Dockets 50-361 and 50-362

CEN--284(S)-NP

Safety Analysis and CPC Methodology Changes

for

San Onofre Nuclear Generating Station

Units No. 2 and 3

June, 1984

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1. SUMMARY

A meeting was held with the NRC on June 29, 1984 to present the methodology changes which Southern California Edison will incorporate into Cycle 2 of SONGS Units 2 and 3. The slides presented to the NRC are given in the Appendix to this document.

Combustion Engineering on behalf of Southern California Edison (SCE) will implement a number of minor CPC algorithm changes for SONGS Unit 2 Cycle 2. These algorithm changes will be incorporated with the software change already planned for Cycle 2 to revise ordinary data base constants to accommodate the Cycle 2 core design. In addition, certain methodology changes will be introduced to the Cycle 2 analyses. A brief review of the nature of each CPC modification is provided here. All of the changes are evolutionary in nature and represent either small adjustments to the methodology used to calculate constants or small differences in the algorithms themselves. Many of these modifications have already been implemented for Palo Verde 1, Cycle 1 (Reference 5.1). It is expected that the SONGS Unit 2 Cycle 2 CPC disks will be copied for use in SONGS Unit 3 Cycle 2. Therefore all changes discussed in this document apply to Cycle 2 of both units.

Detailed algorithm descriptions in the form of functional specifications and discussions of methodology changes are provided in the CPC Software Change Document (Reference 5.2).

Table 1 lists the updates to the CPC setpoint methodology which will be implemented for SONGS 2 Cycle 2.

Table 2 presents the schedule which will be followed for providing documentation for the licensing of SONGS 2 Cycle 2.

TABLE 1

UPDATES TO THE CPC SETPOINT METHODOLOGY

- CHANGES TO CONSTANTS
    - UPDATE OF GRID LOSS COEFFICIENTS
    - [ ] FOR LOSS OF FLOW
    - [ ] RANGE LIMITS*
- MINOR CALCULATIONAL CHANGES
    - HOT PIN TO HOT CHANNEL CONVERSION*
    - NON UNIFORM HEATING FACTOR MODIFICATION*
    - REACTOR COOLANT PUMP PRESSURE RISE CALCULATION*
- ENHANCEMENTS TO THERMAL MARGIN
    - IMPROVEMENT TO UPDATE ALGORITHM
    - POWER UNCERTAINTY AS FUNCTION OF CORE POWER
    - STATISTICAL COMBINATION OF UNCERTAINTIES
- CPC PERFORMANCE ENHANCEMENT
    - TEMPERATURE SHADOWING FACTOR ALGORITHM IMPROVEMENT
    - MODIFY HEAT FLUX DISTRIBUTION EXTRAPOLATION

* These changes were previously reviewed as part of the PVNGS-1 Cycle 1 CPC software. (Reference 5.1).

TABLE 2

SONGS-2 CYCLE 2 MILESTONES

DATE	MILESTONE ACTIVITY
6/29/84	Meeting to discuss methodology changes
7/15/84	Submittal of CPC Software Change Document
9/30/84	End of Cycle 1
9/30/84	Reload License Amendment Request to NRC (including the Reload Analysis Report)
11/15/84	CPC Phase I/Phase II Test Reports
11/15/84	Final SCU Numbers Available
1/1/85	Startup of Cycle 2

2. MINOR CALCULATIONAL AND CONSTANT CHANGES

2.1 Hot Pin to Hot Channel Conversion

Presently, POWER provides a hot pin power distribution in the form of an axial power distribution and appropriate radial peaking factors. This information is used in STATIC as if it were a hot channel power distribution. CETOP-D (the design code) makes the conversion from hot pin to hot channel power directly and thus comparisons between CETOP-D and STATIC (the CPC calculation) in the CPC uncertainty analysis implicitly account for the difference.

For Cycle 2, constants will be inserted into the heat flux equations in STATIC to convert from hot pin to hot channel heat flux distribution explicitly in CPC. This change will provide a more physical approach to the DNBR calculation. It involves minor algorithm adjustments in the CPC software and updates to the functional specification. The explicit conversion from hot pin to hot channel power is already in CPC for Palo Verde (Reference 5.1), and has been reviewed and approved by the NRC for this plant.

