/4.3.2 Table 4.3-2 Note 3 was included in the Waterford 3 Technical Specification as originally amended. It was included as the result of a review performed following an NRC request [Reference 4]. This requested that Waterford 3 review its ESFAS testing commitments against the provisions of IEEE 338-1971 and RG 1.22. Specifically, it was asked that Waterford 3 provide a list of any ESFAS actuation devices, and actuated equipment associated with each, that cannot be tested during plant operation.

In letter W3P83-2273 [Reference 5], Waterford 3 responded to the NRC's request, stating that the system complies with GDC 21, "Protection system reliability and testability," in that the protection system as defined by IEEE 279-1971 and RG 1.22 is designed to permit testing (up to the input to the actuation devices) with the reactor in operation. Additionally, it was explained that a few subgroup relays (actuation devices per RG 1.22) however, could not be tested without adverse consequences for plant safety and/or operability. The actuated equipment listed in the response could not be operated during reactor operation without adverse and unwarranted impact on plant safety and/or operability; however, the equipment could be tested when the reactor is shut down. Additionally, letter W3P84-1328 [Reference 6] documented a meeting between Waterford 3 and the NRC's Instrumentation and Controls Branch (ICSB) to discuss ESFAS subgroup relay testing. The letter states that the meeting resulted in the ICSB's concurrence of Waterford 3's ESFAS subgroup relay test program and updated original letter W3P83-2273 to include a current listing of subgroup relays that are not tested at power but are tested during applicable cold shutdown periods.

Note the following:

1. K114 was listed in letter W3P83-2273 as "not used" but was included in the update letter W3P84-1328.

2. Additional relays are listed in Technical Specification 3/4.3.2 Table 4.3-2 Note 3 and in letter W3P83-2273; however, these relays are not associated with the ESFAS SPV Trip Hardening Modification and therefore are not included in this discussion.

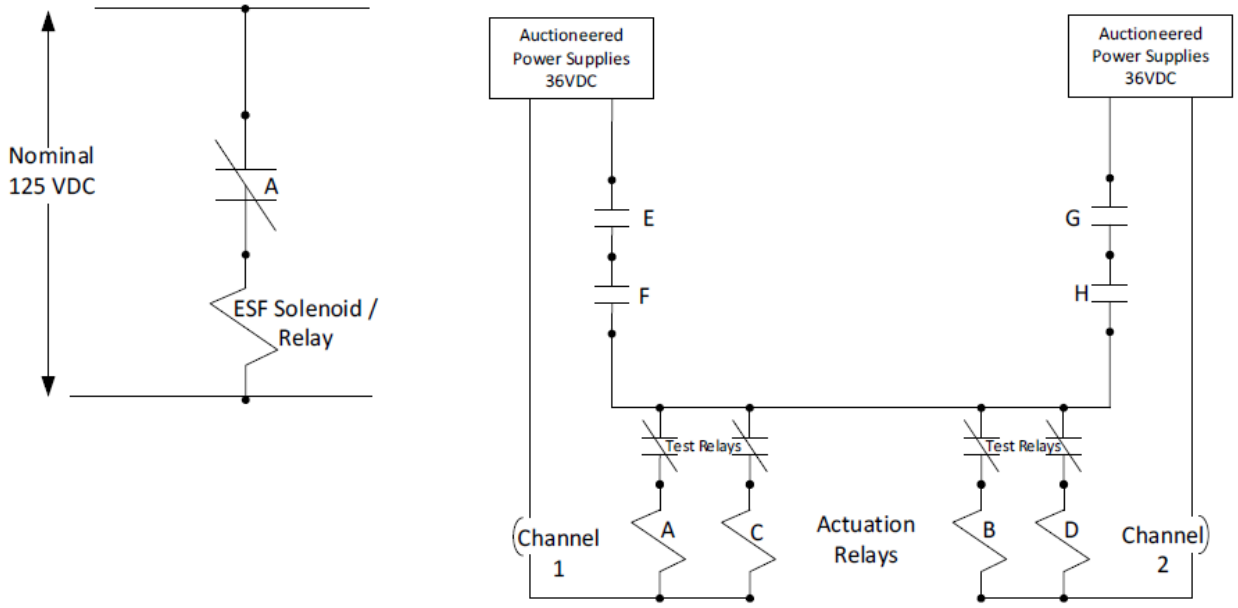
3. The descriptions and designations of the valves affected as stated in letters W3P83-2273 and W3P84-1328 differ from that currently in use. A cross reference is provided in Attachment 4.

Relays K305, K313, and K114 were subsequently listed in Technical Specification 3/4.3.2 Table 4.3-2 Note 3 (as originally amended) as “exempt from testing during power operation but shall be tested at least once per 18 months and during each COLD SHUTDOWN condition unless tested within the previous 62 days.” The phrase “at least once per 18 months” was replaced with “in accordance with the Surveillance Frequency Control Program” by License Amendment 249 [Reference 3].

## 4.0 TECHNICAL EVALUATION

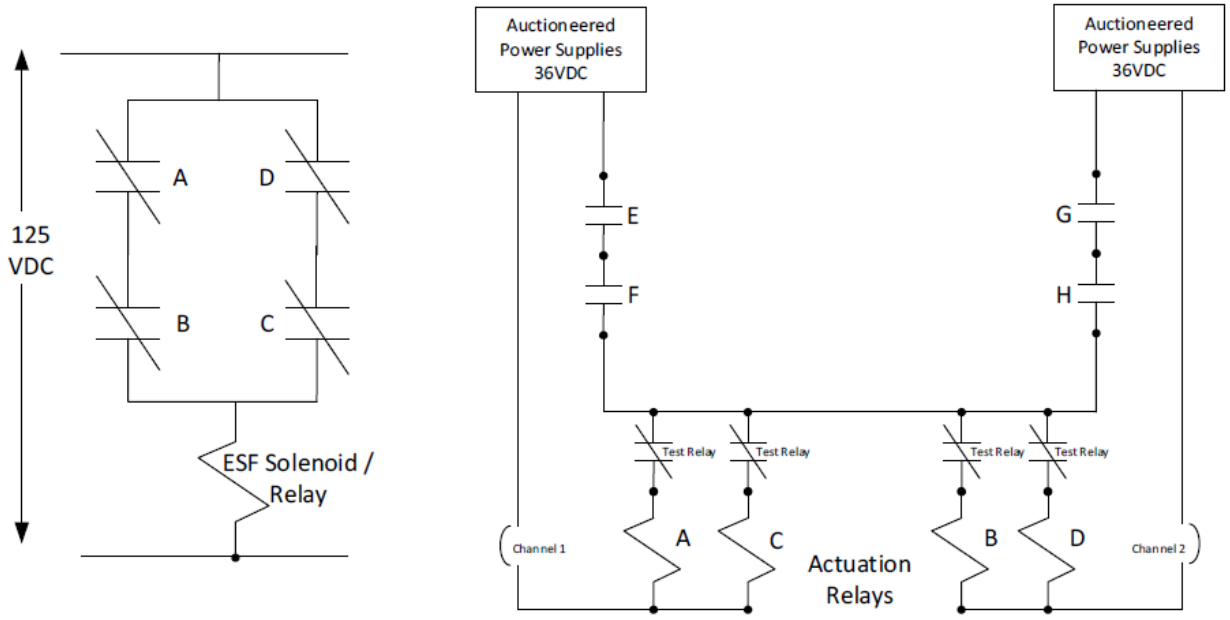
4.1 ESFAS Single Point Vulnerability Trip Hardening

