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ACCESSION NBR:8111130547 DOC.DATE: 81/11/10 NOTARIZED: NO DOCKET #
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50-362 San Onofre Nuclear Station, Unit 3, Southern Californ 05000362
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MIRAGLIA,F. Licensing Branch 3

SUBJECT: Forwards seismic & environ design capabilities of interim ICC/CET instrumentation at Unit 2 inside containment & responses to items in Section 7.2.2 of Suppl.2 to Units 2 & 3 SER,per 811105 request.

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	NRR/DE/EQB	13	3	3	NRR/DE/GB	28	2	2
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November 10, 1981

Director, Office of Nuclear Reactor Regulation
Attention: Mr. Frank Miraglia, Branch Chief
Licensing Branch No. 3
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Gentlemen:

Subject: Docket Nos. 50-361 and 50-362
San Onofre Nuclear Generating Station
Units 2 and 3

Enclosure 2 of the NRC's letter of November 3, 1981 identified two Open Items for which additional information is required to close the items. Consistent with your request, enclosed please find seven (7) copies of the seismic and environmental design capabilities of the interim ICC/CET instrumentation at San Onofre Unit 2 inside containment (Enclosure 1) and seven (7) copies of responses to items described in Section 7.2.2 of Supplement No. 2 to the San Onofre Units 2 and 3 Safety Evaluation Report (Enclosure 2).

If you have any questions or comments concering this information, please contact me.

Very truly yours,

K. P. Baskin
Manager of Nuclear Engineering,
Safety and Licensing

Enclosures

Boal
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ENCLOSURE 1

Seismic and Environmental Design
Capabilities of the Interim ICC/CET
Instrumentation at San Onofre Unit 2
Inside Containment.

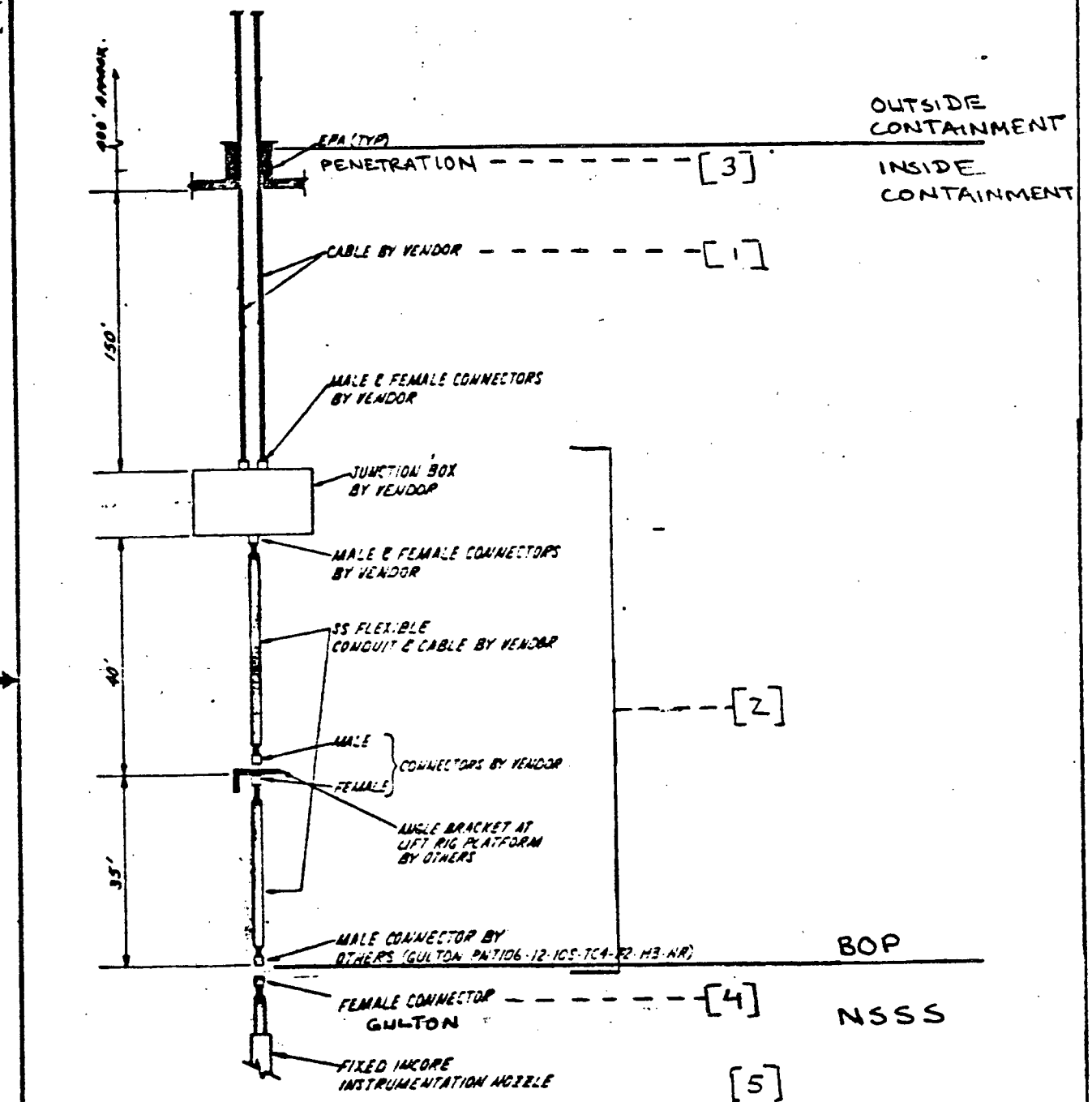
The seismic and environmental design capabilities of the interim CET instrumentation at San Onofre Unit 2 inside containment are provided herein.

