August 30, 2005

Mr. Gordon Bischoff, Manager
Owners Group Program Management Office
Westinghouse Electric Company
P.O. Box 355
Pittsburgh, PA 15230-0355

SUBJECT: SUMMARY OF TELECONFERENCE WITH THE WESTINGHOUSE OWNERS GROUP (WOG) REGARDING WOG TOPICAL REPORT WCAP-15830-P, REVISION 0, "STAGGERED INTEGRATED ESF TESTING" (TAC NO. MB9131)

Dear Mr. Bischoff:

In response to the Westinghouse Owners Group (WOG) Letter No. WOG-05-353, dated July 27, 2005, "Response to the NRC Draft Denial of WCAP-15830, Staggered Integrated ESF [engineered safety feature] Testing," a senior managers level teleconference was held on August 16, 2005, between the Nuclear Regulatory Commission (NRC) and the WOG. The NRC staff's technical reviewers of WCAP-15830 also participated in the teleconference. The purpose of the teleconference was to discuss technical aspects of the NRC staff concerns regarding the review of WCAP-15830. These concerns were provided to the WOG via an e-mail from Girija Shukla (NRC) to Steven DiTommaso (WOG) dated June 15, 2005, "Staff comments on our review of WCAP-15830-P, 'Staggered Integrated ESF Testing.' " WCAP-15830 has both risk-informed and deterministic bases, and the NRC staff concerns related to both of these aspects were discussed in the teleconference.

During the discussion, it became evident that there is a need to have separate technical discussions between the WOG technical staff and the NRC staff to address NRC staff technical concerns regarding WCAP-15830. The following were agreed upon by both the WOG and the NRC staff:

1. Another teleconference will be held between the WOG technical staff and the NRC staff to ensure that the WOG has a full understanding of the NRC staff technical concerns regarding WCAP-15830.

2. Subsequent to the teleconference, a public meeting will be held between the WOG technical staff and the NRC staff to discuss the WOG's proposed responses to the NRC staff technical concerns.

3. After the public meeting, the WOG will formally submit its final response to the staff technical concerns. Based on the WOG's responses, the NRC staff will complete its review of WCAP-15830.

To assist the WOG in preparing for the forthcoming teleconference and public meeting, a detailed discussion of the NRC staff's concerns regarding WCAP-15830 is enclosed. These concerns have already been provided to the WOG via an e-mail from Girija Shukla (NRC) to Thomas Laubham (WOG) dated August 24, 2005. A non-proprietary version of the document, which is also enclosed, will be made available to the public through the NRC's Agencywide

Documents Access Management System. The NRC Project Manager for the Westinghouse Owners Group, Mr. Girija Shukla, will contact you separately to discuss scheduling of the teleconference and public meeting.

If you have any questions, please contact Mr. Girija Shukla at 301-415-8439.

Sincerely,

/RA/
Daniel S. Collins, Acting Chief, Section 2
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Project No. 694

Enclosures: 1. Proprietary Detailed Discussion
2. Non-Proprietary Detailed Discussion

cc w/encls:
Mr. James A. Gresham, Manager
Regulatory Compliance and Plant Licensing
Westinghouse Electric Company
P.O. Box 355
Pittsburgh, PA 15230-0355

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DETAILED DISCUSSION OF THE NRC STAFF CONCERNS REGARDING WESTINGHOUSE OWNERS GROUP TOPICAL REPORT WCAP-15830-P, REVISION 0, "STAGGERED INTEGRATED ESF TESTING"

1.0 NRC STAFF CONCERNS REGARDING RISK-INFORMED ASPECTS OF WCAP-15830

WCAP-15830 provides a methodology for assessing the risk impacts associated with staggered integrated engineered safety feature (ESF) testing. It also provides the application of the methodology to four nuclear power plants (Calvert Cliffs, Units 1 and 2, Fort Calhoun Station, Palisades Nuclear Power Plant, and Waterford Steam Electric Station, Unit 3). The NRC staff's concerns regarding the methodology are discussed below.