The following figure shows the simplified current configuration of the ESFAS single point vulnerability. This is a generic arrangement for explanation purposes. The specific relay changes will be shown in the next sections.




The ESFAS single point vulnerability is associated with the power supply arrangement. If a short circuit were to occur across the relay A coil, power would be lost to the left half of the ESF bus resulting in the de-energization of relays A and C. Such failures would not affect relays B and D as these have a separate negative and circuit breaker. Under this scenario, the ESF equipment associated with relay A would actuate. This is the single point vulnerability identified for MSIS relays K305 and K313, and for CSAS relay K114.

The following figure shows the simplified proposed configuration for the ESFAS single point vulnerability modification. This is a generic arrangement for explanation purposes. The specific relay changes will be shown in the next sections.



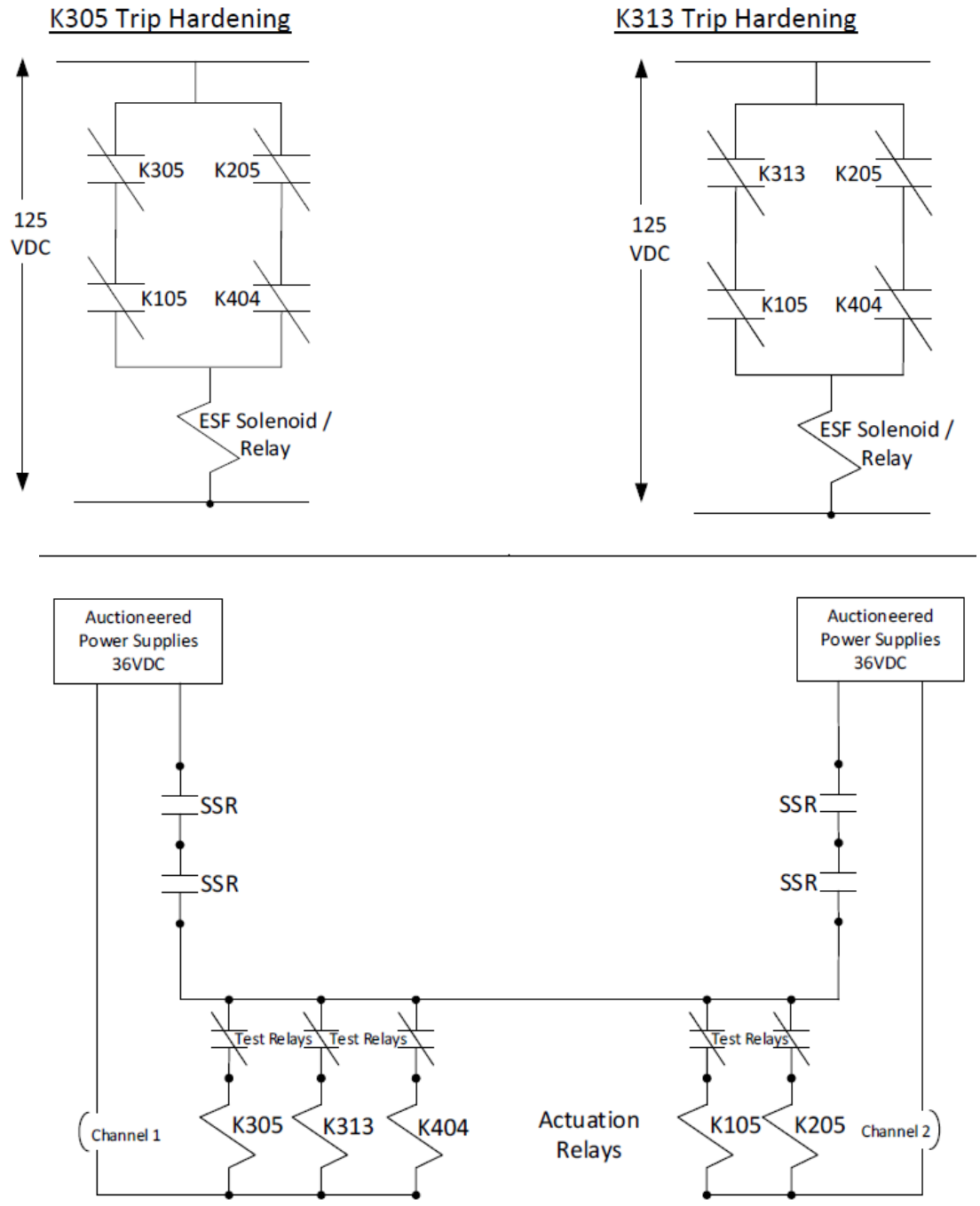

Assume relay A is the original relay. In series with the "A" contact is a newly installed "B" contact. If a short circuit would occur across the relay A coil, this would not cause an actuation to occur due to relay B having a separate negative and circuit breaker. The "A" contact would close while the "B" contact would remain open thus preventing the energization of the downstream ESF solenoid / relay. By paralleling 2 out of 2 with a second 2 out of 2, the actuation system can achieve a better result. The change in logic to address probability of failure to actuate (fail "on") is evaluated as equal to or better than that of the existing single subgroup relay. The existing configuration requires only one actuation relay per train to respond to its respective ESF actuation signal. The one actuation relay is actuated by one specific trip leg (valve group, refer to UFSAR figures 7.2-17 and 7.3-5). Failure of the valve group specific trip leg would result in failure of the actuation relay to respond. The proposed activity adds permissive relays to both the primary's trip leg and the other trip leg using both available trip paths (valve group / pump group). The resulting configuration requires successful actuation of both valve group and pump group trip paths and subsequent actuation of both primary and permissive or permissive and permissive subgroup relays. However, based on UFSAR Table 7.2-5 and sections 7.3.1.1.1.3, 7.3.1.1.2.2.3, 7.3.1.1.3.3, and 7.3.1.1.4.3, successful actuation of the Safety Injection System (SIS), Recirculation Actuation Signal (RAS), CSS (with exception of the valves addressed in this evaluation), and the Containment Isolation System (CIS), respectively, require a similar scheme. The successful actuation of BOTH valve group and pump group trip paths and their associated subgroup relays is required for successful system actuation. In that regard, this modification does not increase the probability of actuation failure of affected MSIS or CSS components any more than the probability of actuation failure of SIS, RAS, CSS, or CIS components as already described in the UFSAR and improves the probability by adding two subgroup paths: path 1 being A and B or path 2 being C and D, with either path providing successful actuation of downstream actuated device (valve).