As indicated numerous times previously by SCE, (most recently at the August 20, 1981 meeting in Bethesda, Md., as documented by SCE's letter of August 31, 1981) the interim and final ICC instrumentation configuration would consist of the following:

Interim	Final
(To be implemented by Fuel Load)	(To be implemented during the First Refueling Outage)
- Subcooled Margin Monitor (SMM)(1)	- SMM upgraded for superheat.
- Existing Core Exit Thermocouples (CET) including backup display (unqualified)(2)	- Qualified CET's
- Critical Function Monitoring System (CFMS) with existing instrumentation	- CFMS modified to include ICC
	- Reactor Vessel Level Monitoring System (heated junction thermocouples)
	- Qualified Safety Parameter Display System (QSPDS)

(1) The existing SMM is currently qualified for post-accident operation and will be modified during the first refueing outage to caculate and display superheat temperatures.

(2) The CET's were not part of the Environmental Qualification program and are not currently qualified for post-accident operation. Their existing seismic and environmental design capabilities are enclosed. The components integral to the qualification of the CETs (e.g., Mineral insulated cables, modified/qualified instrumentation flanges, modified/qualified connectors, modified/qualified Containment Penetratons) have been ordered and their delivery schedule are identified on enclosed Figure 8-1 which indicates that schedule for delivery of all the necessary components is approximately June of 1982.



INTERIM CET CONFIGURATION/EQUIPMENT.

INTERIM CET EQUIPMENT

PERFORMANCE DATA

The performance data for various components of the interim CET equipment inside containment are provided below. It should be noted that some components can be stated to be qualified and some components are not qualified. The entire system has not been subjected to an environmental qualification program and is therefore not considered to be environmentally qualified.

[1] - All cables are qualified for harsh environments. Reference Revision 1 to the San Onofre Units 2 and 3 Environmental Qualification Report which was submitted to the NRC on April 16, 1981.

[2] - All Bendix connectors, the BOP supplied Gulton male connector halves and Junction Boxes were tested by Wyle-Labs in accordance with the requirements of IEEE 323-1971 (Reference Wyle-Lab Test Report No. 44892-1, October 8, 1980. The testing included: (a) thermal aging to an equivalent 40 years plus 6 months using an oven temperature of 150°C for 280 hours; (b) irradiation by Co-60 for 1.0×10^8 rads at 0.5 Mega rads/hr; and (c) seismic DBE testing. Junction boxes passed pressure and seismic tests (NEMA 4 boxes) at 69 psig 50°C and 100% relative humidity for 24 hours. The Bendix and Gulton male connectors and Junction Boxes both passed the testing.

[3] - The Westinghouse penetrations are qualified for operation in a post-LOCA environment. Reference Table 8.1-1 of the San Onofre Units 2 &3 FSAR (Amendment No. 26).

