May 9, 2001

Mr. Richard Bernier, Chairman
CE Owners Group
Mail Stop 7868
Arizona Public Service Company
Palo Verde Nuclear Generating Station
P.O. Box 52034
Phoenix, Arizona 85072-2034

SUBJECT: CE NPSD-1184, "JOINT APPLICATIONS REPORT FOR DC POWER SOURCE ALLOWED OUTAGE TIME EXTENSION," FINAL REPORT, CEOG TASK 849, MARCH 2000 (TAC NO. MA8517)

Dear Mr. Bernier:

By letter dated March 13, 2000, the Combustion Engineering Owners Group (CEOG) submitted CE NPSD-1184, "Joint Applications Report for DC Power Source Allowed Outage Time Extension," for NRC review and approval as part of a collaborative effort of participating CEOG members. The Joint Applications Report (JAR) presents the results of a probabilistic safety assessment (PSA) for extending the allowed outage time for dc power sources. The CEOG requested that the NRC safety evaluation specifically identify the acceptability of the PSA results to the plants referenced in the JAR and identify any additional information required to be provided when the plant-specific license amendment requests are submitted to the NRC for approval.

The staff has found that CE NPSD-1184 is acceptable for referencing in licensing applications for CE designed pressurized water reactors to the extent specified and under the limitations delineated in the report and in the associated NRC safety evalution. The safety evaluation defines the basis for acceptance of the report.

The enclosed safety evaluation concludes that the CEOG PSA results are below or comparable with the guideline values for allowed outage time (AOT) risk defined in the NRC's Standard Review Plan and are considered acceptable. For Waterford Steam Electric Station, Unit 3 (and San Onofre Nuclear Generating Station, Units 2 and 3), these PSA results provide an acceptable basis for extending the AOT from 2 to 24 hours subject to the acceptable implementation of conditions credited in the CEOG PSA into the plant specific technical specification change and addressing the following issues:

- Type of maintenance permitted during the AOT,
- Battery or battery charger operability during the AOT,
- Provisions for establishing non-common cause faults,
- Independence between onsite and offsite systems,
- Recovery of offsite power without dc control power,
- Battery charger capacity,
- Impact of parallel operating battery charger failure on the PSA results,
- PSA credited design and operational features,

a. Cross connecting between buses without dc control power
b. Adding loads without dc control power
c. Transferring dc power supply to vital instrumentation bus

- Implementation of Tier 2 program requirements,
- Configuration risk management program (CRMP) (i.e., Tier 3) or alternative method for meeting section (a)(4) of the maintenance rule,
- Probabilistic risk assessment quality,
- Monitoring of battery and charger performance in relation to the maintenance rule performance criteria, and
- Impact of external events on PSA results.

We do not intend to repeat our review of the matters described in the subject report, and found acceptable, when the report appears as a reference in license applications, except to ensure that the material presented applies to the specific plant involved. Our acceptance applies only to matters approved in the report.

In accordance with procedures established in NUREG-0390, the NRC requests that the CEOG publish an accepted version, within 3 months of receipt of this letter. The accepted version shall incorporate this letter and the enclosed safety evaluation between the title page and the abstract, and add an "-A" (designating "accepted") following the report identification symbol.

Should our criteria or regulations change so that our conclusions as to the acceptability of the report are invalidated, the CEOG and/or the applicants referencing the topical report will be expected to revise and resubmit their respective documentation, or submit justification for the continued applicability of the topical report without revision of their respective documentation.

Sincerely,

/RA/

Stuart A. Richards, Director
Project Directorate IV and Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Project No. 692

Enclosure: Safety Evaluation

cc w/encl: See next page

  a. Cross connecting between buses without dc control power
  b. Adding loads without dc control power
  c. Transferring dc power supply to vital instrumentation bus
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- Impact of external events on PSA results.

