Domestic Members
AmerenUE
Callaway
American Electric Power Co.
D.C. Cook 1 & 2
Arizona Public Service Co.
Palo Verde 1, 2 & 3
Constellation Energy Group
Calvert Cliffs 1 & 2
Dominion Nuclear Connecticut
Millstone 2 & 3
Dominion Virginia Power
North Anna 1 & 2
Surry 1 & 2
Duke Energy
Catawba 1 & 2
McGuire 1 & 2
Entergy Nuclear Northeast
Indian Point 2 & 3
Entergy Nuclear South
ANO 2
Waterford 3
Exelon Generation Company LLC
Braidwood 1 & 2
Byron 1 & 2
FirstEnergy Nuclear Operating Co.
Beaver Valley 1 & 2
FPL Group
St. Lucie 1 & 2
Seabrook
Turkey Point 3 & 4
Nuclear Management Co.
Kewaunee
Palisades
Point Beach 1 & 2
Prairie Island
Omaha Public Power District
Fort Calhoun
Pacific Gas & Electric Co.
Diablo Canyon 1 & 2
Progress Energy
H. B. Robinson 2
Shearon Harris
PSEG – Nuclear
Salem 1 & 2
Rochester Gas & Electric Co.
R. E. Ginna
South Carolina Electric & Gas Co.
V. C. Summer
Southern California Edison
SONGS 2 & 3
STP Nuclear Operating Co.
South Texas Project 1 & 2
Southern Nuclear Operating Co.
J. M. Farley 1 & 2
A. W. Vogtle 1 & 2
Tennessee Valley Authority
Sequoyah 1 & 2
Watts Bar 1
TXU Electric
Commanche Peak 1 & 2
Wolf Creek Nuclear Operating Corp.
Wolf Creek

International Members
Electrabel
Doel 1, 2, 4
Tihange 1 & 3
Electricité de France
Kansai Electric Power Co.
Mihama 1
Takahama 1
Ohi 1 & 2
Korea Hydro & Nuclear Power Co.
Kori 1 – 4
Ulchin 3 & 4
Yonggwang 1 - 5
British Energy plc
Sizewell B
NEK
Krško
Spanish Utilities
Asco 1 & 2
Vandellos 2
Almaraz 1 & 2
Ringhals AB
Ringhals 2 – 4
Taiwan Power Co.
Maanshan 1 & 2

WCAP-15830-P, Rev. 0 (Proprietary)
Project No. 694

September 8, 2004

WOG-04-449

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: **Response to Staff Request for Additional Information Regarding WCAP-15830-P, "Staggered Integrated ESF Testing" (TAC MB9131) (Task 2016)**

Reference: Letter, R. H. Bryan (WOG) to NRC, Transmittal of WCAP-15830-P, Rev. 0 (Proprietary) and WCAP-15830-NP, Rev. 0 (Non-Proprietary), Staggered Integrated ESF Testing," WOG-03-219, April 21, 2003.

The referenced letter transmitted topical report WCAP-15830-P, "Staggered Integrated ESF Testing," for Staff review and approval.

The purpose of this letter is to transmit the enclosed responses to the Staff's Request for Additional Information concerning this report. Westinghouse has determined that the information provided in these responses is non-proprietary, thus withholding of this information pursuant to 10 CFR 2.390 is not requested.

The Westinghouse Owners Group is prepared to discuss these responses, if needed, in order to facilitate completion of the Staff's review of WCAP-15830-P. Questions concerning these responses should be directed to Mr. Sumner Bemis, WOG Project Manager, at 412-374-6204.

Sincerely yours,

Frederick. P. "Ted" Schiffley, II, Chairman
Westinghouse Owners Group

D048

cc: G. Shukla, NRC
WOG Operations Subcommittee
WOG Steering Committee
WOG Licensing Subcommittee
PMO
J. R. Congdon
D. J. Finnicum
C. B. Brinkman
J. A. Gresham

Enclosure: RAI Responses

Response to

Request for Additional Information

concerning

WCAP-15830 Rev 00

"Staggered Integrated ESF Testing"

Request for Additional Information Regarding
WCAP-15830-P, Rev. 0 "Staggered Integrated ESF Testing,"
Report dated March 2003

(Consolidated list of all RAIs)

PRA Branch Information Requests (10/20/2003)

RAI PRA-1: Section 3.1.2 identifies San Onofre, Units 2 and 3 as having a CE ESFAS design. However, there are no columns in Tables 4.2-1 and 4.3-1 for either of the San Onofre units. Please either provide the missing information or explain why the information has been omitted.

Response RAI PRA-1: Data for San Onofre Units 2 and 3 was not provided since the utility did not participate in the project. San Onofre was mentioned in Section 3.1.2 solely to provide a complete description of the CE-fleet.

RAI PRA-2: Table 4.3-1 summarizes the results of the component classification effort by unit. Explain why the number of components in each of the categories (A-1 through C) varies widely from unit to unit, even among units that have similar ESFAS designs. For example, ANO-2, the Palo Verde units, and Waterford-3 all have CE ESFAS designs according to the information provided in Section 3.1. There are no components in Category A-1 (adjust frequency in PSA model) for ANO-2; however, the Palo Verde units have 22 components each and Waterford-3 has 8 components. Discuss how the level of detail used in modeling affects the results and conclusions.

Response RAI PRA-2: Categories A, B or C reflect variations in the surveillance requirements covered by the integrated ESF test from plant to plant, and the degree of overlap in testing by other Technical Specification surveillances.

The variation is also a result of components, identified from plant procedures, contained within the respective plant PSA models. The work illustrated in WCAP-15830 shows the cross reference between the components found in the procedures versus the components modeled in the PSA. The study identified SSCs that are only tested by the integrated ESFAS test. Some plants have a much larger set of components in this category than others. WCAP-15830 shows which SSC-failure probabilities need to change to demonstrate the effect of extending and staggering the ESFAS integrated test interval. Some plants included these SSCs more directly than others. The other categories list items in the plant models that indirectly or implicitly represent the Category A SSCs. On some occasions, when there was no representation of the Category A SSCs, the models were revised to include them.

RAI PRA-3: Section 4.5.2.1.1 states "In fact, the only way to derive the value of λ_s (standby failure rate) is to have a priori knowledge of the unavailability probability and the test/repair interval." Clarify what is meant by this statement. Both maximum likelihood (e.g., NUREG/CR-4550, Vol. 1, Rev. 1, Chapter 8) and Bayesian methods are commonly used to estimate standby failure rates. NUREG/CR-5485, Table 5-10 provides estimators for standby failure rates specific to common-cause failure.

Response RAI PRA-3: There are two standard ways of evaluating the probability that a standby component will fail to perform its function when required, the binomial model and the standby failure rate model.1 More modern techniques include maximum-likelihood and Bayesian methods.

The binomial model assumes a fixed probability of failure to respond on demand. That is, the probability of failure for a given demand is not a function of how often the demands occur.

The standby failure rate model assumes that there is constant standby hazard rate or standby failure rate and that the probability that a standby component will fail on demand is a function of (1) the time since the component was known to be functional and (2) the constant standby failure rate. The component is known to be functional at the start of the test interval and at the end of the test interval (either it passed the test, or it was repaired if it failed the test.) On the average, a functional demand will occur at the midpoint of the test interval.

The maximum-likelihood method also involves a priori failure rate knowledge. In this method, the analyst specifies the joint-probability distribution function for the sample data. The technique as applied to the exponential distribution ($\lambda e^{-\lambda t}$) requires raw data on the total number of failures and the associated time-intervals. Bayesian methods require a priori fail-on-demand probability combined with later (or plant-specific) raw data associated with the same phenomena.

In all cases, the techniques rely on raw data that either directly or indirectly gives the analyst a priori unavailability and test interval.

While the binomial model is appropriate for calculating system unavailabilities for scenarios in which the test intervals for standby components are fixed, it is not appropriate for evaluating the impact of changing test intervals. Therefore, the standby failure rate model (which does have a time-interval factor and is commonly found in plant PRA models) was used for the analyses in WCAP-15830-P.

The second paragraph of Section 4.5.2.1.1 was meant to provide background on potential uncertainty issues. It is agreed that this paragraph is unnecessary and will be deleted.

1 American Nuclear Society and Institute of Electrical and Electronic Engineers, " PRA Procedures Guide: A Guide to the Performance of Probabilistic Risk Assessments for Nuclear Power Plants, " sponsored by the U. S. Nuclear Regulatory Commission and the Electric Power Research Institute, NUREG/CR- 2300 , April 1983.

RAI PRA-4: The "intuitive" equation in Section 4.5.2.1.2 (top of Page 4-23) used to describe the average unavailability due to failure-to-start phenomenon assumes that all independent failure events are adequately described using a binomial process (constant failure-on-demand probability) and that all common-cause failure events are adequately described using a Poisson process (standby failure rate). These assumptions are not reasonable and appear to contradict Section 4.5.3, which provides modeling guidance for failure-to-start events for both the "standby model" and the "binomial model." Note that the term Q(t) is not formally defined in the text until Section 4.5.2.1.3. Please clarify what the equation is intended to demonstrate.

Response RAI PRA-4: The purpose of Section 4.5.2.1.2 is to give a mathematical basis for adjusting the β-factor in the common-cause model as a consequence of introducing staggered testing. The adjustment made to estimate ΔCDF and ΔLERF for the Integrated ESF test interval proposed in WCAP-15830 is based only on the time dependent portion of the equation for failure-on-demand as stipulated in Regulatory Guide 1.177, §A.2.3.5.

The last line on page 4-22 introduces "a proper formula to describe <u>the average unavailability because of failure-to-start</u>" immediately followed by:

$$Q(t) = \frac{F}{N} + 1 + \frac{(e^{-\lambda_{S,C}\tau} - 1)}{\lambda_{S,C}\tau}$$

The equation applies to failure-to-open, failure-to-close and any other on-demand failure. The equation presented in WCAP-15830 is at the end of a historical chain that started with WASH-1400. In WASH-1400, the failure-on-demand probability was a purely cyclic (see the definitions on page 5-1 of NUREG/CR-6141), i.e., function of functional failures divided by demands. A later formulation considered all of the failures-on-demand to be related to time-dependent phenomena, and the probability of failure could be derived from the assumption that availability at any particular time is $e^{-\lambda t}$. In applications that assume the function is needed before a repair can be made, the analyst can assume a constant λ.

The value for λ in the time-dependent model comes from taking all the failures (as in the older method), but <u>dividing it by the time</u> over which the hazard function has a constant slope (rather than the number of assumed demands).

$$Q(t) = \frac{\int_{t_1}^{t_2} (1 - e^{-\lambda t})dt}{t_2 - t_1}$$

$$Q(t) = \frac{(t_2 - t_1) + (\frac{1}{\lambda}) * (e^{-\lambda t_2} - e^{-\lambda t_1})}{t_2 - t_1}$$

$$t_1 \equiv 0$$

$$t_2 \equiv \tau$$

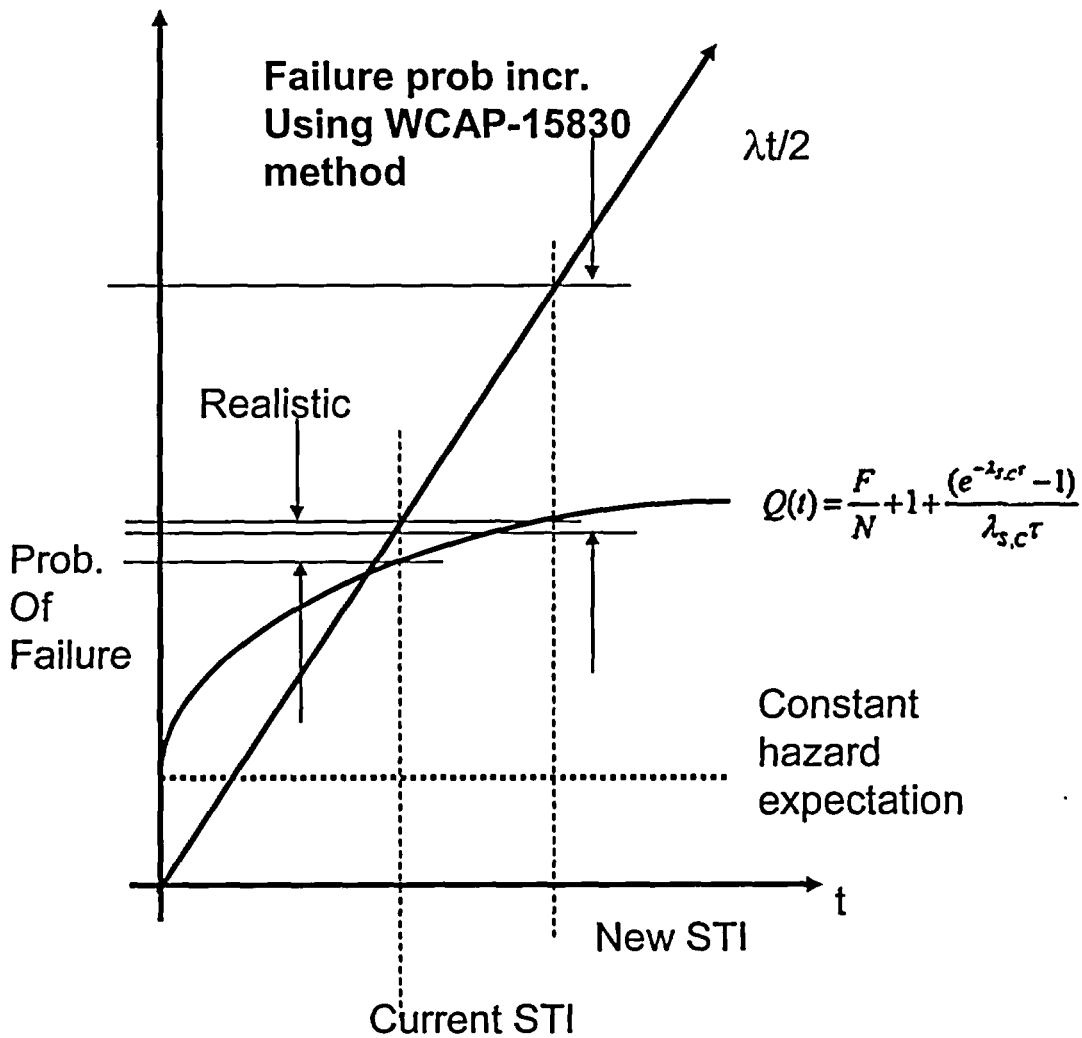
$$Q(t) = 1 + \frac{(e^{-\lambda\tau} - 1)}{\lambda\tau}$$

The equation in Section 4.5.2.1.2 was meant to show that the true unavailability probably lies somewhere in between these two models. Realistic as it is, the difficulty with the equation in

Section 4.5.2.1.2 is that the data analyst would need to be able to parse the failure events into those caused by "the stress of the test" and those caused by "latent phenomena."

The standby time value used for failure-on-demand events in the PRA models is typically the time since the last assumed good-condition of the component. Those times tend to be long in the WCAP-15830 study (i.e., 18 months). Increasing the STI from 18 to 36 months for a particular safety train effectively doubles the independent failure-on-demand probabilities for the components uniquely tested by the integrated ESF test.

It is uncommon for the analyst to have the information needed to parse the failures into the latent and non-latent categories. Modern PRA models as well as WCAP-15830 typically assume all failure-on-demand events are a result of some latent phenomenon. For purposes of estimating ΔCDF and ΔLERF for the Integrated ESF test interval proposed in WCAP-15830, this "all latent" assumption tends to overstate the risk associated with the proposal. The overstatement is illustrated in the following figure. The shape of Q(t) in the following illustration matches the one given in Figure 2.2 of NUREG/CR-5460. The relationship between Q(t) and λt/2 is shown next in a way to qualitatively illustrate the conservatism in the WCAP-15830 method.



In many cases the time-dependent factor in Q(t) is closely approximated by λt/2 when λt is relatively small, i.e., less than 0.1.

$$e^{-x} = 1 - \frac{x}{1!} + \frac{x^2}{2!} - \frac{x^3}{3!} + \ldots$$

$$e^{-x} - 1 = -\frac{x}{1!} + \frac{x^2}{2!} - \frac{x^3}{3!} + \ldots$$

$$Q(t) = 1 + \frac{(e^{-\lambda\tau} - 1)}{\lambda\tau}$$

$$Q(t) = 1 + \frac{1}{\lambda\tau} * (-\frac{\lambda\tau}{1!} + \frac{(\lambda\tau)^2}{2!} - \frac{(\lambda\tau)^3}{3!} + \ldots)$$

$$Q(t) = 1 + (-1 + \frac{(\lambda\tau)^2}{2\lambda\tau} - \frac{(\lambda\tau)^3}{6\lambda\tau} + \ldots)$$

$$Q(t) \approx \frac{\lambda\tau}{2}$$

RAI PRA-5: Please justify the use of a constant failure-on-demand probability (binomial model) for components addressed by the integrated ESF test. The proposed test intervals (up to three years in some cases) seem excessively long and use of a time-dependent probabilistic model (e.g., a Poisson process described with a standby failure rate) may be more appropriate. The justification would be enhanced by either providing or citing relevant statistical studies, engineering analyses, or similar references.

