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NRC Project 692

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Subject: Requested Clarifications to Topical Report CE NPSD-1186

Reference: (1) CEOG Letter, R. Phelps to NRC, Submittal of CE NPSD-1186, "Technical Justification for the Risk Informed Modification to Selected Required Action End States for CEOG PWRs," CEOG-00-121, 4/28/2000.

(2) CEOG Letter, R. Bernier to NRC, "Response to Information Request concerning Topical Report CE NPSD-1186...," CEOG-00-328, 11/21/2000.

(3) CEOG Letter, R. Bernier to NRC, "Clarifications to Topical Report CE NPSD-1186," CEOG-01-037, 2/13/01

Reference (1) submitted Topical Report CE NPSD-1186 for staff review and approval. Responses to informal staff questions and minor editorial changes were submitted in References (2 and 3).

The purpose of this letter is to document additional editorial clarifications regarding the AFW and CIV discussions as requested by the staff during the review of this report. These changes are highlighted with a margin bar on the attached markup pages. Following staff approval, all changes will be incorporated in the approved version of the subject topical report.

Please do not hesitate to contact me at 623-393-5882 or Gordon Bischoff, CEOG Project Office, at 860-285-5494 if you have any questions.

Sincerely,

Richard A. Bernier

Richard A. Bernier, Chairman
CE Owners Group

Attachment: as stated

D047

cc: CE Owners Group
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Table 2-1
Results of Technical Specification Review: Summary of Recommended Changes to Technical Specification Require Actions

ISTS		SONGS T.S. #	Title	Current End State		Proposed End State
Analog	**Digital**			**ISTS**	**SONGS**	
3.1 Reactivity Control Systems						
NONE[2]	NONE[2]	3.1.9 C.1	Boration Systems – Operating	NA	Mode 5 - 30 hrs	Mode 3 – 6 hrs (See Note 5)
3.3 Instrumentation						
3.3.4 F.2	3.3.5.E.2	3.3.5 H.2	ESFAS Instrumentation (RAS-RWST low)	Mode 4 - 12 hrs	Mode 5 - 36 hrs	Mode 4 - 12 hrs
3.3.4 F.2	3.3.5 E.2	3.3.6 F.2	ESFAS Logic and Manual Trip SIAS, CIAS, RAS & CCAS	Mode 4 - 12 hrs	Mode 5 - 36 hrs	Mode 4 - 12 hrs
3.3.7 B.2	3.3.8 B.2	3.3.8 B.2	CPIS	Mode 5 - 36 hrs	Mode 5 - 36 hrs	Mode 4 - 12 hrs
3.3.8 B.2	3.3.9 B.2	3.3.9 B.1	CRIS[7,15]	Mode 5 - 36 hrs	Manually Align 1 Train of CREACUS into Emergency	See Note 18. Mode 4 - 12 hrs
3.3.9 B.2	NA	NA	CVCS Isolation Signal	Mode 5 - 36 hrs	NA	Mode 4 - 12 hrs
3.3.10 B.2	NA	NA	Shield Building Filtration Actuation Signal[8]	Mode 5 - 36 hrs	NA	Mode 4 - 12 hrs
3.4 RCS						
3.4.6 B.1	3.4.6 B.1	3.4.6 B.1	RCS Loops-Mode 4	Mode 5 - 24 hrs	Mode 5 - 24 hrs	Mode 4 - 12 hrs
3.5 ECCS						
3.5.4 C.2	3.5.4 C.2	3.5.4 C.2[9]	RWST	Mode 5 - 36 hrs	Mode 5 - 36 hrs	Mode 3 – 6 hrs (See Note 5)
3.6 Containment Systems						
3.6.1 B.2	3.6.1 B.2	3.6.1 B.2	Containment[17]	Mode 5 - 36 hrs	Mode 5 - 36 hrs	Mode 4 - 12 hrs
3.6.2 D.2	3.6.2 D.2	3.6.2 D.2	CTMT Air Locks	Mode 5 - 36 hrs	Mode 5 - 36 hrs	Mode 4 - 12 hrs
3.6.3 F.2	3.6.3 E.2	3.6.3 G.2	CIVs[19]	Mode 5 - 36 hrs	Mode 5 - 36 hrs	Mode 4 - 12 hrs
3.6.4 B.2	3.6.4 B.2	3.6.4 B.2	CTMT Pressure	Mode 5 - 36 hrs	Mode 5 - 36 hrs	Mode 4 - 12 hrs
3.6.5 B.2	3.6.5 B.2	3.6.5 B.2	CTMT Air Temp	Mode 5 - 36 hrs	Mode 5 - 36 hrs	Mode 4 - 12 hrs
3.6.6A B.2 & F.2	3.6.6A B.2 & F.2	3.6.6.1B.2 & F.2	CTMT Spray and Cooling Systems (Credit taken for Iodine Removal)	Mode 5 - 84 hrs (CTMT spray) Mode 5 -36 hrs (CTMT cooling)	Mode 4 - 84 hrs (CTMT spray) Mode 4 -36 hrs[16] (CTMT cooling)	Mode 4 - 84 hrs[6] (CTMT Spray)[4] Mode 4 – 36 hrs (CTMT Cooling)
3.6.6 B F.2	3.6.6B F.2	3.6.6.2 C.1	CTMT [Spray and] Cooling Systems [Mode 4] (Credit not taken for Iodine Removal[10])	Mode 5 - 36 hrs[10]	Mode 5 - 36 hrs (CTMT cooling)[16]	Mode 4 - 12 hrs[6]