2.2 Non-Uniform Heating (Fk) Correction Factor Modification

The calculation of the non-uniform heating correction factor (Fk) in the CE-1 correlation in UPDATE does not differentiate between small changes about steady state and larger changes during transients. This results in a larger DNBR penalty than necessary during steady state operation.

For Cycle 2, the Fk algorithm now used and approved by the NRC for Palo Verde (Reference 5.1) will be implemented in the SONGS-2, CPC. This modification provides different Fk factor adjustments[

] As a result, more accurate calculations of Fk will be made for small changes in operating conditions (i.e., near steady state) while calculating more conservative values of Fk for large changes in operating conditions (i.e., transients).

2.3 Grid Loss Coefficient Update

The SONGS CPC data base currently retains spacer grid loss coefficients which were based on the ANO-2 spacer grid design. SONGS has instead a mixture of HID-1 and HID-2 grid designs, and therefore should have different grid loss coefficients. The effects of these different grid loss coefficients on SONGS DNBR calculations was judged to be very small and conservative. Nevertheless, the NRC imposed a license condition that these coefficients be corrected in the future (Reference 5.3).

The grid loss coefficients will be corrected for the appropriate number and type of grids in the Cycle 2 CPC software update. Note that only constants will be revised and that no algorithm changes are involved.

2.4 [ ] for Loss of Forced Reactor Coolant Flow

Protection against Loss of Flow is currently provided by a CPC trip on low DNBR. A projection of decreasing DNBR is performed by CPC based on the perceived decreasing flow rate and a conservative derivative of the DNBR with respect to flow. This projection starts from a point which credits the underflow fraction installed in COLSS. The projection is sufficiently conservative such that a rapid trip results for a Loss of Flow event.

The FLOW algorithms in CPC already contain logic to [ ]

[ ] For Cycle 2, the Loss of Flow event will be analyzed assuming that CPC provides an automatic trip on [

] rather than a DNBR-flow projection. The FLOW algorithm [ ] will be chosen based on that analysis. The DNBR projection logic currently in use will not be removed; however, the flow projection constants in that algorithm will be relaxed so that there is no interference with the [ ] The remaining FLOW algorithms and low DNBR trip functions will be otherwise unaffected. This change, which only involves changes to CPC constants, results in [ ] The revised setpoints will be insensitive to [ ] As a result this change will significantly reduce the possibility of a reactor trip during a [ ] The result of this change is [ ] and a reduction in the number of unnecessary reactor trips.

The loss-of-flow event will continue to be analyzed to the same criteria. Any change in time-to-trip resulting from the setpoint change will be accommodated by a change in the COLSS underflow fraction. Consequently, there is no degradation to plant safety because the outcome of the most limiting loss-of-flow event will be unchanged. The detailed analysis of the loss-of-flow event will be presented in the reload analysis report.

2.5 PFMLTD and PFMLTL Range Limits

The positive range limit on the CEAC penalty factor multipliers, [ ] and [ ] will be shifted from [ ] to [ ] This change is in anticipation of the need for a wider range of values in the future and has no impact on the calculational logic. This change was implemented in the PVNGS-1 Cycle 1 software and was previously submitted to the NRC (Reference 5.1).

2.6 Reactor Coolant Pump Pressure Rise Calculation

The calculation of pressure rise across the reactor coolant pump in the FLOW algorithm will be modified to account for forward flow through the pump when the pump rotor is locked at or near zero RPM. This change was implemented in the PVNGS-1 Cycle 1 software and was previously submitted to the NRC.

2.7 Modification of Heat Flux Distribution Extrapolation in STATIC

For certain CEA configurations, radial peaking factor assignments, and/or radial peaking factor multipliers, it is possible [ ] This [ ] which results in a CPC channel trip. Experience has shown that this condition occurs only at low power with a partially rodded core. This change [ ] in the top of the core.

[ ]

A check is performed for [ ] If any are detected, [ ] This change will result in a significant reduction in the probability of unnecessary reactor trips.