RAI PRA-5 Response: Westinghouse concurs that the standby-failure-rate model is the most appropriate model for components uniquely in the scope of the Integrated ESF test when determining the ΔCDF and ΔLERF associated with the surveillance test interval proposed in WCAP-15830.

The discussion of the constant failure-on-demand probability (binomial model) was provided as background on the two standard methods for evaluating the probability of failure for standby equipment. That background was meant to show the reasonableness of the approach taken in WCAP-15830 in regards to adjusting independent and Common Cause Failure numbers for the extended STI risk calculation.

The NRC has made licensees aware of the aging issue on numerous occasions, particularly in regard to electrical components (NRC Bulletins 83-01, 84-02, and 88-01; Information Notices 81-01, 82-04, 82-13, 83-19, 84-20, 87-66, 88-14, 88-98, 90-41, and 90-43). The preventive-maintenance (PM) program at each plant is intended to ensure that the covered components stay in the linear (constant hazard) region of the reliability curve. The PM programs are also set up to replace components before known age-related issues begin to affect the reliability of the component. The PM programs will not change as a result of extending and staggering the Integrated ESF test surveillance interval. Therefore, it is reasonable to assume that the λ factor in the failure-on-demand equations is constant during the service-life of modeled components. Furthermore, it is reasonable and even conservative to assume that the probability of failure-on-demand increases in proportion to the standby-time.

RAI PRA-6: Section 4.5.2.1.3 (bottom of Page 4-23) states "Simply testing the ability of the component to start-on-demand without attendant tasks to address latent phenomena eliminates the benefit of the standby failure model." Footnote 1 to this section explains that the term "latent phenomena" includes items such as lubricant hardening, metal fusing, dry out of packing, loosened connections due to vibration, etc. Please clarify what is meant by the statement, considering the following observations:

a. *The only outcomes of an integrated ESF test are either "pass" or "fail." Such tests may detect certain types of degradation (e.g., a diesel generator starts but does not load within the required time); however, test instructions usually provide explicit directions for determining when to treat such degradation as a failure.*

b. *If the stochastic process leading to failure is characterized using a constant standby failure rate, then that process must be a Poisson process. Since a Poisson process has no memory, there is no difference between the concepts of "good-as-new" and "good-as-old." The same conclusion holds true for a binomial process. Therefore, neither of the commonly used stochastic models is capable of relating the degree of degradation to the probability of failure.*

RAI PRA-6 Response: The maintenance program at a nuclear power plant handles routine maintenance, testing, predictive maintenance, preventive maintenance, and corrective maintenance. Routine maintenance amounts to housekeeping, inspections, and other tasks that do not involve adjustments or changes to equipment. Testing measures the performance of equipment and compares it to acceptance criteria. Problems uncovered by testing result in follow-up maintenance and testing. Preventive maintenance is intended to keep components in prime-of-life condition after installation. In addition, preventive maintenance replaces components before known age-related issues become a factor in the reliability of the function expected from that component. Corrective maintenance is similar to preventive maintenance except that the work is driven by unexpected failure of the component. The overall objective of the maintenance program is to ensure the plant components function as expected and components operate reliability.

Any activity in the plant that uncovers a problem in the plant results in a "maintenance task" to restore the degraded function. This is no different for the particular case of the Integrated ESF test. PRA stand-by failure probability assumptions rely on equipment being fully functional upon return-to-service (a.k.a. "good as new" in WCAP-15830). In short, a component starts off each interval in the same condition as at the start of the previous interval. At the time of return-to-service, the component has no residual problem that would violate the assumptions behind using $\lambda\tau/2$ to estimate the mean standby-failure probability.

RAI PRA-7: Section 4.5.2.1.3 (top of Page 4-24) states "Without rigorously running as-found tests (as tends to be the case)..." This statement implies that integrated ESF tests are usually conducted only after preventative maintenance (i.e., usually only as-left tests are performed). Appendix A to 10 CFR Part 50 (General Design Criteria 18, 37, 40, 43, and 46) indicates that one of the main purposes of integrated ESF testing is to confirm "...the operability of the systems as a whole and, under conditions as close to design as practical, the full operation sequence that brings the systems into operation..." While as-left tests are useful in confirming that maintenance has been correctly performed, they do not indicate that ESF systems would have successfully operated if no preventative maintenance had been performed prior to the test. Does the statement in Section 4.5.2.1.3 reflect the actual policies and practices of one or more of the plants addressed by WCAP-15830-P? It is suggested that the statement be clarified to avoid possible misinterpretations and casting doubts on the efficacy of integrated ESF testing.

RAI PRA-7 Response: The broad discussion in Section 4.5 was intended to illustrate that the approach taken by Westinghouse is a reasonable means to demonstrate the minimal risk impact of the proposed surveillance interval change. Section 4.5.2.1.3 addresses the effect that the proposed surveillance-interval change has on the CCF events in the PRA models. The discussion illustrates how plant practices translate into common-cause approximations used in the PRA models. This discussion did not mean to infer a non-compliance with Appendix A to 10CFR50 after reading Section 4.5.2.1.3.

In the "real-world" of plant operation, problems are discovered by both inspection and other non-invasive observation (as tends to be the case) as well as by a "test-adjust-retest-return to service" pattern.

For obvious problems such as stuck valves, burned-out relay coils, clogged intake structure inlets, or disconnected wires, the INOPERABLE condition is simply assumed to have occurred without a confirming test. Corrective maintenance begins as soon as feasible after discovery to restore the unavailable or degraded safety function.

Less obvious problems are typically uncovered by testing. The Integrated ESF test proves the functionality of certain safety-related components in a way that is not done by any other test.

PRA analysts (as suggested in RG 1.177 A.2.3.5 and especially for purposes of WCAP-15830) assume that all independent-random on-demand failures (no matter how they are found) are all due to phenomena in the standby period. The longer the standby period lasts, the more likely it is that the on-demand failure will occur. The discussion of independent-random failures in Section 4.5 is provided because the common-cause failure probability (in the β-factor and MGL approach) is simply a fraction of the independent-random failure probability.

RAI PRA-8: This RAI was restated following discussions between NRC and WEC and is covered by RAI #4 of the additional list of RAIs provided on 05/18/2004.

Section 4.5.2.1.3 (Pages 4-24 through 4-26) concludes that there should be no change in common-cause failure (CCF) probabilities when converting from a sequential (non-staggered) test policy to a staggered test policy. The term "staggered test policy" means testing one, and only one, ESF train during each refueling outage unless the tested train fails, whereupon the remaining trains would also be tested. Perhaps a more revealing description of the proposed testing policy is "staggered-and-stretched" since the time between planned tests of a given train increases. In essence, the staggered-and-stretched test policy is equivalent to deleting some of the tests conducted under a non-staggered test policy.

The conclusion that there should be no changes in CCF probabilities was reached through a two-fold argument. First, given that the standby failure rate model applies, the total component unavailability, Q_T, is proportional to the testing interval (e.g., doubling the test interval doubles the total unavailability). Second, the conditional probability of CCF given a single component failure depends on the testing policy. Section 4.5.2.1.3 justifies the second argument by reproducing a demonstration presented in Section A.3 of NUREG/CR-5485. The intent of that demonstration was to illustrate the fact that the test policy (non-staggered or staggered) must be considered when estimating CCF parameters. Specifically, the demonstration concerned a two-train system where CCF is modeled using the beta-factor approach. Statistical estimators (maximum likelihood) of the beta factor were developed for both test policies. The demonstration showed that the ratio of the beta factor estimator for the non-staggered test policy to the beta factor estimator for the staggered test policy is approximately equal to 2. Combining the two arguments (the total unavailability increases by a factor of 2, and the beta factor decreases by a factor of 2) suggests that the CCF probability remains unchanged when adopting the staggered-and-stretched test policy.

The NRC staff believes that the report authors have misinterpreted the demonstration provided in Section A.3 of NUREG/CR-5485. The point of the demonstration was to illustrate how test policy impacts CCF parameter estimators. The demonstration does not prove, nor claim to prove, that adopting a staggered test policy reduces the likelihood of CCF. NUREG/CR-5460 presents engineering oriented methods (cause-defense matrices) for crediting defenses against CCF. This report notes that a staggered test policy is weakly effective at reducing CCF due to certain human-related failures introduced during test and maintenance activities (e.g., repeating an erroneous action on multiple equipment trains). The report also explains why other types of CCF mechanisms (e.g., environmental effects) are not reduced or eliminated by adopting a staggered test policy.

Please provide an engineering oriented rationale for why the CCF potential (and, hence, CCF parameters) should decrease when a staggered-and-stretched test policy is adopted. The cause-defense matrix methodology in NUREG/CR-5460 is one example of an acceptable approach. Relevant data, assumptions, and calculations should be provided for review.

RAI PRA-8 Response: Section 4.5 of WCAP-15830 was written to demonstrate the reasonableness of the approach taken to address common-cause when trying to estimate ΔCDF and ΔLERF for the Integrated ESF test interval proposed. The premise is that the models use a β-factor technique to model common-cause failure. This is a simple technique which assigns a fraction of the independent failure rate to a fault tree basic-event, which is inserted into each train model that shares the subject component. Given this common-cause modeling technique,

WCAP-15830 describes basic-event adjustments needed to estimate ΔCDF and ΔLERF for the Integrated ESF test interval proposed.

In the risk assessment discussed in WCAP-15830, the common-cause probabilities in the model for the in-scope components each had two adjustments. As noted in Section 5.2.6 of NUREG/CR-6141, common-cause is typically modeled using a β-factor or MGL model where the common-cause failure probability of cross-train components is a function of the standby time (in this case, the surveillance test interval). Both factors in the two part CCF model were adjusted for each in-scope component for the extended STI case, (1) the representative independent failure probability, and (2) the β-factor.

Westinghouse recognizes that the most important basic events in the model are those associated with common-cause. To minimize the risk associated with the proposed STI extension, the WOG is also asking that the Integrated ESF test be put on a staggered test basis. One of the main advantages of staggering is called out in Section 5.2.6 of NUREG/CR-6141 as well as NUREG/CR-5460, Section 2.2.4 (page 23).

Extending the STI causes the independent-failure probability component of the CCF model to double as the STI is doubled. This approach is well understood and accepted. Performing Integrated ESF tests on a staggered test basis causes the analyst to change the associated β-factors for the reasons described below.

NUREG/CR-5460, Section 2.2.1 (page 13 and 16) notes that there is uncertainty involved in assigning a root cause to identified degradation when there are a number of proximate causes, one of which may be common-cause. In any event, more frequent testing (staggered compared to sequential) gives the licensees more opportunities to identify and correct any problems, including those that may lead to a common-cause failure during an actual transient. This benefit is cited in Section 5.2.4, page 5-7, of NUREG/CR-6141.

A CCF event is actually an AND-gate of an independent failure probability and a CCF related factor. Under that premise, WCAP-15830 covered the reasonable changes to events in the model. The reasonable treatment of independent on-demand failures is to double the failure probability as its test interval doubles. For recognized common-cause failure modes, both NUREG/CR-5485 and WCAP-15830 show the staggered β-factor is half as much as the sequential β-factor in a two train system. The net effect in WCAP-15830 is that the CCF probabilities for "Category A" components were kept at the baseline value.

WCAP-15830 used the technique in Appendix A of NUREG-5485 as a basis for adjusting the β-factor in the model. Westinghouse agrees with the statement in NUREG/CR-5460, Section 2.2.4 (page 23), where it says that tests that detect latent phenomena reduce the maximum time that multiple components would be failed because of a CCF event. The paragraph before that one tempers the benefit of staggered testing by saying, in effect, that the test procedure itself may not be written to detect unknown latent phenomena. However, nothing in NUREG/CR-5460 disputes that, in general, tests adequately measure the ability of a system to perform its safety-related function. Given the demonstrated long-term reliability of safety-related systems at nuclear plants, it is statistically uncommon for a test to reveal a problem that results in degraded performance. It follows that for the occasional problem that is uncovered by testing, it is likely that only a fraction (something less than 100%) of the causes will be in the "potential common-cause" category. It is clear that a staggered set of tests makes it more likely that the licensee will uncover a degraded component sooner than it would if the tests are run sequentially.

NUREG/CR-5460 notes that common-cause failure associated with intra-system cross-ties are not affected by the choice between staggered and sequential testing schemes. Westinghouse is in full agreement with that assessment. Failure of a cross-tie between two trains (that can lead to

the failure of the safety-system) is captured by the logic of the model used to measure the risk of doubling the surveillance test interval for Integrated ESF testing and at the same time adopt a staggered test scheme. The inclusion of cross-ties in the model is a matter of judgment used to create the PRA model. Implicit in the corrective action programs at the plants is that whenever a problem is uncovered, steps are taken to maintain the proper safety-related function of the affected systems. Thus, the problems identified are dealt with (by corrective maintenance) and the PRA models can safely assume that future preventative maintenance keeps the component in the constant hazard region of the reliability curve. Even though the corrective action program may eliminate (or at least manage) a failure mechanism, techniques like β-factor modeling will still cause risk calculations to attribute a portion of the independent failure probability to common-cause failures.

The Integrated ESF test assures that safety-related components (that typically do not operate in the emergency mode) will fulfill their required safety function. On-demand failure probabilities are those affected by the change in surveillance test interval; run-failures are governed by the transient mission time and are independent of the surveillance test interval.

RAI PRA 9: Please identify the exact source of CCF data used by each plant addressed in the report. The NRC staff believes that ASME RA-S-2002, "Supporting Requirements DA-D6 and DA-D7 for Capability Category I," should be addressed.

RAI PRA-9 Response: The following paragraphs identify the source of common cause failure (CCF) data used by the individual participants

Calvert Cliffs 1 and 2: The Calvert Cliffs Staggered ESFAS analysis results use several common cause sources:

- CE NPSD-1029 Used as Prior Coupled with NPRDS Data Search results
- Pickard, Lowe and Garrick (PLG) Generic Common Cause Estimates
- EPRI TR-100382 Rev 0, Database of Common-Cause Events for Risk and Reliability Applications, EPRI TR-100382, Project 3200-2, Final Report, June 1992.
- EPRI TR-102747 Common-Cause Data Analysis Tool (CCDAT) User's Manual
- Industry experience
- NUREG/CR-5497

Regarding DA-D7, the utility approach for treating CCF data at Calvert Cliffs is consistent with Category 3.

Waterford 3: The Waterford 3 model uses the methodology from NUREG/CR-5485 to account for common-cause failures. The CCFWIN program described in NUREG/CR-6268, "USNRC Common-Cause Failure Database and Analysis System," with CCFWIN data from NUREG/CR-5497 was used to calculate the Waterford 3 common-cause factors. Other sources, including NUREG/CR-5485 for valve and electrical component screening values, NUREG/CR-5497 and NUREG/CR-5485 for pumps, EPRI-NP-5613 for fans, chillers and room coolers, and NUREG/CR-3289 for relays and transmitters, were used when applicable common cause failure data was not available from CCFWIN. The common-cause failure modeling for the Level 1 model was updated in 2003.

The common-cause failure group screening process used the guidance of CE NPSD-1072-P, "CEOG PSA Standards – Guidelines for Identifying Common Cause Failure Basic Events." The method described in this report captures the dominant common-cause events.

The common-cause failure events for this application, other than those affected by changing from non-staggered to staggered testing, were changed to account for the increased failure probability due to the longer surveillance interval. As stated in WCAP-15830-P, the common cause failure factor for breaker failures was a conservative screening beta factor of 0.2. The effects on common-cause failure probabilities due to changing from non-staggered to staggered testing were implemented as described in Section 4.5.3.3 of WCAP-15830-P.

Palisades: Palisades used "Guidelines on Modeling Common Failures in Probabilistic Risk Assessment," NUREG/CR-5485, November 1998 for determining their common-cause factors.

Fort Calhoun: The common cause values used in the Fort Calhoun Station PRA model for support of WCAP-15830 consist of two components; an independent failure rate and a common-cause failure rate.

The independent failure rate includes a generic failure rate from NUREG/CR-4639 that has been updated using Bayesian methods and plant specific data from the most recent three years prior to the update. The independent failure rates are updated every refueling outage (i.e. every 18-months).