1.1 Agreement with Risk-Informed Decisionmaking Principles

1.1.1 Key Principle #1 - Proposed Change Meets the Current Regulations

The first key principle of risk-informed decisionmaking states that "The proposed change meets the current regulations unless it is explicitly related to a requested exemption or rule change." However, as discussed in Section 2.0 below, the application does not explain how the proposed change will continue to meet the requirements of General Design Criterion (GDC) 17, GDC 18, acceptance guidelines of Regulatory Guide (RG) 1.9, RG 1.108, and Institute of Electrical and Electronics Engineers (IEEE) Std 387, or request exemption or rule change. Explanation of how regulatory requirements will be met is needed.

1.1.2 Key Principle #2 - Proposed Change Is Consistent With Defense-in-Depth Philosophy

The second key principle of risk-informed decisionmaking states that "The proposed change is consistent with the defense-in-depth philosophy." However, the staff review shows that WCAP-15830 does not provide adequate details to demonstrate that the proposed change is consistent with the defense-in-depth philosophy. Explanation is required on how defense-in-depth will continue to be provided.

1.1.3 Key Principle #3 - Proposed Change Maintains Sufficient Safety Margins

The third key principle of risk-informed decisionmaking states that "The proposed change maintains sufficient safety margins." However, the application does not explain how the proposed change will continue to meet the requirements of GDC 17, GDC 18, acceptance guidelines of RG 1.9, RG 1.108, and IEEE Std 387, or provide justification for deviations from these criteria. Explanation is required on how sufficient safety margins will be maintained.

1.1.4 Key Principle #4 - Proposed change Should Have Small Risk Increases

The fourth key principle of risk-informed decisionmaking states that "When proposed changes result in an increase in core damage frequency (CDF) or risk, the increases should be small and consistent with the intent of the Commission's Safety Goal Policy." The stated objective of WCAP-15380 is to demonstrate on a risk-informed basis that extending the test frequency for surveillance requirements typically addressed by integrated ESF testing results in a negligible increase in plant risk. This demonstration is based on the application of a risk-informed methodology that estimates the change in CDF and large early release frequency (LERF) due to the proposed test frequency changes at four plants. The methodology is intended to be applied at individual plants; it is not (nor is it intended to be) a methodology that provides a conservative or bounding analysis that applies to all of the affected plants.

In general, the methodology is acceptable, however, WCAP-15830 does not conclusively demonstrate that the adoption of staggered integrated ESF testing results in a negligible risk increase in all plants, because the methodology was only applied to four plants, and there is considerable variation in integrated ESF test procedures within the affected group of plants. Additional explanation is required on how the fourth key principle of risk-informed decisionmaking will be satisfied.

1.1.5 Key Principle #5 - Impact of Proposed Change Should be Monitored

The fifth key principle of risk-informed decisionmaking states that "The impact of the proposed change should be monitored using performance measurement strategies." WCAP-15830 does not contain explicit provisions that address this principle. The WOG expected each user of WCAP-15830 to include a description of how the impact of the proposed test frequency changes would be monitored, which makes the report incomplete for the staff review.

1.2 Agreement With RG 1.177 Guidance for Risk-Informed Test Frequency Changes

1.2.1 Identification of Test Frequencies to be Evaluated

Section 2.2 of WCAP-15830 identifies the specific surveillance requirements (SRs) that are addressed by the methodology provided in WCAP-15830.

1.2.2 Determination of Risk Contribution Associated with the Subject Test Frequencies

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The staff observes that the Category A-4 components are omissions in the baseline PRA that must be addressed in order to help ensure the risk evaluation of the proposed staggered integrated ESF testing regime is reasonably complete. WCAP-15830 provided an example of some of the omitted Category A-4 components identified during the application of the methodology to the four demonstration plants, which revealed an issue common to all of the units: the integrated ESF test is the sole test that verifies individual loads are shed on bus undervoltage. Failure to shed a load has a possible indirect effect on the plant standby electrical system and the emergency diesel generators (EDGs). Successful EDG operation and loading depend on the emergency buses being stripped on the undervoltage and then automatically re-loaded in accordance with the design loading sequence. Components that provide the load shed functions were not typically addressed in the PRA logic models and, hence, were designated as Category A-4 components. Some PRA logic models did include these components, which were then designated as Category A-3 components.