[4] - Performance data for the NSSS supplied Gulton female connector halves are specified as follows:

Temperature:	250°F	
Gamma Dose:	200 R/hr	normal operating
Neutron Dose:	300 R/hr	range
Pressure:	0 psig	
Humidity:	0 - 100% relative humidity	
Seismic:	Qualified to DBE levels to ensure system integrity	

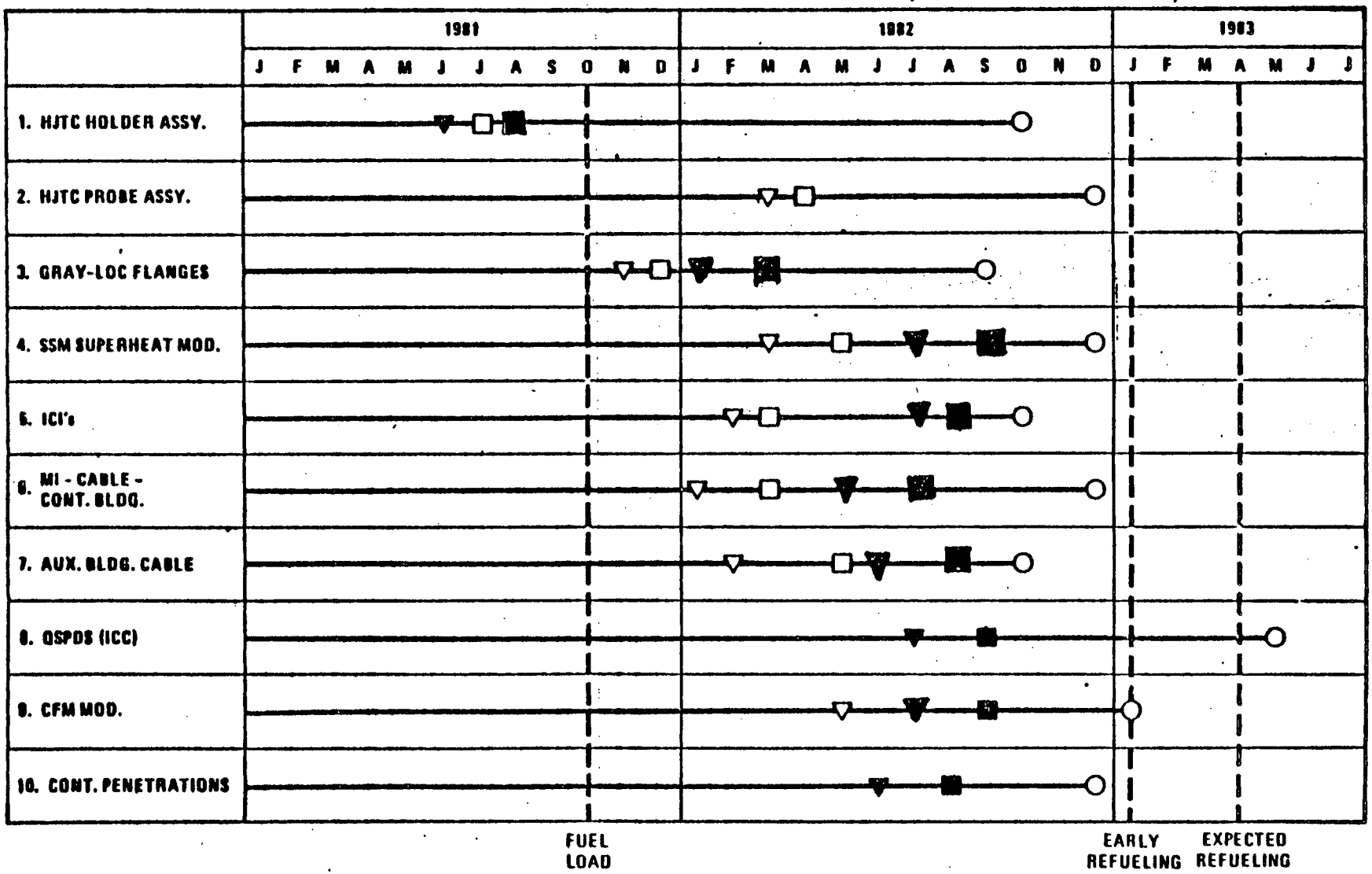
[5] - Performance data for the CET instrumentation is as follows:

Temperature:	650°F, nominal operating temperature 40 - 1600°F, performance range
Pressure:	2500 psia
Seismic:	Qualified to DBE levels to ensure system integrity

FIGURE 8-1 EARLIEST POSSIBLE ICC INSTALLATION SCHEDULE – SONGS 2

Based on Data through 4/81
▽ EARLIEST EXPECTED DELIVERY FOR FIRST UNIT
□ INSTALLATION COMPLETE
○ QUALIFICATION COMPLETE (ESTIMATED)

Based on Data through 8/81
▼ ACTUAL REVISED DELIVERY DATE
■ INSTALLATION COMPLETE (ASSUMES PLANTSHUTDOWN)



ENCLOSURE 2

Responses to Items Described in
Section 7.2.2 of Supplement No. 2
to the San Onofre Units 2 and 3
Safety Evaluation Report.

SER ITEM

7 INSTRUMENTATION AND CONTROLS

7.2 Reactor Protection System

7.2.2 Computer Based Portion of the Reactor Protection System - Core Protection Calculator

We have completed our review of several aspects of the San Onofre 2 and 3 Core Protection Calculator (CPC) system. These aspects are the CPC hardware, the data acquisition and processing system, and the executive operating system. Because the CPC has not been incorporated into previous plant designs other than Arkansas Nuclear One Unit 2 (ANO-2), we have taken the operating experience at ANO-2 and the previous review and acceptance of the ANO-2 CPCs into account during our review. We have also evaluated the proposed modifications to the original ANO-2 software design, including modifications to the executive software.

The conclusions of our review of San Onofre 2 and 3 are as follows:

(1) With the exception of Position 20 which addresses data links between the CPC and the plant computer, we require that the applicants amend the FSAR to provide a formal commitment to meet the requirements on CPCs in Table 7.1 of NUREG-0308, "Safety Evaluation Report, Arkansas Nuclear One, Unit 2."

(2) The data links between the plant computer and the CPCs may be connected only if the plant Technical Specifications include provisions to assure that (a) plant procedures shall be in effect to control modifications to CPC addressable constants, (b) these procedures are consistent with methods described in the bases to the Technical Specifications, (c) CPC addressable constants and their physically realistic allowed ranges (i.e., upper and lower bounds) are identified in the Technical Specifications, (d) values of addressable constants outside the allowed range are not to be entered without approval of the Plant Safety Committee, (e) an independent verification shall be conducted to confirm that addressable constant modifications have been made as approved by the Plant Safety Committee or the Engineering Staff (whichever is applicable), and (f) modifications to the CPC addressable constants based on information obtained through the Plant Computer Data Links shall not be made without approval of the Plant Safety Review Committee.

(3) CPC operating experience at ANO-2 and CPC environmental tests indicate a sensitivity of the CPCs to fluctuations and extremes in thermal environment. Therefore, the San Onofre 2 and 3 Technical Specifications will include the requirement that CPC functional tests be performed to confirm continued operability of each CPC channel whenever the CPC cabinet thermal environment exceeds allowable ranges. The allowable ranges should be justified on the basis of environmental tests of the CPCs and CPC operational experience at ANO-2.

RESPONSE

With respect to item (1), Responses to NRC Questions 221.18 and 221.20 have been revised to include the commitment to meet the requirements of Table 7.1 of NUREG-0308 with the exception of Position 20. The enclosed revised responses will be incorporated as part of the San Onofre Units 2 and 3 FSAR by Amendment No. 27 to the FSAR which is forthcoming.

With respect to items (2) and (3), the Technical Specifications for modifications to addressable constants and the Technical Specifications for CPC functional testing due to fluctuations and extremes in the thermal environment have been included as part of SCE's formal comments to the proof and review copy of the Technical Specifications for San Onofre Units 2 and 3 which were transmitted to the NRC by letter dated November 9, 1981.

Question 221.18

With regard to the Core Protection Calculator system, we require that the following information be provided:

(1) Identification of the revisions to the Software Specifications CEN-57(A)-P and CEN-58(A)-P made for San Onofre Units 2 and 3;

(2) The test report for verification of the San Onofre 2 and 3 CPC software;

(3) The data base constants and changes to the CPC algorithms; and

(4) Modifications to the proposed technical specifications.

