Attachment

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION RELATED TO COMBUSTION ENGINEERING OWNERS GROUP JOINT APPLICATIONS REPORT CE NPSD-1045 PROJECT NO. 692

1. INTRODUCTION

1.1 Background

In April 1998, the Combustion Engineering Owners Group (CEOG) submitted, for staff review, a joint applications report (JAR) to modify the technical specifications (TS) of the containment spray system (CSS) [1]. The proposed changes would allow an extension of the allowed outage time (AOT) to 7 days for one CSS train. The JAR provided risk-informed and deterministic arguments to justify the AOT extension. It provided a summary of the results of risk assessments for all of the Combustion Engineering (CE) plants, except for the Calvert Cliffs units. The conclusions are applicable to all CE plants except for the Calvert Cliffs units.

The JAR also requested modifications to the low pressure safety injection (LPSI) system and CSS action statement end states. The staff did not complete its review of the modifications to the LPSI and CSS TS end states. Subsequent to the CEOG's submittal of the Joint Application Report, the industry undertook an initiative to review the end states of all of the TS Limiting Conditions for Operation (LCOs) in an effort to identify the most risk-beneficial end state for each LCO. The CEOG is leading this initiative. Therefore, the staff concluded, after discussion with the CEOG, that the review of all end state issues should be deferred until the industry submits its generic request for changes to TS end states. The staff believes that this deferral will provide the most efficient and effective review of all TS end state issues and will ensure that they are reviewed in a consistent manner.

The staff requested Scientech, Inc., to evaluate the joint applications report focusing on the risk-informed analyses performed to support the AOT extension requests. The findings document the results of the review activities performed for the risk-informed portion of the submittal. The review activities were based on the requirements of the statement of work (SOW) [2] and the guidance provided by the staff. The review was also carried out, to the extent consistent with the SOW, by the guidance contained in standard review plans (SRPs) [3,4] and regulatory guides [5,6], with the results largely extracted from the resulting Scientech Technical Evaluation Report [7].

1.2 Compliance of Review Process with SRPs

The general guidance for evaluating the technical bases for a risk-informed modification to a licensing basis is provided in Chapter 19 of the NRC Standard Review Plan (SRP) [3]. The specific guidance for the evaluation of changes to AOTs and surveillance test intervals is contained in Chapter 16.1 of the SRP [4]. Chapter 19 of the SRP requires the review activities to address five key principles that collectively govern the staff's risk-informed decision-making process. These principles are listed below and are depicted in Figure 1.

I. The proposed TS change meets the current regulations.
II. The impact of the proposed TS change is consistent with the defense-in-depth philosophy.
III. The proposed TS change maintains sufficient safety margin.
IV. The incremental risk associated with the proposed change is small and consistent with the intent of the Commission's Safety Goal Policy Statement [8]. (Since the AOTs are entered infrequently and are considered temporary in nature, the SRP for TS provides specific acceptance guidelines applicable only to AOT risk).
V. The licensee has the ability to monitor the impact of the proposed change using performance measurement strategies and then commits to such a program.