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO TOPICAL REPORT CE NPSD-1184,

"JOINT APPLICATIONS REPORT FOR DC POWER SOURCE

ALLOWED OUTAGE TIME EXTENSION"

PROJECT NO. 692

1.0 INTRODUCTION

In a Joint Applications Report (JAR) (References 1, 2, and 3), the Combustion Engineering Owners Group (CEOG) provided the technical basis (i.e., risk-informed and deterministic justifications) for changing the technical specification (TS) allowed outage times (AOTs) for the safety related 125 volt dc sources of the electrical power system at nuclear power plants with Combustion Engineering (CE) pressurized water reactor (PWR) designs. Specifically, the JAR provides the methodology and technical justification for the extension of the AOT for the battery or its respective charger(s) from the current 2 hour AOT to either an 8 or 24 hour AOT. The scope of this effort covers dc systems where the dc bus remains energized from either a battery or battery charger, one of which must be operable.

The proposed methodology presented in the JAR applies to the batteries and charger(s) for all CE-PWR designs. The specific applications of this methodology were presented for Waterford Steam Electric Station, Unit 3 (WSES-3) and San Onofre Nuclear Generating Station, Units 2 and 3 (SONGS 2 and 3); thus, our evaluation is primarily focused on the acceptability of the application of this methodology as it relates to the dc system design at WSES-3 and SONGS 2 and 3.

For CE units with two dc system trains (e.g., Arkansas Nuclear One Unit 2 [ANO-2]), failure of a single dc system train will render safety system loads and indications within the affected division inoperable. For units with three or four dc system trains (such as WSES-3 and SONGS 2 and 3), the unavailability of a single dc system train will not necessarily render all safety system loads and indications within the affected division inoperable. Because of this design difference, the WSES-3 and SONGS 2 and 3 units are less affected (from a risk perspective during the AOT) by the loss of a dc system train than other CE units with two dc system trains. Thus, for WSES-3 and SONGS 2 and 3, the JAR has presented the methodology and technical justification for the extension of the AOT from the current 2 hour AOT to a 24 hour AOT. The scope of the JAR covers a safety related 125 volt dc system train that remains energized by one of its power sources (i.e., an operable battery or battery charger). If the dc system train does not remain energized from an operable battery or battery charger, then the 2 hour AOT applies.

The objective of this evaluation, as requested by CEOG (Reference 4), is to identify the acceptability of the probabilistic safety assessment (PSA) results and to identify additional information required to be provided when the plant-specific license amendment requests are submitted to the NRC for approval. To accomplish this objective, Information Systems Laboratories (ISL), Inc. was commissioned to evaluate the JAR. The ISL evaluation (Reference 5) primarily focused on the conditions credited for assuring conformance of CEOG PSA results with guideline values for AOT risk defined in the NRC's Standard Review Plan. The CEOG PSA results for large early release frequency (LERF)-based single AOT risk [incremental conditional large early release probability (ICLERP)], (4.3E-09 for WSES-3 and 3.0E-08 for SONGS 2 and 3), are both below the guideline value of 5.0E-08 (Tier 1). The CEOG PSA results for core damage frequency (CDF)-based single AOT risk [incremental conditional core damage probability (ICCDP)], (6.1E-08 for WSES-3 and 7.6E-07 for SONGS 2 and 3), are either lower or comparable to the guideline value of 5E-07 (Tier 1).

The average change in CDF and LERF, respectively, for WSES-3 are 6.0E-08 per year and 4.3E-09 per year. Corresponding average changes in CDF and LERF for SONGS 2 and 3 are 7.6E-07 per year and 3.0E-08 per year.

The above average change in CDF and LERF values are based on an assumed average entry of once per year into the limiting condition for operation (LCO) for a duration of 24 hours. Because on-line maintenance of a safety related battery is a rare event, the values presented above are very conservative. SONGS 2 and 3 does not anticipate any corrective maintenance of a safety related dc power source that would utilize the full-extended AOT (based on a review of prior maintenance history). Also, SONGS 2 and 3 does not plan any changes to their planned preventive maintenance programs of the dc power source that would utilize the full extended AOT. WSES-3 anticipates entering the LCO and utilizing the extended AOT for only corrective maintenance activity, which is a rare event.

Regarding the recent (February 3, 2001) fire at SONGS Unit 3, the increase in the frequency of this event impacted the average SONGS living PRA model CDF and LERF (i.e., increase of 3.0E-6 per year and 6.0E-8 per year, respectively). The impact is a negligible contributor to the dc power source ICCDP and ICLERP (i.e., 1.0E-9 and 1.0E10, respectively). Thus, the impact of the recent fire event at SONGS Unit 3 on the dc power source AOT extension is insignificant.