4.2 Main Steam Isolation Signal Single Point Vulnerability Modification

The K305 relays will be trip hardened by adding 3 additional relays creating a 2 out of 2 paralleled with 2 out of 2 logic scheme. Spare relays used to trip harden the K305 relay are K105, K205, and K404. K305 and K404 are powered from one power supply while K105 and K205 are powered by a separate power supply. K305 trip hardened contacts are wired in series with K105 contacts. K205 contacts are wired in series with K404 contacts. K305 AND K105 OR K205 AND K404 are required to close to actuate associated downstream ESF equipment.

The K313 relays will be trip hardened by adding 3 additional relays creating a 2 out of 2 paralleled with 2 out of 2 logic scheme. Spare relays used to trip harden the K313 relay are K105, K205, and K404. K313 and K404 are powered from one power supply while K105 and K205 are powered by a separate power supply. K313 trip hardened contacts are wired in series with K105 contacts. K205 contacts are wired in series with K404 contacts. K313 AND K105 OR K205 AND K404 are required to close to actuate associated downstream ESF equipment.

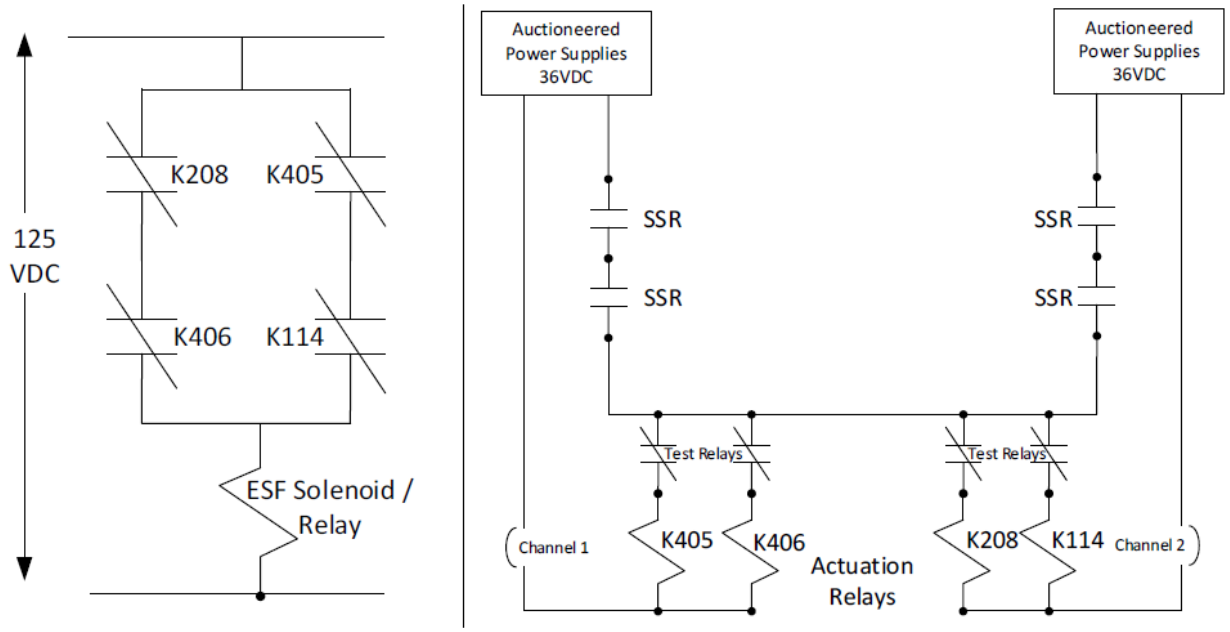
The following figure is a simplified diagram of the scheme.



4.3 Containment Spray Actuation Signal Single Point Vulnerability Modification

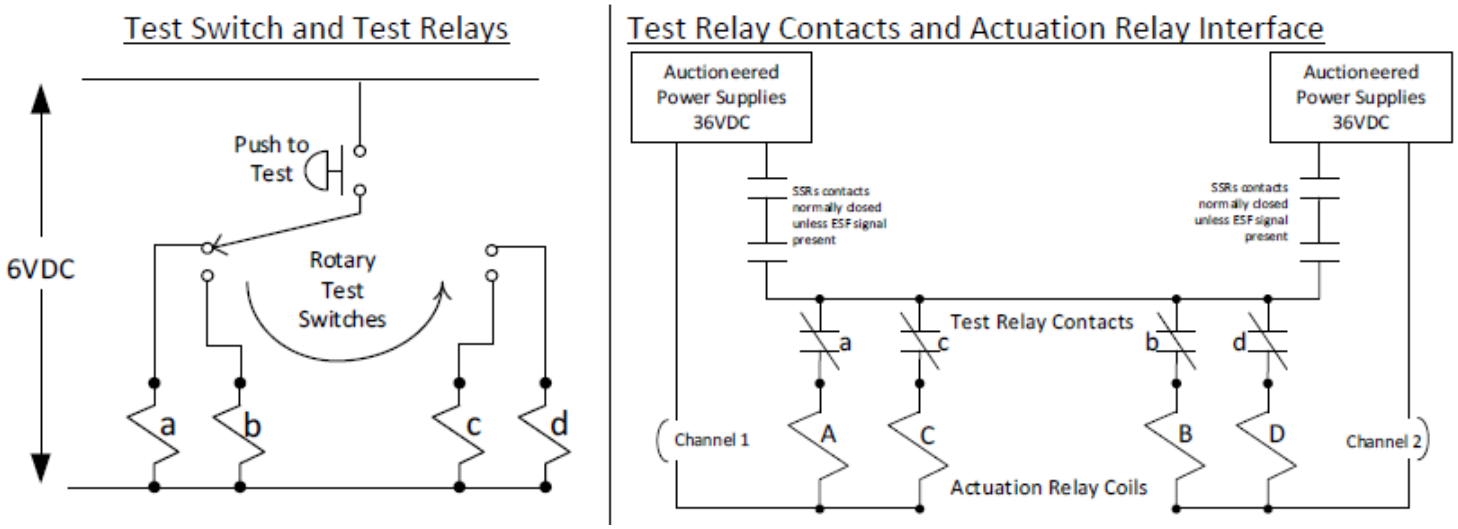
The K114 relay will be trip hardened by adding 3 additional relays creating a 2 out of 2 paralleled with 2 out of 2 logic scheme. Spare relays used to trip harden the K114 relay are K208, K405, and K406. K114 and K208 are powered from one power supply while K405 and K406 are powered by a separate power supply. K114 trip hardened contacts are wired in series with K405 contacts. K208 contacts are wired in series with K406 contacts. K114 AND K405 OR K208 AND K406 are required to close to actuate associated downstream ESF equipment.