3. ENHANCEMENTS TO THERMAL MARGIN

Thermal Margin is defined to be the power increase (measured as a percentage of full power capability) needed to reach the COLSS alarm or CPC pre-trip alarm.

The Cycle 2 fuel management has been defined and consequently power distribution information and thermal hydraulic analysis for Cycle 2 are now available. Based on this information a thermal margin balance has been performed relative to Cycle 1 and the results of this calculation are summarized below. The major changes relative to Cycle 1 are as follows:

1. Radial power distribution. Fxy, the one pin planar radial peaking factor, increases in Cycle 2 because of the mismatch between Batch D enrichments and the initial core enrichments. For Cycle 2, maximum Fxy is predicted to be 1.55 compared to a value of 1.44 for Cycle 1.

2. The most limiting DNBR values result from the end-of-cycle (EOC) axial power shapes which are characteristically double-peaked. For Cycle 2 the EOC axial power shapes are, in fact, less limiting than the Cycle 1 shapes. This results in a positive contribution to thermal margin in Cycle 2.

3. The thermal hydraulic properties of the core are influenced by the shape of the intra-assembly power distribution in the fuel assembly containing the pin with minimum DNBR. For Cycle 2 this is found to be more severe than was calculated for Cycle 1.

4. The Cycle 2 fuel management contains both fresh and burned fuel and consequently there is a much wider variation of power shapes in different types of fuel assembly. As a result the uncertainties resulting from the power distribution synthesis will be greater in Cycle 2 than in Cycle 1.

As a result of the significant changes which are listed above, it is predicted that without the benefit of analysis or algorithm changes CPC margin and COLSS margin would [ ] relative to Cycle 1.

In order to prevent an excessive number of pre-trip alarms and inadvertent CPC trips it is necessary to remove some of the excessive conservatism in the calculation of the CPC DNBR for nominal power operation. Three CPC improvements will be implemented for SONGS 2 Cycle 2 which improve thermal margin for normal operation by removing excessive conservatisms in the calculation of the CPC DNBR.

3.1 Statistical Combination of Uncertainties (SCU) Methodology

The Cycle 1 CPC accommodates uncertainties in a combination of deterministic and statistical methods. System parameter uncertainties are deterministically built into the constants within the CETOP-2 STATIC algorithm. Flow, temperature, pressure and power measurement uncertainties were also treated deterministically. [ ] was used in determination of the CPC modeling errors.

A program for statistical combination of system and state parameter uncertainties is planned for Cycle 2. This program includes the combination of system parameter uncertainties in a single adjustment [ ] and the combination of measurement uncertainties with the CPC modeling errors in the calculation of the [ ] terms.

The DNBR limit for Cycle 2 [ ] at a 95/95 probability/confidence level. This will result in a [ ] constant, changes to CETOP-2 constants to remove uncertainties, and use of a consistent CETOP-D deck for transient analyses. [ ] will be statistically treated in the overall CPC uncertainty analyses. This will result in smaller [ ] terms than if the Cycle 1 method were used.

No CPC algorithms will be changed. SCU has received generic approval during the review of the CESSAR for Palo Verde (Reference 5.4). The methods used will be the same as those reviewed by NRC for PVNGS-2, Cycle 1 (Reference 5.4).

3.2 UPDATE Algorithm Improvement

The UPDATE algorithm of CPC provides rapid and conservative recalculation of DNBR based upon the detailed DNBR calculation contained in the STATIC algorithm, updated state parameter measurements, and derivatives of the DNBR. As part of the overall CPC undertainty analysis, comparisons of UPDATE and STATIC-predicted DNBRs based on [ ] are used to quantify this conservatism. Presently, the UPDATE algorithm of CPC applies a penalty to the updated DNBR at all times.

An algorithm change will be implemented in Cycle 2 which will [ ] In essence, this change minimizes excess conservatisms at normal operating conditions, but retains these conservatisms during transient operation.

The CPC UPDATE algorithm is based on [

]

The new method uses [

]

For planned changes in plant operating conditions the change in state parameters will be relatively slow, thus causing [
]

For this type of operation [ ] to the UPDATE algorithm which will insure the conservatism of the calculated DNBR.