For WSES-3 and SONGS 2 and 3:

- The single AOT risk for WSES-3 is lower than the guideline value. The low value is primarily attributed to the existence of redundancy in the number of chargers that serve each dc safety system train. Each of three dc system trains is equipped with two safety related battery chargers. The CEOG PSA model assumes both chargers would be connected to the affected dc train during the AOT and each charger has (or the combination of the two chargers have) sufficient capacity to meet 100 percent of the normal and transient loading requirements.

- The single AOT risk for SONGS 2 and 3 is comparable to the guideline value. This comparability occurs despite the fact that each dc system train is served by only one charger. The primary factors responsible for lower than expected AOT risk are the following design and operational features that are credited in the CEOG PSA model:

- the ability to cross-connect between the same train 4kV ac safety-related buses at SONGS 2 and 3;

- the four independent dc buses each of which feeds a redundant train of safety related primary and secondary plant instrumentation, one of which feeds the turbine-driven auxiliary feedwater pump (AFW), a second which feeds the Train A emergency safety features (ESF) equipment, and a third which feeds the Train B ESF equipment;

- the provisions for maintaining the battery or battery charger in an operable condition;

- the provisions for transferring the dc bus power supply to the 120 volt ac vital instrumentation bus to its secondary power supply; and

- the provisions for closing the motor-driven auxiliary feedwater pump 4kV breaker manually.

The JAR primarily conveys that the proposed AOT time extension of [24 hours] is applicable either (a) when one full capacity charger is operable and the battery is inoperable, or (b) when the battery is operable and the battery charger is inoperable. The current 2 hour AOT continues to apply when both the battery and battery charger are considered inoperable. The JAR identifies a number of conditions (and/or site specific design configurations) that must be met (or must be in place) for the risk informed arguments presented in the JAR to be valid. To identify additional information required to be provided when the plant-specific license amendment requests are submitted to the NRC for approval, these design and operational features credited in the CEOG PSA model (including the features described above for WSES-3 and SONGS 2 and 3) are the primary focus of the following discussion and evaluation. The evaluation of these features will be performed when the plant-specific application for TS change is submitted for approval.

2.0 DISCUSSION

Implementation of the proposed AOT time extension allows time for limited scope battery (or battery charger) repairs during power operation. Battery replacement takes longer than 24 hours. Also, testing (i.e., performance and discharge tests) take longer than 24 hours. Battery replacement and testing are thus considered beyond the scope of this proposed AOT extension. Limited discharge of the battery, however, due to an unplanned inoperability of the battery charger or due to planned testing may be within the scope of this proposed AOT extension. The intent of the JAR is to justify extending the AOT based on risk-informed arguments in order to perform short duration on-line repair of faulty dc electrical equipment. The JAR assumes that the proposed full allowed outage time is adequate for performing the majority of on-line maintenance for the dc power sources. For example, the JAR asserts that the correction of inter-cell or cable high resistance readings can be performed within 6 to 8 hours; battery cell replacement can be accomplished in 8 to 16 hours; and bolt replacements can be accomplished within 4 to 6 hours.

For a plant configuration where a battery or its associated battery charger is out-of-service, the JAR specifies that the unaffected division of ESF equipment (i.e., the division with the operable battery and associated charger) will remain fully functional. The JAR asserts:

- With a battery out-of-service on turbine trip, the unaffected division will have offsite and onsite ac and dc power sources available. ESF equipment in the unaffected division will be available.

- With a battery out-of-service on turbine trip with loss of offsite power, both divisions will lose their offsite ac power sources. Onsite ac and dc power sources and ESF equipment will be available in the unaffected division.

- With a charger out-of-service on turbine trip, offsite and onsite ac and dc power sources and ESF equipment in both divisions will be available.

- With a charger out-of-service on turbine trip with loss of offsite power, onsite ac and dc power sources and ESF equipment will be available in both divisions. The dc power source in the affected division (i.e., the division with the charger out-of-service) will become unavailable after some period of time.

- The condition or event which caused the inoperability is not present in the dc power subsystem of the unaffected division - the inoperability is not the result of a common condition or event.

- The switchyard dc system is independent and separate from the safety-related dc system. A single failure (or fault) of an ac load in the affected division (i.e., the division without dc control power) will cause loss of the affected division and ESF equipment but will not have an impact on ESF equipment (or cause loss of offsite power to the unaffected division).