The following figure is a simplified diagram of the scheme.

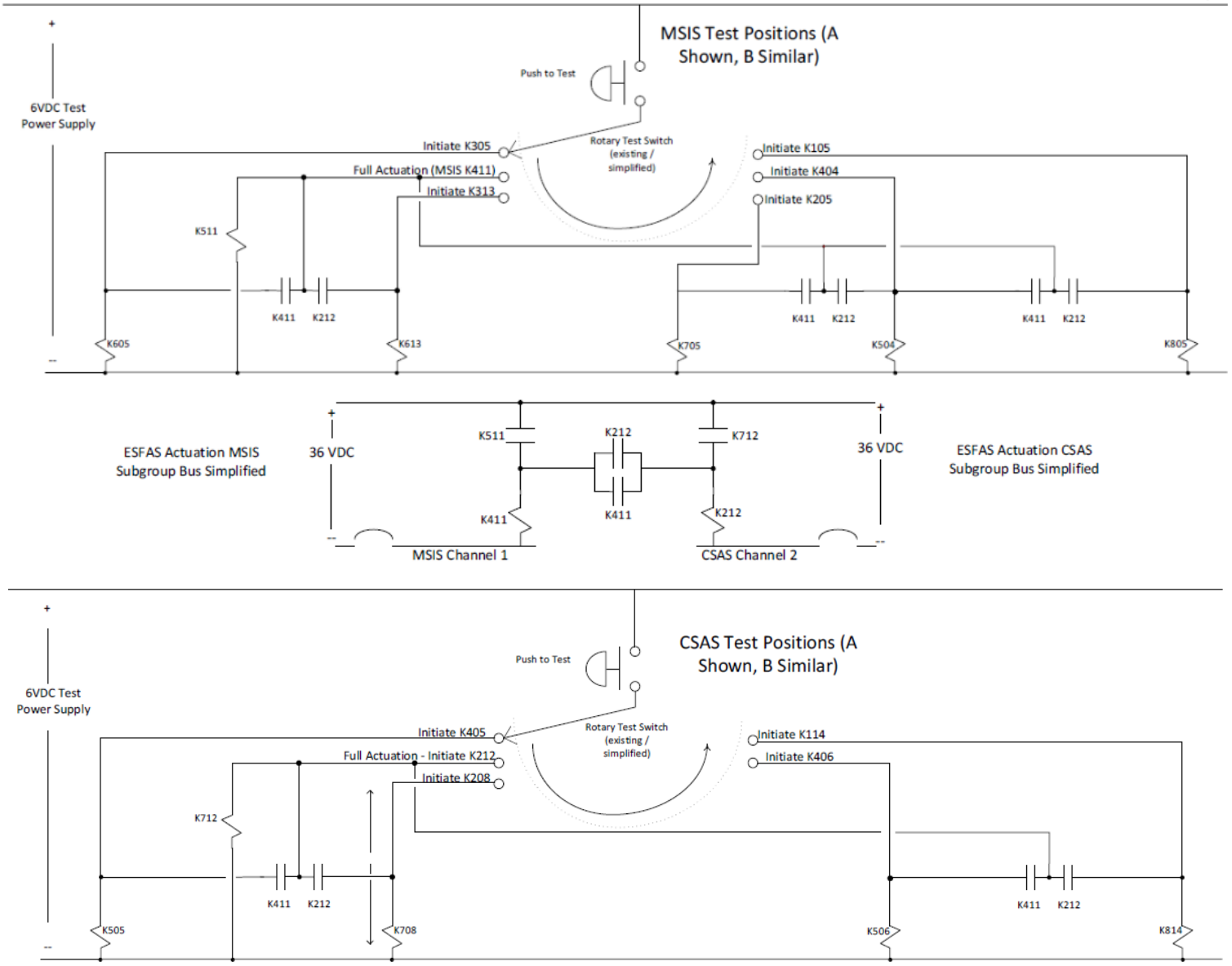



4.4 Relay Testing Change

Spare relays used in the trip hardening scheme have associated test relays located in the ESFAS cabinets that are pre-wired to test switches in the Control Room. This wiring exists currently for the spare actuation relays. This change will take advantage of the pre-wired test relays and switch positions to incorporate both discrete online testing and gang operated offline testing that will test both actuation relays and downstream ESF devices. The next figure is a simplified version of the test switch arrangement and how it discretely controls the actuation relays. This figure represents any given ESFAS actuation relay (A, B, C, D) and its test relay pair (a, b, c, d). By aligning the rotary switch to the “c” position and pressing the test pushbutton, “c” test relay would be energized by the 6 volt source and its associated normally closed contact in series with ESFAS actuation relay “C” would be de-energized from its 36 vdc source. The testing of actuation relay “C” is achieved without dropping out the entire actuation relay bus. This same method is employed for each actuation relay. By trip hardening the relays with 3 other relays, a single relay no longer actuates the downstream ESF function and can be tested at power. This design change assigns existing spare switch positions in the control room to allow testing of each trip hardened relay.