[

]

This penalty factor along with the rest of the CPC calculations and penalty factors insure that the DNBRs calculated during transients and accidents will generate a trip signal when needed.

The UPDATE penalty factor modification therefore insures that the safety margin of the CPCs is maintained for all modes of operation. It will increase the steady state operating margin [ ] which will reduce the possibility of spurious trips and increase plant operational flexibility.

3.3 Power Uncertainty As A Function Of Core Power Level

Addressable penalty bias constants are used to adjust the thermal power and neutron-flux power level in the CPCs. Present methodology implements [ ] values of these penalty biases to bound the power level range set by CPC design requirements.

[ ]

4. CPC PERFORMANCE ENHANCEMENT

4.1 Temperature Shadowing Factor Modification

The temperature shadowing factor (TSF) is used to correct the CPC neutron flux power for decalibration effects resulting from changes in coolant density. A multiplier is applied to the neutron flux power calculation to correct ex-core detector response for inlet moderator temperature changes. In the current algorithm, the TSF is [ ] of moderator temperature change which is measured at start-up. The uncertainty in the measurement of the TSF is accommodated in the overall uncertainty term [ ]

[ ] the TSF on moderator temperature using a [ ] temperature will be implemented for Cycle 2. The ex-core detector calibration procedures will be modified accordingly.

[

] This change will allow the TSF uncertainty to be included directly in the factor itself. This insures a conservative correction to TSF at conditions different from the calibration temperature but improves margin near the calibration temperature (which should be near nominal conditions).

5. REFERENCES

5.1 Enclosure 1-P to LD-82-039, "CPC/CEAC Software Modification for System 80". March, 1982.

5.2 CEN-281(S)-P, "CPC/CEAC Software Modifications for San Onofre Nuclear Generating Station Units 2 and 3", June 1984.

5.3 Safety Evaluation report (for SONGS 2/3), NUREG-0712, Supplement 4, January 1982 (p. 4-5).

5.4 S.E.R. Related to Final Design Approval of C-E Standard NSSS (CESSAR) NUREG-0852, Supplement 2, September 1983 (pp. 4-11 to 24).

5.5 Combination of System Parameter Uncertainties in Thermal Margin Analyses for Arkansas Nuclear One Unit 2, CEN-139(A)-P, November 1980.

5.6 Robert A. Clark (NRC) to William Cavanaugh, III (AP&L), "Operation of ANO-2 During Cycle 2", July 21, 1981, Transmitting Amendment No. 26 to Facility Operating License No. NPF-6 for ANO-2.

APPENDIX TO CEN-284(S)

SONGS 2 Cycle 2 Methodology Changes
Presentation to the NRC
June 29, 1984

SONGS 2 CYCLE 2 METHODOLOGY CHANGES

PRESENTATION TO THE NRC
JUNE 29, 1984

AGENDA

1. INTRODUCTION
2. OVERVIEW OF CYCLE 2 DESIGN
    - GROUNDRULES
    - FUEL MANAGEMENT
3. UPDATES TO THE SAFETY ANALYSIS METHODOLOGY

FATES-3	DIT/ROCS
CESEC-3	FIESTA SCRAM CURVES

4. UPDATES TO THE SETPOINT METHODOLOGY
    - CHANGES TO CPC CONSTANTS
    - CPC ALGORITHM CHANGES
    - SCU METHODOLOGY APPLIED TO SONGS
5. SUMMARY OF METHODOLOGY CHANGES
6. REVIEW OF LICENSING SCHEDULE

SONGS 2

GROUNDRULES FOR CYCLE 2

CYCLE 1 TERMINATION BURNUP	13,800 TO 14,200 MWD/T
CYCLE 2 LENGTH (ANNUAL CYCLE)	10,000 MWD/T
MAXIMUM CORE RATED POWER (UNCHANGED FROM CYCLE 1)	3,390 MW_T
BASE LOADED OPERATION FOR CYCLE 2	
CONVENTIONAL OUT-IN FUEL MANAGEMENT	
72 FRESH BATCH D ASSEMBLIES	