The identification of Category A-4 components may have ramifications beyond the proposed staggered integrated ESF testing regime. For example, the omission of components that provide the load-shedding function implies that some previous risk evaluations of EDG completion time extensions may be inadequate because not all failure modes of the EDGs were addressed. Therefore, the staff review shows that users of WCAP-15830 must reassess

previous risk-informed approvals to determine how the selective omission of the Category A-4 components affects the conclusions of their supporting risk evaluations. This staff position is consistent with Section 5.6 of the American Society of Mechanical Engineers (ASME) PRA Standard (ASME RA-S-2002), Addendum A as endorsed by RG 1.200.

WCAP-15830 recognizes that two different probabilistic modeling approaches may be used to quantify the probabilities of PRA logic model events involving failures to change state upon demand (e.g., "failure to start" and "failure to open"):

- The binomial failure model, which assumes that the failure-on-demand probability is constant (i.e., that it does not depend on the test frequency).

- The standby failure rate model, which assumes that the standby failure rate is constant (i.e., that it does not depend on the test frequency).

The staff observes that these probabilistic models were presumed to be applicable in the first PRA of nuclear power plants (WASH-1400, "Reactor Safety Study," which was issued in 1975), and have been widely used by nuclear power plant PRA practitioners ever since. The use of these two probabilistic models has been endorsed in Supporting Requirement DA-A2 of ASME-RA-S-2002, "Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications."

Since WCAP-15830 offers no justification that these probabilistic models remain appropriate when evaluating the risk increase associated with the proposed test frequency change and the WOG expected each user of WCAP-15830 to provide the justification on a plant-specific basis, this makes the report incomplete for the staff review.

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] The staff review shows that the treatment of CCF event probabilities in the WCAP-15830 methodology is consistent with the guidance contained in NUREG/CR-5485.

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Appendix A of NUREG-5485 provides a detailed explanation of the impact of the testing regime (staggered as compared to non-staggered) on the estimate of beta factors, which agrees with the explanation in WCAP-15830. In order to ensure that the plant is actually operated consistent with the assumptions made in WCAP-15830 concerning CCF event probabilities and, hence, that the PRA results for proposed test frequency change are meaningful, the staff review shows that WCAP-15830 must require immediate testing of all ESF trains if any failures are detected during the scheduled test of a given ESF train.

Section 4.5.3.3 of WCAP-15830 recommends the addition of basic events to PRA logic models to capture the impact of adopting a staggered ESF testing regime on the probabilities of CCFs involving standby failures. Specifically, each CCF event would be represented using a Boolean AND gate with three input events as follows:

- The first event represents the failure of a single component; the event's probability is the total component failure probability. Event probabilities quantified using the standby failure rate model are assumed to be directly proportional to the test frequency. Event probabilities quantified using the constant failure-on-demand model do not depend on the test frequency.

- The second event represents the CCF of similar components; its probability is the CCF beta factor (the conditional probability that all similar components fail given failure of any one of them) appropriate to the type of component represented by the first event.

- The third event is a dummy event; its probability equals 0.5, which represents the reduction in the CCF beta factor achieved by adopting a staggered ESF testing regime.

This modeling approach produces the correct impact on CDF and LERF. However, the staff observes that the addition of dummy events to capture the impact on CCF will perturb the importance measures produced by the PRA, which may be of concern during certain risk-informed applications (e.g., applications pertaining to 10 CFR 50.69). Therefore, WCAP-15830 does not provide sufficient information to demonstrate that use of such dummy events is appropriate.

1.2.3 Determination of Risk Impact from the Proposed Change to the Test Frequency

The following table provides the risk evaluations performed using WCAP-15830 methodology:
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These results are incomplete because the impact of adopting a staggered ESF testing regime on LERF was not provided for Palisades and the method used to assess LERF for Waterford needs further justification. In addition to these specific issues, the staff cannot generally accept or reject these results until its concerns about PRA technical adequacy are resolved.