The gang operation of MSIS and CSAS utilize two relays (K212 and K411) (formerly spare actuation relays) and associated test relays K511 and K712. The spare actuation relay contacts will be used to tie test actuation power to the test relays of trip hardened relays allowing for simultaneous dropout of trip hardened relays for MSIS or CSAS. The gang operation is achieved using two existing spare relays and associated test relays including their pre-wired and pre-assigned test positions in the control room. Two relays are used to prevent introduction of a single point vulnerability if only one relay were used. The K212 and K411 relays provide the contacts and wiring to provide 6 VDC test power to all associated test relays for trip hardened contacts of MSIS and CSAS. The MSIS and CSAS test relay coil power is selected using the control room test switches and pushbutton. Only MSIS or CSAS can receive the test power at any given time due to exclusivity of the test switch. When aligned to K411, only test relays associated with MSIS will receive the 6 VDC necessary to pickup up test relays K605, K613, K705, K504, and K805. Power is provided through the test switch alignment and depressing the 'Push to Test' pushbutton. Once the pushbutton is depressed, the 6 VDC source picks up test relay K511. Test relay K511 contact closes providing 36 VDC power to MSIS subgroup relay K411. K411 contacts close to provide the same 36 VDC source to K212. Contacts for K411 and K212 provide 6 VDC power source ties from the test switch to all test relays associated with MSIS. The contacts which tie the coils of actuation relays K411 and K212 together are utilized to maintain electrical separation when not in gang operation. The relays K411 and K212 are shared between MSIS and CSAS; the 6 VDC power source is exclusive such that only power is available to MSIS or CSAS when aligned. The next figures are simplified versions of the test switch arrangement and the gang operation of the MSIS and CSAS.

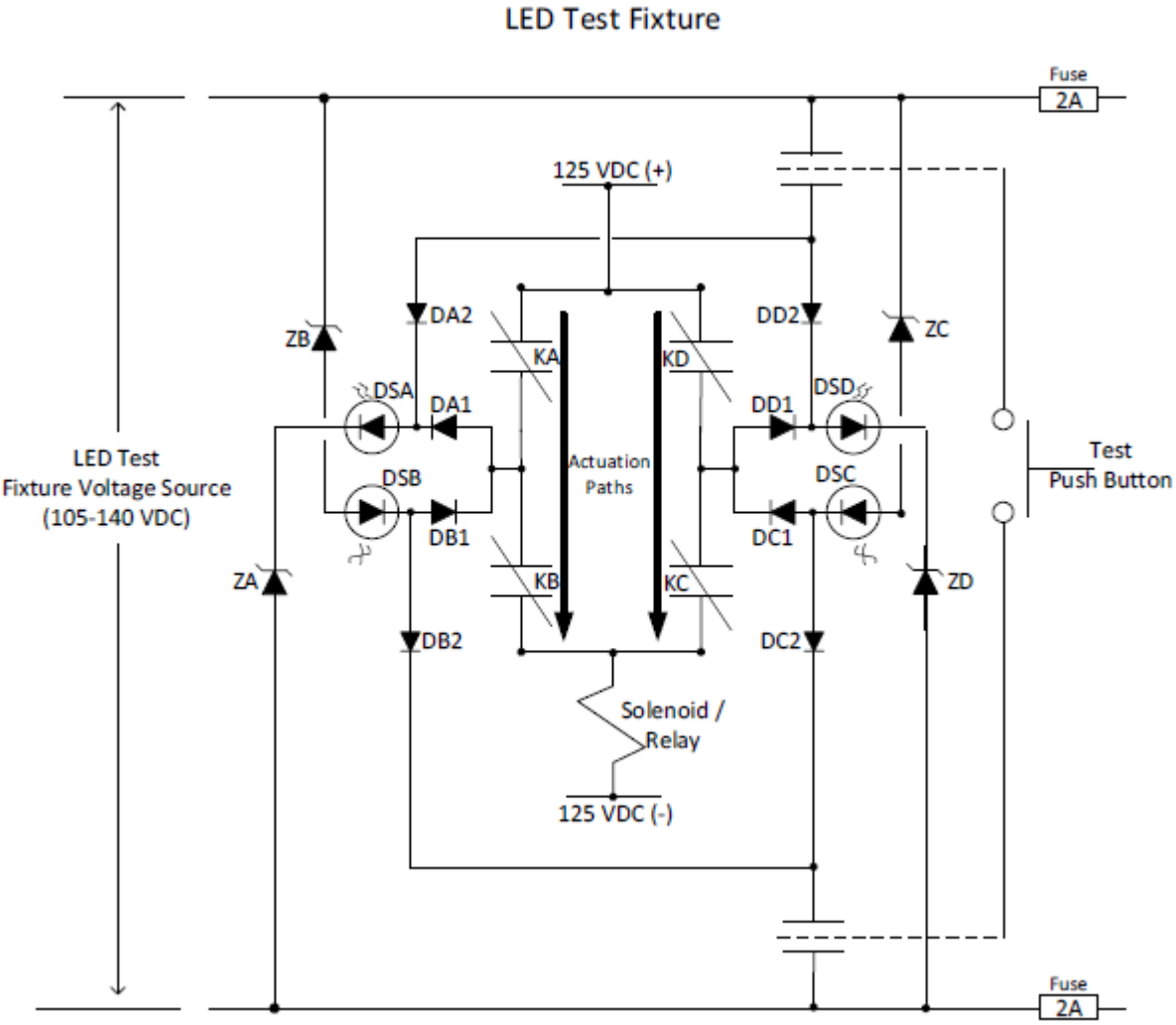



## 4.5 LED Relay Light Indication

The LED Test Fixture provides light indications of trip hardened contact closures during testing. The LED Test Fixture is also used during normal operating rounds to verify trip hardened relays have not failed during the operating cycle. A test pushbutton is provided for lamp checks during operator rounds to verify all LEDs are in working order.

During a full actuation of either CSAS or MSIS, either by gang operation during offline testing or by actual ESFAS signal received due to an event, the LED Test Fixture is not used. This is acceptable as full actuations are verified by proper operation of the downstream ESF component indications (valve closes, pump starts, etc.). Existing indications in the control room will continue to be relied upon for ESF component response during MSIS and CSAS full actuations with no changes required.

The next figure is a simplified diagram of the LED Test Fixture. KA through KD are the subgroup actuation relay contacts. DSA through DSD are the LEDs used to monitor their respective actuation contact. The following examples assume all contacts are open unless stated otherwise. As an example, assume Operations is performing an online surveillance test of each relay (KA, KB, KC, KD) discretely, meaning only one is being tested at a time. The first step Operations will perform is verifying the LEDs are working properly by depressing the 'Test Push Button.' Once all LEDs are verified illuminated, the pushbutton will be released, extinguishing the LEDs. Next, Operations will verify no LEDs remain illuminated (which would indicate a failed actuation relay or contact). Once all LEDs are verified extinguished, testing may be performed. Assume KA is under test. Contact KA is monitored by LED DSA. When KA is closed, DSA is illuminated (ON). When KA is open, DSA is not illuminated (OFF). The remaining LEDs (DSB through DSD) function in the same manner.



## 5.0 REGULATORY ANALYSIS

5.1 Applicable Regulatory Requirements/Criteria

The proposed change has been evaluated to determine whether applicable regulations and requirements continue to be met. The ESFAS complies with 10 CFR 50 Appendix A, General Design Criteria (GDC) related to protection system reliability and testability (GDC 21). Surveillance requirements for the testing of the ESFAS system relate to requirements of 10 CFR 50.36, Technical specifications. RG 1.22 describes acceptable methods for periodic tests of the protection system during reactor operation.