Table 2-1
Results of Technical Specification Review: Summary of Recommended Changes to Technical Specification Require Actions

ISTS		SONGS T.S. #	Title	Current End State		Proposed End State
Analog	**Digital**			**ISTS**	**SONGS**	
3.6.11.B.2	3.6.11 B.2	NA	Shield Building	Mode 5 - 36 hrs[10]	NA	Mode 4 - 12 hrs[6]
3.7 Plant Systems						
~~3.7.5 C.2~~	~~3.7.5 C.2~~	~~3.7.5 E.2~~	~~AFW~~	~~Mode 4 w/o SG HR - 18 hrs~~	~~Mode 4-12 Hrs~~	~~Mode 4 w/o[3] SG for HR -18 hrs~~
3.7.7 B.2	3.7.7 B.2	3.7.7 B.2	CCW[1,2,12]	Mode 5 - 36 hrs	Mode 5 - 36 hrs	Mode 4 - 12 hrs
3.7.8 B.2	3.7.8 B.2	3.7.8 B.2	SWC[2,12]	Mode 5 - 36 hrs	Mode 5 - 36 hrs	Mode 4 - 12 hrs
3.7.9 B.2	3.7.9 B.2	NA	UHS[2,12]	Mode 5 - 36 hrs	NA	Mode 4 - 12 hrs
3.7.10	3.7.10 B.2	3.7.10 B.2	ECW[2]	Mode 5 - 36 hrs	Mode 5 - 36 hrs	Mode 4 - 12 hrs
3.7.11	3.7.11 B.2	3.7.11 B.2	CREACUS[13,14]	Mode 5 - 36 hrs	Mode 5 - 36 hrs	Mode 4 - 12 hrs
3.7.12 B.2	3.7.12 B.2	NA	CREATCS[14]	Mode 5 - 36 hrs	NA	Mode 4 - 12 hrs
3.7.13 B.2	3.7.13 B.2	NA	ECCS Pump Room EACS[2, 14]	Mode 5 - 36 hrs	NA	Mode 4 - 12 hrs
3.7.15 B.2	3.7.15 B.2	NA	Penetration Room EACS[2,14]	Mode 5 - 36 hrs	NA	Mode 4 - 12 hrs
3.8 Power Sources						
3.8.1	3.8.1 F.2	3.8.1 F.2	AC Sources-Operating	Mode 5 - 36 hrs	Mode 5 - 36 hrs	Mode 4 - 12 hrs (W SGHR)
3.8.4 B.2	3.8.4 B.2	3.8.4.B.2	DC Sources-Operating	Mode 5 - 36 hrs	Mode 5 - 36 hrs	Mode 4 - 12 hrs (W SGHR)
3.8.7 D.2	3.8.7 D.2	3.8.7 B.2	Inverters-Operating	Mode 5 - 36 hrs	Mode 5 - 36 hrs	Mode 4 - 12 hrs (W SGHR)