The common cause failure rate is calculated using the MGL approach as described in NUREG/CR-4780. Similar to other operating Pressurized Water Reactors (PWRs), a review of the Fort Calhoun operating experience shows little to no data for common cause failures. Consequently, generic data based on the industry PWR experience was used in the Fort Calhoun Station PRA. EPRI ALWR Utility Requirements Document, Volume II, ALWR Evolutionary Plant, Chapter 1, Appendix A, "PRA Key Assumptions and Groundrules," Rev. 03, November 1991, was used to develop common cause failure rates for Fort Calhoun Station, with values for the MGL parameters obtained from the EPRI Key Assumptions and Groundrules Document. When there is no useful source of data for common cause failures, the EPRI Groundrules document recommends that generic values be used for the multiple Greek parameters. The recommended values for β, γ, and Δ (for starting or actuating failures) are 0.1, 0.5, 0.9, respectively and 1.0 for all other Greek letters. (An additional set of generic values is also recommended for operating type failures; these values are 0.05, 0.5, and 0.9 for β, γ, and Δ respectively and 1.0 for all other Greek letters). Common cause factors were subsequently evaluated in accordance with the procedure given in NUREG/CR-4780.

Omaha Public Power District performed a self-assessment of their PRA model to identify tasks that would need to be performed to meet Capability Category II of the ASME PRA Standard, RA-S-2002. This self-assessment was performed in October of 2003 by a team of recognized PRA experts. The conclusion regarding sub-requirement DA-D6 of the Standard was that additional work would need to be performed before Capability Category II would be met for this item. Specifically, for dominant common cause events (FV>0.001), Bayesian updating should be performed on the MGL factors. For sub-requirement DA-D7 of the Standard, the conclusion was that there were no significant issues to be addressed to meet this sub-requirement.

Arkansas Nuclear One, Unit 2: The initial evaluation of the overlap between the Integrated Safeguards tests and other required tests performed at ANO-2 indicated a 100% overlap between the Integrated Safeguards tests and other required tests. Thus, at ANO-2, there are no components for which the test interval or common cause factors need to be adjusted since there are no components for which the Integrated Safeguards test is the sole functional test. ANO-2 is evaluating their overall testing program and is not pursuing a change to the Integrated Safeguards tests at this time.

RAI PRA-10: Concerning the load shed and breaker modeling issues discussed in Section 4.6, please address the following items:

a. *Identify by name which plants required adjustments to their PRA logic models to incorporate the diesel generator dependency on the load shed function.*

b. *What is the correct interpretation of the base CDFs and LERFs presented in Table 5.2-1? Do these values incorporate modeling changes needed to address the load shed issue?*

RAI PRA-10 Response: The load shed and breaker modeling PRAs discussed in WCAP-15830 Section 4.6 were revised to address the load shed issue and new base CDF and LERF values were calculated based on the guidance provided in WCAP-15830 Section 4.4. The base CDF and LERF values presented in Table 5.2-1 represent the new base values that were calculated after the model changes to address the load shed issue.

Electrical Branch RAI regarding OPPD submittal (12/30/2003)

RAI OPPD-1: If there are any active components that are only tested as a result of the integrated testing, describe those components and justify the extended testing time will not degrade those components such as, but not limited to, degradation of the normally-open contacts from external effects such as contact oxidation.

RAI OPPD-1 Response: The calculated Standby Failure Rate for all major components includes failure probabilities for a variety of possible failure modes attributable to sub-components. In the case of relays, failure of contacts to complete a circuit because of oxidized surfaces and burned out coils are examples of a failure that are typically subsumed into the Standby Failure Rate estimated for the relay. Typically, PRA models do not break out all of the possible sub-component failures separately. The models usually break SSCs down into components that can be removed/replaced. Sub-components that, by themselves, render the SSC non-functional would have importance measures the same as the SSC. For example, pumps are modeled as a single SSC and failures arising from bearings, impellers, and seals are typically subsumed unless there is a particular interest in a very specific failure mode. The rules of statistics require significant sample sizes from defined populations so that analysts can safely draw inferences. Most incident reports are not detailed enough to attribute a failure to a particular piece-part, e.g., a relay contactor.

PRA Branch Information Request (05/18/2004)

RAI PRA-11: The PRA methodology presumes that standby failure rates remain constant (i.e., unaffected by a change in the test interval). However, as noted in RG 1.177, Section 2.3.4, "Generally, for most components, the increase of a surveillance interval beyond a certain value may reduce the component's performance (i.e., increase the failure rate)." Justify the assumption that standby failure rates remain constant, citing or providing relevant information and data. Provide sensitivity analyses to demonstrate that the risk impact is small if the assumption is not true.

RAI PRA-11Response: See response to RAI PRA-4.

RAI PRA-12: Section 5.2.2.3 of WCAP-15830 indicates that external events have only partially been considered. For example, with the exception of Calvert Cliffs, the impact of the proposed change on fire risk has not been addressed for any plant addressed by the WCAP. RG 1.174, Section 2.2.3.1 indicates that all plant operating modes and initiating events should be addressed. Justify the treatment of external events in WCAP-15830 by providing qualitative or quantitative risk arguments that indicate the risk acceptance guidelines in RG 1.174 are satisfied when all initiating events (internal and external) are considered.

RAI PRA-11 Response: WCAP-15830 provides a broad discussion of the risk impact of extending the surveillance test interval for the integrated ESF tests. External events considerations and transition risk are plant specific. All plant specific issues will be covered within the technical specification change request that each participating WOG member will make when implementing the surveillance interval extension.

RAI PRA-12: For each nuclear power plant addressed by WCAP-15830, provide a list of components for which common-cause failures (CCFs) have been modeled. Annotate this list to indicate which components are affected by the proposed change in ESF testing policy.

RAI PRA-12 Response: Refer to Attachment 1.

RAI PRA-13: Section 4.5.2.1.3 describes an approach to adjust common-cause failure (CCF) beta factors when shifting from a non-staggered test policy to a staggered test policy. This section needs to be revised to improve its technical bases as follows:

a) Include a discussion of how much and why CCF beta factors change with respect to test policy based on the cause-defense approach to CCFs presented in NUREG/CR-5460. This report indicates that a staggered test policy reduces the coupling associated with certain human-related failures. However, a staggered test policy is unlikely to affect human errors associated with programmatic or procedural deficiencies. In addition, a staggered test policy provides no defense against most other sources of CCF. As a result, it is reasonable to apply the CCF beta factors developed for a non-staggered test policy to a staggered test policy.

b) Delete the argument that CCF beta factors for a staggered test policy are approximately equal to one-half of the CCF beta factors for a non-staggered test policy, which is

currently based on a comparison of statistical estimators applicable for the two test policies. The current discussion of statistical estimators is valid, but not relevant. It is important to distinguish between the test policy behind the data used to estimate the CCF beta factors and the test policy that applies to the systems being modeled (not necessarily the same).

c) *Describe how CCF basic event probabilities are impacted by test policy. As noted above, the CCF beta factors are approximately constant with respect to test policy. Therefore, for a constant failure-per-demand model, the CCF basic event probabilities do not change when a staggered test policy is adopted. However, the assumption that the failure-per-demand probability is actually constant needs to be explored. For a standby failure rate model, the CCF basic event probabilities change due to changes in the fault exposure time (i.e., the time between tests that detect standby CCFs), which requires consideration of the number of components in the CCF group and the order in which they are tested. These considerations should help to explain the conclusion in Sections 4.5.3.2 and 4.5.3.3.*

RAI PRA-13 Response: See response to RAI PRA-8.

RAI PRA-14: Section 4.5.3.3 suggests the addition of a basic event having probability 0.5 to a CCF AND gate. While this approach will produce the correct numerical risk results and provides analysis flexibility (i.e., simple to switch between non-staggered and staggered test policies), how does the addition of this basic event affect the computation of importance measures which are often utilized to make risk-informed component rankings, etc.?

RAI PRA-14 Response: To avoid quantification issues, the common-cause failure probabilities have values determined separately from the frequency of core damage or other transients of interest. Users of CAFTA frequently build a "module-AND-gate" to manage the common-cause failures. The software is able to quantify those module-AND-gates independently of any other gate in the tree. Importance measures only use the value attributable to the module-AND-gate. The software can be set to look-up a value quantified for the module and, in parallel, ignore the logic below the module-AND-gate.

WCAP-15830 will be revised to state that after approval of the STI extension requested, the plants will need to update their models. In particular, the CCF events impacted by the change will be modified in a manner to ensure that the importances for these events are determined appropriately. This can be accomplished by "hardwiring the CCF probabilities" or by setting the quantification process such that for impacted "CCF probability modules," the importances are calculated at the module level.

RAI PRA-15: WCAP-15830 provides an approach for obtaining quantitative risk insights that may be used to partially support the Tier 1 assessment described in RG 1.177. The Tier 1 assessment also requires consideration of the validity of the PRA. Some information is provided in the appendices to WCAP-15830 concerning PRA validity; however, this information lacks depth and does not provide an adequate basis to support a staff finding that the PRAs used are valid. Also, WCAP-15830 does not discuss the Tier 2 and Tier 3 assessments described in RG 1.177. The staff expects that each licensee who makes reference to WCAP-15830 will provide a complete assessment (Tiers 1 through 3) under RG 1.177. WCAP-15830 should be revised to

indicate exactly which portions of RG 1.177 it addresses and which portions will be separately addressed by each licensee through their individual applications.

RAI PRA-15 Response: WCAP-15830 summarizes information provided by the participants. Each licensee who makes reference to WCAP-15830 will provide a complete assessment (Tiers 1 through 3) under RG 1.177.

Electrical Branch Information Request (06/01/2004)

RAI No.E-1: The WCAP does not specify how many emergency diesel generator (EDG) technical specifications surveillance requirements (SR) are proposed for staggered testing. Please clarify.

Response to RAI E-1: The following refueling interval EDG SRs (per NUREG-1432) are addressed by the Integrated ESF test and therefore within the scope of WCAP-15830. However, the choice of SRs to be included is plant specific and must be evaluated and justified on a plant specific basis. Whether or not they apply and are chosen for inclusion in the staggered Integrated ESF program is described in the plant specific applications (See Appendices A, B, C and D):

- SR 3.8.1.11
- SR 3.8.1.12
- SR 3.8.1.16
- SR 3.8.1.18
- SR 3.8.1.19

In addition, some participants have included other EDG SRs in their plant specific appendix. For example:

- SR 3.8.1.9
- SR 3.8.1.10
- SR 3.8.1.13
- SR 3.8.1.15
- SR 3.8.1.17

Each appendix (Table 2-4a) describes the plant specific SRs for which a staggered testing program is proposed.

WCAP-15830 Section 2.2 (pages 2-4 and 2-5) describes the generic surveillance requirements (SRs) that were considered for inclusion in the proposed staggered test program. EDG SRs that may be included in the integrated ESF/LOOP test (IESF) are identified in the second paragraph on page 2-5. Although the choice of EDG SRs is plant specific, the report lists the SRs that are within the scope of the WCAP and those that are not. Tables 4.2-1 and 4.2-2 (pages 4-3 and 4-4) also define the functions (surveillance requirements) covered by the Integrated ESF test at the participating plants as well as the EDG surveillances that are specifically not included in the WCAP-15830 generic analyses. Those that are not included in the generic analysis may be included and addressed in the plant specific appendix and TS change submittal. Table 2-4a in each plant specific appendix lists all affected SRs and the proposed surveillance test interval. This table includes the EDG surveillances that the utility will include in their TS change request.

RAI E-2: For each SR selected, provide a discussion as to how these SRs are covered by other surveillance tests which are claimed to be performed on a more frequent basis. Also, identify the components and functions that are tested only by the integrated ESF test and not by any other surveillance tests.

Response to RAI E-2: The following table contains the selected SRs that were identified in the response to RAI E-1. A discussion is also provided as to how each SR is verified by the Integrated ESF test or other ESF surveillance tests. The discussions are generic since design, components, and test procedures vary from plant to plant. Typically, Integrated ESF testing is arranged such that all the selected surveillance requirements are addressed at one time during the outage, one train at a time The Integrated ESF test may be accomplished using one multi-section test procedure or using a number of separate test procedures performed one after the other.

Description of selected Surveillance Requirements

SR 3.8.1.11	Verify on an actual or simulated loss of offsite power signal: a. De-energization of emergency buses; b. Load shedding from emergency buses; c. DG auto-starts from standby condition and: 1. energizes permanently connected loads in ≤[10] seconds, 2. energizes auto-connected shutdown loads through automatic load sequencer, 3. maintains steady state voltage ≥ [3740] V and ≤ [4580] V, 4. maintains steady state frequency ≥ [58.8] Hz and ≤ [61.2] Hz, and 5. Supplies permanently connected and auto-connected shutdown loads for ≥5 minutes.
SR 3.8.1.12	Verify on an actual or simulated Safety Injection (SI) actuation signal each DG auto-starts from standby condition and: a. In ≤10 seconds after auto-start and during tests, achieves voltage ≥ [3740] V and frequency ≥ [58.8] Hz b. Achieves steady state voltage≥ [3740] V and ≤ [4580] V and frequency ≥ [58.8] Hz and ≤ [61.2] Hz; c. Operates for ≥5 minutes; d. Permanently connected loads remain energized from the offsite power system, and e. Emergency loads are energized [or auto-connected through the automatic load sequencer] from the offsite power system.
SR 3.8.1.16	Verify each DG: a. Synchronizes with offsite power source while loaded with emergency loads upon a simulated restoration of offsite power; b. Transfers loads to offsite power source; and c. Returns to ready-to-load operation.
SR 3.8.1.18	Verify interval between each sequenced load block is within ± [10% of design interval] for each emergency [and shutdown] load sequencer.

SR 3.8.1.19	Verify on an actual or simulated loss of offsite power signal in conjunction with an actual or simulated SI actuation signal: a. De-energization of emergency buses; b. Load shedding from emergency buses; and c. DG auto-starts from standby condition and: 1. energizes permanently connected loads in ≤ [10] seconds, 2. energizes auto-connected emergency loads through [load sequencer], 3. achieves steady state voltage ≥ [3740] V and ≤ [4580] V, 4. achieves steady state frequency ≥ [58.8] Hz and ≤ [61.2] Hz, and 5. supplies permanently connected [and auto-connected] emergency loads for ≥ [5] minutes.

SR 3.8.1.11 (Loss of Offsite Power test)
Integrated ESF and LOOP testing is typically the only test used to verify de-energization of the emergency buses and load shedding on a loss of offsite power. In addition, Integrated ESF and LOOP testing is typically the primary test used to verify that the DG auto starts on a LOOP, energizes permanently connected loads on the emergency buses, and auto-loads the shutdown loads via the sequencer. WCAP-15830 does not credit other ESF testing to perform these functions, however, there are plant specific exceptions addressed in Appendix A, B, C and D. Safety bus UV relays and breaker trip functions are tested by more frequent tests. DG operability and availability is assured by other more frequently performed TS surveillances (monthly operability runs), routine inspections and regular preventative maintenance. UV relays and other designs for disconnecting loads from the bus on a loss of power are usually tested only by the integrated ESF and LOOP test. Sequencer operability is verified by other tests. Sequencer output relays frequently are tested only by the integrated test. The operability of safety related End Equipment such as pumps, fans, valves etc. is usually verified by quarterly TS surveillance requirement tests.

SR 3.8.1.12 (DG auto-start test on SI)
Integrated ESF and LOOP testing is typically when DG auto-start on SI is verified. It can easily be incorporated into the test scheme while dedicated resources are available and the plant is configured to perform ESF and LOOP testing. Emergency loads are sequenced on to the emergency buses which are powered from offsite. The DGs auto-start but are not loaded. WCAP-15830 does not credit any other ESF testing to perform these functions. SI actuation relays are tested by other more frequent tests. Sequencers are frequently tested by other more frequent tests. Sequencer output relays frequently are tested only by the integrated ESF and LOOP test.

SR 3.8.1.16 (Restoration of Off-site power test with DG loaded with emergency loads)
Integrated ESF and LOOP testing is typically the only test that verifies that power to emergency buses (with emergency loads attached) can be transferred from the DGs back to offsite power after it is restored.

SR 3.8.1.18 (Emergency and Shutdown sequencer timing verification test)
Emergency and Shutdown sequencer timing is frequently verified during integrated ESF testing at some plants. The logic and timing functions of sequencers are frequently tested by other more frequent tests on a monthly or quarterly interval. Sequencer output relays are frequently tested only by the integrated test.

SR 3.8.1.19 (Loss of Offsite Power with SI test)
This surveillance requirement is always addressed by the Integrated ESF and LOOP test. The purpose of this surveillance test is to assure that all ESF SI functions perform as designed with a

concurrent loss of off site power. Most of the functions and components tested by this surveillance are also addressed by SR 3.8.1.11 and 12.