As discussed below, the change provided in this LAR does not affect the conclusions provided in the UFSAR and the ESFAS continues to comply with the regulation.

GDC 21 – Protection system testability
This GDC requires that the protection system be designed for high functional reliability and inservice testability commensurate with the safety functions to be performed. The protection system shall be designed to permit periodic testing of its functioning when the reactor is in operation, including a capability to test channels independently to determine failures and losses of redundancy that may have occurred.

The protection system as defined by IEEE Standard 279-1971 and RG 1.22 is designed to permit testing (up to the input to the actuation devices) with the reactor in operation. Testing is in compliance with IEEE 338-1971 and consistent with the recommendations of RG 1.22.

Regulatory Guide 1.22 - Periodic Testing of Protection System Actuation Functions
Regulatory Guide 1.22 Section D (Regulatory Position) Item 1 states:

> The protection system should be designed to permit periodic testing to extend to and include the actuation devices and actuated equipment.
>
> a. The periodic tests should duplicate, as closely as practicable, the performance that is required of the actuation devices in the event of an accident.
> b. The protection system and the systems whose operation it initiates should be designed to permit testing of the actuation devices during reactor operation.

Regulatory Guide 1.22 Section D Item 1 compliance:

- The proposed change will remove Technical Specification Table 4.3-2 Note 3 exemption for testing relays K305, K313, and K114. The removal of the exemption from testing during power operation means the impacted relays will be tested at power. Specifically, with the removal of the exemption, the MSIS subgroup relays will be covered by Technical Specification Table 4.3-2 Item 4.d and the CSAS subgroup relays will be covered by Technical Specification Table 4.3-2 Item 2.c. Technical Specification Surveillance 4.3.2.1 Table 4.3-2 Item 2.c and Item 4.d are specific to the subgroup relay tests. The ESFAS single point vulnerability trip hardening modification will allow periodic tests (online) for each of the subgroup relays. The test allows the subgroup relays to be actuated which meets the as closely as practicable performance required for these devices.
- This change complies with the RG 1.22 Section D Item 1 position.

Regulatory Guide 1.22 Section D Item 2 states:

Acceptable methods of including the actuation devices in the periodic tests of the protection system are:

a. Testing simultaneously all actuation devices and actuated equipment associated with each redundant protection system output signal;
b. Testing all actuation devices and actuated equipment individually or in judiciously selected groups;
c. Preventing the operation of certain actuated equipment during a test of their actuation devices;
d. Providing the actuated equipment with more than one actuation device and testing individually each actuation device.

Method a. set forth above is the preferable method of including the actuation devices in the periodic tests of the protection system. It shall be noted that the acceptability of each of the four above methods is conditioned by the provisions of regulatory positions 3 and 4 below.

Regulatory Guide 1.22 Section D Item 2 compliance:

- The K305 and K313 relays are associated with the MSIS, with the end devices being the MSIVs, MFIVs, main feedwater regulating valves, and the startup feedwater regulating valves. The K114 relays are associated with the CSAS, with the end devices being the CCW containment isolation valves.
- Actuation of the K114, K305, and K313 end devices would result in plant transients that would trip the plant and adversely impact the safe operation. The ESFAS single point vulnerability trip hardening modification logic test allows the relays to be tested preventing the operation of the end devices to ensure plant safety is maintained (RG 1.22 Item 2.c). The subgroup relay tests allow the testing of the individual relays to ensure proper operation (RG 1.22 Item 2.d).
- This change complies with the RG 1.22 Section D Item 2 position.

Regulatory Guide 1.22 Section D Item 3 states:

Where the ability of a system to respond to a bona fide accident signal is intentionally bypassed for the purpose of performing a test during reactor operation:

a. Positive means should be provided to prevent expansion of the bypass condition to redundant or diverse systems, and
b. Each bypass condition should be individually and automatically indicated to the reactor operator in the main control room.

Regulatory Guide 1.22 Section D Item 3 compliance:

- The ESFAS subgroup relay tests are performed in the control room. Each subgroup relay is selected from a selector switch which prevents the expansion of the test to the other relays. This change is not impacting or changing an operational bypass.
- This change complies with the RG 1.22 Section D Item 3 position.

Regulatory Guide 1.22 Section D Item 4 states:

Where actuated equipment is not tested during reactor operation, it should be shown that:

a. There is no practicable system design that would permit operation of the actuated equipment without adversely affecting the safety or operability of the plant;
b. The probability that the protection system will fail to initiate the operation of the actuated equipment is, and can be maintained, acceptably low without testing the actuated equipment during reactor operation, and
c. The actuated equipment can be routinely tested when the reactor is shut down.

Regulatory Guide 1.22 Section D Item 4 compliance:

- The proposed change will remove Technical Specification Table 4.3-2 Note 3 exemption for testing relays K305, K313, and K114. The removal of the exemption from testing during power operation means the impacted relays will be tested at power. This change is only associated with the subgroup relays. The end devices associated with the K114, K305, and K313 relays will continue to not be tested at power because actuation of the end devices would result in plant transients that would trip the plant and adversely impact the safe operation. The ESFAS single point vulnerability trip hardening modification logic test allows the relays to be tested preventing the operation of the end devices to ensure plant safety is maintained.
- The change for the subgroup relays does not require the RG 1.22 Section D Item 4 exemption.

10 CFR 50.36(c)(3) – Surveillance Requirements

10 CFR 50.36(c)(3) requires that Technical Specifications include surveillance requirements, which are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met. No modifications to trip setpoints or channel responses are associated with this change.

In conclusion, on the basis of the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

5.2 No Significant Hazards Consideration

The proposed change will modify Waterford 3 Technical Specification Table 4.3-2 (Engineered Safety Features Actuation System Instrumentation Surveillance Requirements) Note 3 to remove the exemption for testing relays K114, K305, and K313 at power. Waterford 3 has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, “Issuance of amendment,” as discussed below:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No.

   The proposed change will remove the Technical Specification Table 4.3-2 Note 3 exemption for testing relays K305, K313, and K114 at power. The Technical Specification Table 4.3-2 Note 3 exemption allowed the K305, K313, and K114 to not be tested during power operation. The K305 and K313 relays are associated with the Main Steam Isolation Signal (MSIS). The K114 relays are associated with the Containment Spray Actuation Signal (CSAS). The removal of the exemption from testing during power operation means the impacted relays will be tested more frequently improving the ability to identify failed components.