Footnotes to Table 2-1

1) If the plant were already in Mode 4 with an affected SDC loop, Condition B of 3.4.6 is also applicable. It requires entry into Mode 5 within 24 hours.
2) Technical specification is not applicable to all PWR designs.
3) ~~18 hours provides time to transition to Mode 4 on SDC (consistent with ISTS).~~ Deleted.
4) Times chosen consistent with SONGS Units 2 & 3 bases.
5) Mode 3 within 6 hours for condition when Tank Contents out of limits. Mode 5 within 36 hours for other inoperabilities.
6) Mode 4 for plants with diverse and redundant CTMT cooling systems. Palo Verde, SONGs, St. Lucie and ANO require CS in Mode 1, 2 & 3 only.
7) System called CREFAS (Control Room Essential Filtration Actuation Signal) at APS.
8) Applicable to St. Lucie Units 1 & 2 and Waterford Unit 3.
9) Section 3.5.5 for APS.
10) APS "Two Containment Spray Trains shall be Operable." Required Actions is to be in Mode 4 with RCS pressure < 385 psig.
11) Deleted
12) Systems vary among utilities, equivalent systems for APS is EW, ESPS, UHS (T.S. 3.7.9A.2) and EC. SONGS has a CCW flow path and tank level Technical Specification 3.7.7.1 for the Primary Plant Makeup Storage Tank (PPMST).
13) Also referred to as CREACS, CREVAS, CREVS and CREAFS.
14) These systems have similar functions to maintain environmental conditions for personnel and ECCS equipment.

15) System called CRRS at Calvert Cliffs.
16) SONGs TS is unique and requires applicability of CS and CCs in Modes 1, 2 and 3. Only CC units are TS'd in Mode 4. The variations are based on level of redundancy. The CC system consists of 2 CS trains and 2 cooling trains. Inoperability of 1 CS train is given a longer time to enter Mode 4.
17) Other restrictions apply, see Section 5.5.10 of this report.
18) Manually aligning 1 train of CREACUS into emergency Mode accomplishes function of CRIS.
19) Applicable to conditions with a single CIV inoperable.

The technical basis for the end state changes included in this report also apply to equivalent TS Conditions and Required Actions (or equivalent) contained within CEOG member plant's individual Customized and Standard Technical Specifications, (See Attachment A).

5.5 SPECIFIC TECHNICAL SPECIFICATION ASSESSMENTS

In performing the Defense-in-Depth assessment, it is assumed that the purpose of the TS Required Action to enter shutdown is to complete a short duration repair of the component under consideration.

This section provides a summary of the basis for the change of each of the risk-informed TS end state changes proposed. The format of each of the subsequent subsections will be as follows:

i) Description
ii) Plant Applicability
iii) Limiting Condition for Operation
iv) Licensing Basis for LCO
v) Condition Requiring Entry into End State
vi) Proposed Modification to End State Required Actions
vii) Basis for Proposed Change
viii) Defense-in-Depth Considerations
ix) Tier 2 Restrictions

This section provides an integrated discussion of the risk and deterministic issues, focusing on specific technical specifications. In performing these assessments it is assumed that the required Mode 4 end state entry is for the temporary repairs of inoperable equipment so that the plant may be returned to service without incurring additional risks and costs associated with establishing a cold shutdown condition. In instances where the proposed end state change is not applicable to all CE designed units, it is identified within item (ii). The risk justification for Mode 4 end state entry is based on qualitative and quantitative analyses presented in Section 5.4.

~~All TSs are subject to the restriction that when the inoperability involves a degradation of the TS SG heat removal capability, with no concurrent inoperability of the SDC system, the required plant end state should be Mode 4 on Shutdown Cooling.~~

5.5.12 T.S. 3.6.3 CONTAINMENT ISOLATION VALVES

Operability of the containment isolation valves ensures that leakage rates will not exceed permissible values. The containment isolation valves and air locks form part of the leakage boundary. For systems that communicate with the containment atmosphere, two redundant isolation valves are provided for each line that penetrates containment. For systems that do not communicate with the containment atmosphere, at least one isolation valve is provided for each line. Similarly, with regard to containment air locks, the air lock is fitted with redundant seals and doors, one located on each side of the air lock. This LCO is entered when containment leakage is within limits, but, some portion of the containment isolation function is impaired (e.g. one valve in a two valve path inoperable or containment purge valves have leakage in excess of Tech Spec limits). The issue of concern in this TS is the appropriate action/end state for extended repair of an inoperable CIV when one Containment Isolation Valve in a single line is inoperable.