(5) Provide a commitment to (a) implement the final software change procedure approved for the ANO-2 facility in accordance with Appendix B provisions of 10 CFR Part 50, and (b) utilize the services of a qualified computer consultant to provide independent verification that approved changes in the software are properly made. Provide documentation or a reference to documentation describing the final version of the software to which change procedures are to be applied.

Response

In order to facilitate the NRC review of CPC system software modifications, the following software design and test information has been submitted: 26

(1) Table 221.18-1 is a summary of the software differences between San Onofre and ANO-2. The ANO-2 baseline software is defined in the Basis to the ANO-2 Technical Specification (Appendix A to Operating License NPF-6) Section 2.2.1 as modified by References 1 and 2. 21

CEN-135(S)-P is a detailed description of the software changes described in table 221.18-1 which includes algorithm descriptions in symbolic algebra.

(2) The software test results of Phase I and Phase II software testing are provided in CEN-176(S)-P and CEN-173(S)-P (references 7 and 8). The CPC and CEAC data base material is provided in CEN-175(S)-P (reference 9). The time to trip analysis is provided in reference 10. 26

(3) The generation of detailed software design documentation and test documentation is included as part of the structured QA design documentation described in response to NRC Position 16 on ANO-2. These types of design documents have been used in the design process on San Onofre 2 and include CPC and CEAC Functional Design 26

Specifications (previously provided as references 4 and 5) and a Data Base Document previously submitted as reference 6 and superceded by reference 9.

(4) As noted in the response to San Onofre Question 032.30, the San Onofre 2 and 3 software changes are not expected to impact Technical Specifications. Should a change to Technical Specifications be found to be necessary, the recommended changes will be submitted on a schedule appropriate to the Technical Specification review.

(5) Subsequent to the completion of the San Onofre CPC software base design, any revisions to the San Onofre software base design and test documentation have been prepared in accordance with the CPC Protection Algorithm Software Change Procedure (CEN-39(A)-P, Revision 2, and its Supplement 1-P Revision 1) established in response to NRC Position 19 on ANO-2. SCE intends to utilize the services of a qualified consultant (may be an SCE employee) to independently review all software changes prior to implementation at San Onofre Units 2 and 3.

(6) With the exception of Position 20, SCE agrees to meet the requirements on CPCs in Table 7.1 of NUREG 0308, as requested.

References: Response to Question 032.30. No FSAR change was made.

1. NRC Audit of the ANO-2 CPCS at the Arkansas Site, September 13-14, 1979.

2. DC Trimble (AP + L), "CPC Software Modifications," Letter #2-010-25 to NRC Director of Nuclear Reactor Regulation, dated January 31, 1980.

3. CEN-135(S)-P, "CPC/CEAC Software Modifications for San Onofre Unit 2 (Response to NRC Question 221.18)."

4. CEN-148(S)-P "Functional Design Specification for a Control Element Assembly Calculation."

5. CEN-147(S)P "Functional Design Specification for a Control Protection Calculator".

6. CEN-149(S)P "CPC/CEAC Data Base Document".

7. CEN-176(S)P "CPC/CEAC System Phase I Software Verification Test Report".

8. CEN-173(S)P "CPC/CEAC System Phase II Software Verification Test Report".

9. CEN-175(S)-P "SONGS-2 Cycle 1 CPC and CEAC Data Base Document.

26 10. SONGS-2 Cycle 1 Control Protection Calculator Time to Trip Analysis.

27 11. CEN-184(S)-P Revision 1 Response to Question on Documents Supporting SONGS 2 License Submittal.