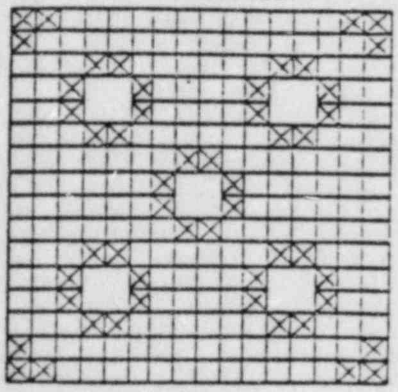
SONGS-2 CYCLE 2
QUARTER CORE LOADING PATTERN

							D	D
				D	D	D	B	C
			D	D	B	C.	C+	B
		D	C+	B	B	D/	B	D/
	D	D	B	C	B	B	C	B
	D	B	B	B	C	C	C	B
D	D	C.	D/	B	C	C+	B	D/
D	B	C+	B	C	C	B	C	B
	C	B	D/	B	B	D/	B	A

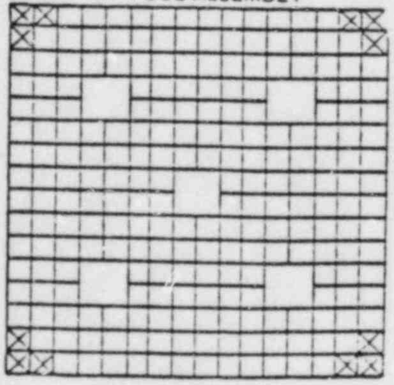
ENRICHMENT ZONING PATTERN FOR

D AND D/ FUEL ASSEMBLIES

D FUEL ASSEMBLY



D/ FUEL ASSEMBLY



FUEL ROD TYPE	FUEL ROD ENRICHMENT (W/O U235) D ASSEMBLY	FUEL ROD ENRICHMENT (W/O U235) D/ ASSEMBLY
□	3.65	2.78
⊠	2.78	1.92

WATER HOLE

□

UPDATE OF SAFETY ANALYSIS METHODOLOGY

IMPLEMENTATION OF IMPROVED CODES

- FATES-3
- CESEC-3
- DIT/ROCS
- FIESTA

UPDATES TO THE SETPOINT METHODOLOGY

- CORE PROTECTION CALCULATOR (CPC)
  - CHANGES TO CONSTANTS

    UPDATE OF GRID LOSS COEFFICIENTS

    [ ] FOR LOSS OF FLOW

    [ ] RANGE LIMITS
  - MINOR CALCULATIONAL CHANGES

    HOT PIN TO HOT CHANNEL CONVERSION

    NON UNIFORM HEATING FACTOR MODIFICATION

    REACTOR COOLANT PUMP PRESSURE RISE CALCULATION
  - ENHANCEMENTS TO THERMAL MARGIN

    IMPROVEMENT TO UPDATE ALGORITHM

    POWER UNCERTAINTY AS FUNCTION OF CORE POWER
  - CPC PERFORMANCE ENHANCEMENT

    TEMPERATURE SHADOWING FACTOR ALGORITHM IMPROVEMENT

    MODIFY HEAT FLUX DISTRIBUTION EXTRAPOLATION
- STATISTICAL COMBINATION OF UNCERTAINTIES

CHANGES TO CPC CONSTANTS

UPDATE OF GRID LOSS COEFFICIENTS

CYCLE 1:

- ASSUMED COEFFICIENTS APPROPRIATE TO GRID STRUCTURE OF ARKANSAS NUCLEAR ONE UNIT 2 (ANO-2).
- SER IMPOSED A LICENSE CONDITION TO CORRECT COEFFICIENTS AT FUTURE CPC SOFTWARE MODIFICATION.

CYCLE 2:

- COEFFICIENTS REFLECT CORRECT REPRESENTATION OF HID-1 AND HID-2 GRIDS.
- NO ALGORITHM CHANGE INVOLVED.

CHANGES TO CPC CONSTANTS

(CONT.)

[ ] FOR LOSS-OF-FLOW PROTECTION

CYCLE 1:

- LOF PROTECTION SUPPLIED BY CPC TRIP ON LOW DNBR PROJECTION.