Plant Applicability

All

Limiting Condition for Operation (LCO)

Each containment isolation valve shall be OPERABLE in Modes 1, 2, 3 and 4.

Licensing Basis for LCO

In Modes 1, 2, 3 and 4, a DBA could cause a release of radioactive material to containment. In Mode 5, the probability and consequences of DBAs are reduced due to the pressure and temperature limitations of these Modes. Therefore, the containment isolation valves are not required to be OPERABLE in Mode 5.

Containment integrity is required to limit releases of radioactive materials to the environment. The containment isolation valves form part of the leakage boundary. For systems that communicate with the containment atmosphere, two redundant isolation valves are provided for each line that penetrates containment. For systems that do not communicate with the containment atmosphere, at least one isolation valve is provided for each line. Design Basis Accidents of specific concern are LOCAs, MSLBs and CEA Ejection accidents.

Condition Requiring Entry into End State

A required action to maneuver the plant into Mode 5 will occur when one or more penetration flow paths exist with one or more containment isolation valves inoperable [except for purge valve leakage and shield building bypass leakage not within limit] and the affected penetration flow path cannot be isolated with the prescribed AOT/CT.

Proposed Modification for End State Required Actions

Modify ~~Condition G of~~ SONGS TS (and their equivalents) to accommodate a Mode 4 end state for any penetration having one CIV inoperable. ~~when the required actions defined by Conditions A, B, C, D, E and F are not completed in the specified time. Mode 4 entry is proposed at 12 hours.~~

Basis for Proposed Change

Remaining in Mode 4 (vs. Mode 5) while the deficient condition is corrected would maintain more mitigation systems available to respond to any event that could lead to a loss of RCS inventory or decay heat removal. Thus, the risk of plant operation in Mode 4 is no greater than that for Mode 5 (and should

5.5.17 T.S. 3.7.5 AUXILIARY FEEDWATER SYSTEM

The ISTS already affords the proper end state considerations or conditions when one or more AFW pumps are available. Therefore, no change is requested for this TS. ~~The AFW system supplies feedwater to the steam generators to remove decay heat from the RCS upon the loss of normal feedwater supply. The AFW pumps take suction through separate and independent suction lines from the Condensate Storage Tank (CST) and pump to the steam generator secondary side via separate and independent connections to the MFW piping inside containment. The steam generators function as a heat sink for core decay heat. The heat load is dissipated by releasing steam to the atmosphere from the steam generators via the Main Steam Safety Valves (MSSVs) or Atmospheric Dump Valves (ADVs). If the main condenser is available, steam may be released via the steam bypass valves and recirculated to the CST.~~

~~The AFW System varies among CE designed PWRs. For SONGS the AFW consists of two motor driven AFW pumps and one steam turbine driven pump configured into three trains. Each motor driven pump provides 100% of AFW flow capacity; the turbine driven pump provides 100% of the required capacity to the steam generators as assumed in the accident analysis. The pumps are equipped with independent recirculation lines to prevent pump operation against a closed system. One pump at full flow is sufficient to remove decay heat and cool the unit to SDC system entry conditions.~~

~~The steam turbine driven AFW pump receives steam from either main steam header upstream of the Main Steam Isolation Valve (MSIV). Each of the steam feed lines will supply 100% of the requirements of the turbine driven AFW pump. The turbine driven AFW pump supplies a common header capable of feeding both steam generators, with DC powered control valves actuated to the appropriate steam generator by the Emergency Feedwater Actuation System (EFAS).~~

~~The design basis of the AFW system is to supply water to the steam generators to remove decay heat and other residual heat, by delivering at least the minimum required flow rate to the steam generators at pressures corresponding to the lowest MSSV set pressure.~~

~~Plant Applicability~~

~~All~~

~~Limiting Condition for Operation (LCO)~~

~~[Three] AFW trains shall be OPERABLE in Modes 1, 2 and 3, and Mode 4 when steam generator is relied upon for heat removal.~~