On turbine trip with a battery out-of-service, the JAR asserts that the affected division (i.e., the division with the battery out of service) will (depending on the power system design) either (a) lose both offsite and onsite ac power supplies and the availability of the affected division's ESF equipment, or (b) retain the offsite ac power supply to ESF buses, retain safety-related dc control power through the battery charger, retain the availability of the onsite standby power supply, and thus retain the availability of ESF equipment in the affected division.

Non-recovery probabilities for loss of offsite power and station blackout scenarios have been developed and utilized in the CEOG PSA risk calculation. These probabilities are based on industry operating experiences that reflect the causes of losing offsite power. Once offsite ac power is recovered, plant equipment not previously failed is assumed available (in a probabilistic sense) to help in event mitigation. Typically for these scenarios, the available motor-driven EFW (or AFW) pumps may be started and the turbine-driven EFW (or AFW) pump (if available) will now have dc control power to function. Therefore, when offsite ac power is recovered within the allowable time frame, core damage is averted since the EFW (or AFW) system will restore the heat removal capability of the steam generators.

SONGS 2 and 3 has an installed design to manually cross-connect one unit's emergency diesel generator safety related bus to the same train of the other unit's emergency diesel generator safety related bus. Loss of control power to either cross-tie breaker will prevent cross-tying the units from the control room. At SONGS 2 and 3, the dependence of the cross-tie breakers on safety related dc power is included in the CEOG PSA risk calculation. The JAR asserts that the manual closure of the cross tie breakers can be accomplished.

The turbine-driven pump at the plant may be available and would function, so long as the steam generators are not overfilled. However, all AFW control is performed "blind", that is without available instrumentation (only after both batteries fail will all instrumentation be lost). This potential is mitigated in some CE designed PWRs by either increased redundancy in dc systems or additional plant features that make them more robust to a loss of offsite power event. At SONGS 2 and 3, the turbine-driven AFW pump can be operated manually without safety related 125 volt dc control power. At WSES-3, the turbine-driven EFW pump can also be operated to deliver makeup to the steam generators; however, WSES-3 does not currently credit this recovery action in the CEOG PSA risk model. After the battery is depleted, the turbine-driven EFW pump is modeled as failed.

If a safety related dc battery is taken out of service, the JAR assumes that the battery chargers are incapable of handling the transient loading requirements. The JAR assumes that the affected battery chargers will trip off-line following a reactor trip with loss of offsite power, causing a consequential loss of the affected dc bus.

- This assumption is not applicable to WSES-3. The battery chargers at WSES-3 (two battery chargers operating in parallel) are capable of handling the transient loading requirements for complicated transients. The JAR thus specifies that both battery chargers must be operable during the proposed 24 hour AOT extension when the battery is disconnected and/or when the battery is inoperable.

- This assumption is applicable to SONGS 2 and 3. The JAR asserts that the risk calculations are based on the battery charger operating in tandem with the battery (i.e., both the battery and its associated battery charger must be connected to the dc bus). The JAR thus specifies that the battery charger must be operable and connected to the battery and the battery must have sufficient capacity and capability to meet transient loading requirements.

The JAR states that the proposed AOT modifications described are consistent with the objectives and intent of the maintenance rule. The overall risk of performing maintenance will be controlled via implementation of a configuration risk management program (CRMP) consistent with the guidance set forth in Regulatory Guide (RG) 1.177, "An Approach for Plant-Specific, Risk-Informed Decision Making: Technical Specifications."

To meet section (a)(4) of the maintenance rule, licensees may use a "Configuration Risk Management Program." The CRMP provides a proceduralized risk-informed assessment to manage the risk associated with equipment inoperability. The CRMP applies to TS structures, systems, and components for which a risk-informed allowed outage time has been granted.

The CRMP should include the following elements:

- Provisions for the control and implementation of a Level 1, at power, internal events, probabilistic risk assessment (PRA)-informed methodology. The assessment shall be capable of evaluating the applicable plant configuration.

- Provisions for performing an assessment prior to entering the LCO condition for preplanned activities.

- Provisions for performing an assessment after entering the LCO for unplanned entry into the LCO.