   The removal of the Technical Specification Table 4.3-2 Note 3 exemption for testing relays K305, K313, and K114 means these relays will be tested more frequently. This testing frequency will be consistent with the other Technical Specification Table 4.3-2 subgroup relays that do not have an exemption. The probability of an operator choosing the wrong subgroup relay during testing is no different for this change as it is for the existing Technical Specification Table 4.3-2 subgroup relays that are already tested on this same frequency. Thus, there will be no significant increase in the probability of an operator error causing an accident.

   The change will also eliminate a potential single failure vulnerability associated with MSIS (relays K305 and K313) and CSAS (relay K114). The elimination of the single failure potential will lower the probability of an accident due to the spurious actuation of the MSIS or CSAS.

   The change uses a parallel 2 out of 2 with second 2 out of 2 to ensure no single failure of one actuation path would prevent the other actuation path from completing its function. This ensures no additional failure mode would prevent required equipment from actuating and increasing accident consequences.

   Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

   Response: No.

   The proposed change will remove the Technical Specification Table 4.3-2 Note 3 exemption for testing relays K305, K313, and K114. The K305, K313, and K114 relays are part of the Engineered Safety Features Actuation System (ESFAS). The ESFAS is used for accident mitigation but an inadvertent actuation could cause an accident. The K305 and K313 relays are associated with the MSIS. The K114 relays are associated with the CSAS. The potential failures of the main steam isolation and containment spray systems have been evaluated in the Waterford 3 Updated Final Safety Analysis Report (UFSAR). The potential accidents are as follows:

- Loss of External Load which could be caused by closure of the Main Steam Isolation Valves (MSIVs) (UFSAR Section 15.2, Decrease in Heat Removal by the Secondary System).
- Loss of normal Feedwater Flow which could be caused by the closure of the Main Feedwater Isolation Valves (UFSAR Section 15.2, Decrease in Heat Removal by the Secondary System).
- Asymmetric Steam Generator Transient which could be caused by the closure of one MSIV (UFSAR Section 15.9.1.1, Asymmetric Steam Generator Transient).
- Loss of component cooling to Reactor Coolant Pumps (RCPs) which could be caused by the closure of the RCP Component Coolant Water valve. This could lead to RCP seal assembly damage and the possibility for a loss of coolant accident (UFSAR Section 15.6, Decrease In Reactor Coolant System Inventory).
- Inadvertent containment spray which could be caused by actuation of one train of containment spray (UFSAR Section 6.2.1.1.3, Design Evaluation - Containment Pressure - Temperature Analysis)

The removal of the exemption from testing during power operation means the impacted relays will be tested more frequently thereby improving the ability to identify failed components; however, they will be tested at power. The ESFAS K305, K313, and K114 relay test logic is designed to test the relays at power and not actuate the end devices which could adversely impact the plant. Any failures that could actuate plant equipment would continue to be bounded by the existing UFSAR accidents; therefore, no new accident is being created.

The ESFAS is used for accident mitigation. The removal of the exemption from testing during power operation means the impacted relays will be tested more frequently thereby improving the ability to identify failed components. This lowers the possibility of the ESFAS equipment not being available when needed. This also means that with the ESFAS equipment available, this change does not create the possibility of a different kind of accident.

Therefore, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

   Response: No.

   The proposed change will remove the Technical Specification Table 4.3-2 Note 3 exemption for testing relays K305, K313, and K114. The removal of the exemption from testing during power operation means the impacted relays will be tested more frequently thereby improving the ability to identify failed components. The more frequent testing will improve the margin of safety.

The change will also eliminate a potential single failure vulnerability associated with MSIS (relays K305 and K313) and CSAS (relay K114). The elimination of the single failure potential will improve the margin of safety by reducing the potential of an accident due to the spurious actuation of the MSIS or CSAS.

Based on this analysis, it was determined that the proposed change does not: (1) involve a significant increase in the probability or consequences of an accident previously evaluated; (2) create the possibility of a new or different kind of accident from any previously evaluated; nor (3) involve a significant reduction in a margin of safety. Therefore, the amendment does not involve a significant hazards consideration.

5.3 Environmental Considerations

The proposed amendment has been evaluated for environmental considerations. The review has resulted in the determination that the proposed amendment would change requirements with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22, paragraph (b), no environmental impact statement or environmental assessment needs to be prepared in connection with the proposed amendment.

## 6.0 PRECEDENCE

The proposed change will remove the Technical Specification Table 4.3-2 Note 3 exemption for testing relays K305, K313, and K114 at power. This change complies with RG 1.22 positions.

## 7.0 REFERENCES

1) Waterford Steam Electric Station Unit 3, Technical Specifications, through Amendment 250.

2) Waterford Steam Electric Station Unit 3, Updated Final Safety Analysis Report (UFSAR), Revision 309.

3) Waterford 3 License Amendment 249, Adoption of TSTF-425 Revision 3 “Relocate Surveillance Frequencies to Licensee Control – RITSTF Initiative 5b,” July 26, 2016 [ADAMS Accession Number ML16159A419].

4) Letter from G.W. Knighton to L.V. Maurin, “Waterford 3 Engineered Safety Features Actuation System Surveillance Requirements,” May 10, 1983 [ADAMS Accession No. 8306020687].

5) Letter W3P83-2273, F. J. Drummond to G. W. Knighton, “Engineered Safety Features Actuation System (ESFAS) Surveillance Requirements,” July 21, 1983 [ADAMS Accession No. 8307260489].

6) Letter W3P84-1328, K. W. Cook to G. W. Knighton, “Engineered Safety Features Actuation System (ESFAS) Subgroup Relay Testing Meeting 4/26/84,” May 14, 1984 [ADAMS Accession No. 8405180062].

7) Public Meeting with Entergy Operations, Inc. Regarding a Planned License Amendment Request to Revise Technical Specification 3.3.2, "Engineered Safety Features Actuation System Instrumentation," for Waterford Steam Electric Station, Unit 3 [ADAMS Accession Number ML17318A139].

8) Waterford Unit 3 - Licensee Presentation Slides for November 16, 2017, Category 1 Public Meeting Regarding Engineered Safety Features Actuation System [ADAMS Accession Number ML17318A123].

9) Regulatory Guide 1.22 Revision 0, Periodic Testing of Protection System Actuation Functions, February 1972.