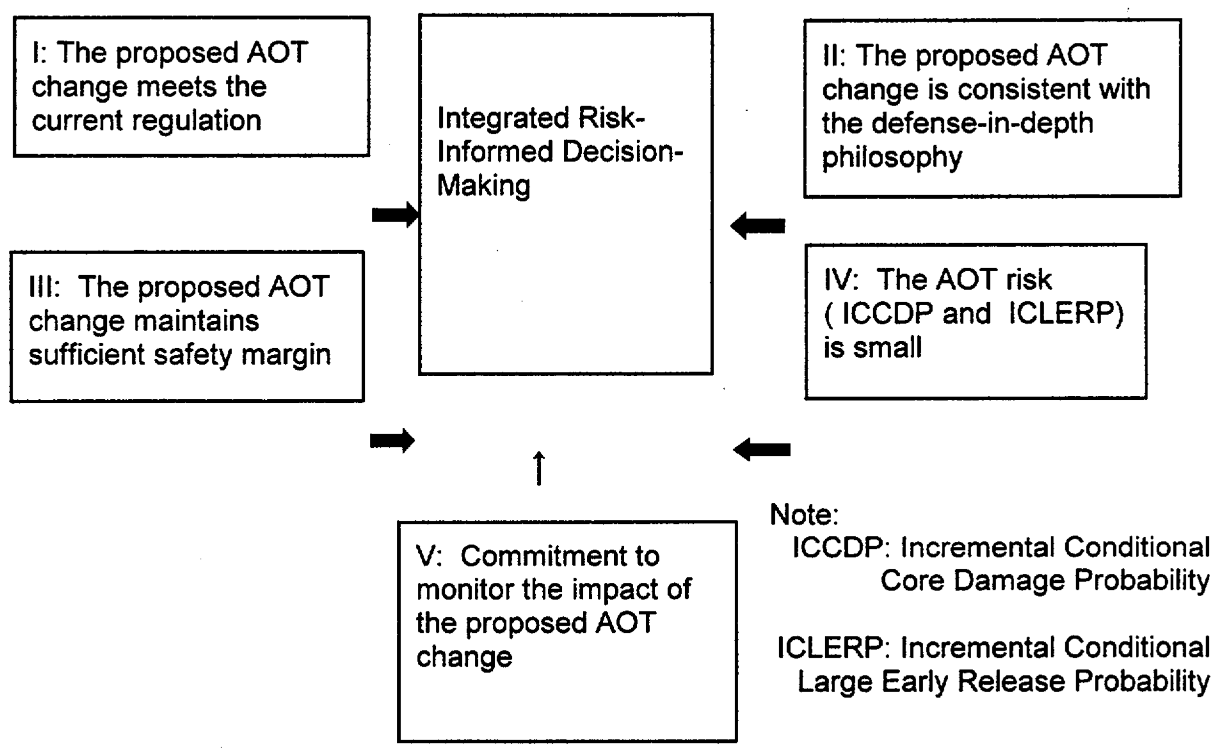

Figure 1: Principles of Risk-Informed Integrated Decision-Making

The staff decision in granting any requested change is guided by a process that requires the determination of whether a licensing basis change meets the set of key principles shown above. In risk-informed TS AOT applications, Principles I, compliance with the regulations is met. Compliance with the regulations is not affected by changing an AOT. The regulations do not require specific AOTs, but, rather, require "remedial actions" when an LCO cannot be met. With regard to Principle III, the proposed AOT change maintains sufficient safety margins because, for all types of plant designs reviewed, the loss of one CS train is well within the design basis analyses of the plants. The intent of Principles II, IV, and V is met by a three-tiered approach [4] as discussed below.

In Tier 1, an individual licensee is expected to determine the change in plant operational risk specifically with respect to core damage frequency (CDF and ICCDP) as a result of the proposed TS modification. In addition, in order to get a better understanding of the impact of the TS change on containment performance, the licensee is expected to perform an analysis of the large early release frequency (LERF and ICLERP) under the modified TS conditions and then discuss the results. Accordingly, the attributes of Principle IV are met directly by the assessment needs of Tier 1. The evaluation of the probabilistic analyses performed by the CEOG to demonstrates conformance with Principle IV.

In Tier 2, an individual licensee is expected to evaluate and understand the plant's status with respect to defense-in-depth when proposing an AOT change. The licensee should provide reasonable assurance that risk-significant plant equipment outage configurations will not occur when specific plant equipment is out of service consistent with the proposed TS change. An effective way to perform such an assessment is to evaluate equipment according to its contribution to plant risk while the equipment covered by the proposed AOT change is out of service. Once plant equipment is so evaluated, an assessment can be made as to whether certain enhancements to the TS or procedures are needed to avoid risk-significant plant configurations. In addition, compensatory actions that can mitigate any corresponding increase in risk should be identified and evaluated. Any changes made to the plant design or operating procedures as a result of such a risk evaluation should be incorporated into the analyses utilized for TS changes under Tier 1. Thus, the Tier 2 evaluation satisfies the intent of Principle II to ensure the proposed change is consistent with the defense-in-depth philosophy . A probabilistic analysis can be used to support and augment traditional engineering evaluations performed to justify conformance with Principle II (Tier 2).

In Tier 3, the licensees assure that the risk impact of out-of-service equipment is appropriately evaluated in anticipation of a configuration and in response to an evolving plant configuration condition. This is expected to be an intrinsic part of all maintenance scheduling. Again, Tier 3 generally meets the intent of Principle V. This review evaluates whether the licensees have the ability to predict high-risk configurations, and if so, whether they commit to a risk-informed configuration control system.