CYCLE 2:

- LOF PROTECTION SUPPLIED BY THE [ ]
- [ ] TRIP SETPOINT TO BE DETERMINED BY LOF ANALYSIS.
- RESULTING SYSTEM LESS SENSITIVE TO UNDER-FREQUENCY TRANSIENTS.
- SIMPLIFIES FUTURE RELOAD SETPOINT ANALYSIS.

CPC ALGORITHM CHANGES

- CPC/CEAC SOFTWARE MODIFICATION DOCUMENT
- ALGORITHM IMPROVEMENTS FOR SONGS-2 CYCLE 2
- CHANGES DERIVED FROM IMPLEMENTATION OF PVNGS-1 CYCLE 1 SOFTWARE

ALGORITHM IMPROVEMENTS

TEMPERATURE SHADOWING FACTOR

CYCLE 1:

- TSF IS A [ ] OF MODERATOR TEMPERATURE CHANGE.

CYCLE 2:

- IMPLEMENT [ ] OF MODERATOR TEMPERATURE USING A [ ] INLET MODERATOR TEMPERATURE.
- REDEFINE SLOPE OF TEMPERATURE SHADOWING CORRECTION FACTOR ADDRESSABLE CONSTANT TO [ ]
- RESET [ ] TO [ ] WHENEVER [ ] IS ADJUSTED.
- ALLOWS USE OF [ ] OF CORRECTION BASED ON RELATION TO [ ]

ALGORITHM IMPROVEMENTS

(CONT.)

THERMAL/NEUTRON FLUX POWER UNCERTAINTIES [ ]

CYCLE 1:

- A SINGLE THERMAL/NEUTRON FLUX POWER UNCERTAINTY [ ]
- [ ]

CYCLE 2:

- UNCERTAINTIES TO BE APPLIED [ ]
- [ ]
- [ ]
- [ ]

ALGORITHM IMPROVEMENTS

(CONT.)

MORE REALISTIC MODELING OF DNBR PENALTY IN UPDATE ALGORITHM

CYCLE 1:

- OFF-LINE COMPARISONS OF UPDATE AND STATIC-PREDICTED DNBR'S ARE USED TO QUANTIFY THE CONSERVATISM OF UPDATE RECALCULATION OF DNBR.
- UPDATE CONSERVATIVELY APPLIES A PENALTY TO DNBR AT ALL TIMES.

CYCLE 2:

- PROVIDES A MORE REALISTIC DNBR FOR NORMAL OPERATING CONDITIONS.

ALGORITHM IMPROVEMENTS

(CONT.)

MODIFY HEAT FLUX DISTRIBUTION EXTRAPOLATION IN STATIC ALGORITHM

CYCLE 1:

- FOR CERTAIN CEA CONFIGURATIONS, RADIAL PEAKING FACTOR ASSIGNMENTS, AND/OR RADIAL PEAKING FACTOR MULTIPLIERS, [ ]
- [ ]
- THIS CONDITION OCCURS ONLY AT LOW POWER WITH A PARTIALLY RODDED CORE.

CYCLE 2:

- [
-]

CHANGES DERIVED FROM IMPLEMENTATION OF
PVNGS-1 CYCLE 1 SOFTWARE

- NON-UNIFORM HEATING CORRECTION FACTOR IN UPDATE ALGORITHM ADJUSTED BY [ ] ADDITIONAL CONSTANTS BASED ON [ ] IN QUALITY MARGIN.
- CALCULATION OF FOUR LINEAR HEAT DISTRIBUTIONS IN STATIC ALGORITHM MODIFIED TO ACCOUNT FOR DIFFERENCE BETWEEN HOT CHANNEL AND HOT PIN RELATIVE POWERS.
- REACTOR POWER CUTBACK ALGORITHMS (NOT APPLICABLE TO SONGS).
- CALCULATION OF PRESSURE RISE ACROSS REACTOR COOLANT PUMP IN FLOW ALGORITHM MODIFIED TO ACCOUNT FOR FORWARD FLOW THROUGH PUMP WITH PUMP ROTOR LOCKED AT OR NEAR ZERO RPM.
- POSITIVE RANGE LIMIT ON CEAC PENALTY FACTOR MULTIPLIERS, [ ] SHIFTED FROM [ ] TO [ ]

SCU METHODOLOGY APPLIED TO SONGS

SCU METHODOLOGY EXPERIENCE

CALVERT CLIFFS	UNIT 1	(A)
CALVERT CLIFFS	UNIT 2	(A)
ST. LUCIE	UNIT 1	(CYCLE 5) (A)
ST. LUCIE	UNIT 2	(CYCLE 2) (S)
ANO	UNIT 2	(A)
PALO VERDE	UNITS 1, 2 & 3	(A)
CESSAR-F*		(A)

A - SUBMITTED AND APPROVED.
S - SUBMITTED - UNDER REVIEW.