1.2.4 Sensitivity and Uncertainty Evaluations

As stated in Section 2.2.5.3 of RG 1.174:

> In interpreting the results of a PRA, it is important to develop an understanding of the impact of a specific assumption or choice of model on the predictions of the PRA .... The impact of using alternative assumptions or models may be addressed by performing appropriate sensitivity studies, or they may be addressed using qualitative arguments, based on an understanding of the

contributors to the results and how they are impacted by the change in assumptions or models.

The WCAP-15830 methodology makes three key assumptions that heavily influence the PRA numerical results:

1. Certain components tested by the integrated ESF test may be reasonably represented in the PRA by using the standby failure rate model (i.e., the assumption that standby failure rates do not depend on the test frequency).

2. Certain components tested by the integrated ESF test may be reasonably represented in the PRA by using the binomial failure model (i.e., the assumption that failure-on-demand probabilities do not depend on the test frequency).

3. The adoption of a staggered testing regime reduces the potential for CCF by one-half (i.e., the assumption that CCF beta factors are reduced by one-half).

The methodology in WCAP-15830 does not contain provisions to perform sensitivity or uncertainty evaluations. The WOG expected each user of WCAP-15830 to provide the results of studies that assess the sensitivity of CDF and LERF to the above assumptions, which makes the report incomplete.

1.3 PRA Technical Adequacy

SRP Chapter 16.1 indicates that the quality of the PRA must be compatible with the safety implications of the TS change being requested and the role that the PRA plays in justifying that change. The bulk of WCAP-15830 concerns evaluations of the risk impacts associated with the proposed test frequency change for integrated ESF testing. There is minimal discussion about the impact of the proposed change on defense-in-depth and safety margins. Therefore, the risk evaluations play a major role in justifying the proposed test frequency change. Hence, emphasis needs to be placed on ensuring that the PRAs used to support the risk evaluations are technically adequate.

Section 2.3.2 of WCAP-15830 partially summarizes RG 1.174 and RG 1.177, but does not mention the sections in these regulatory guides that discuss PRA technical adequacy. The methodology proposed for evaluating the risk impacts of the proposed test frequency change is technical in nature, and does not contain explicit provisions to ensure that the PRAs are technically adequate. The WOG expected users of WCAP-15830 to address the issue of PRA technical adequacy, which makes the report incomplete:

The staff reviewed the discussions of PRA technical adequacy provided in the four applications of the WCAP-15830 methodology (for the Calvert Cliffs application, Sections A4.2, A4.3, and A4.4; for the Fort Calhoun application, Sections B4.2, B4.3, and B4.4; for the Palisades application, Sections C4.2 and C4.3; for the Waterford application, Sections D4.2, D4.3, and D4.4). The information provided lacks the detail needed by the staff to reach a conclusion that the PRA used to support the risk evaluation of the proposed test frequency change is technically adequate. Specifically:

1. Contrary to SRP Chapter 19.1, Section III.1.1, documentation of the intermediate results of the process was not provided. Specifically:

    a. The cause-effect relationships between the proposed test frequency change and the plant SSCs, operator actions, and plant operational characteristics were not identified, and

    b. The mapping of cause-effect relationships onto PRA model elements were not provided.

As a result, the staff cannot conclude that the process was correctly executed.

2. Contrary to SRP Chapter 19.1, no statements were provided that the PRA models had been revised to reflect any significant changes in design or operational practices (including operating procedures), and that the data used to estimate the parameters are current. In addition to the above information, the staff expects that a risk-informed submittal should also provide the following information:

    a. A description of the licensee's PRA updating process.

    b. Certification that the licensee has adequately addressed recent plant modifications and operational changes, which are not reflected in the current PRA model, that could have a significant impact on the PRA results of the specific application.

3. Contrary to SRP Chapter 19.1, Section IV.1, documentation of the significant peer review findings and progress made towards resolving them (or arguments that resolution of the findings is not needed) was not provided. As a result, the staff cannot conclude that the PRAs used to support the risk evaluations are technically adequate.

Summary of NRC Staff Concerns Regarding the Risk-Informed Aspects of WCAP-15830:

- The proposed methodology presented in WCAP-15830 does not appear to satisfy the five key principles of risk-informed decisionmaking contained in RG 1.174, and SRP Chapter 19.0.