This review draws from the individual plant examination probabilistic risk assessments (PRAs) submitted by the CE plants and the corresponding PRA evaluations performed by the staff and their contractors. Recognizing that a common methodology was employed by the CEOG to quantify AOT risk, and because CE plants generally have similar design characteristics[1] , it is expected that the variation in AOT risk results is caused by the differences in the underlying PRA models. This evaluation attempts to highlight those modeling differences. The variability in PRA models can be attributed to factors such as:

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[1]Notable design differences are: (1) several CE plants do not have power-operated relief valves (PORVs) and (2) the Palo Verde units do not have a diverse containment cooling system.

- minor design or operational differences
- PRA assumptions (e.g., success criteria)

1.3 Scope and Structure of Report

The purpose of Reference [7] is to establish the validity of the conclusions drawn in the CEOG joint applications report for TS modifications related to the CSS. It provides a technical basis for the staff's safety evaluation (SE) on the joint applications report. Reference [7] primarily addresses the PRA aspects of the joint applications to determine that each individual licensee meets the attributes of Principle IV. The approach taken relies on comparative studies to identify factors that cause variations in risk profiles. The PRA evaluation focuses on:

- comparing AOT risk results among CE plants to identify variations
- identifying modeling assumptions in the underlying PRA models that affect the AOT risk results
- establishing the basis for the reported AOT risk results

Reference [7] also addresses the concept of defense-in-depth (Principle II), probabilistically by using the AOT risk results and programmatically by determining the licensee's commitment to Tier 2. The individual licensee's commitment to meet Principle V, by committing to a risk configuration control system, is also addressed.

Section 2 provides a summary of the proposed TS changes. Section 3 summarizes the general risk-informed strategy employed by the CEOG to justify the TS change. In Section 4 the AOT risk results (from the CDF point of view) are compared relative to the guideline value. Section 5 examines the mitigating strategies credited in the PRA for the CSS in the prevention and mitigation of the core damage sequences. The ability of other systems to perform the function of the CSS is also discussed to set the stage of the evaluation of the defense-in-depth. Section 5 also examines the impact of the AOT change on LERF. Section 6 addresses the licensees' ability to meet Tier 2 and 3 elements. The Evaluation Summary is presented in Section 7, followed by the conclusions in Section 8, configuration risk management in Section 9, and References in Section 10.

2. CURRENT AND PROPOSED TECHNICAL SPECIFICATIONS

The proposed AOT change would extend the AOT for one train of the CSS (including the shutdown cooling (SDC) heat exchanger) from 1, 2,or 3 days to 7 days during Mode 1, 2 or 3[2].

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[2]These operation modes are known as Mode 1: at power; Mode 2; start-up; and Mode 3: hot standby. In these modes, steam generator (SG) cooling is available.

3. METHODOLOGY USED FOR ASSESSMENT OF AOT RISK

The at power AOT risk analysis approach employed by the CEOG is consistent with the methods described in Reference 11; estimates for single AOT risk and yearly AOT risk are obtained. Consistent with the guidelines of NUREG/CR-6141 [11], common cause failures received different treatment in the AOT analysis for corrective maintenance (CM) and preventive maintenance (PM). When the LCO Action Statement is prompted by the need for CM (i.e., equipment failure), the redundant active component in service is assigned the β-factor which is the conditional failure probability given one component has already failed. The AOT risk for CM is directly proportional to the value chosen for β. The AOT risk predicted for CM can be interpreted as the upper bound for the AOT risk associated with the LCO configuration. For PM (i.e., no equipment failure), the failure probability of the redundant component in service is not adjusted and it includes both independent and common cause failure rates. It should be noted that, by far, AOTs are used for PM.

4. AOT RISK RESULTS FOR AT POWER CONFIGURATIONS

Each licensee evaluated the AOT-induced change in the CDF, which also allowed for the determination of the single AOT-induced risk. In estimation of the yearly AOT risk, the licensees assumed that with the AOT extension, the average number of entries in an LCO Action Statement per year would not change relative to present practices, a conservative assumption. With exception of Arkansas Nuclear One, Unit 2 (ANO-2) and Palo Verde, the single AOT risk for CE plants is low and below the incremental conditional core damage probability guideline value of 5.0E-7 for both PM and CM.