- Provisions for assessing the need for additional actions after the discovery of additional equipment out-of-service conditions while in the LCO condition.

- Provisions for considering other applicable risk-significant contributors, such as Level 2 issues and external events, qualitatively or quantitatively.

The CRMP provides the necessary assurances that appropriate assessments of plant risk configurations using software, matrices, or PRA analyses augmented by appropriate engineering judgement, are sufficient to support the proposed AOT extension requests for batteries/chargers. In addition, the CRMPs are used to assess changes in core damage frequency resulting from applicable plant configurations. The CRMPs use software, matrices, or if necessary, the full PRA to aid in the risk assessment of online maintenance and to evaluate the change in risk from a component failure. The CRMP is used when a battery/charger is intentionally taken out-of-service for a planned activity excluding short duration activities. In addition, the CRMP is used for unplanned maintenance or repairs of the batteries/chargers. Implementation of the CRMP with the following provisions described below will be addressed when the plant-specific application for TS change is submitted.

The CRMP shall include the following key elements:

1. Key Element 1, Implementation of CRMP

   A use of the CRMP is to implement section (a)(4) of the maintenance rule (10 CFR 50.65) with respect to on-line maintenance for risk-informed TSs, with the following additions and clarifications:

   - The scope of the structures, systems, and components (SSCs) to be included in the CRMP will be those SSCs modeled in the licensee's plant PRA in addition to those SSCs considered risk-significant in accordance with the plant maintenance rule program that are not modeled in the PRA.

   - The CRMP is PRA informed and may be in the form of either a matrix, an on-line assessment, or a direct PRA assessment.

   - CRMP will be invoked for:

- ❏ Risk-informed inoperability: A risk assessment shall be performed prior to entering the LCO for preplanned activities. For unplanned entry into the LCO, a risk assessment will be performed in accordance with plant procedures, utilizing the maintenance configuration matrix, augmented by appropriate engineering judgement.

- ❏ Additional SSC inoperability and/or loss of functionality: When in the risk-informed completion time, if an additional SSC within the scope of the CRMP becomes inoperable or non-functional, a risk assessment shall be performed in accordance with plant procedures.

- Tier 2 commitments apply for planned maintenance only, but will be evaluated as part of the Tier 3 assessment for unplanned occurrences.

2. Key Element 2, Control and Use of the CRMP

- Plant modifications and procedure changes will be monitored, assessed, and dispositioned as part of the normal PRA update process.

  - ❏ Evaluation of changes in plant configuration or PRA model features can be dispositioned by implementing PRA model changes or by the qualitative assessment of the impact of the changes on the CRMP. This qualitative assessment recognizes that changes to the PRA take time to implement and that changes can be effectively compensated for without compromising the ability to make sound engineering judgements. Limitations of the CRMP are identified and understood for each specific completion time extension.

- Procedures exist for the control and application of CRMP, including description of the process when outside the scope of the CRMP.

3. Key Element 3, Level 1 Risk-Informed Assessment

- The CRMP is based on a Level 1, at power, internal events PRA model. The CRMP assessment may use any combination of quantitative and qualitative input. Quantitative assessments can include reference to software, pre-existing calculations, or new PRA analyses.

- Quantitative assessments should be performed whenever necessary for sound decision making.

- When quantitative assessments are not necessary for sound decisionmaking, or are beyond the scope of the PRA model, qualitative assessments will be performed. Qualitative assessments will consider applicable, existing insights from quantitative assessments previously performed.

4. Key Element 4

External events and Level 2 issues are treated qualitatively and/or quantitatively.

3.0 EVALUATION

The JAR conveys that the primary intent of the proposed AOT extension is to provide for the potential of on-line maintenance of a battery or its respective charger that is declared inoperable during power operation. A secondary intent of the proposed AOT extension could be to provide additional time to recharge a battery (and return it to operable status) because it may have been discharged for some period of time due to an unexpected inoperability of a battery charger or planned testing. If, within the two hour AOT for an inoperable battery and battery charger, one out-of-one (or two out-of-two) battery charger(s) can be returned to operable status, it appears that the JAR (in addition to its primary intent) may provide justification for a 24 hour AOT to recharge the battery and reestablish its operability following an unplanned battery charger failure or planned testing. However, this secondary intent has not been explicitly addressed and is thus considered outside the scope of the JAR. If applicable, the utilization of the 24 hour AOT extension (and its acceptability) to recharge the battery following discharge may be addressed as part of the site specific application for AOT extension.