RAI E-3: Identify the surveillance tests, other than LOOP and integrated ESF tests that verify load shedding on the safety buses.

Response to RAI E-3: Although plant-specific exceptions exist, there are usually no other surveillance tests except the LOOP and integrated ESF test that verify load shedding from the safety buses in the event of a combined LOOP and ESF actuation. Undervoltage tests can also be used to demonstrate successful load shed capability for some components.

RAI E-4: It is stated on page 4-28, middle of second paragraph, that the first load Block contains the most important equipment; the second load Block contains the next important equipment and so on. If one of the breakers for equipment in the first load Block were to fail to open on a LOOP, the EDG would not trip on overload because the startup current for that load would already be within the load capacity for the first load Block. However, it is not clear to the staff why failure to open load was randomly selected in the first block and not from other load Blocks (it could be any running load) in which case the EDG could trip on overload. Please revise your model accordingly assuming the EDG trips on overload when first Block equipment is applied assuming one of the normally operating loads do not trip on LOOP signal.

Response to RAI E-4: Failure of a <u>non-first load Block</u> load to shed is the most limiting case and may result in EDG overload and failure. Each participant performed engineering analyses to evaluate the impact on the DG of "failure to load shed." A variety of loads and combination of loads were evaluated. The results vary because the loading margin is different for each DG at each plant

From page 4-28: "The first load Block contains the most important equipment, the second load Block contains the next most important equipment and so on. The amount of equipment in a given load Block is determined by total startup (or inrush) current of the equipment compared to the remaining load capability of the associated diesel given the loads already connected to the diesel. The sum of the startup currents for the equipment in the first load Block is typically close to the maximum capacity of the diesel because this equipment is needed for immediate response to design basis accidents. Therefore, if one of the breakers for equipment in the first load Block were to fail to open on a loss-of-offsite power, then the diesel would not trip on overload because the startup current for that piece of equipment would already be counted within the load capacity for the first load Block. However, if one of the breakers for equipment in the second or subsequent load Block were to fail to open on a loss-of-offsite power, the diesel may not have sufficient capacity to pickup that load in conjunction with the loads in the first load Block. In this case there is a potential that the diesel would trip on overload and would continue to trip on overload every time the loads were re-sequenced on to the bus. This would be modeled as failure of the diesel."

RAI E-5: It is stated on page 4-29, second paragraph, that a third set of safety-related breakers provide power to normally operating loads that are turned on and off by closing or opening the associated breakers. These loads may be continuously operating or they may be operated cyclically in conjunction with redundant/parallel components. Please identify these loads which are turned on of off by closing or opening the breakers. Do these loads trip on a LOOP signal and have you consider the failure of these loads to trip any time during sequencing?

Response to RAI E-5: Typically, 'Group 3' safety-related loads trip on a LOOP signal. These loads include:

- Charging Pumps
- Component Cooling Water Pumps
- Essential Service Water Pumps
- Safety related area HVAC components

Failure to trip (load shed) at any time during the sequencing process was considered and was part the engineering review/analyses performed by each participate.

Electrical Branch Information Request (07/29/2004)

RAI E-6: From a deterministic standpoint, please provide technical justification for extending the performance of SRs 3.8.1.11, 12, 16, 18 and 19 from the current frequency of every refueling cycle to every other refueling cycle.

Response to RAI E-6: Deterministic elements of defense-in-depth, the impact of the proposed change on these elements and safety margins are discussed in Section 5.1 of WCAP-15830, Assessment of Deterministic Factors. The impact of the proposed change in surveillance frequency was evaluated and determined to be consistent with the defense-in-depth philosophy. The analysis in WCAP-15830 demonstrates that a conservative treatment of the standby-failure probability results in insignificant changes in risk metrics in accordance with plant models. The proposed STI extension does not rely on any physical changes to any structure, system, or component in the plant. Also, the change does not require new dependencies among the systems providing defense-in-depth. As the SSCs do not change, any deterministic analysis associated with ESFAS operation is also unaffected by the STI extension. Further, each plant specific TS change submittal must contain a discussion of how the proposed change in test frequency remains compliant with codes and standards that have been previously committed to and with the margin to safety analysis acceptance criteria contained within the plant's licensing bases.

The proposed change in test frequency for all functions and components tested solely by the integrated test has been evaluated using a Risk-Informed approach. The technical justification contained in WCAP-15830 utilizes methods for assessing the nature and impact of the licensing basis changes as described in Reg. Guide 1.174 and 1.177.

RAI E-7: Identify the components and functions of the above SRs that are covered by other SRs which are claimed to be performed on a more frequent basis and discuss how they fully complement each other.

Response to RAI E-7: Section 4.2 of WCAP-15830 describes the procedure review process used to determine the degree of overlap in testing for each component tested by the IESF test. A systematic review of the integrated ESF test procedures for each participant was performed in order to identify all of the components tested by the integrated ESF test and the functions tested. The functions relate to specific TS surveillance requirements, test objectives and acceptance criteria. A separate review was performed for each plant because the test objectives and specific functions vary from one unit to the next. Once the integrated ESF test procedure was reviewed and the components being tested and function identified, other surveillance procedures testing the same component were reviewed. These test procedures were used to identify overlap with

the integrated ESF test, where an overlapping test is defined as one that tests the same component and function at the same or greater frequency as the integrated ESF test.

Note that the approach used in WCAP-15830 was a 'procedure' review process, as opposed to a 'surveillance requirement' review process. This review identified the overlap in testing, not necessarily the overlap in surveillance requirements, to confirm if the same functions and components were exercised by other TS tests as they were in the integrated ESF test.

As discussed in the response to RAI E-2, not all refueling interval EDG surveillance requirements are addressed by WCAP-15830. Of those that are addressed, each participant may choose to include them in the proposed change to extend the test frequency if applicable to the individual plant. Each applicable SR must then be evaluated and justified on a plant specific basis.

Table RAI E-7A shows the generic EDG surveillance requirements as listed in NUREG-1432 and identifies whether or not that particular SR is address by the integrated ESF test at each of the participant plants.

Table RAI E-7AEDG surveillances addressed by Integrated ESF/LOOP testing

EDG testing included in the scope of WCAP-15830 (NUREG 1432 references)	**Description**	**Addressed by Calvert Cliffs IESF test**	**Addressed by Fort Calhoun IESF testing**	**Addressed by Waterford 3 IESF testing**	**Addressed by Palisades IESF testing**
SR 3.8.1.11	Loss of Offsite Power test (without ESF actuation)	No	Yes	Yes	Yes
SR 3.8.1.12	ESF Actuation (without a Loss of Offsite Power)	No	Yes	Yes	No
SR 3.8.1.16	Restoration of Offsite Power test	Yes	No	Yes	Yes
SR 3.8.1.18	Sequencer time verifications	No	No	Yes	Yes
SR 3.8.1.19	Loss of Offsite Power test in conjunction with an ESF actuation	Yes	Yes	Yes	Yes

Tables RAI E-7B, C, D and E summarize the overlap in EDG testing at each of the participating plants. These tables provide a brief discussion of the components and functions of the above SRs that are covered by other SRs which are performed on the same or more frequent basis. A Risk-Informed approach was used to demonstrate acceptability in situations where the integrated ESF test is the only test for a particular function, such as those related to DG operability.

Table RAI E-7B
Summary of Overlap in DG testing at Calvert Cliffs

EDG SRs (per NUREG-1432)	Equivalent Calvert Cliffs SR	Sub-section of equivalent SR	Functional Description	Other SRs overlapping SRs covered by the Integrated ESF/LOOP test		
SR 3.8.1.16	Restoration of Offsite Power test (SR 3 8 1.14)	SR 3 8 1 14a	Verify each EDG synchronizes with offsite power source while loaded upon a simulated restoration of offsite power	The Integrated LOOP and ESF test is the only test that verifies the restoration of offsite power following a LOOP with or without SI event. No overlapping SR.		
		SR 3 8 1 14b	Manually transfers loads to offsite power source; and	Refer to SR 3.8.1.14a remarks on other test procedures		
		SR 3 8 1.14c	Returns to ready-to-load operation	Refer to SR 3 8.1.14a remarks on other test procedures		
SR 3.8.1.19	Loss of Offsite Power in conjunction with an ESF Actuation (SR 3 8 1.15)	SR 3 8 1 15a	De-energization of emergency buses	Integrated test is only test that verifies incoming breaker opens on an actual loss of offsite power. However, breaker UV trips are tested by simulated UV testing on a more frequent bases	The UV relays (DG-LOVS) tested every quarter by Channel Functional Test Addresses SR 3 3 8 1.	Breaker operability addressed by periodic breaker tests and inspections
		SR 3 8 1 15b	Load shedding from emergency buses	The Integrated LOOP and ESF test is the only test that verifies load shed function	Breaker operability addressed by IST for the associated load and periodic breaker tests and inspections	
		SR 3 8 1.15 c 1	DG auto start from standby and energizes permanently connected loads in < 10 sec	Integrated ESF test is primary test to verify DG starts and loads on a ESF actuation with concurrent LOP.	SR 3.3.5.1 (Quarterly Channel Functional test of ESFAS actuation logic) (example - STP O-7A-1). SR 3.8.1.3 (Monthly DG start verification) (example STP-O-8A-1)	Permanently connect loads are Category "B". They are exempt for inclusion in the risk analyses because changes to the integrated ESF test interval for these components do not affect the risk measures (CDF and LERF). The integrated ESF test verifies that these breakers remain closed when their supply-side bus is de-energized and then re-energized. Each breaker has additional reasons why they may be excluded. Example are provided in Section 4 4 5 of the WCAP.
		SR 3 8 1.15 c 2	DG auto start from standby and energizes auto connected loads though sequencer	SR 3 3.4 5 (ESF Equipment Response Time testing) (24 mos.) (example - STP O-56A-1)	SR 3.3.5.1 (Quarterly Channel Functional test of ESFAS actuation logic) (example - STP O-7A-1)	SR 3 8.1.8 (Monthly test of LOCI sequencer times (within + 10%). T.S. 5.5 8, Inservice Testing Program (example STP O-73B-1)
		SR 3 8 1 15 c 3	DG auto start from standby and Maintains steady state voltage	SR 3 8.1.3 (Monthly DG start verification) (example STP-O-8A-1)	SR 3 8.1.4 (Monthly DG start, synchronization and 1 hour load test) (example STP-O-8A-1)	SR 3.8.1.9 (Semi-annual DG start verification) (example STP-O-8A-1)
		SR 3 8 1 15 c.4	DG auto start from standby and maintains steady state frequency	SR 3.8 1.3 (Monthly DG start verification) (example STP-O-8A-1)	SR 3.8.1.4 (Monthly DG start, synchronization and 1 hour load test) (example STP-O-8A-1)	SR 3 8.1.9 (Semi-annual DG start verification) (example STP-O-8A-1)
		SR 3 8 1.15 c 5	DG auto start from standby and supplies permanently connected and auto-connected loads for > 5 mins	Integrated ESF test is primary test to verify DG starts and loads on a ESF actuation with concurrent LOP.	SR 3 8.1.8 (Monthly test of LOCI sequencer times (within + 10%)	Permanently connect loads are Category "B". They are exempt for inclusion in the risk analyses because changes to the integrated ESF test interval for these components do not affect the risk measures (CDF and LERF). The integrated ESF test verifies that these breakers remain closed when their supply-side bus is de-energized and then re-energized. Each breaker has additional reasons why they may be excluded. Example are provided in Section 4 4 5 of the WCAP.

Table RAI E-7C
Summary of Overlap in DG testing at Fort Calhoun Station

EDG SRs (per NUREG-1432)	Equivalent Fort Calhoun Station SR	Sub-section of equivalent SR	Functional Description	Other SRs overlapping SRs covered by the Integrated ESF/LOOP test		
SR 3.8.1.11	Loss of Offsite Power test (without ESF actuation). T.S.3.7(1)c. Demonstrates satisfactory overall automatic operation of each EDG	T.S 3.7(1)c. I	Initiation of a simulated auto-start signal to verify that the EDG starts, followed by.	Integrated ESF and LOOP tests are the only tests to verify load shed functions on OPLS (OP-ST-ESF-0002 and OP-ST-ESF-0006) .	Breaker operability addressed by periodic PMs (breaker tests and inspections).	
		T.S 3.7(1)c. ii (1)	Initiation of a simulated simultaneous loss of 4.16 kV supplies to bus 1A3 (1A4). Proper operation will be verified by observation of: (1) De energization of bus 1A3 (1A4)	Integrated test is only test that verifies incoming breaker opens on an actual loss of offsite power. However, breaker UV trips are tested by simulated UV testing on a more frequent bases		
		T.S 3.7(1)c, ii (2)	Load shedding from bus (both 4160 V and 480 V)	Integrated ESF and LOOP tests are the only tests to verify load shed functions on OPLS (OP-ST-ESF-0002 and OP-ST-ESF-0006) .		
		T.S 3.7(1)c, ii (3)	Energization of bus 1A3 (1A4)			
		T.S 3.7(1)c. ii (4)	Automatic sequence start of emergency load			
		T.S 3.7(1)c, ii (5)	Operation of > 5 minutes while its generator is loaded with the emergency load			
		T.S 3.7(1)c, iii	Verification that emergency loads do not exceed the 2000-HR kW rating of the engine			
SR 3.8.1.12	Verify that the SI system will respond to an automatic and manual actuation signal as required;	T.S.3.6(1) and T.S.3.1, Table 3-2, Item 3b	EDG Sequencer operation	T.S.3.1, Table 3-2, Item 10, Quarterly Load Sequencer test (example OP-ST-ESF-0022)		
			Load shedding		T.S.3.1 table 3-2, Item 3(b), Refueling 480v Load Shed verifications on SIAS, (example OP-ST-ESF-0015)	
			ESF signal actuation	T.S.3.1 table 3-2, Item 3(a), Quarterly SI Channel Functional Test (example OP-ST-ESF-0009)		
			End Equipment Operability	IST program operability testing		
SR 3.8.1.19	Loss of Offsite Power in conjunction with an ESF Actuation,			Integrated test is only test that verifies incoming breaker opens on an actual loss of offsite power. However, breaker UV trips are tested by simulated UV testing on a more frequent bases		

Table RAI E-7D
Summary of Overlap in DG testing at Waterford Unit 3

EDG SRs (per NUREG-1432)	Equivalent Waterford Unit 3 SR	Sub-section of equivalent SR	Functional Description	Other SRs overlapping SRs covered by the Integrated ESF/LOOP test		
SR 3.8.1.11	Loss of Offsite Power test (without ESF actuation), 4.8.1.1.2.e.3	4.8.1.1.2.e.3.a)	De-energization of emergency buses and Load shedding from emergency buses	Integrated test is only test that verifies incoming breaker opens on loss of offsite power and load shed functions.	Breaker operability addressed by periodic breaker tests and inspections	
		4.8.1.1.2.e.3.b)	Verify EDG Auto Starts, energizes emergency busses and permanently connected loads, verify auto-connected emergency loads are connected to emergency bus through automatic load sequencer, verify steady state voltage and frequency are achieved within 10 seconds and maintained > 5 minutes)	The integrated LOOP and ESF test is the only test that verifies operation of the output relays for the automatic load sequencer	OPT-903-068, Emergency Diesel Generator and Subgroup Relay Actuation Verification. Test is performed every 62 days. Test demonstrates the operability of each diesel generator as required by Technical Specification Surveillance Requirements 4.8.1.1.2(a). SR 44.8.1.1.2.a.4 verifies DG auto start on a simulated LOOP, simulated LOOP in conjunction with ESF and a ESF w/o LOOP. The test also verifies steady state voltage and frequency are achieved within 10 seconds and maintained > 5 minutes). SIAS automatic actuation logic and subgrouop relays are also tested	Permanently connect loads are Category "B". They are exempt for inclusion in the risk analyses because changes to the integrated ESF test interval for these components do not affect the risk measures (CDF and LERF). The integrated ESF test verifies that these breakers remain closed when their supply-side bus is de-energized and then re-energized. Each breaker has additional reasons why they may be excluded. Example are provided in Section 4.4.5 of the WCAP.
SR 3.8.1.12	ESF Actuation (without a Loss of Offsite Power), 4.8.1.1.2.e.4	4.8.1.1.2.e.4	SIAS without loss of offsite power with auto start of diesel generator and operating in standby at proper voltage and frequency for > 5 minutes	OPT-903-068, Emergency Diesel Generator and Subgroup Relay Actuation Verification. Test is performed every 62 days. Test demonstrates the operability of each diesel generator as required by Technical Specification Surveillance Requirements 4.8.1.1.2(a). SR 44.8.1.1.2.a.4 verifies DG auto start on a simulated ESF w/o LOOP. The test also verifies steady state voltage and frequency are achieved within 10 seconds and maintained > 5 minutes). SIAS automatic actuation logic and subgrouop relays are also tested		
SR 3.8.1.16	Restoration of Offsite Power test, 4.8.1.1.2.e.8	4.8.1.1.2.e.8.a)	Verify each DG: Synchronizes with offsite power source while loaded with emergency loads upon a simulated restoration of offsite power	The integrated LOOP and ESF test is the only test that verifies the restoration of offsite power following a LOOP with or without SI event .		
		4.8.1.1.2.e.8.b)	Transfer loads to offsite power source; and	See SR 4.8.1.1.2.e.8.a) remarks on other test procedures		
		4.8.1.1.2.e.8.c)	Returns to ready-to-load operation	See SR 4.8.1.1.2.e.8.a) remarks on other test procedures		
SR 3.8.1.18	Sequencer time verifications, 4.8.1.1.2.e.11	4.8.1.1.2.e.11	Verify that the automatic load sequence timer is OPERABLE with the time of each load block within ± 10% of the sequwenced load block time	The integrated test is the only test that verifies timing of DG sequencers		
SR 3.8.1.19	Loss of Offsite Power test in conjunction with an ESF actuation, T.S.-4.8.1.1.2.e.5	T.S.-4.8.1.1.2.e.5.a)	De-energization of emergency buses and Load shedding from emergency buses	Integrated test is only test that verifies incoming breaker opens on loss of offsite power and load shed functions		