**Attachment 2**

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**Revised (Markup) Technical Specification Page**

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TABLE 4.3.-2 (Continued)

ENGINEERED SAFETY FEATURES ACTUATION SYSTEM INSTRUMENTATION SURVEILLANCE REQUIREMENTS

| FUNCTIONAL UNIT | CHANNEL CHECK | CHANNEL CALIBRATION | CHANNEL FUNCTIONAL TEST | MODES FOR WHICH SURVEILLANCE IS REQUIRED |
|---|---|---|---|---|
| 7. EMERGENCY FEEDWATER (EFAS) | | | | |
| a. Manual (Trip Buttons) | N.A. | N.A. | SFCP | 1, 2, 3 |
| b. SG Level (1/2) - Low and ΔP (1/2) - High | SFCP | SFCP | SFCP | 1, 2, 3 |
| c. SG Level (1/2) - Low and No Pressure - Low Trip (1/2) | SFCP | SFCP | SFCP | 1, 2, 3 |
| d. Automatic Actuation Logic (except subgroup relays) | N.A. | N.A. | SFCP(2) | 1, 2, 3 |
| Actuation Subgroup Relays | N.A. | N.A | SFCP(1) (3) | 1, 2, 3 |
| e. Control Valve Logic (Wide Range SG Level - Low) | SFCP | SFCP | SFCP(5) | 1, 2, 3 |

TABLE NOTATION

(1) Each train or logic channel shall be tested in accordance with the Surveillance Frequency Control Program.

(2) Testing of Automatic Actuation Logic shall include the energization/deenergization of each initiation relay and verification of the OPERABILITY of each initiation relay.

(3) A subgroup relay test shall be performed which shall include the energization/deenergization of each subgroup relay and verification of the OPERABILITY of each subgroup relay. Relays K109, ~~K114,~~ K202, K301, ~~K305,~~ K308 ~~and K313~~ are exempt from testing during power operation but shall be tested in accordance with the Surveillance Frequency Control Program and during each COLD SHUTDOWN condition unless tested within the previous 62 days

and

(4) Using installed test switches.

(5) To be performed during each COLD SHUTDOWN if not performed in the previous 6 months.

(6) Each train shall be tested, with the exemption of relays, K110, K410 and K412, in accordance with the Surveillance Frequency Control Program. Relays K110, K410 and K412 shall be tested in accordance with the Surveillance Frequency Control Program.

**Attachment 3**

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**Revised (Clean) Technical Specification Page**

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TABLE 4.3.-2 (Continued)

ENGINEERED SAFETY FEATURES ACTUATION SYSTEM INSTRUMENTATION SURVEILLANCE REQUIREMENTS

| FUNCTIONAL UNIT | CHANNEL CHECK | CHANNEL CALIBRATION | CHANNEL FUNCTIONAL TEST | MODES FOR WHICH SURVEILLANCE IS REQUIRED |
|---|---|---|---|---|
| 7. EMERGENCY FEEDWATER (EFAS) | | | | |
| a. Manual (Trip Buttons) | N.A. | N.A. | SFCP | 1, 2, 3 |
| b. SG Level (1/2) - Low and ΔP (1/2) - High | SFCP | SFCP | SFCP | 1, 2, 3 |
| c. SG Level (1/2) - Low and No Pressure - Low Trip (1/2) | SFCP | SFCP | SFCP | 1, 2, 3 |
| d. Automatic Actuation Logic (except subgroup relays) | N.A. | N.A. | SFCP(2) | 1, 2, 3 |
| Actuation Subgroup Relays | N.A. | N.A | SFCP(1) (3) | 1, 2, 3 |
| e. Control Valve Logic (Wide Range SG Level - Low) | SFCP | SFCP | SFCP(5) | 1, 2, 3 |

TABLE NOTATION

(1) Each train or logic channel shall be tested in accordance with the Surveillance Frequency Control Program.

(2) Testing of Automatic Actuation Logic shall include the energization/deenergization of each initiation relay and verification of the OPERABILITY of each initiation relay.

(3) A subgroup relay test shall be performed which shall include the energization/deenergization of each subgroup relay and verification of the OPERABILITY of each subgroup relay. Relays K109, K202, K301, and K308 are exempt from testing during power operation but shall be tested in accordance with the Surveillance Frequency Control Program and during each COLD SHUTDOWN condition unless tested within the previous 62 days

(4) Using installed test switches.

(5) To be performed during each COLD SHUTDOWN if not performed in the previous 6 months.

(6) Each train shall be tested, with the exemption of relays, K110, K410 and K412, in accordance with the Surveillance Frequency Control Program. Relays K110, K410 and K412 shall be tested in accordance with the Surveillance Frequency Control Program.

**Attachment 4**

**to**

**W3F1-2017-0067**

**Cross Reference of Current to Historical Equipment Descriptions and Designations Related to ESFAS SPV Trip Hardening Modification**

**(1 Page)**

## Cross Reference of Current to Historical Equipment Descriptions and Designations Related to ESFAS SPV Trip Hardening Modification

The following provides a cross reference between the historical equipment descriptions and designations used in Letters W3P83-2273 and W3P84-1328 and those used in current Waterford 3 plant documentation.

| Actuation Relay | | Actuated Equipment | | | |
|---|---|---|---|---|---|
| | | Designation | | Description | |
| Train A | Train B | Historical | Current | Historical | Current |
| K305A MSIS | K305B MSIS | 2MS-V602A | MS-124A | SG #1 Main Steam Isolation Valve | Main Steam Isolation Valve 1 |
| | | 2FW-V823A | FW-184A | SG #1 Feedwater Isolation Valve | SG1 Main Feedwater Isolation Valve |
| | | 5FW-FM833 | FW-173A | SG #1 Feedwater Control Valve | SG1 Main Feedwater Regulating Valve |
| | | 5FW-FM835 | FW-166A | SG #1 Feedwater Control Bypass Valve | SG1 Startup Feedwater Regulating Valve |
| K313A MSIS | K313B MSIS | 2MS-V604B | MS-124B | SG #2 Main Steam Isolation Valve | Main Steam Isolation Valve 2 |
| | | 2FW-V824B | FW-184B | SG #2 Feedwater Isolation Valve | SG2 Main Feedwater Isolation Valve |
| | | 5FW-FM834 | FW-173B | SG #2 Feedwater Control Valve | SG2 Main Feedwater Regulating Valve |
| | | 5FW-FM836 | FW-166B | SG #2 Feedwater Control Bypass Valve | SG2 Startup Feedwater Regulating Valve |
| K114A | | 2CC-F243A/B | CC-710 | CCW to RCPs Containment Isolation Valve | CCW Return Header Inside Containment Isolation Valve |
| | K114B | 2CC-F147A/B | CC-713 | CCW from RCP's Containment Isolation Valve[s] | CCW Return Header Outside Containment Isolation Valve |
| | | 2CC-F146A/B | CC-641 | | CCW to Containment Outside Containment Isolation Valve |