Operability of the battery charger when the battery is inoperable has not been clearly defined in the JAR. Similarly, operability of the battery when the battery charger is inoperable has not been defined. Battery and battery charger operability will be addressed when the plant-specific application for TS change is submitted.

When a battery or its associated charger is inoperable, CEOG asserts that the risk justifications presented in the JAR are based, in part, on the redundant (unaffected) trains/divisions of safety-related dc power being fully functional. The JAR indicates that the proposed AOT extension for battery or charger inoperability is limited to non-common cause faults that would cause the affected electrical equipment to be taken out of service. The JAR specifies that common cause faults will be identified based on an engineering assessment performed by the CEOG member utility. The assessment will ensure that the condition (or event) which caused the inoperability is not common to redundant (or the unaffected) trains/divisions of safety-related power and that the unaffected trains/divisions are fully functional. The staff agrees that the proposed assessment provides a reasonable methodology for assuring the functionality of the redundant system and is therefore considered acceptable. The ISL evaluation recommended that each licensee be required to perform an operability determination of the unaffected redundant battery (or charger) shortly after entering the LCO, i.e., within 30 minutes. The implementation of this requirement for an operability determination will be addressed when the plant-specific application for TS change is submitted.

The JAR asserts that failure of an ac load without dc control power for protective relaying will result in loss of the affected ESF train. The JAR specifies that protective relaying in the switchyard would prevent loss of offsite power to ESF equipment in the unaffected division. The JAR, thus, asserts the plant-specific requirement for independence between onsite and offsite systems. The evaluation/implementation of this plant-specific design requirement will be addressed, as applicable, when the plant-specific application for TS change is submitted.

The JAR asserts that recovery of offsite power is based on industry operating experience and that once offsite ac power is recovered, plant equipment not previously failed is assumed available (in a probabilistic sense) to help in event mitigation. Once offsite power is restored, it is not clear how it will become available to ESF equipment without dc control power. The offsite supply breaker must be re-closed manually without dc control power. The time needed for re-closing the offsite supply breaker to Class 1E loads was not addressed in the JAR. The capability (and time available) for reestablishing ac power to ESF equipment from the offsite system following its recovery will be addressed when the plant-specific application for TS change is submitted.

The PSA for WSES-3 and ANO-2 assume that the capacity of the charger (or combined chargers for WSES-3) is large enough to provide enough energy to satisfy the normal and transient loading requirements. Verification of charger capacity will be addressed when the plant-specific application for TS change is submitted.

WSES-3 uses two battery chargers. The common cause failure of both chargers (primarily because each charger has less than 100 percent capacity) is not currently modeled as part of the risk calculation but will be included in a later update of the model. The impact of common cause failure of both chargers will be addressed when the plant-specific application for TS change is submitted.

For SONGS 2 and 3, the battery charger is not sized to handle transient loading requirements with the battery removed from service. Because of this limitation, the PSA appropriately assumes that both the battery and the charger are required for energizing the dc bus. This implies that if a reactor trip occurs during the AOT, the charger will also trip off-line leading to the loss of a dc bus. Despite this design feature, the PSA results for the AOT reported for SONGS 2 and 3 are low. This is because the SONGS 2 and 3 PSA credits emergency ac cross-connect capability between both units and several operational features that are not typical among other CE plants. Identification and implementation of PSA credited design and operational features will be addressed when the plant-specific application for TS change is submitted.

One of the principle requirements of the staff's risk-informed review process (i.e., Tier 2) is to establish whether each licensee is evaluating defense-in-depth when entering a LCO. The information provided in the JAR is not plant-specific in this regard. For example, the staff expects that licensees will have procedures forbidding switchyard work during an AOT, even though the switchyard dc system is independent and separate from the safety-related dc system. Implementation of Tier 2 capabilities will be addressed when the plant-specific application for TS change is submitted.

One of the principle requirements of the staff's risk-informed review process (i.e., Tier 3 - configuration risk management program), is to ensure that licensees have:

- a predetermined knowledge of high risk configurations (e.g., risk matrix, spectrum of probabilistic risk assessment (PRA) analyses, or an on-line safety monitor), or

- the ability to evaluate and compensate for configuration risks as they evolve.