5. BASIS OF AOT RISK RESULTS

5.1 Validity of PRA Models

An initial screening was performed to determine the validity of the PRAs used in the TS modification application. To gain confidence that the risk model used by each licensee to support this application was technically suitable, a quick and limited review of each individual plant examination model was completed. The review focused on (1) the accident scenarios for which the function of CSS and SDC is credited and (2) the diverse systems credited to perform the function of CSS and SDC. This exercise provided the basis to compare the reported AOT risk results.

Based on this initial screening, it was determined that the PRAs have no apparent large defects and that they generally model CSS and SDC in a similar manner.

The proposed AOT for CSS affects the risk by impacting:

- Accident sequences that can be prevented from leading to core damage, and
- Accident sequences that can be mitigated following core damage.

The CSS therefore, affects both CDF and the frequency of releases given the occurrence of core damage. This is because the CSS performs the critical function of controlling containment temperature and pressure to:

- Cool the RCS inventory that is spilled in the sump as a result of a loss-of-coolant accident (LOCA) event (core damage prevention role), and

- Prevent the release of radionuclides subsequent to a core damage sequence (core damage mitigation role).

The proposed TS also impact the long term cooling function that can be provided by the shutdown cooling system (SDCS) following a small break LOCA, a steam generator tube rupture (SGTR), or a main steamline break (MSLB). In the normal alignment, the SDCS has only a core damage prevention role and, as such, primarily impacts CDF.

The pumps and shutdown cooling (SDC) heat exchanger require cooling by the service water system directly or through an intermediate cooling loop of the component cooling water system (CCWS). If entry into an LCO is caused by the CS pump outage, the plants with the ability to use the SDC as a backup to the spray pump can still preserve the spray function of the affected train. If, however, the heat exchanger is removed from the service, both the spray and SDC capability of the affected train would be lost completely unless cross-connect capability with systems such as service water (SW) are credited. Some plants have such capability, but it is generally not credited in the PRA unless proceduralized.

5.2 Success Paths

When a plant with a diverse containment heat removal capability enters into an LCO, only one success path may be affected. In the worst case, if one assumes both trains of the CSS are impacted due to common cause phenomena (i.e., corrective maintenance) four additional success paths are still available. The remaining success paths (four or five, depending on the condition) translate into a very high availability for the "containment cooling" function as long as the support systems to these success paths are available. This is the reason that the majority of the CE plant PRAs predict a negligible risk impact while in the LCO condition. The exceptions are ANO-2 and Palo Verde. The ANO-2 IPE assumes fan coolers require a relatively high humidity environment for effective operation. The IPE conservatively assumes that without the atmosphere wetting function of the CSS, the fan coolers cannot effectively cool the containment. *In effect, the* ANO-2 IPE *does not credit the fan coolers*. Assuming that the ANO-2 fan coolers are of the same design as other CE plants, one can conclude that the AOT risk for the ANO-2 should be as low as the others. This is not true for the Palo Verde units because fan coolers are not part of the plant's design. In response to RAI No. 4 [9] the CEOG argues that the ability of the Palo Verde units to align the SDC pump to a spray train increases the redundancy of the CSS when in the LCO. This is only true if the cause of the entry into the LCO is not related to the heat exchanger.

The following representative CSS related LCO configurations could be postulated for the Palo Verde units:

- One CSS pump is out of service for PM. The licensee can still claim that both trains are available if the SDC pump is aligned to the affected train.

- One CSS pump is out of service for CM. The licensee may claim the availability of the backup SDC pump for the affected train but also must recognize that the pump of the unaffected CSS train may be inoperable due to a common cause failure.

- One SDC heat exchanger is out of service for PM. The licensee can only claim the availability of one backup CSS train.

- One SDC heat exchanger is out of service for CM. The licensee has lost one train of the CSS and the remaining backup train may potentially be impacted as well.

The risk impact of the postulated above configurations varies. The risk impact is lowest for the first configuration and highest for the last one.

5.3 How the CEOG Intends to Evaluate Defense-in-Depth When in an LCO Condition Related to the CSS

In Response to Question 5 of the RAIs, the CEOG states:

"The risk assessment is to be performed in accordance with the Configuration Risk Management Program (CRMP). The key elements of the CRMP will be consistent with those required by the technical specification regulatory guide. For the CSS the risk assessment will consider the status of the redundant spray capability and/or the availability of safety grade fan coolers." The risk impact of the maintenance action will be established via reference to an

applicable, pre-existing Probabilistic Safety Assessment (PSA), a risk matrix, or an "on-line" risk monitor."