- It is unclear how compliance with the guidance contained in RG 1.177 and SRP Chapter 16.1 concerning the risk evaluation of proposed test frequency changes is demonstrated.

- It is unclear how compliance with the guidance contained in RG 1.174, SRP Chapter 19.0, and SRP Chapter 19.1 is satisfied to demonstrate that the PRA used to support the risk evaluation of the proposed test frequency change is technically adequate, and that the adoption of staggered integrated ESF testing results in a negligible risk increase in all plants.

- An adequate basis for the proposed change that is generically applicable to all plants has not been provided. The WCAP-15830 methodology was applied to four plants only, and there is considerable variation in integrated ESF test procedures from one plant to another.

2.0 NRC STAFF CONCERNS REGARDING DETERMINISTIC ASPECTS OF WCAP-15830

The proposed change would permit performance on a staggered basis of the following SRs that are typically performed by the integrated ESF testing during every refueling outage:

SR 3.8.1.11 - EDG start verification on LOOP
SR 3.8.1.12 - EDG start verification on ESF actuation
SR 3.8.1.16 - Restoration of offsite power following LOOP
SR 3.8.1.18 - EDG load sequencer interval verification
SR 3.8.1.19 - EDG start verification on LOOP with ESF actuation

WCAP-15830 methodology is based on the premise that the effect of this change in test frequency on risk is negligible because the integrated ESF test is not the primary operability test for the majority of the components tested. Other surveillance procedures are performed on many of these components and functions at the same interval or more frequently. Therefore, there may be a considerable overlap between the integrated ESF test and other testing. In cases where the integrated ESF test is the sole test to demonstrate operability, a risk review and evaluation has been performed to confirm that the change in risk associated with extending the SR frequency is acceptable. The following explanation is a brief overview of the justification used in the report:

The operability of the EDG is assured by other frequently performed TS-required surveillances (monthly operability runs), the functional test required every 184 days, routine inspections, and regular preventative maintenance. Similarly, safety bus undervoltage (UV) relays and breaker trip functions are tested more frequently. The operability of safety-related pumps, fans, valves etc., is usually verified by quarterly TS surveillance tests. Safety injection actuation relays are also tested by other more frequent tests.

However, WCAP-15830 acknowledges that the integrated ESF and loss-of-offsite-power (LOOP) testing is the only test used to verify that: (1) the emergency buses are de-energized and loads are shed on a LOOP, (2) the EDG auto-starts on a LOOP and energizes permanently connected loads on the emergency buses and shutdown loads are automatically loaded via the sequencer, (3) the emergency and shutdown sequencer logic and timing functions of sequencers work correctly, and (4) the emergency loads are sequenced onto the emergency buses which are powered from the offsite power source on an ESF signal without LOOP. WCAP-15830 does not credit any other testing to perform these functions.

After reviewing the proposed change, the staff observes that WCAP-15830 does not explain how implementing the proposed change would be compatible with the following acceptance guidelines and criteria:

As recommended by Position 2a.(1) of RG 1.108, "Periodic Testing of Diesel Generators Used as Onsite Electric Power Systems at Nuclear Power Plants," SR 3.8.1.11 demonstrates the as-designed operation of the EDG during LOOP. This test verifies all actions required after a LOOP, including shedding of the nonessential loads and energization of the emergency buses and respective loads from the EDG. It further demonstrates the capability of the EDG to automatically achieve the required voltage and frequency within the specified time. The requirement to verify the connection and power supply of permanent and auto-connected loads is intended to satisfactorily show that the EDG logic would allow only the safe shutdown loads to be powered from the EDG.

As recommended by Position 2.2.6 of RG 1.9, "Selection, Design, Qualification, and Testing of Emergency Diesel Generator Units Used as Class 1E Onsite Electric Power Systems at Nuclear Power Plants," SR 3.8.1.12 demonstrates that the EDG automatically starts and achieves the required voltage and frequency within the specified time from the design-basis actuation signal (ESF signal) and operates for $5 minutes. It also ensures that permanently connected loads and emergency loads are energized from the offsite power system on an ESF signal without LOOP.