Due to lack of plant-specific data in the JAR, licensees should furnish information in individual submittals on how Tier 3 (i.e., CRMP) [or alternate methodology for meeting section (a)(4) of the maintenance rule] will be implemented. Implementation will be addressed when the plant-specific application for TS change is submitted.

To ensure that specific PRAs are adequate to support the requested TS changes, each licensee should furnish information on PRA quality, including:

- Assurance that the PRA reflects the as-built, as-operated plant.

- Updates of the PRA since the last review cycle, including corrections of weaknesses identified by past reviews.

- Details of their peer review process, a summary of the peer review findings, and a discussion of the independence of internal reviews/reviewers.

- Description of PRA quality assurance methods.

- Results of reviews of pertinent accident sequences and cut sets for modeling adequacy and completeness (with respect to this application).

The licensee must provide specific documentation on PRA quality as described in RG 1.177. PRA quality will be addressed when the plant-specific application for TS change is submitted.

The staff expects the licensee to implement these TSs changes and other administratively controlled documentation in accordance with the three-tiered approach referenced above. The licensee will monitor battery and charger performance in relation to the maintenance rule performance criteria. Application of implementation and monitoring strategies will help to ensure that extension of the battery/charger AOT from 2 hours to 24 hours will not degrade operational safety over time and that the risk incurred when a battery/charger is taken out of service is acceptable.

4.0 CONCLUSION

The results of the CEOG PSA are below or comparable with the guideline values for AOT risk defined in the NRC's Standard Review Plan and are considered acceptable. For WSES-3 and SONGS 2 and 3, these PSA results provide an acceptable basis for extending the AOT from 2 to 24 hours subject to the acceptable implementation of conditions credited in the CEOG PSA into the plant-specific TS change and addressing the following issues.

- Type of maintenance permitted during the AOT,
- Battery or battery charger operability during the AOT,
- Provisions for establishing non-common cause faults,
- Independence between onsite and offsite systems,
- Recovery of offsite power without dc control power,
- Battery charger capacity,
- Impact of parallel operating battery charger failure on the PSA results,
- PSA credited design and operational features,

  - Cross connecting between buses without dc control power
  - Adding loads without dc control power
  - Transferring dc power supply to vital instrumentation bus
- Implementation of Tier 2 program requirements,
- CRMP (i.e., Tier 3) or alternative method for meeting section (a)(4) of the maintenance rule,
- PRA quality,
- Monitoring of battery and charger performance in relation to the maintenance rule performance criteria, and
- Impact of external events on PSA results.

5.0 REFERENCES

1. CE NPSD-1184, Rev. 00, "Joint Application Report for DC Power Source Allowed Outage Time Extension," Final Report, CEOG Task 849, March 2000, Prepared for the Combustion Engineering Owners Group by ABB C-E Nuclear Power, Inc. (ADAMS Accession Number ML003694375).

2. Response to Request for Additional Information concerning CEOG Topical Report CE NPSD-1184, "Joint Applications Report for DC Power AOT Extension," to NRC from Richard Bernier, Chairman, CE Owners Group, November 21, 2000, CEOG-00-327 (NRC Project No. 692, ADAMS Accession Number ML003771376).

3. Response to Request for Additional Information concerning CEOG Topical Report CE NPSD-1184, "Joint Applications Report for DC Power AOT Extension," to NRC from Richard Bernier, Chairman, CE Owners Group, April 10, 2001, CEOG-01-091 (NRC Project No. 692).

4. CE Owners Group Submittal of CE NPSD-1184, "Joint Applications Report for DC Power Source Allowed Outage Time Extension," March 2000, to NRC from Ralph Phelps, Chairman, CE Owners Group, CEOG-00-070, March 13, 2000. (NRC Project No. 692, ADAMS Accession Number ML003694338).

5. Technical Evaluation of the CEOG Joint Applications for DC Power Source Allowed Outage Time Extension, Prepared for the Office of Nuclear Reactor Regulation, NRC by Information Systems Laboratories, Inc., November 2000, ISL-NRC-00-010 (ADAMS Accession Number ML003776980).

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Date: May 9, 2001