Evaluation of Defense-in-Depth When in an LCO Condition (Palo Verde Units)

When the Palo Verde units remove a CSS train from service without the potential for recovery (removal of the heat exchanger), one back up capability for the available train remains. From a risk point of view, the loss of defense-in-depth can be tolerated for a short time. This is because the CSS is challenged to respond to LOCAs which are rare events. If, however, the LCO condition is caused by the removal of a pump, the functionality of the affected train can still be preserved assuming the procedural requirements exist to align the SDC pump to the affected train. In this case, two success paths for containment cooling functions can be credited.

Evaluation of Defense-in-Depth When in an LCO Condition (Balance of CE Plants)

When CE plants remove a CSS train from service, with or without the potential for recovery, there are several other means of achieving the containment cooling function (the back up train and diverse fan coolers). From a risk point of view, there is essentially no impact on the defense-in-depth for these plants. The high level of redundancy and diversity for the containment cooling function offsets the risk impact caused by the loss of the mitigation capability of the affected train for challenges associated with transient events when the secondary coolant is lost
(i.e., the need for "feed and bleed").

5.4 CORE DAMAGE MITIGATION

The effect of removing a train of the CS on the ability of the subject CE plants to mitigate the consequences of core damage is measured by ΔLERF or by ICLERP {ICLERP = (CLERF-LERF)X(duration of single AOT under consideration)}. The guidance measure for incremental conditional large early release probability (ICLERP) is 5.0E-8. Specifically, the TS regulatory guide states:

"The licensee has demonstrated that the TS AOT modification has only a small quantitative impact on plant risk. An incremental conditional core damage probability (ICCDP) of less than 5.0E-7 is considered small for a single TS AOT modification. An incremental conditional large early release probability (ICLERP) of 5.0E-8 or less is also considered small. Also, the ICCDP contribution should be distributed in time such that any increase in the associated conditional risk is small and within the normal operating background (risk fluctuations) of the plant (Tier 1)."

Considering all the above, the following assessment was performed:

The LERF is made up of contributions from bypass, loss-of-containment-isolation, and early failure of the containment. According to the Palo Verde IPE PRA, the respective conditional probabilities for early "failure" are 4% (for bypass), less than 0.1% (for loss-of-containment-isolation) and 10% (for actual early failure of the containment). A recent NRC report, NUREG/CR-6475 [12], states that the actual probability of early failure of the containment for the Palo Verde units is at least an order of magnitude smaller than the 10% value determined in the IPE PRA. Thus, we can say that the LERF is conservatively about 5% of the CDF for Palo Verde. Since the baseline CDF for Palo Verde is 4.74E-5/year (Table 6.3.2-1 of [1], then the LERF is 2.37E-6/year. The $\Delta LERF_1$ is then just the "change factor" (Table 6.3.2-1 of [1] of 1.5 times the LERF minus 2.37E-6, or $\Delta LERF_1$ = 1.2E-6/year. This translates into an $ICLERP_1$ value of 2.2E-8. However, there may be contributions to the ICLERP from containment response to the core damage events, i.e., $\Delta LERF_2$. The three parts of $\Delta LERF_2$ are:

- Contribution from a change in the release from containment bypass. This will be zero, since the CS systems have no effect on bypass events.
- Contribution from a change in the release from the "loss of containment integrity" events. This will be small and will not contribute, although the absence of a spray train might increase the release, the increase will be small since the baseline probability is small.
- Contribution from a change in the release from early containment failure: Although the absence of a CS system will not increase the probability of early containment failure, its absence could increase the released source term if and when the containment does fail. However, the IPE PRA for Palo Verde apparently does not give any credit for containment sprays (See Figure 11.7-1, page 11-170, of the PRA) for the base-case assessment. Thus, as with the other two contributions, this contribution is small and negligible.

The conclusion that can be drawn for the three Palo Verde units is that the $\Delta LERF_2$ is negligible and that a conservative estimate of the $\Delta LERF$ is $\Delta LERF_1$ = 1.2E-6year, or the ICLERP = 2.2E-8, a value below the guideline of 5.0E-8. All other CE plants should have an ICLERP value considerably below the value for Palo Verde.