~~The LCO is modified by a Note indicating that only one AFW train, which includes a motor driven pump, is required to be operable in Mode 4. This is because of reduced heat removal requirements, the short period of time in Mode 4 during which AFW is required, and the insufficient steam supply available in Mode 4 to power the turbine driven AFW pump.~~

~~Licensing Basis for LCO~~

~~This LCO requires that three AFW trains be operable to ensure that the AFW system will perform the design safety function to mitigate the consequences of accidents that could result in overpressurization of the reactor pressure coolant boundary.~~

~~In Modes 1, 2 and 3, the AFW System is required to be OPERABLE and to function in the event that the MFW is lost. In addition, the AFW System is required to supply enough makeup water to replace steam generator secondary inventory, depleted as the unit cools to Mode 4 conditions.~~

~~In Mode 4, the AFW System may be used for heat removal via the steam generators.~~

~~In Mode 5, the steam generators are not normally used for decay heat removal, and the AFW System is not required.~~

~~AFW is required for steam generator heat removal when MFW is not available. In Modes 1, 2 and 3, all three AFW pumps are required to be operable. In the Mode 4 base risk analysis of Section 5.4, the turbine-driven AFW pump is assumed to be unavailable due to low steam pressure.~~

~~In the SONGS Units 2 & 3 TSs, both motor-driven pumps are required to ensure that at least one train is available, given a single failure. However, in Mode 4, SONGS TS 3.7.5 states that only one motor-driven pump is required.~~

~~Condition Requiring Entry into End State~~

1. ~~One steam supply to turbine driven AFW pump inoperable, or~~
2. ~~One AFW train inoperable [for reasons other than the above condition], or~~
3. ~~Two AFW trains with two motor driven pumps inoperable, or~~
4. ~~Two AFW trains with one motor driven pump and one steam driven pump inoperable and equipment not returned to service within the associated AOT/CT.~~

~~Proposed Modification for End State Required Actions~~

~~Mode 4 with heat removal via the SDC system with an 18 hour entry requirement.~~

~~Basis for Proposed Change~~

~~For cases in which both motor-driven pumps are available, remaining in Mode 4 should be a lower risk condition than continuing to Mode 5 because more diversity of heat removal and injection sources remain available. With impaired SG heat removal capability, and a fully operational SDC system, core heat removal via SDC is the preferred mode of heat removal when in the shutdown modes. NUREG-1432 also allows staying in Mode 4 if RCS heat removal requirements are fully met by the use of SDC trains. SDC on Mode 4 is preferred to Mode 5 since AFW remains a proceduralized backup (albeit impaired).~~

~~The eighteen hour time frame provides sufficient time for the plant staff to enter Mode 4 and place the plant in SDC. This time requirement is consistent with the current ISTS required action.~~

~~Defense-in-Depth Consideration~~

~~The AFW system provides feedwater to the steam generators to remove RCS decay heat upon loss of normal feedwater supply. The typical AFW system consists of 3 pumps (one turbine-driven and two motor-driven). One pump at full flow is sufficient to remove decay heat and cool the plant to SDC system entry conditions. The proposed modification to the end state of the TS to Mode 4 without reliance on SG heat removal is consistent with NUREG-1432 which allows staying in Mode 4 if RCS heat removal requirements are fully met by the use of SDC trains. Unavailability of AFW pumps limits the usefulness of SG heat removal. Hence SDC operation in Mode 4 under the TS conditions provides sufficient Defense-in-Depth for RCS heat removal.~~