Table RAI E-7E
Summary of Overlap in DG testing at Palisades

EDG SRs (per NUREG-1432)	Equivalent Palisades SR	Sub-section of equivalent SR	Functional Description	Other SRs overlapping SRs covered by the Integrated ESF/LOOP test		
SR 3.8.1.11	Loss of Offsite Power test (without ESF actuation), S.R. 3.8.1.7	S.R. 3.8.1.7.a	De-energization of emergency buses	Integrated test is only test that verifies incoming breaker opens on loss of offsite power.	The UV relays are tested every 18 months by RT-129, Functional Test of safety bus Undervoltage Relays. Addresses SR 3.8.1.7.a and c.	Breaker operability addressed by periodic breaker tests and inspections.
		S.R. 3.8.1.7.b	Load shedding from emergency buses	Integrated test is the only test which verifies operation of the load shed actuation relays on a LOOP.	Breaker operability addressed by IST for the associated load and periodic breaker tests and inspections.	
		S.R. 3.8.1.7.c.2	DG auto start from standby and energizes auto connected loads though sequencer.	Integrated Test is only test that verifies sequencer timing	DG Operability is verified every 31 days by MO-7A-1/2 (Emergency Diesel Generator test). Address SR 3.8.1.2 and 3. Verifies DG auto start on a simulated LOOP, simulated LOOP in conjunction with ESF and a ESF w/o LOOP. The test also verifies steady stat	
		S.R. 3.8.1.7.c.5	DG auto start from standby and supplies permanently connected and auto-connected loads for ≥ 5 mins	Start verifications for operability performed by RE-139-1/2. Test performed every 18 months. Addresses SR 3.8.1.7.c.1, 3 and 4. The purpose is to verify that the actuation time of those diesel generator components not measured during performance of Technical Specification Surveillance Procedure MO-7A-1/2, (Emergency Diesel Generator test) is less than 0.5 seconds and total analyzed startup time is less than 9.95 seconds. Also, to verify steady state Diesel Generator voltage and frequency are within acceptable values. And to record diesel generator voltage regulator and governor response during SIS conditions for trend information.	DG Operability is verified every 31 days by MO-7A-1/2 (Emergency Diesel Generator test). Address SR 3.8.1.2 and 3. Verifies DG auto start on a simulated LOOP, simulated LOOP in conjunction with ESF and a ESF w/o LOOP. The test also verifies steady state voltage and frequency are achieved within 10 seconds; and verified DG is synchronized and loaded, and operates for ≥ 60 minutes.	Permanently connect loads are Category "B". They are exempt for inclusion in the risk analyses because changes to the integrated ESF test interval for these components do not affect the risk measures (CDF and LERF). The integrated ESF test verifies that these breakers remain closed when their supply-side bus is de-energized and then re-energized. Each breaker has additional reasons why they may be excluded. Example are provided in Section 4.4.5 of the WCAP.
SR 3.8.1.16	Restoration of Offsite Power test, S.R. 3.8.1.9	S.R. 3.8.1.9 a	Verify each DG. Synchronizes with offsite power source while loaded with emergency loads upon a simulated restoration of offsite power	The integrated LOOP and ESF test is the only test that verifies the restoration of offsite power following a LOOP with or without SI event.,		
		S.R. 3.8.1.9 b	Transfer loads to offsite power source; and	See SR 3.8.1.9 a remarks on other test procedures		
		S.R. 3.8.1.9.c	Returns to ready-to-load operation.	See SR 3.8.1.9 a remarks on other test procedures		
SR 3.8.1.18	Sequencer time verifications, S.R. 3.8.1.10	None	Verify the time of each sequenced load is within + 0.3 second of design timing for each automatic load sequencer	Integrated test is the only test which verifies timing of the sequencer		
SR 3.8.1.19	Loss of Offsite Power test in conjunction with an ESF actuation, S.R. 3.8.1.11	SR 3.8.1.11a	De-energization of emergency buses	Integrated test is only test that verifies incoming breaker opens on loss of offsite power.	The UV relays are tested every 18 months by RT-129, Functional Test of safety bus Undervoltage Relays. Addresses SR 3.8.1.11.a and c	
		SR 3.8.1.11b	Load shedding from emergency buses	Integrated test is the only test which verifies operation of the load shed actuation relays on a LOOP with concurrent SIS.		

RAI E-8: In PRA space, how is SR 3.8.1.16 modeled?

Response to RAI E-8: In the PRAs for a Loss of offsite power with successful EDG operation, restoration of offsite power is not modeled because it is not required for successful core damage mitigation. Recovery of offsite power is only modeled for Station Blackout events where the EDGs have failed.

Attachment 1

RAI PRA-12 RESPONSE

Affected Components for which Common-Cause Failures (CCFs) Have been Modeled

Calvert Cliffs Plant:

The table below lists components considered for common cause that are impacted by the proposed staggered ESFAS testing. Note that only the base failure rates are adjusted for the submittal.

Designator	Description	Value	Beta	Gamma	Delta	Epsilon
BPLD1D	Trip Logic Module Fails on Demand	3.83E-07	6.99E-02	2.52E-01	2.84E-01	n/a
BPRL1D	UV Relays Fails to Energize	1.31E-04	6.99E-02	2.52E-01	2.84E-01	n/a
BPRL1E	Relays Fails to Energize	1.87E-04	5.08E-01	9.97E-01	9.97E-01	n/a
BPCB4O	Breakers Fails to Open	2.11E-04	1.60E-02	1.87E-01	7.91E-01	n/a

Fort Calhoun Station:

Table 1 shows the components in the model that had affiliated basic event probabilities changed and that also have affiliated CCF events (which were not changed).

Table 1	
Comp ID	**Description**
1A3-1	BREAKER UNIT; 161KV NORMAL FEED TO BUS 1A3
1A4-20	BREAKER UNIT: 161KV NORMAL FEED TO BUS 1A4
86-1/S1-2	AC SEQUENCER S1-2 AUTO START LOCKING OUT RELAY
86A1/CIAS	CONTAINMENT ISOLATION ACTUATION SIGNAL L.O. RELAY
86A1/CPHS	CONTAINMENT PRESS HI SIGNAL L.O. RELAY
86A1/RAS	SAFETY INJECT RECIRC ACT SIGNAL L.O. RELAY
86A1/SIAS	SAFETY INJECTION ACTUATION SIGNAL L.O. RELAY CH
86A1/STLS	SIRW TANK LO LEVEL SIGNAL L.O. RELAY
86A1X/RAS	SAFETY INJECT RECIRC ACT SIGNAL L.O. RELAY
86A1X/SIAS	SAFETY INJECT ACT SIGNAL L.O. RELAY
86B/STLS	SIRW TANK LO LEVEL SIGNAL LOCKING-OUT RELAY
86B1/CIAS	CONTAINMENT ISOL ACT SIGNAL L.O. RELAY
86B1/CPHS	CONTAINMENT HI PRESS SIGNAL L.O. RELAY
86B1/PPLS	PRESSURIZER LO PRESSURE SIGNAL L.O RELAY
86B1/RAS	SAFETY INJECT RECIRC ACT SIGNAL L.O. RELAY
86B1/SIAS	SAFETY INJECTION ACTUATION SIGNAL L.O. RELAY CH
86B1/STLS	SIRW TANK LO LEVEL SIGNAL L.O. RELAY
86B1X/RAS	SAFETY INJECT RECIRC ACT SIGNAL L.O. RELAY
86B1X/SIAS	SAFETY INJECTION ACT SIGNAL L.O. RELAY

Table 1	
Comp ID	**Description**
86BX/RAS	SAFETY INJ RECIRC ACT SIGNAL L.O. RELAY
A/94-1/SIAS	CB-4/AUX AUXILIARY RELAY FOR SAFETY INJ ACTUATION
A/94-1/VIAS	TRIP RELAY
A/94-2/SIAS	CB-4/AUX AUXILIARY RELAY FOR SAFETY INJ ACTUATION
A/94-3/SIAS	AC/DC-1 AUX RELAY FOR SAFETY INJECTION ACTUATION
B/94-1/VIAS	TRIP RELAY
B/94-2/SIAS	CB-4/AUX AUXILIARY RELAY FOR SAFETY INJ ACTUATION
B/94-2/SIAS	CB-4/AUX AUXILIARY RELAY FOR SAFETY INJ ACTUATION
B/94-4/SIAS	AC/DC-1 AUX RELAY FOR SAFETY INJECTION ACTUATION
HCV-204	LETDOWN HEAT EXCHANGER CH-7; INLET VALVE
HCV-2880A	COMP COOLING HT EXCH AC-1A; RAW WATER INLET VALVE
HCV-2880B	COMP COOLING HT EXCH AC-1A; RAW WATER OUTLET VALVE
HCV-2881A	COMP COOLING HT EXCH AC-1B; RAW WATER INLET VALVE
HCV-2881B	COMP COOLING HT EXCH AC-1B; RAW WATER OUTLET VALVE
HCV-2882A	COMP COOLING HT EXCH AC-1C; RAW WATER INLET VALVE
HCV-2882B	COMP COOLING HT EXCH AC-1C; RAW WATER OUTLET VALVE
HCV-489A	COMP COOLING HT EXCH AC-1A; CCW INLET VALVE
HCV-489B	COMP COOLING HT EXCH AC-1A; CCW OUTLET VALVE
HCV-490A	COMP COOLING HT EXCH AC-1B; CCW INLET VALVE
HCV-490B	COMP COOLING HT EXCH AC-1B; CCW OUTLET VALVE
HCV-491A	COMP COOLING HT EXCH AC-1C; CCW INLET VALVE
HCV-491B	COMP COOLING HT EXCH AC-1C; CCW OUTLET VALVE
HCV-492A	COMP COOLING HT EXCH AC-1D; CCW INLET VALVE
HCV-492B	COMP COOLING HT EXCH AC-1D; CCW OUTLET VALVE
TCV-202	REACTOR COOLANT SYSTEM LOOP 2A; LETDOWN TEMPERATURE CONTROL VLV

Method

Fort Calhoun uses the beta-factor method to model CCFs. As is typical in PRA models built with the CAFTA suite, the CCF model amounts to multiple uses of an AND-gate with two inputs, (1) a random-failure pseudo-basic event, and (2) a beta-factor pseudo-basic events. The name of the random-failure pseudo-basic event in common-cause modeling is a stylized name chosen by the analyst so that it can be easily associated with the true random-failure basic events in the common-cause group.

The steps of the method are summarized on Table 2. In short, basic events were compared to the pseudo-basic event names available from the fault tree model. Only one-for-one relationships were found. That is, when a common-cause group exists for the fault tree item, there was only one associated CCF. Once the associated pseudo-basic event name was found, the CCF-module name (i.e., the name of the AND-gate) was recorded as shown in Table 2 for the purpose of this response.

Table 2				
Component ID	**True Random-Failure Basic Event**	**CCF Group**	**CCF pseudo-basic event**	**CCF Module Name**
1A3-1	ECBD1A33	Y	ECBD1A33X	EMMCCFBK03
1A4-20	ECBD1A44	Y	ECBD1A33X	EMMCCFBK03
742A-1	GREB0742A1	N		
742A-2 a.k.a. 742A-8	GREB0742A-2 a.k.a. GREB0742A8	N		
742A-3	GREB0742A3	N		
742A-5	GREB0742A5	N		
742B-1	GREB0742B1	N		
742B-2	GREB0742B-2	N		
742B-4	GREB0742B4	N		
742B-5	GREB0742B5	N		
86-1/S1-2	GREE861S12	Y	GREE861S1X	GMMCCF33
86-A/D2	EREE86AD2	N		
86A1/CIAS	GREEA1CIAS	Y	GREE0CIASX	GMMCCF11
86A1/CPHS	GREEA1CPHS	Y	GREE0CPHSX	GMMCCF07
86A1/RAS	GREEA1RAS	Y	GREE0RASX	GMMCCF22
86A1/STLS	GREEA1STLS	Y	GREE0STLSX	GMMCCF21
86A1X/RAS	GREEA1XRAS	Y	GREE0RAXSX	GMMCCF37
86A1/SIAS	GREEA1SIAS	Y	GREE0SIASX	GMMCCF44
86A1X/SIAS	GREEA1XSIA	Y	GREEASIASX	GMMCCF45
86B/STLS	GREE0BSTLS	Y	GREE0STLSX	GMMCCF21
86B1/CIAS	GREEB1CIAS	Y	GREE0CIASX	GMMCCF11
86B1/CPHS	GREEB1CPHS	Y	GREE0CPHSX	GMMCCF07
86B1/PPLS	GREEB1PPLS	Y	GREE0PPLSX	GMMCCF04
86B1/RAS	GREEB1RAS	Y	GREE0RASX	GMMCCF22
86B1/STLS	GREEB1STLS	Y	GREE0STLSX	GMMCCF21
86B1X/RAS	GREEB1XRAS	Y	GREE0RAXSX	GMMCCF37
86B1/SIAS	GREEB1SIAS	Y	GREE0SIASX	GMMCCF44
86B1X/SIAS	GREEB1XSIA	Y	GREEASIASX	GMMCCF45
86BX/RAS	GREE0BXRAS	Y	GREE0RAXSX	GMMCCF37
94-B1/LS	ERNE94-B1/LS	N		
A/94-1/SIAS	GREBA941SI	Y	GREB94SIAX	GMMCCF10
A/94-1/VIAS	GREBA941VI	Y	GREB94VIAX	GMMCCF12

Table 2				
Component ID	**True Random-Failure Basic Event**	**CCF Group**	**CCF pseudo-basic event**	**CCF Module Name**
A/94-2/SIAS	GREBA942SI	Y	GREB94SIAX	GMMCCF10
A/94-3/SIAS	GREBA943SI	Y	GREB94SIAX	GMMCCF12
AC-A/1AD1	ERNEACA1A1	N		
AC-A/1AD2	ERNEACA1A2	N		
B/94-2/SIAS	GREBB941SI	Y	GREB94SIAX	GMMCCF10
B/94-1/VIAS	GREBB941VI	Y	GREB94VIAX	GMMCCF12
B/94-2/SIAS	GREBB942SI	Y	GREB94SIAX	GMMCCF10
B/94-4/SIAS	GREBB944SI	Y	GREB94SIAX	GMMCCF12
HCV-204	OAVCHCV204	Y	OAVCTC202X	OMMCCFLTDN
HCV-257	OAVCHCV257	N		
HCV-264	OAVCHCV264	N		
HCV-2880A	WAVN-2880A	Y	WAVN-2882X	WMMCCFAOVS
HCV-2880B	WAVN-2880B	Y	WAVN-2882X	WMMCCFAOVS
HCV-2881A	WAVN-2881A	Y	WAVN-2882X	WMMCCFAOVS
HCV-2881B	WAVN-2881B	Y	WAVN-2882X	WMMCCFAOVS
HCV-2882A	WAVN-2882A	Y	WAVN-2882X	WMMCCFAOVS
HCV-2882B	WAVN-2882B	Y	WAVN-2882X	WMMCCFAOVS
HCV-438B	WAVC438B	N		
HCV-438D	WAVC438D	N		
HCV-489A	CAVNV-489A	Y	CAVNHC400X	DMMCCFVALV
HCV-489B	CAVNV-489B	Y	CAVNHC400X	DMMCCFVALV
HCV-490A	CAVNV-490A	Y	CAVNHC400X	DMMCCFVALV
HCV-490B	CAVNV-490B	Y	CAVNHC400X	DMMCCFVALV
HCV-491A	CAVNV-491A	Y	CAVNHC400X	DMMCCFVALV
HCV-491B	CAVNV-491B	Y	CAVNHC400X	DMMCCFVALV
HCV-492A	CAVNV-492A	Y	CAVNHC400X	DMMCCFVALV
HCV-492B	CAVNV-492B	Y	CAVNHC400X	DMMCCFVALV
PCV-1849A	IAVCP01849A	N		
PCV-1849B	IAVCP01849B	N		
TCV-202	OAVCTCV202	Y	OAVCTC202X	OMMCCFLTDN
1B3A-6	ECBY1B3A-6	N		
1B3B-5	ECBY1B3B-5	N		
1B3B-6	ECBY1B3B-6	N		

Table 2				
Component ID	**True Random-Failure Basic Event**	**CCF Group**	**CCF pseudo-basic event**	**CCF Module Name**
1B3B-7	ECBY1B3B-7	N		
1B3B-3	ECBY1B3C-3	N		
1B3C-4C-2	ECBY1B3C-4C-2	N		
1B3C-5	ECBY1B3C-5	N		
94-A1/LS	ERNE94-A1/LS	N		
94-A2/LS	ERNE94-A2/LS	N		

Palisades Plant:

The following components were evaluated for the impact of changing the ESF testing frequency from 18 to 36 months (the breaker to the component is included in the parentheses after each component). Components listed in **BOLD** are those that are affected by the increase in the test interval. For these components the probability of breaker failure to open was doubled due to the test frequency extension. For the other components the evaluation demonstrated that testing and/or normal operating conditions verified proper functioning of the components and breakers at frequencies less than the ESF Testing frequency (i.e. monthly or quarterly testing). Common cause was evaluated by the use of an aggregate common cause term representing the probability of 1 of X breakers on either bus failing to open resulting in a failure of the load shed function on both buses.