6 TIER 2 AND 3 CAPABILITIES

<u>Tier 2 Capability</u>

The main principle of the Tier 2 program is to establish whether each licensee is evaluating defense-in-depth when proposing an AOT change. The review process for the individual plant-specific amendments will include an assessment of the each licensees' evaluation with respect to Tier 2.

<u>Tier 3 Capability</u>

The main principle of the Tier 3 program is to establish whether the licensees have:

1) a predetermined knowledge of high risk configurations (e.g., risk matrix or an online risk monitor) and
2) the ability to evaluate the risk of LCO conditions as they evolve.

Each licensee's ability to meet the Tier 3 principles will have to be submitted along with the AOT relaxation request.

7. EVALUATION SUMMARY

Modeling differences reflect assumptions that are based upon individual or team judgment. During each modeling step, this judgment must weigh the conservative estimate against the best estimate and arrive at a system logic. If this system logic is not embedded in the plant system itself (e.g., resulting from thermal-hydraulic analyses) but is based on an assumption (e.g., based on design basis documents or expert judgment), it should be viewed in a different light. With this in mind, it should be noted that the level of conservatism and/or detail in the PRA might distort the projected AOT risk at a plant.

We have identified the important modeling assumptions that affected the AOT risks in the JAR. They are presented in the following table:

Table 3: Effect of Various Hypothetical Modeling Assumptions on Calculated Risks

		Effect on Baseline CDF	**Effect on AOT Risk**
1.	Apply stringent success criteria to downed system (using licensing base success criterion)	↑	↑
2.	Crediting downed system in multiple mitigation strategies (crediting CSS to support mitigation of LOCA and transient events (feed and bleed operation)	↓	↑
3.	Crediting diverse system as alternative to downed system (CE plants with diverse containment cooling credited fan coolers for sump cooling function)	↓	↓

With these relationships in mind, the review of the CEOG individual plant examination PRAs highlighted the following factors that significantly affected the AOT risk results:

- All PRAs, with the exception of the Palo Verde units and ANO-2, credited a single (or a pair of) fan cooler units(s) to be functionally equivalent to a containment spray train. That is, a fan cooler (or a pair of fan coolers) can cool the containment and the sump in a post-LOCA accident. With these success criteria, the impact of the LCO configuration is bound to be negligible for plants other than the Palo Verde units and ANO-2 as is evident from the reported risk results (related to items 1 and 3 of the above table). That is, the single AOT risk values are well below the SRP guideline value (i.e., 5.0E-7). In the case of Palo Verde, the single AOT risk is comparable to the acceptance guideline. For ANO-

2 the single AOT risk is higher (by a factor of close to two) than Palo Verde because of credit taken by ANO-2 for the feed and bleed operation (see next two observations).

- The ANO-2 IPE conservatively assumes that without the atmosphere wetting function of the CSS, the fan coolers cannot effectively cool the containment. In effect, the ANO-2 IPE did not credit the fan coolers (related to items 1 and 3 of the above table).

- Many CE plants credited the once-through-cooling capability (related to Item 2 of the above table). The risk impact of the LCO configuration on the feed and bleed operation is low (with the exception of ANO-2) because the containment cooling function required in the feed and bleed operation is supported by the diversity provided by the fan coolers.

- Since the CEOG advocates on-line maintenance of both the SDCS and the CSS, it is important that "at power" maintenance of these systems is not scheduled for the same time because the SDC pumps are credited as backup to the CSS pumps in supporting the containment spray function. Similarly, the maintenance of the CSS pumps in the lower modes of operation should be performed so that at least one CSS pump remains operable as a backup to the SDC pumps.

- The risk impact of the LCO configuration is dependent on which component of the CSS is affected. If the SDC heat exchanger is removed from service, one train of the SDCS and the CSS train that uses the affected SG are lost. If, however, the LCO configuration is caused by the removal of a CSS pump, the affected train can still be operational if a SDC pump can be aligned to the affected train.

- Regarding the impact of the LCO configuration on large early release, the ICLERPs for all the plants including the Palo Verde units are below the SRP guideline value (i.e., 5.0E-8). This is due to the ineffectiveness of the CSS in changing the LERF.

- The ICCDPs for all the plants are in an acceptable range, particularly since, by far, the primary AOT usage is for preventive maintenance. The proposed average CDFs/yr are unchanged except for those for Palo Verde 1/2/3 and ANO-2, which increase by 3% and 6%, respectively.