As recommended by RG 1.108, Position 2.a.(6), SR 3.8.1.16 ensures that the manual synchronization and automatic load transfer from the EDG to the offsite source can be accomplished and the EDG returns to ready-to-load status when offsite power is restored. It also ensures that the auto-start logic is reset to allow the EDG to reload if a LOOP subsequently occurs. The EDG is considered to be in ready-to-load status when the EDG is at rated speed and voltage, the output breaker is open and can receive the auto-close signal on bus UV, and load sequence timers are set.

SR 3.8.1.18 ensures that under accident and LOOP conditions, loads are sequentially connected to the bus by the sequencer. The sequencing logic controls the permissive and starting signals to motor breakers to prevent overloading of the EDGs due to high motor starting currents. The 10 percent load sequencing time interval tolerance ensures that enough time exists for the EDG to restore frequency and voltage before the next load is applied and that safety analysis assumptions regarding ESF equipment time delays are not violated.

As recommended by RG 1.108, Position 2.9.(2), SR 3.8.1.19 demonstrates EDG operation, during a LOOP in conjunction with an ESF actuation signal. In this event, the EDGs are required to supply the necessary power to ESF systems so that the design limits of the fuel, reactor coolant system pressure boundary and containment are not exceeded.

Additionally, RG 1.108, Position 2a, recommends that the above SRs be performed every 18 months (every refueling). This frequency takes into consideration unit conditions required for performing the surveillances and is intended to be consistent with the expected fuel cycle lengths. Therefore, the staff considers the current test frequency acceptable from a engineering judgment standpoint.

Further, RG 1.9 recommends that high reliability be designed into the EDGs and maintained throughout their service lifetime. This can be achieved by appropriate periodic testing. The periodic testing at a reasonable interval provides a basis for taking corrective actions needed to maintain high in-service reliability of installed EDGs. The database developed will assist ongoing monitoring of performance for all EDGs during service.

Institute of Electrical and Electronics Engineers (IEEE) Std 387-1984, "IEEE Standard Criteria for Diesel Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations," recommends that EDGs be periodically tested. RG 1.9 Regulatory Position C.2.3.2, "Surveillance Testing," and IEEE Std 387 Section 6.5, "Periodic Tests," require, among other tests, that SRs 3.8.1.11, 12, 16, and 19, be performed every refueling to demonstrate that the capability and reliability of the EDGs continue to satisfy the requirements of GDC 17 of 10 CFR Part 50, Appendix A.

IEEE 387 and RG 1.9 recommend that periodic refueling outage tests and monthly start and load tests be utilized to demonstrate that the EDG has adequate capacity and capability to perform its design function. The staff review shows that, as part of the licensing bases, refueling outage tests and the monthly start and load tests will demonstrate sufficient capacity and capability (assuming the offsite system is unavailable) to assure (1) that specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences and (2) that the core is cooled and containment integrity and other vital functions are maintained in the event of postulated accidents pursuant to the requirements of GDC 17.

EDGs are the major source of emergency ac power in the event of a LOOP. The reliability of EDGs has always been important to the NRC, but it became even more important after the power blackout event of August 14, 2003. The event highlighted the fact that the Nation's electric grid is no longer being operated in the manner envisioned when the grid was designed and constructed. An unreliable grid cannot ensure that the offsite power system (preferred power supply) is available to ensure the safe operation of nuclear power plants. As a result, the dependency on the EDGs has increased and the NRC has been paying more attention to the reliability of the EDGs.

WCAP-15830 states that the operability of EDG is assured by other frequently performed TS-required surveillance tests such as monthly testing, semiannual testing, and refueling outage testing. However, these tests simply demonstrate the ability and capacity of the EDG to supply power and are not intended to test the sequencer and EDG automatic start circuitry. Therefore, failures associated with the EDG automatic features of EDG, breaker, and sequencer are not detected during these tests. These surveillance tests are considered a partial demonstration of the EDG's capability and not representative of the EDG's performance under actual accident conditions with loss-of-offsite-power (LOOP). These tests do not test the type of demand that the EDG train (the diesel engine, generator, and the associated subsystems necessary to power and sequence loads on the safety-related bus) would experience during a LOOP. As a result, these tests cannot be used to assure the reliability of

the entire EDG train (EDG output breaker, and sequencer). Therefore, extending the test frequency of integrated ESF and LOOP tests would increase the likelihood of undetected failures in these components and functions.