2400 Volt Bus 1C Station Power Transformer 1-2 Incoming Breaker (152-105)
2400 Volt Bus 1C Startup Transformer 1-2 Incoming Breaker (152-106)
2400 Volt Bus 1D Startup Transformer 1-2 Incoming Breaker (152-203)
2400 Volt Bus 1D Station Power Transformer 1-2 Incoming Breaker (152-202)
Service Water Pump P-7A (152-204)
Service Water Pump P-7B (152-103)
Service Water Pump P-7C (152-205)
Auxiliary Feedwater Pump P-8A (152-104)
Auxiliary Feedwater Pump P-8C (152-209)
Transformer X13 (152-108)
Component Cooling Water Pump P-52A (152-109)
Component Cooling Water Pump P-52B (152-208)
Component Cooling Water Pump P-52C (152-116)
Containment Spray Pump P-54A (152-210)
Containment Spray Pump P-54B (152-112)
Containment Spray Pump P-54C (152-114)
Dilution Water Pump P-40A (152-102)
High Pressure Safety Injection Pump P-66A (152-207)
High Pressure Safety Injection Pump P-66B (152-113)
Low Pressure Injection Pump P-67A (152-206)
Low Pressure Injection Pump P-67B (152-111)
Switchyard Feeder Breaker 2 (152-110)
Transformer X77 (152-110)
Transformer X16 (152-211)

Control Room HVAC Refrigeration Condensing Unit VC-10 (52-2624)
Control Room HVAC Refrigeration Condensing Unit VC-11 (52-2524)
Control Room Ventilation Main Supply Fan V-95 (52-2529)
Control Room Ventilation Main Supply Fan V-96 (52-2629)
Motor Control Center MCC7 (52-1103)
Motor Control Center MCC8 (52-1201)
Instrument Air Compressor C-2A (52-1106)
Instrument Air Compressor C-2B (52-1207)
Instrument Air Compressor C-2C (52-1107)
Containment Air Cooler Recirculation Fan V-1A (52-1208)
Containment Air Cooler Recirculation Fan V-2A (52-1209)
Containment Air Cooler Recirculation Fan V-3A (52-1210)
Containment Air Cooler Recirculation Fan V-4A (52-1108)
Charging Pump P-55A (52-1205)
Charging Pump P-55B (52-1206)
Charging Pump P-55C (52-1105)
Main Exhaust Fan V-6A (52-1215)
Main Exhaust Fan V-6B (52-1111)
Breaker 52-1118 (Bus 11 to Bus 12 x-tie)
Breaker 52-1217 (Bus 12 to Bus 11 x-tie)

The following relays were evaluated for the impact of the change in the ESF test frequency. All relays were evaluated as impacted by the change in ESF testing frequency. The probabilities for all relays were evaluated at 18 and 36 month intervals. Common cause failure of the relay was evaluated by using an aggregate event to represent the probability of 1 of X relays on either bus failing to actuate resulting in a load shed failure of both buses.

2.4KV BUS 1C & 480V BUS 11 UV & LOAD SHED 194-108
2.4KV BUS 1C & 480V BUS 11 UV & LOAD SHED 94-1909
2.4KV BUS 1C & 480V BUS 11 UV & LOAD SHED 94-1109A
2.4KV BUS 1C & 480V BUS 11 UV & LOAD SHED 94-1109B
2400V BUS 1C UNDERVOLTAGE AUXILIARY RELAY 127-1/X1
2400V BUS 1C UNDERVOLTAGE AUXILIARY RELAY 127-1/X2
2400V BUS 1C UNDERVOLTAGE AUXILIARY RELAY 127-7/X1
2400V BUS 1C UNDERVOLTAGE AUXILIARY RELAY 127-7/X2
2400 V BUS 1C UV TIME DELAY RELAY 162-153
2400 V BUS 1C TIME DELAY AUXILIARY RELAY 162-153/X1
2400 VOLT BUS 1C UNDERVOLTAGE RELAY 127-1
2400 VOLT BUS 1C UNDERVOLTAGE RELAY 127-7
2.4KV BUS 1D & 480V BUS 12 UV & LOAD SHED 194-211
2.4KV BUS 1D & 480V BUS 12 UV & LOAD SHED 94-2013
2.4KV BUS 1D & 480V BUS 12 UV & LOAD SHED 94-1213A
2.4KV BUS 1D & 480V BUS 12 UV & LOAD SHED 94-1213B
2400V BUS 1C UNDERVOLTAGE AUXILIARY RELAY 127-2/X1
2400V BUS 1C UNDERVOLTAGE AUXILIARY RELAY 127-2/X2
2400V BUS 1C UNDERVOLTAGE AUXILIARY RELAY 127-8/X1
2400V BUS 1C UNDERVOLTAGE AUXILIARY RELAY 127-8/X2
2400 V BUS 1D UV. TIME DELAY RELAY 162-154
2400 V BUS 1D TIME DELAY AUXILIARY RELAY 162-154/X1
2400 VOLT BUS 1D UNDERVOLTAGE RELAY 127-2
2400 VOLT BUS 1D UNDERVOLTAGE RELAY 127-8

The following is a listing of component groupings for which common cause is applied in the PSA. None of the probabilities for these groups were changed as a result of the evaluation in the change in the ESF test frequency (except as noted above).

AFW System
- Pumps
- Flow Control Valves
- Control Logic
- Pump Breakers
- Check Valves
- Pump Low Flow Switches

Atmospheric Dump Valves

CCW System
- Pump
- Pump Breakers
- Pump Discharge Check Valves

DC Power
- Station Batteries
- Station Battery Chargers

Diesel Generators

Diesel Generator Output Breakers

Diesel Generator Room HVAC
- Fans
- Temperature Switches

Diesel Generator Fuel Oil Supply
- Solenoid Valves
- Level Switches

Fire Protection System
- Pumps
- Diesel Fire pump Batteries
- Pump Discharge Check Valves

Charging System
- Pumps
- Pump Breakers
- Check Valves
- Motor Operated Valves

High Pressure Injection System
- Pumps
- Pump Breakers
- Motor-Operated Valves
- Check Valves
- Pump Suction Subcooling Valves

Instrument Air System
- Compressors
- Compressor Breakers
- Solenoid Valves

Low Pressure Injection/Shutdown Cooling System
- Pumps
- Pump Breakers
- Motor-Operated Valves
- Check Valves

Main Feedwater System

- Feedwater Regulating Valves
- Feedwater Stop Valves

Primary Coolant System
- Primary Coolant Pumps
- Pressurizer Spray Valves
- PORVs

AC Power System
- Inverters
- Breakers by functional group (or included in systems with component groups)
- Transformers by function or location

High Pressure Air System
- Compressors

Actuation Logic
- Sequencers
- CHP Relays
- Load Shed Relays
- SIS Relays
- SISX Relays
- RAS Relays

Containment Spray System
- Pumps
- Pump Breakers
- Spray Valves
- Check Valves

Safety Injection Tanks
- Check Valves

Service Water System
- Pumps
- Pump Breakers
- Check Valves
- Air Operated Valves

Containment Air Coolers
- Fans
- Fan Breakers
- Air-Operated Valves
- Solenoid Valves

Engineered Safety Features Common Components
- Air-Operated Valves
- Check Valves
- Motor-Operated Valves
- Solenoid Valves
- Sump Screens

Waterford Unit 3:

COMPONENT ID	COMPONENT DESCRIPTION	Affected?
4KV-EBKR-2A-1	4KV circuit breaker (A2 bus), 2A-1	no
4KV-EBKR-2A-4	4KV circuit breaker (A2 bus), 2A-4	no
4KVEBKR2A-8	2A BUS TIE TO SWITCHGEAR 3A	yes
4KV-EBKR-2B-1	4KV circuit breaker (A2 bus), 2B-1	no
4KV-EBKR-2B-4	4KV circuit breaker (A2 bus), 2B-4	no

COMPONENT ID	COMPONENT DESCRIPTION	Affected?
4KVEBKR2B-8	2B BUS TIE TO SWITCHGEAR 3B	yes
4KVEBKR3A-11	3A BUS TIE TO SWITCHGEAR 2A	yes
4KVEBKR3B-11	3B BUS TIE TO SWITCHGEAR 2B	yes
7KV-EBKR-1A-1	7KV circuit breaker (A1 bus), 1A-1	no
7KV-EBKR-1A-4	7KV circuit breaker (A1 bus), 1A-4	no
7KV-EBKR-1B-1	7KV circuit breaker (A1 bus), 1B-1	no
7KV-EBKR-1B-4	7KV circuit breaker (A1 bus), 1B-4	no
ACCEBKR315A-10H	ACCW WET COOLING TOWER A FAN 1 ACCEBKR315A-10H	yes
ACCEBKR315A-10M	ACCW WET COOLING TOWER A FAN 2 ACCEBKR315A-10M	yes
ACCEBKR315A-11H	ACCW WET COOLING TOWER A FAN 3 ACCEBKR315A-11H	yes
ACCEBKR315A-11M	ACCW WET COOLING TOWER A FAN 4 ACCEBKR315A-11M	yes
ACCEBKR315A-12H	ACCW WET COOLING TOWER A FAN 5 ACCEBKR315A-12H	yes
ACCEBKR315A-12M	ACCW WET COOLING TOWER A FAN 6 ACCEBKR315A-12M	yes
ACCEBKR315A-13H	ACCW WET COOLING TOWER A FAN 7 ACCEBKR315A-13H	yes
ACCEBKR315A-13M	ACCW WET COOLING TOWER A FAN 8 ACCEBKR315A-13M	yes
ACCEBKR315B-10H	ACCW WET COOLING TOWER B FAN 1 ACCEBKR315B-10H	yes
ACCEBKR315B-10M	ACCW WET COOLING TOWER B FAN 2 ACCEBKR315B-10M	yes
ACCEBKR315B-11H	ACCW WET COOLING TOWER B FAN 3 ACCEBKR315B-11H	yes
ACCEBKR315B-11M	ACCW WET COOLING TOWER B FAN 4 ACCEBKR315B-11M	yes
ACCEBKR315B-12H	ACCW WET COOLING TOWER B FAN 5 ACCEBKR315B-12H	yes
ACCEBKR315B-12M	ACCW WET COOLING TOWER B FAN 6 ACCEBKR315B-12M	yes
ACCEBKR315B-13H	ACCW WET COOLING TOWER B FAN 7 ACCEBKR315B-13H	yes
ACCEBKR315B-13M	ACCW WET COOLING TOWER B FAN 8 ACCEBKR315B-13M	yes
ACCEBKR3A-3	ACCW PUMP A ACCEBKR3A-3	yes
ACCEBKR3B-6	ACCW PUMP B ACCEBKR3B-6	yes
ACCMFAN0001A	Wet cooling tower fan, ACCMFAN0001A	no
ACCMFAN0001B	Wet cooling tower fan, ACCMFAN0001B	no
ACCMFAN0002A	Wet cooling tower fan, ACCMFAN0002A	no
ACCMFAN0002B	Wet cooling tower fan, ACCMFAN0002B	no
ACCMFAN0003A	Wet cooling tower fan, ACCMFAN0003A	no
ACCMFAN0003B	Wet cooling tower fan, ACCMFAN0003B	no
ACCMFAN0004A	Wet cooling tower fan, ACCMFAN0004A	no
ACCMFAN0004B	Wet cooling tower fan, ACCMFAN0004B	no
ACCMFAN0005A	Wet cooling tower fan, ACCMFAN0005A	no
ACCMFAN0005B	Wet cooling tower fan, ACCMFAN0005B	no
ACCMFAN0006A	Wet cooling tower fan, ACCMFAN0006A	no
ACCMFAN0006B	Wet cooling tower fan, ACCMFAN0006B	no
ACCMFAN0007A	Wet cooling tower fan, ACCMFAN0007A	no
ACCMFAN0007B	Wet cooling tower fan, ACCMFAN0007B	no
ACCMFAN0008A	Wet cooling tower fan, ACCMFAN0008A	no
ACCMFAN0008B	Wet cooling tower fan, ACCMFAN0008B	no
ACCMFLT0001A	Wet cooling tower A strainer	no
ACCMFLT0001B	Wet cooling tower B strainer	no
ACCPMP0001 A	ACCW pump A	no
ACCPMP0001 B	ACCW pump B	no
BAMEBKR312A-2D	BORIC ACID MAKEUP PUMP B BAMEBKR312A-2D	yes
BAMEBKR313A-3D	BORIC ACID MAKEUP PUMP A BAMEBKR313A-3D	yes
BAMMPMP0001A	boric acid makeup pump A	no
BAMMPMP0001B	boric acid makeup pump B	no
BAMMVAAA113A	boric acid makeup tank gravity feed, BAM113 A	no