8. CONCLUSIONS REGARDING CEOG LICENSEES PROBABILISTIC RISK ASSESSMENTS USED TO SUPPORT THE PROPOSED AMENDMENTS

Based on the three-tiered approach, the staff finds/requires the following:

a. The proposed CSS AOT modifications have only a minimal quantitative impact on plant risk. The calculated ICCDPs are small, primarily because of the redundancy in CSS configuration and fan cooler backup for most plants.

b. The licensees' submittals shall discuss implementation of procedures that prohibit entry into an extended CSS AOT for scheduled maintenance purposes if external event conditions or warnings are in effect. The licensees' procedures will also include compensatory measures and normal plant practices that help avoid potentially high risk configurations during the proposed extended CSS AOT.

c. The licensees' submittals shall describe a risk-informed configuration risk management program to assess the risk associated with the removal of equipment from service during the extended CSS AOT. The program provides the necessary assurances that appropriate assessments of plant risk configurations are sufficient to support the proposed AOT extension request for CSSs.

The NRC staff concludes that the CSS AOT extension will result in very small increases in plant risk. The licensees have/shall have processes for scheduling and controlling maintenance activities into which plant risk is incorporated; this compensates for the small risk increases and uncertainties associated with the proposed CSS AOT changes. The staff finds, therefore, that if b. and c. above are provided by a licensee, the PRA insights provided support the proposed CSS AOT extension for all the plants with the exception, at this time of Calvert Cliffs Units 1 and 2.

9. CONFIGURATION RISK MANAGEMENT PROGRAM

The licensees shall propose a "Configuration Risk Management Program" in the form of a new TS or other administratively controlled documents that the staff finds acceptable, if such a program has not been approved in a previous TS amendment. The Configuration Risk Management Program (CRMP) provides a proceduralized risk-informed assessment to manage the risk associated with equipment inoperability. The programs apply to technical specification structures, systems, and components for which a risk-informed allowed outage time has been granted. The proposed programs include the following elements:

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

b. Provisions for performing an assessment prior to entering the LCO Condition for preplanned activities.

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

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

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

As stated above, the CRMPs are acceptable in that the programs provide the necessary assurances that appropriate assessments of plant risk configurations using software, matrices, or PRA analyses augmented by appropriate engineering judgment, are sufficient to support the proposed AOT extension requests for CSSs.

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 will be used when a CSS train 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 CSS.

The licensee has committed/will have committed to implementation of the CRMP (Regulatory Guide 1.177) as described below.

The Configuration Risk Management Program (CRMP) includes the following key elements:

Key Element 1. Implementation of CRMP

The intent of the CRMP is to implement (a)(3) of the Maintenance Rule (10 CFR 50.65) with respect to on-line maintenance for risk-informed technical specifications, 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, and on-line assessment, or a direct PRA assessment.

- CRMP will be invoked as follows for:

Risk-Informed Inoperability: A risk assessment shall be performed prior to entering the LCO Condition for preplanned activities. For unplanned entry into the LCO Condition, 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/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.

Key Element 2. Control and Use of the CRMP

1) 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 judgments.

   - Limitations of the CRMP are identified and understood for each specific Completion Time extension.

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

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.

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

b. When quantitative assessments are not necessary for sound decision making, 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.

Key Element 4. Level 2 Issues/External Events

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

If a licensee requests a TS change consistent with this JAR after the revision to the maintenance rule, 10 CFR 50.65, becomes effective (64 FR 38551, July 19, 1999), then implementation of a plant CRMP will not be necessary. The licensee's implementation of the provisions of 10 CFR 50.64(a)(4) will provide adequate configuration risk management.

The staff expects the licensee to implement these TS changes or other administratively controlled documentation in accordance with the three-tiered approach described above. The AOT extension will allow efficient scheduling of online maintenance within the boundaries established by implementing the maintenance rule. The licensee will monitor CSS performance in relation to the maintenance rule performance criteria. Therefore, application of implementation and monitoring strategies will help to ensure that extension of the TS CSS AOT does not degrade operational safety over time and that the risk incurred when a CSS train is taken out of service is acceptable. In this manner, conformance with the attributes of Principle V will be achieved.

Principal Contributor: M. Wohl

10. REFERENCES

1. Joint Applications Report: Modification to the Containment Spray System, and Low Pressure Safety Injection System Technical, C-E Owners Group, CE NPSD-1045, March 1998

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