The LOOP and integrated ESF testing are the only tests used to verify deenergization of the emergency buses and load shedding on a loss of offsite power. In addition, these tests are the primary tests for verifying that the EDG auto-starts on a LOOP, energizes permanently connected loads on the emergency buses, and auto-loads the shutdown loads via the sequencer. Disconnecting loads, starting of the EDG, and sequencing of load group test the availability of sufficient capacity and capability of EDGs to power their associated load group when needed (assuming the offsite system is not functioning). Additionally, an actuation signal from the undervoltage relays trips the offsite power supply breaker to the load group. Tripping the supply breaker isolates (and thus protects) the load group from the degraded and transient voltage conditions that may exist on the offsite power supply during a LOOP event. This protection, in accordance with the requirements of GDC 17, minimizes the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear power unit, the loss of power from the transmission network, or the loss of power from the onsite electric power supplies.

The requirement to verify the connection and power supply of permanent and auto-connected loads is intended to satisfactorily show the relationship of these loads to the EDG loading logic. Two distinct EDG loading logics are used by the sequencer: (a) one logic is for loading the safe shutdown loads in the event of a LOOP, and (b) the other logic is used to load the accident loads in the event of an ESF actuation with LOOP. RG 1.9, RG 1.108 and IEEE Std 387 recommend that the design features be tested on a periodic basis not to exceed every refueling outage to assure that appropriate loads are powered in a proper sequence without overloading the EDG. For many plants, the interval between the refueling outages has been extended from the 18 months to every 24 months, and the frequency of these surveillances has also been extended from every 18 months to every 24 months. Therefore, to further increase the test frequency to every other refueling would, in staff's view, further reduce the reliability of components and functions that are tested only by the integrated ESF and LOOP test. Further, increasing the test frequency would be inconsistent with RG 1.9, RG 1.108 and IEEE Std 387, to which licensees have previously committed. In addition, increasing the test frequency would not assure the reliability of the EDG and its associated subsystems since the increased time between testing would adversely impact the reliability of these systems.

As stated above, the monthly testing does not represent the type of demand that the EDG and its subsystems would experience during a UV condition. As a result, these tests do not represent the true reliability of the entire EDG train. Extending the test frequency of these SRs to every other refueling would provide very few data points from surveillance tests that would truly simulate an EDG train response to a safety bus UV condition, and represent the reliability of the whole EDG train over the life of the plant.

INEL-95/0035, "Emergency Diesel Generator Power System Reliability 1987-1993," points out that the nature of the failures experienced during actual demands differs somewhat from failures discovered during monthly testing. The EDG failures observed during actual demands appeared to be difficult for operators to diagnose and recover from. These EDG train failures were caused by problems with instrumentation and controls and electrical subsystems. The above operating experience indicates how important these periodic integrated ESF and LOOP tests are for detecting failures in the EDG train which can only be detected during the integrated ESF testing.

Summary of NRC Staff Concerns Regarding the Deterministic Aspects of WCAP-15830:

- The methodology presented in WCAP-15830 does not demonstrate: 1) sufficient capacity and capability of the EDGs to power their associated load group by disconnecting loads on a LOOP, starting of EDG and sequencing of loads to satisfy the requirements of GDC 17 and, 2) the EDG train is designed with a capability to test periodically the operability of the EDG train as a whole and under conditions as close to design as practicable to satisfy the requirements of GDC 18.

- WCAP-15830 also proposes to increase the test frequency of SR 3.8.1.18 and 3.8.1.16. However, the information provided in WCAP-15830 does not identify what other, more frequently performed surveillance tests verify the operability of many of the components and functions tested by the above surveillances.

- It is unclear how the proposed change is consistent with the acceptance guidelines of RG 1.9, RG 1.108, and IEEE Std 387.

- The proposed change could reduce the reliability of components and functions that are only tested by the integrated ESF tests.

- Extending the test frequency would increase the likelihood of undetected component and function failures.