COMPONENT ID	COMPONENT DESCRIPTION	Affected?
BAMMVAAA113B	boric acid makeup tank gravity feed, BAM113 B	no
CB IPT6701-SMA	Containment high pressure (CIAS, MSIS, SIAS) Channel A	no
CB IPT6701-SMB	Containment high pressure (CIAS, MSIS, SIAS) Channel B	no
CB IPT6701-SMC	Containment high pressure (CIAS, MSIS, SIAS) Channel C	no
CB IPT6701-SMD	Containment high pressure (CIAS, MSIS, SIAS) Channel D	no
CB IPT6702-SMA	Containment high-high pressure (CSAS) Channel A	no
CB IPT6702-SMB	Containment high-high pressure (CSAS) Channel B	no
CB IPT6702-SMC	Containment high-high pressure (CSAS) Channel C	no
CB IPT6702-SMD	Containment high-high pressure (CSAS) Channel D	no
CC EBKR315A-1F	DRY COOLING TOWER A FAN 1 CC EBKR315A-1F	yes
CC EBKR315A-1M	DRY COOLING TOWER A FAN 2 CC EBKR315A-1M	yes
CC EBKR315A-2F	DRY COOLING TOWER A FAN 3 CC EBKR315A-2F	yes
CC EBKR315A-2M	DRY COOLING TOWER A FAN 4 CC EBKR315A-2M	yes
CC EBKR315A-3F	DRY COOLING TOWER A FAN 5 CC EBKR315A-3F	yes
CC EBKR315A-3M	DRY COOLING TOWER A FAN 6 CC EBKR315A-3M	yes
CC EBKR315A-4F	DRY COOLING TOWER A FAN 7 CC EBKR315A-4F	yes
CC EBKR315A-4M	DRY COOLING TOWER A FAN 8 CC EBKR315A-4M	yes
CC EBKR315A-5F	DRY COOLING TOWER A FAN 9 CC EBKR315A-5F	yes
CC EBKR315A-5M	DRY COOLING TOWER A FAN 10 CC EBKR315A-5M	yes
CC EBKR315A-7F	DRY COOLING-TOWER A FAN 11 CC EBKR315A-7F	yes
CC EBKR315A-7M	DRY COOLING TOWER A FAN 12 CC EBKR315A-7M	yes
CC EBKR315A-8F	DRY COOLING TOWER A FAN 13 CC EBKR315A-8F	yes
CC EBKR315A-8M	DRY COOLING TOWER A FAN 14 CC EBKR315A-8M	yes
CC EBKR315A-9F	DRY COOLING TOWER A FAN 15 CC EBKR315A-9F	yes
CC EBKR315B-1F	DRY COOLING TOWER B FAN 1 CC EBKR315B-1F	yes
CC EBKR315B-1M	DRY COOLING TOWER B FAN 2 CC EBKR315B-1M	yes
CC EBKR315B-2F	DRY COOLING TOWER B FAN 3 CC EBKR315B-2F	yes
CC EBKR315B-2M	DRY COOLING TOWER B FAN 4 CC EBKR315B-2M	yes
CC EBKR315B-3F	DRY COOLING TOWER B FAN 5 CC EBKR315B-3F	yes
CC EBKR315B-3M	DRY COOLING TOWER B FAN 6 CC EBKR315B-3M	yes
CC EBKR315B-4F	DRY COOLING TOWER B FAN 7 CC EBKR315B-4F	yes
CC EBKR315B-4M	DRY COOLING TOWER B FAN 8 CC EBKR315B-4M	yes
CC EBKR315B-5F	DRY COOLING TOWER B FAN 9 CC EBKR315B-5F	yes
CC EBKR315B-5M	DRY COOLING TOWER B FAN 10 CC EBKR315B-5M	yes
CC EBKR315B-7F	DRY COOLING TOWER B FAN 11CC EBKR315B-7F	yes
CC EBKR315B-7M	DRY COOLING TOWER B FAN 12 CC EBKR315B-7M	yes
CC EBKR315B-8F	DRY COOLING TOWER B FAN 13 CC EBKR315B-8F	yes
CC EBKR315B-8M	DRY COOLING TOWER B FAN 14 CC EBKR315B-8M	yes
CC EBKR315B-9F	DRY COOLING TOWER B FAN 15 CC EBKR315B-9F	yes
CC EBKR3A-2	COMPONENT COOLING WATER PUMP A CC EBKR3A-2	yes
CC MFAN0001A	Dry cooling tower fan, CC MFAN0001A	no
CC MFAN0001B	Dry cooling tower fan, CC MFAN0001B	no
CC MFAN0002A	Dry cooling tower fan, CC MFAN0002A	no
CC MFAN0002B	Dry cooling tower fan, CC MFAN0002B	no
CC MFAN0003A	Dry cooling tower fan, CC MFAN0003A	no
CC MFAN0003B	Dry cooling tower fan, CC MFAN0003B	no
CC MFAN0004A	Dry cooling tower fan, CC MFAN0004A	no
CC MFAN0004B	Dry cooling tower fan, CC MFAN0004B	no
CC MFAN0005A	Dry cooling tower fan, CC MFAN0005A	no
CC MFAN0005B	Dry cooling tower fan, CC MFAN0005B	no

COMPONENT ID	COMPONENT DESCRIPTION	Affected?
CC MFAN0006A	Dry cooling tower fan, CC MFAN0006A	no
CC MFAN0006B	Dry cooling tower fan, CC MFAN0006B	no
CC MFAN0007A	Dry cooling tower fan, CC MFAN0007A	no
CC MFAN0007B	Dry cooling tower fan, CC MFAN0007B	no
CC MFAN0008A	Dry cooling tower fan, CC MFAN0008A	no
CC MFAN0008B	Dry cooling tower fan, CC MFAN0008B	no
CC MFAN0009A	Dry cooling tower fan, CC MFAN0009A	no
CC MFAN0009B	Dry cooling tower fan, CC MFAN0009B	no
CC MFAN0010A	Dry cooling tower fan, CC MFAN0010A	no
CC MFAN0010B	Dry cooling tower fan, CC MFAN0010B	no
CC MFAN0011A	Dry cooling tower fan, CC MFAN0011A	no
CC MFAN0011B	Dry cooling tower fan, CC MFAN0011B	no
CC MFAN0012A	Dry cooling tower fan, CC MFAN0012A	no
CC MFAN0012B	Dry cooling tower fan, CC MFAN0012B	no
CC MFAN0013A	Dry cooling tower fan, CC MFAN0013A	no
CC MFAN0013B	Dry cooling tower fan, CC MFAN0013B	no
CC MFAN0014A	Dry cooling tower fan, CC MFAN0014A	no
CC MFAN0014B	Dry cooling tower fan, CC MFAN0014B	no
CC MFAN0015A	Dry cooling tower fan, CC MFAN0015A	no
CC MFAN0015B	Dry cooling tower fan, CC MFAN0015B	no
CC-EBKR-3AB-4	CCW Pump AB Breaker	no
CC-EBKR3B-8	COMPONENT COOLING WATER PUMP B CC EBKR3B-8	yes
CC-MPMP0001 A	CCW pump A	no
CC-MPMP0001 AB	CCW pump AB	no
CC-MPMP0001 B	CCW pump B	no
CCMVAAA125-A	Containment Spray Header Isolation, 125A	no
CCMVAAA125-B	Containment Spray Header Isolation, 125B	no
CCMVAAA128-A	Containment Spray Header Riser Check, 128A	no
CCMVAAA128-B	Containment Spray Header Riser Check, 128B	no
CCSEBKR317A-2M	CONTAINMENT COOLING FAN A CCSEBKR317A-2M	yes
CCSEBKR317A-3M	CONTAINMENT COOLING FAN C CCSEBKR317A-3M	yes
CCSEBKR317B-2M	CONTAINMENT COOLING FAN D CCSEBKR317B-2M	yes
CCSEBKR317B-3M	CONTAINMENT COOLING FAN B CCSEBKR317B-3M	yes
CCSMFAN0003 A	Containment fan cooler A	no
CCSMFAN0003 B	Containment fan cooler B	no
CCSMFAN0003 C	Containment fan cooler C	no
CCSMFAN0003 D	Containment fan cooler D	no
CDCEBKR31A-8B	CEDM COOLING FAN A CDCEBKR31A-8B	yes
CDCEBKR31A-9B	CEDM COOLING FAN C CDCEBKR31A-9B	yes
CDCEBKR31B-8B	CEDM COOLING FAN B CDCEBKR31B-8B	yes
CDCEBKR31B-9B	CEDM COOLING FAN D CDCEBKR31B-9B	yes
CEDEBKR32A 6A	MG Set A output brkr	no
CEDEBKR32B 6A	MG Set B output brkr	no
CHWEBKR311A-5M	CHILLED WATER PUMP A CHWEBKR311A-5M	yes
CHWEBKR311B-5M	CHILLED WATER PUMP B CHWEBKR311B-5M	yes
CHWMPMP0001-A	chilled water pump A	no
CHWMPMP0001-AB	chilled water pump AB	no
CHWMPMP0001-B	chilled water pump B	no
CMUEBKR311A-4M	CCW MAKEUP PUMP A CMUEBKR311A-4M	yes
CMUEBKR311B-4M	CCW MAKEUP PUMP B CMUEBKR311B-4M	yes

COMPONENT ID	COMPONENT DESCRIPTION	Affected?
CS EBKR3A-6	CONTAINMENT SPRAY PUMP A CS EBKR3A-6	yes
CS EBKR3B-5	CONTAINMENT SPRAY PUMP B CC EBKR3B-5	yes
CS MPMP0001 A	Containment Spray motor driven pump A	no
CS MPMP0001 B	Containment Spray motor driven pump B	no
CS-EBKR-3A-6	Containment Spray motor driven A pump breaker	no
CS-EBKR-3B-5	Containment Spray motor driven pump B breaker	no
CVCEBKR31A-5C	Charging Pump A	yes
CVCEBKR31AB-4C	CHARGING PUMP AB CVCEBKR31AB-4C	yes
CVCEBKR31B-6C	Charging Pump B CVCEBKR31B-6C	yes
CVCISV0216A	pressurizer aux. spray valve, 216A	no
CVCISV0216B	pressurizer aux. spray valve, 216B	no
CVCMPMP0001A	charging pump A	no
CVCMPMP0001AB	charging pump AB	no
CVCMPMP0001B	charging pump B	no
CVCMVAAA194A	charging pumps discharge check, CVC 194 A	no
CVCMVAAA194AB	charging pumps discharge check, CVC 194 AB	no
CVCMVAAA194B	charging pumps discharge check, CVC 194 B	no
CVCMVAAA217A	pressurizer aux. spray check, 217A	no
CVCMVAAA217B	pressurizer aux. spray check, 217B	no
DC EBATA	DC Battery A	no
DC EBATAB	DC Battery AB	no
DC EBATB	DC Battery B	no
DC EBC1A	Battery Charger 1A	no
DC EBC1AB	Battery Charger 1AB	no
DC EBC1B	Battery Charger 1B	no
DC EBC2A	Battery Charger 2A	no
DC EBC2AB	Battery Charger 2AB	no
DC EBC2B	Battery Charger 2B	no
DC-EBKR-311A-14D	Battery Charger A1 Breaker	yes
DC-EBKR-311AB-2D	Battery Charger AB1 Breaker	yes
DC-EBKR-311AB-2H	Battery Charger AB2 Breaker	yes
DC-EBKR-311B-14D	Battery Charger B1 Breaker	yes
DC-EBKR-312A-3B	Battery Charger A2 Breaker	yes
DC-EBKR-312B-3B	Battery Charger B2 Breaker	yes
EFWEBKR3A-10	EMERGENCY FEEDWATER PUMP A EFWEBKR3A-10	yes
EFWEBKR3B-2	EMERGENCY FEEDWATER PUMP B EFWEBKR3B-2	yes
EFWMPMP0001 A	EFW pump A	no
EFWMPMP0001 AB	EFW pump AB	no
EFWMPMP0001 B	EFW pump B	no
EFWMVAAA207 A	EFW Pump Suction Line Root Valve, EFW 207 A	no
EFWMVAAA207 AB	EFW Pump Suction Line Root Valve, EFW 207 A/B	no
EFWMVAAA207 B	EFW Pump Suction Line Root Valve, EFW 207 B	no
EFWMVAAA2191 A	EFW Header Discharge Check 2191A	no
EFWMVAAA2191 B	EFW Header Discharge Check 2191B	no
EFWMVAAA223 A	EFW Header Backup Flow Control, EFW 223 A & B, 224 A & B, 228 A & B, 229 A & B	no
EFWMVAAA223 B	EFW Header Backup Flow Control, EFW 223 A & B, 224 A & B, 228 A & B, 229 A & B	no
EFWMVAAA224 A	EFW Header Primary Flow Control, EFW 223 A & B, 224 A & B, 228 A & B, 229 A & B	no
EFWMVAAA224 B	EFW Header Primary Flow Control, EFW 223 A & B, 224 A & B, 228 A & B, 229 A & B	no
EFWMVAAA228 A	EFW Header Primary Isolation, EFW 223 A & B, 224 A & B, 228 A & B, 229 A & B	no
EFWMVAAA228 B	EFW Header Primary Isolation, EFW 223 A & B, 224 A & B, 228 A & B, 229 A & B	no

COMPONENT ID	COMPONENT DESCRIPTION	Affected?
EFWMVAAA229 A	EFW Header Backup Isolation, EFW 223 A & B, 224 A & B, 228 A & B, 229 A & B	no
EFWMVAAA229 B	EFW Header Backup Isolation, EFW 223 A & B, 224 A & B, 228 A & B, 229 A & B	no
EG MDSL0001 A	Emergency diesel generator A	no
EG MDSL0001 B	Emergency diesel generator B	no
EGAEBKR312A-4F	EDG 3A-S AIR COMPR #1 EGA-EBKR-312A-4F	yes
EGAEBKR312A-5F	EDG 3A-S AIR COMPR #2 EGA-EBKR-312A-5F	yes
EGAEBKR312B-4F	EDG 3B-S AIR COMPR #1 EGA-EBKR-312B-4F	yes
EGAEBKR312B-5F	EDG 3B-S AIR COMPR #2 EGA-EBKR-312B-5F	yes
EG-EBKR312A-4D	EDG 3A-S SPACE HTR ES-EBKR-312A-4D	yes
EG-EBKR312B-4D	EDG 3B-S SPACE HTR ES-EBKR-312B-4D	yes
EG-EBKR-3A-14	EDG A output Breaker	no
EG-EBKR-3B-15	EDG B output Breaker	no
EGLEBKR-312A-5D	EG A LUBE OIL HEATER EGL-EBKR-312A-5D	yes
EGLEBKR312B-5D	EG B LUBE OIL HEATER EGL-EBKR-312B-5D	yes
ESFERELK716-A	CIAS actuation relay, ESFERELK716-A	no
ESFERELK716-B	CIAS actuation relay, ESFERELK716-B	no
ESFERELK718-A	RAS actuation relay, ESFERELK718-A	no
ESFERELK718-B	RAS actuation relay, ESFERELK718-B	no
ESFERELK719-A	EFAS1 actuation relay, ESFERELK719-A	no
ESFERELK719-B	EFAS1 actuation relay, ESFERELK719-B	no
ESFERELK721-A	EFAS2 actuation relay, ESFERELK721-A	no
ESFERELK721-B	EFAS2 actuation relay, ESFERELK721-B	no
ESFERELK816-A	SIAS actuation relay, ESFERELK816-A	no
ESFERELK816-B	SIAS actuation relay, ESFERELK816-B	no
ESFERELK818-A	CSAS actuation relay, ESFERELK818-A	no
ESFERELK818-B	CSAS actuation relay, ESFERELK818-B	no
ESFERELK819-A	MSIS actuation relay, ESFERELK819-A	no
ESFERELK819-B	MSIS actuation relay, ESFERELK819-B	no
FP EBKR31AB-5A	MOTOR DRIVEN FIRE PUMP FP EBKR31AB-5A	yes
FW MPMP0001-A	Turbine driven feed water pump A	no
FW MPMP0001-B	Turbine driven feed water pump B	no
FW MVAAA162-A	Feed water control bypass valve FW-162 A	no
FW MVAAA162-B	Feed water control bypass valve FW-162 B	no
HT-EBKR-312A-5M	CVCS SYSTEM A TRACING HT-EBKR-312A-5M	yes
HT-EBKR-312B-5M	CVCS SYSTEM B TRACING HT-EBKR-312B-5M	yes
HVCEBKR311A-4H	CR AIR HANDLING UNIT A HVCEBKR311A-4H	yes
HVCEBKR311A-5B	CR EMERGENCY FLTR UNIT A HVCEBKR311A-5B	yes
HVC-EBKR311A-5D	CONT RM TOILET EXH FAN A E-34 HVC-EBKR-311A-5D	yes
HVCEBKR311B-4H	CR AIR HANDLING UNIT B HVCEBKR311B-4H	yes
HVCEBKR311B-5B	CR EMERGENCY FLTR UNIT B HVCEBKR311B-5B	yes
HVC-EBKR311B-5D	CONT RM TOILET EXH FAN B E-34 HVC-EBKR-311B-5D	yes
HVCEBKR313A-4F	CR HVAC EQUIPMENT ROOM AHU A HVCEBKR313A-4F	yes
HVCEBKR313B-4F	CR HVAC EQUIPMENT ROOM AHU B HVCEBKR313B-4F	yes
HVFEBKR314A-1G	FHB EQUIP RM EXH FAN E-21A HVFEBKR314A-1G	yes
HVFEBKR314A-1J	FHB EFU E-35A HVFEBKR314A-1J	yes
HVFEBKR314B-1G	FHB EQUIP RM EXH FAN E-21B HVFEBKR314B-1G	yes
HVFEBKR314B-1J	FHB EFU E-35B HVFEBKR314B-1J	yes
HVREBKR311A-14B	EFW PUMP ROOM A AHU HVR-EBKR-311A-14B	yes
HVREBKR311A-14K	CHARGING PUMP ROOM A AHU HVREBKR311A-14K	yes
HVREBKR311A-3H	RCA HVAC EQUIP RM EXHAUST FAN A HVREBKR311A-3H	yes