Table 221.18-1
CPC/CEAC SOFTWARE DIFFERENCES BETWEEN SONGS 2 & 3 AND ANO-2

AREA OF CHANGE	DESCRIPTION	REASON
A. General CPC/CEAC Modifications		
1. CEAC Subgroup Deviation Monitoring	The CEAC algorithm is modified to process a 2 CEA subgroup.	SONGS Units 2 & 3 have a 2-CEA subgroup.
2. Addressable Constants	Addressable constants are added for power distribution constants measured during startup.	The accuracy of core power and power distribution calculations is improved.
3. Addressable Constants	LPD and DNBR pretrip alarm setpoints are made addressable constants.	Flexibility in setting pretrip alarm setpoints is added.
4. POWER Program	Fixed numbers currently in algorithms are changed to constants in the data base.	The flexibility to change power distribution data without algorithm design changes is enhanced.
5. FLOW and STATIC Programs	Improved curve fits for coolant properties (enthalpy, specific volume) are provided.	The accuracy of coolant property determination is increased.
6. Heat Flux and LPD Filtering	Heat flux and LPD filtering at low powers is provided.	The uncertainties below 20% power for increasing power events are reduced.
7. Minimum Compensated Cold Leg Temperature	The minimum compensated cold leg temperature calculation is modified.	The accuracy of neutron flux determination is increased.
8. Compensation of Planar Radials	Temperature compensation of plant radials is added.	The accuracy of the planar radial calculation is increased.
B. Operator Interface		
1. Point ID Table	The Point ID table is revised.	More useful CPC information is provided for startup testing and normal operation.
C. DNBR Calculation		
1. DNBR Correlation	The W-3 DNBR calculation is replaced by the CE-1 DNBR calculation	The accuracy of the DNBR calculation is increased.

21

Question 221.20

Your response in Amendment 17 to question 221.18, item (3), is not clear. This part of the question requested that you provide the data base constants and changes to the CPC algorithms. Your response stated that "Generation of detailed software design documentation and test documentation is included as part of the structured QA design documentation described in response to NRC position 16 on ANO-2. These types of design documents will be used in the design process on San Onofre 2 and 3 and include CPC and CEAC Functional Design Specifications and a Data Base Document." We see no commitment to supply this documentation to the NRC in your response. We require that you submit the CPC and CEAC Functional Design Specifications and Data Base Document for our review. The San Onofre CPC design will not be approved prior to NRC review of these documents.

Response

In order to facilitate the NRC review of CPC system software modifications, the following software design and test information have been submitted: 26

(1) Table 221.18-1 is a summary of the software differences between San Onofre and ANO-2. The ANO-2 baseline software is defined in the Basis to the ANO-2 Technical Specification (Appendix A to Operating License NPF-6) Section 2.2.1 as modified by references 1 and 2.

CEN-135(S)-P is a detailed description of the software changes described in table 221.18 which includes algorithm descriptions in symbolic algebra.

(2) The software test results of Phase I and Phase II Software testing are provided in CEN-176(S)-P and CEN-173(S)-P (references 7 and 8). The CPC and CEAC data base material is provided in CEN-175(S)-P (reference 9). The time to trip analysis is provided in reference 10. 26

(3) The generation of detailed software design documentation and test documentation is included as part of the structured QA design documentation described in response to NRC Position 16 on ANO2. These types of design documents have been used in the design process on San Onofre 2 and 3 and include CPC and CEAC Functional Design Specifications (previously provided as references 4 and 5) and a Data Base Document previously submitted as reference 6 and susperceded by reference 9. 26

(4) As noted in the response to San Onofre Question 032.30, the San Onofre 2 and 3 software changes are not expected to impact Technical Specifications. Should a change to Technical Specifications be found to be necessary, the recommended changes will be submitted on a schedule appropriate to the Technical Specification review.

(5) Subsequent to the completion of the San Onofre CPC software base design, any revisions to the San Onofre software base design and test documentation will be prepared in accordance with the CPC Protection Algorithm Software Change Procedure (CEN-39(A)-P, Revision 2, and its Supplement 1-P Revision 1) established in response to NRC Position 19 on ANO-2. SCE intends to utilize the services of a qualified consultant (may be an SCE employee) to independently review all software changes prior to implementation at San Onofre Units 2 and 3. 26

(6) With the exception of Position 20, SCE agrees to meet the requirements on CPS in Table 7.1 of NUREG 0308, as requested. 27

References

Response to NRC Question 032.30. No FSAR change was made.

1. NRC Audit of the ANO-2 CPCS at the Arkansas Site, September 13-14, 1979.

2. DC Trimble (AP + L), "CPC Software Modifications," Letter #2-010-25 to NRC Director of Nuclear Reactor Regulation, dated January 31, 1980.

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6. CEN-149(S)-P "CPC/CEAC Data Base Document". 26

7. CEN-176(S)-P "CPC/CEAC System Phase I Software Verification Test Report".

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