~~Tier 2 Restrictions~~

~~None.~~

Table 5.5–1
Technical Specification End State Assessment

Technical Specification Action	Title	Current End State	Proposed End State	Plant Applicability	Proposed Basis	
					Relative Risk Assessment	Deterministic Assessment
					transitioning to SDC expose the plant to additional interfacing system LOCA (ISLOCA) events. The low LERF end state would be that associated with Mode 4 on SG heat removal. Continued operation in Mode 4 where containment closure is expected is more desirable end state than Mode 5 w/o containment closure requirements.	radiological material. No LERF impact, provided containment closure is assured and leakage is judged to be to small. Leakage in the fission product barrier is less important in Mode 4 than at full power. This is because the fission product active inventory is lower in mode 4 and the containment pressure threat will be lower due to less stored energy in the RCS. Containment leakages should be low due to restrictions on allowable leakage sources for entry in this action.
3.6.2 D.2	Containment Air Locks	Mode 5 - 36 hrs	Mode 4 – 12 hrs	All	Same as above	Defense in depth is assured via operability of redundant air lock seals. Entry into LCO has no impact on public risk.
SONGS 3.6.3 G.2 ISTS(analog) 3.6.3 F.2 ISTS(digital) 3.6.3 E.2	Containment Isolation Valves	Mode 5 - 36 hrs	Mode 4 – 12 hrs (Applicable to conditions with a single CIV inop.)	All	Same as above.	Defense in depth is assured via operability of redundant CIVs in affected lines. Entry into LCO has no impact on public risk.
3.6.4 B.2	CTMT Pressure	Mode 5 - 36 hrs	Mode 4 – 12 hrs	All	Containment pressure initial condition does not vary significantly in CE large dry containments. This small variation has no direct impact on CDF or LERF. Mode 4 is a lower risk state than Mode 5 due to increased redundancy in RCS cooling systems. Mode 4 SGHR operation also averts risks associated with plant realignments during SDC	<u>UPPER LIMIT PRESSURE</u> Max. pressure is conservatively set by DB Analysis with a system with Mode 1 level energy release. In Mode 4 challenges to containment integrity are reduced due to (1) lower RCS internal energy level and (2) lower decay heat than present in Mode 1. Thus, in Mode 4, small increases in initial pressure, as

Table 5.5–1
Technical Specification End State Assessment

Technical Specification Action	Title	Current End State	Proposed End State	Plant Applicability	Proposed Basis	
					Relative Risk Assessment	Deterministic Assessment
3.7 Plant Systems						
SONGS 3.7.5 E.2 ISTS 3.7.5 C.2	Auxiliary Feedwater System	Mode 4 - 12 hrs	Mode 4 - 18 hrs (Consistent with existing ISTS 3.7.5) ~~without~~ reliance ~~upon SG for heat removal~~	All	Note that e~~E~~xisting NUREG-1432 allows staying in Mode 4 on SG heat removal if the RCS heat removal requirements are fully met by one motor driven AFW train. ~~the use of SDC trains.~~ If the motor driven AFW train is inoperable, the action to restore AFW is immediate and all other LCO 3.0.3 and LCO-required actions are suspended. ~~It appears that flexibility already exists.~~	Unavailability of AFW, limits usefulness of SG HR. The current action ensures that the plant is not forced into a less safe condition. ~~In this situation,~~ SDC operation in Mode 4 also provides ~~sufficient~~ defense--in-depth for RCS heat removal. (See NUREG-1432, B 3.7.5 E.1.)
3.7.7 B.2	Component Cooling Water System (See Att. C)	Mode 5 - 36 hrs	Mode 4 – 12 hrs	All except ANO 2	Component cooling needed for RCS heat removal in SDC (RCS heat removal). Vulnerable to SBO. Higher Mode 5 risk. Mode 4 is lower risk than Mode 5 since Mode 4 operation allows for non-CCW based RCS heat removal paths.	In addition to providing cooling to SDC heat exchangers, CCW supports the cooling of ECCS equipment, and cooling of RCPs. It also supports normal and emergency cooling of containment and post-accident heat removal during the recirculation Mode. Unavailability of CCW reduces ability in one or more of the following areas: (1) Energy removal during SDC, (2) RCP cooling during SG Heat Removal, (3) Post-accident containment cooling, and (4) ECCS equipment cooling. Availability of redundant train of CCW maintains design basis capability during repair.
3.7.8 B.2	Salt Water Cooling System / Service Water System / Essential Spray Pond System / Auxiliary CCW	Mode 5 -36 hrs	Mode 4 – 12 hrs on SGHR	All	Mode 4 is lower risk than Mode 5 since Mode 4 operation allows for non-SDC based RCS heat removal paths. Needed to support SDC heat removal function.	The service water system supports the CCW system. Availability of redundant train of equipment maintains design basis capability during repair.