COMPONENT ID	COMPONENT DESCRIPTION	Affected?
HVREBKR311A-5	CVAS EXHAUST FAN A HVREBKR311A-5F	yes
HVREBKR311AB-5B	CCW PUMP ROOM AB AHU A HVREBKR311AB-5B	yes
HVREBKR311AB-5H	CHARGING PUMP ROOM AB AHU A HVREBKR311AB-5H	yes
HVREBKR-311B-14B	EFW PUMP ROOM B AHU HVR-EBKR-311B-14B	yes
HVREBKR311B-14K	CHARGING PUMP ROOM B AHU HVREBKR311B-14K	yes
HVREBKR311B-5F	CVAS EXHAUST FAN B HVREBKR311B-5F	yes
HVREBKR313A-2M	RCA HVAC EQUIPMENT ROOM AHU A HVREBKR313A-2M	yes
HVREBKR313A-4D	SDC HX A RM COOLER AH-3A HVREBKR313A-4D	yes
HVREBKR313A-4K	SI PUMP ROOM A AHU-2 (SA) HVREBKR313A-4K	yes
HVREBKR313A-4M	CCW PUMP ROOM A AHU HVREBKR313A-4M	yes
HVREBKR313A-5D	CCW HX A RM COOLER AH-24A HVREBKR313A-5D	yes
HVREBKR313A-5K	SI PUMP ROOM A AHU-2 (SC) HVREBKR313A-5K	yes
HVREBKR313B-4D	SDC HX B RM COOLER AH-3B HVREBKR313B-4D	yes
HVREBKR313B-4K	SI PUMP ROOM B AHU 1B HVREBKR313B-4K	yes
HVREBKR313B-4M	CCW PUMP ROOM B AHU HVREBKR313B-4M	yes
HVREBKR313B-5D	CCW HX B RM COOLER AH-24B HVREBKR313B-5D	yes
HVREBKR313B-5K	SI PUMP ROOM B AHU-2 (SD) HVREBKR313B-5K	yes
HVREBKR3A-7	RAB NORMAL EXHAUST FAN A HVREBKR3A-7	yes
HVREBKR3B-13	RAB NORMAL EXHAUST FAN B HVREBKR3B-13	yes
HVRMAHU0028A	room cooling to ccw pump A room	no
HVRMAHU0028AB	room cooling to ccw pump AB room from A train	no
HVRMAHU0028B	room cooling to ccw pump B room	no
HVRMAHU0030	room cooling to ccw pump AB room from B train	no
HVRMAHU0034A	room cooling to safeguards pump room A	no
HVRMAHU0034AB	room cooling to safeguards pump room AB	no
HVRMAHU0034B	room cooling to safeguards pump room B	no
HVRMAHU0036A	room cooling to safeguards pump room A	no
HVRMAHU0036B	room cooling to safeguards pump room B	no
HVRMAHU0038A	room cooling to efw pump A	no
HVRMAHU0038B	room cooling to efw pump B	no
HVRMAHU0040A	room cooling to charging pump A room	no
HVRMAHU0040AB	room cooling to charging pump AB room from A train	no
HVRMAHU0040B	room cooling to charging pump B room	no
HVRMAHU0042AB	room cooling to charging pump AB room from B train	no
HVRMFAN0025-A	diesel generator A exhaust fan	no
HVRMFAN0025-B	diesel generator B exhaust fan	no
IA MCMP0001 A	Instrument air and Station Air compressors	no
IA MCMP0001 B	Instrument air and Station Air compressors	no
IA MFLT0001 A	Instrument Air A Inlet Air filter	no
IA MFLT0001 B	Instrument Air B Inlet Air filter	no
IA MFLT0002 A	Instrument Air A After filter	no
IA MFLT0002 B	Instrument Air B After filter	no
IA-EBKR31A-9A	INST AIR COMPRESSOR A IA EBKR31A-9A	yes
IA-EBKR31B-9A	INST AIR COMPRESSOR B IA EBKR31B-9A	yes
ID-EBKR311A-14F	SUPS MC NORMAL SUPPLY ID-EBKR-311A-14F	yes
ID-EBKR311A-3M	SUPS A BYPASS SUPPLY ID-EBKR-311A-3M	yes
ID-EBKR-311AB-3H	SUPS AB NORMAL SUPPLY ID-EBKR-311AB-3H	yes
ID-EBKR-311B-14F	SUPS MD NORMAL SUPPLY ID-EBKR-311B-14F	yes
ID-EBKR312A-2B	SUPS MA NORMAL SUPPLY ID-EBKR-312A-2B	yes
ID-EBKR312A-2F	SUPS A NORMAL SUPPLY ID-EBKR-312A-2F	yes

COMPONENT ID	COMPONENT DESCRIPTION	Affected?
ID-EBKR312B-2B	SUPS MB NORMAL SUPPLY ID-EBKR-312B-2B	yes
ID-EBKR312B-2F	SUPS 3B (Norm Feeder)	yes
ID-EBKR313A-2B	SUPS MC BYPASS SUPPLY ID-EBKR-313A-2B	yes
ID-EBKR313A-4H	SUPS MA BYPASS SUPPLY ID-EBKR-313A-4H	yes
ID-EBKR313B-2B	SUPS MD BYPASS SUPPLY ID-EBKR-313B-2B	yes
ID-EBKR313B-3H	SUPS B BYPASS SUPPLY ID-EBKR-313B-3H	yes
ID-EBKR313B-4H	SUPS MB BYPASS SUPPLY ID-EBKR-313B-4H	yes
ID-EBKR31A-8C	COMPUTER SUPS NORMAL SUPPLY	yes
ID-EBKR31AB-3B	COMPUTER SUPS BYPASS SUPPLY	yes
ID-EMT-A	safety 390 bus transformer	no
ID-EMT-B	safety 391 bus transformer	no
ID-EUPS-A	Static Inverter A	no
ID-EUPS-B	Static Inverter B	no
ID-EUPS-MA	Static Inverter MA	no
ID-EUPS-MB	Static Inverter MB	no
ID-EUPS-MC	Static Inverter MC	no
ID-EUPS-MD	Static Inverter MD	no
MS MVAAA401 A	EFW PUMP AB Steam Supply, MS 401 A	no
MS MVAAA401 B	EFW PUMP AB Steam Supply, MS 401 B	no
MS MVAAA402 A	EFW Pump AB Steam Supply Check, MS 402 A	no
MS MVAAA402 B	EFW Pump AB Steam Supply Check, MS 402 B	no
RC IPT102-A	Pressurizer pressure (CIAS, SIAS) Channel A	no
RC IPT102-B	Pressurizer pressure (CIAS, SIAS) Channel B	no
RC IPT102-C	Pressurizer pressure (CIAS, SIAS) Channel C	no
RC IPT102-D	Pressurizer pressure (CIAS, SIAS) Channel D	no
RFREBKR311A-2M	ESSENTIAL CHILLER A OIL PUMP RFR-EBKR-311A-2M	yes
RFREBKR311B-2M	ESSENTIAL CHILLER B OIL PUMP RFR-EBKR-311B-2M	yes
RFREBKR3A-9	ESSENTIAL CHILLER A RFREBKR3A-9	yes
RFREBKR3B-14	ESSENTIAL CHILLER B RFREBKR3B-14	yes
RFRMCHL0001-A	Essential Chiller A	no
RFRMCHL0001-B	Essential Chiller B	no
RFRMCHL0001-C	Essential Chiller C	no
SA MCMP0001 A	Instrument air and Station Air compressors	no
SA MCMP0001 B	Instrument air and Station Air compressors	no
SA MCMP0001 C	Instrument air and Station Air compressors	no
SA MFLT0001 A	Station Air A Inlet Air filter	no
SA MFLT0001 B	Station Air B Inlet Air filter	no
SA MFLT0001 C	Station Air C Inlet Air filter	no
SA MFLT0002 A	Station Air A After filter	no
SA MFLT0002 B	Station Air B After filter	no
SA MFLT0002 C	Station Air C After filter	no
SBVEBKR31A-5B	SBV EXHAUST FAN A SBVEBKR31A-5B	yes
SBVEBKR31B-5B	SBV EXHAUST FAN B SBVEBKR31B-5B	yes
SG ILT1113-A	Steam generator 1 level (EFAS) Channel A	no
SG ILT1113-B	Steam generator 1 level (EFAS) Channel B	no
SG ILT1113-C	Steam generator 1 level (EFAS) Channel C	no
SG ILT1113-D	Steam generator 1 level (EFAS) Channel D	no
SG ILT1123-A	Steam generator 2 level (EFAS) Channel A	no
SG ILT1123-B	Steam generator 2 level (EFAS) Channel B	no
SG ILT1123-C	Steam generator 2 level (EFAS) Channel C	no

COMPONENT ID	COMPONENT DESCRIPTION	Affected?
SG ILT1123-D	Steam generator 2 level (EFAS) Channel D	no
SG IPT1013-A	Steam generator 1 pressure (CIAS, SIAS) Channel A	no
SG IPT1013-B	Steam generator 1 pressure (CIAS, SIAS) Channel B	no
SG IPT1013-C	Steam generator 1 pressure (CIAS, SIAS) Channel C	no
SG IPT1013-D	Steam generator 1 pressure (CIAS, SIAS) Channel D	no
SG IPT1023-A	Steam generator 2 pressure (CIAS, SIAS) Channel A	no
SG IPT1023-B	Steam generator 2 pressure (CIAS, SIAS) Channel B	no
SG IPT1023-C	Steam generator 2 pressure (CIAS, SIAS) Channel C	no
SG IPT1023-D	Steam generator 2 pressure (CIAS, SIAS) Channel D	no
SI EBKR 3A-5	LPSI Pump A Breaker	no
SI EBKR 3B-4	LPSI Pump B Breaker	no
SI ILT305A	RWSP level low (RAS) Channel A	no
SI ILT305B	RWSP level low (RAS) Channel B	no
SI ILT305C	RWSP level low (RAS) Channel C	no
SI ILT305D	RWSP level low (RAS) Channel D	no
SI MPMP0001-A	Low Pressure Safety Injection Pump A	no
SI MPMP0001-B	Low Pressure Safety Injection Pump B	no
SI MVAAA107 A	Refueling Water Storage Pool Outlet Check, SI-107 A	no
SI MVAAA107 B	Refueling Water Storage Pool Outlet Check, SI-107 B	no
SI MVAAA1071 A	LPSI pump suction check, SI-1071 A	no
SI MVAAA1071 B	LPSI pump suction check, SI-1071 B	no
SI MVAAA108 A	LPSI pump suction check, SI-108 A	no
SI MVAAA108 B	LPSI pump suction check, SI-108 B	no
SI MVAAA122 A	LPSI pump discharge check, SI-122 A	no
SI MVAAA122 B	LPSI pump discharge check, SI-122 B	no
SI MVAAA138-A	LPSI Flow Control MOV SI-138 A	no
SI MVAAA138-B	LPSI Flow Control MOV SI-138 B	no
SI MVAAA139-A	LPSI Flow Control MOV SI-139 A	no
SI MVAAA139-B	LPSI Flow Control MOV SI-139 B	no
SI MVAAA142 A	LPSI Header Inside Containment Check, SI-142 A	no
SI MVAAA142 B	LPSI Header Inside Containment Check, SI-142 B	no
SI MVAAA143 A	LPSI Header Inside Containment Check, SI-143 A	no
SI MVAAA143 B	LPSI Header Inside Containment Check, SI-143 B	no
SI MVAAA201A	HPSI suction check valves SI-201 A	no
SI MVAAA201B	HPSI suction check valves SI-201 B	no
SI MVAAA207 A	HPSI discharge check valve, SI-207 B	no
SI MVAAA207 AB	HPSI discharge check valve, SI-207 AB	no
SI MVAAA207 B	HPSI discharge check valve, SI-207 A	no
SI MVAAA225 A	HPSI HDR A Flow Control SI-225 A	no
SI MVAAA225 B	HPSI HDR B Flow Control SI-225 B	no
SI MVAAA226 A	HPSI HDR A Flow Control SI-226 A	no
SI MVAAA226 B	HPSI HDR B Flow Control SI-226 B	no
SI MVAAA227 A	HPSI HDR A Flow Control SI-227 A	no
SI MVAAA227 B	HPSI HDR B Flow Control SI-227 B	no
SI MVAAA228 A	HPSI HDR A Flow Control SI-228 A	no
SI MVAAA228 B	HPSI HDR B Flow Control SI-228 B	no
SI MVAAA241	SI HEADER CHECK VALVE 241	no
SI MVAAA242	SI HEADER CHECK VALVE 242	no
SI MVAAA243	SI HEADER CHECK VALVE 243	no
SI MVAAA244	SI HEADER CHECK VALVE 244	no

COMPONENT ID	COMPONENT DESCRIPTION	Affected?
SI MVAAA335 A	Safety Injection Header Check, SI-335 A	no
SI MVAAA335 B	Safety Injection Header Check, SI-335 B	no
SI MVAAA336 A	Safety Injection Header Check, SI-336 A	no
SI MVAAA336 B	Safety Injection Header Check, SI-336 B	no
SI MVAAA602 A	Safety Injection Sump Outlet Header Isolation, SI-602 A	no
SI MVAAA602 B	Safety Injection Sump Outlet Header Isolation, SI-602 B	no
SI MVAAA604 A	SI-604 A, SI SUMP OULTET HEADER CHECK	no
SI MVAAA604 B	SI-604 B, SI SUMP OULTET HEADER CHECK	no
SI-EBKR3A-4	HIGH PRESSURE SAFETY INJECTION PUMP A SI EBKR3A-4	yes
SI-EBKR-3A-4	HPSI Pump A Breaker	no
SI-EBKR3A-5	LOW PRESSURE SAFETY INJECTION PUMP A SI EBKR3A-5	yes
SI-EBKR-3AB-3	HPSI Pump AB Breaker	no
SI-EBKR3B-3	HIGH PRESSURE SAFETY INJECTION PUMP B SI EBKR3B-3	yes
SI-EBKR-3B-3	HPSI Pump B Breaker	no
SI-EBKR3B-4	LOW PRESSURE SAFETY INJECTION PUMP B SI EBKR3B-4	yes
SI-MPMP-0002 A	High Pressure Safety Injection Pump A	no
SI-MPMP-0002 B	High Pressure Safety Injection Pump B	no
SI-MPMP-0002 C	High Pressure Safety Injection Pump AB	no
SI-MSMP-0001 A	SI SUMP A Strainer	no
SI-MSMP-0001 B	SI SUMP B Strainer	no
SSDEBKR312A-8M	MCC-312A SAFETY TO NONSAFETY TIE	yes
SSDEBKR312B-8M	MCC-312B SAFETY TO NONSAFETY TIE	yes
SSDEBKR313A-8M	MCC-313A SAFETY TO NONSAFETY TIE	yes
SSDEBKR313B-8M	MCC-313B SAFETY TO NONSAFETY TIE	yes
SSDEBKR314A-2M	MCC-314A SAFETY TO NONSAFETY TIE	yes
SSDEBKR314B-2M	MCC-314B SAFETY TO NONSAFETY TIE	yes
SSD-EMT-21A	non-safety 2A bus transformer	no
SSD-EMT-21B	non-safety 2B bus transformer	no
SSD-EMT-315A	safety 315 A bus transformer	no
SSD-EMT-315B	safety 315 B bus transformer	no
SSD-EMT-31A	safety 31 A bus transformer	no
SSD-EMT-31B	safety 31 B bus transformer	no
ST-EMTA	SUT transformer A	no
ST-EMTB	SUT transformer B	no
SVSEBKR311A-13B	SWITCHGEAR A AUX AIR HANDLING UNIT SVSEBKR311A-13B	yes
SVSEBKR311A-13K	BATTERY ROOM AB EXHAUST FAN A SVSEBKR311A-13K	yes
SVSEBKR-311A-14H	BATTERY ROOM EXH FAN A SVS-EBKR-311A-14H	yes
SVSEBKR311A-2F	BATTERY ROOM A EXHAUST FAN A SVSEBKR311A-2F	yes
SVSEBKR311A-2H	COMPUTER BATTERY ROOM EXH FAN A SVSEBKR311A-2H	yes
SVSEBKR311A-3F	BATTERY ROOM B EXHAUST FAN A SVSEBKR311A-3F	yes
SVSEBKR311B-13B	SWITCHGEAR B AUX AIR HANDLING UNIT SVSEBKR311B-13B	yes
SVSEBKR311B-13K	BATTERY ROOM AB EXHAUST FAN B SVSEBKR311B-13K	yes
SVSEBKR311B-14H	BATTERY ROOM EXH FAN B SVS-EBKR-311B-14H	yes
SVSEBKR311B-2F	BATTERY ROOM A EXHAUST FAN B SVSEBKR311B-2F	yes
SVSEBKR311B-2H	COMPUTER BATTERY ROOM EXH FAN B SVSEBKR311B-2H	yes
SVSEBKR311B-3F	BATTERY ROOM B EXHAUST FAN B SVSEBKR311B-3F	yes
SVSEBKR313A-5H	SWITCHGEAR A MAIN AIR HANDLING UNIT SVSEBKR313A-5H	yes
SVSEBKR313B-5H	SWITCHGEAR B MAIN AIR HANDLING UNIT SVSEBKR313B-5H	yes
SVSMAHU0002A	room cooling to cable spreading room AH30, SVSMAHU0002A	no
SVSMAHU0002B	room cooling to cable spreading room AH30, SVSMAHU0002B	no