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* SER NUREG 0852, SEPT. 1983, DOCKET NO. STN-50-470

APPLICATION OF SCU METHODOLOGY TO SONGS

SUMMARY

- SCU METHODOLOGY USED FOR SONGS-2 CYCLE 2 IS IDENTICAL WITH THAT FOR CESSAR PLANTS.
- SCU HAS BEEN IMPLEMENTED ON MANY PLANTS.
- METHODOLOGY HAS BEEN EXTENSIVELY REVIEWED BY NRC.

SUMMARY

SAFETY ANALYSIS - METHODOLOGY UPDATED TO STANDARDIZE TO C-E's LATEST APPROVED METHODOLOGY.

FATES-3
CESEC-3
DIT/ROCS
FIESTA

SETPOINT METHODOLOGY

1. SCU IMPLEMENTED: METHODOLOGY SAME AS THAT APPROVED FOR SYSTEM 80 AND ANO-2.
2. CPC CONSTANTS: GRID LOSS COEFFICIENTS

   [ ]
3. CPC ALGORITHM CHANGES
   (A) STANDARDIZATION TO SYSTEM-80 SOFTWARE.
   (B) ALGORITHM IMPROVEMENTS
   - TEMPERATURE SHADOWING FACTOR
   - [ ]
   - IMPROVEMENT OF UPDATE ALGORITHM
   - HEAT FLUX DISTRIBUTION EXTRAPOLATION

PLANNED TECH SPEC CHANGES FOR CYCLE 2

(BASED ON ANALYSIS ASSUMPTIONS)

POSITIVE MTC LIMIT FROM $+0.13$ (x 10^{-4} $\Delta K/K/^{\circ}F$
TO $+0.0$ POWER $> 70\%$
$+0.5$ POWER $\leq 70\%$.

RESTRICTION OF REGULATING CEA TRANSIENT INSERTION LIMITS
TRANSIENT INSERTION LIMIT FOR PL CEAs.

POSITIVE ASI LIMIT FROM +0.50 TO + 0.28
AND FROM +0.50 TO +0.20 COLSS OUT-OF-SERVICE.

NOTE: CHANGES ALSO POSSIBLE IN TEST EXCEPTIONS AS A RESULT OF MINOR CHANGES IN NOMINAL CORE CHARACTERISTICS.
E.G., EXCEPTION ON ASI FOR S.A.M. TEST.

LIKELY TECH SPEC CHANGES FOR CYCLE 2

(BASED ON ANALYSIS RESULTS)

DNBR LIMIT (SCU)

MODE 5 SHUTDOWN MARGIN (BORON DILUTION)

COLSS OUT-OF-SERVICE LIMIT LINE (ROPM ANALYSES)

BORATED WATER SOURCE DATA (COOLDOWN/BORATION ANALYSES)

REDEFINITION OF CPC ADDRESSABLE CONSTANT FOR EXCORE DETECTOR TEMPERATURE SHADOWING (ALGORITHM IMPROVEMENT)

MINIMUM VALUE OF CPC ADDRESSABLE CONSTANT FOR AZIMUTHAL TILT (IMPROVED COLSS AVERAGE TILT)

CEAC/RSPT INOPERABLE PENALTY (ROPM ANALYSES)

POWER REDUCTION FIGURE IN CEA MISALIGNMENT ACTION (CEA DROP ANALYSIS)

RTD RESPONSE-TIME-DEPENDENT PENALTIES (VARIOUS SETPOINT ANALYSES)

COMBUSTION ENGINEERING, INC.

ENCLOSURE 4