File No: 009-OPS92-079
Revision: 00
Page: 1 of 2

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 05 Group 07 Engineering Limit and Bases

PARAMETER: Containment Temperature

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 4/27/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREER Martin Greer 4/28/93
Name Signature Date
Independent Reviewer

APPROVED BY: J.R. Congdon
Cognizant Engineering Manager (Print Name)

Joseph R. Congdon 4/28/93
Cognizant Engineering Manager (Signature) Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 05 **Group:** 07

Parameter: Containment Temperature

Step Value(s):	**Use(s):**
CONSTANT OR LOWERING	To determine if containment pressure is less than the CIAS setpoint and determine the appropriate success path to be used.
< 145 °F	To verify expected post-trip containment temperature conditions.

Engineering Limit(s):

None

Bases for Engineering Limit(s):

No applicable basis/reference was found (See Ref. 1)

Assumptions:

None

References:

1. EMail Message, "Boiler Plate for References," Paul Curry (SCE) to Bill Watson (ABB C-E), 3/1/93.

CHECKLIST NO. 9

REVIEW OF OTHER DESIGN DOCUMENTS

Checklist 1 (Exhibit 3.3-1 of QAP 3.3) shall be considered whenever this Checklist is used, and if applicable, the Independent Reviewer shall include it in the reviewer's statement.

Document Title/Number/Revision: 009- 0P592 -679

		OK	N/A
1.	Were the inputs correctly selected and incorporated into the design?		✓
2.	Is the material presented sufficiently detailed as to purpose, method, assumptions, references, and units?	✓	
3.	Are the assumptions necessary to perform the design activity adequately described and reasonable? Where necessary, are the assumptions identified for subsequent reverifications when the detailed design activities are completed?		✓
4.	Are the appropriate quality and quality assurance requirements specified?	✓	
5.	Are the applicable codes, standards and regulatory requirements including issue and addenda properly identified, and are their requirements for design met?		✓
6.	Have applicable construction and operating experience been considered?		✓
7.	Have the design interface requirements been satisfied?		✓
8.	Was an appropriate design method used?		✓
9.	Have the adjustment factors, uncertainties, and empirical correlations been correctly applied?		✓
10.	Is the output (results and conclusions) reasonable compared to inputs?		✓
11.	Are the specified parts, equipment, and processes suitable for the required application?		✓
12.	Are the specified materials compatible with each other and the design environmental conditions to which the material will be exposed?		✓
13.	Have adequate maintenance features and requirements been specified?		✓
14.	Are accessibility and other design provisions adequate for performance of needed maintenance and repair?		✓
15.	Has adequate accessibility been provided to perform the in-service inspection expected to be required during the plant life?		✓
16.	Has the design properly considered radiation exposure to the public and plant personnel?		✓

EXHIBIT 3.10-1

		OK	N/A
17.	Are the acceptance criteria incorporated in the design documents sufficient to allow verification that design requirements have been satisfactorily accomplished?		✓
18.	Have adequate pre-operational and subsequent periodic test requirements been appropriately specified?		✓
19.	Are adequate handling, storage, cleaning and shipping requirements specified?		✓
20.	Are adequate identification requirements specified?	✓	
21.	Has an appropriate title page been used?	✓	
22.	Are all pages sequentially numbered and marked with a valid number?	✓	
23.	Is the presentation legible and reproducible?	✓	
24.	Have all cross-outs or overstrikes in the documentation been initialed and dated by the author of the change?	✓	
25.	Are requirements for record preparation review, approval, retention, etc., adequately specified?	✓	

Comments/Remarks: ____________________

MARTIN GREER / Martin Greer 4/28/93
Independent Reviewer: Name/Signature/Date

EXHIBIT 3.10-1

File No: 009-OPS92-090
Revision: 01
Page: 1 of 3

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 05 Group 01 Engineering Limit and Bases

PARAMETER: Containment Spray Flow

PREPARED BY: John M. Flaherty | rev. 01
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 4/7/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREER	Martin Greer	4/28/93
Name Independent Reviewer	Signature	Date

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/28/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 05 **Group:** 01

Parameter: Containment Spray Flow

Step Value(s):	**Use(s):**
> 1750 GPM	To determine if containment spray flow is adequate to meet SFSC criteria (> 1750 gpm per train). To determine if containment spray flow is adequate to meet the containment cooling requirements. To verify that 50% of the required containment heat removal capability is being provided by one train of containment spray (> 1750 gpm).

Engineering Limit(s):

Lower Limit: 1750 GPM

Bases for Engineering Limit(s):

1750 GPM is the value of Containment Spray Flow assumed in the Containment Peak Pressure Analysis for the containment design basis accident (Ref 1, Table 6.2-11). This flowrate was used as the minimum acceptable value from a single train of Containment Spray (CS). The analysis shows the acceptability of this flowrate when combined with the heat removal capacity of two Containment Fan Coolers (CACs). Two CACs operating in the emergency mode or another CS train at minimum flow must be functioning in addition to the one CS train delivering flow at the engineering limit in order to provide the total required heat removal capacity.

Assumptions:

| rev. 01

1. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license.

   Ref: 1

| rev. 01

2. The references noted below are assumed to be Secondary Design documents. This assumption is justified based on the fact that they describe strategies which have been reviewed and commented on by the NRC.

   Ref: 2

References:

1. San Onofre 2&3 FSAR, Updated, Rev. 8, Section 6 (Engineered Safety Features).
2. CEN-152, <u>Emergency Procedure Guidelines</u>, Rev. 3.

CHECKLIST NO. 9

REVIEW OF OTHER DESIGN DOCUMENTS

Checklist 1 (Exhibit 3.3-1 of QAP 3.3) shall be considered whenever this Checklist is used, and if applicable, the independent Reviewer shall include it in the reviewer's statement.

Document Title/Number/Revision: 009-OPS92-090 Rev.01

		OK	N/A
1.	Were the inputs correctly selected and incorporated into the design?		✓
2.	Is the material presented sufficiently detailed as to purpose, method, assumptions, references, and units?	✓	
3.	Are the assumptions necessary to perform the design activity adequately described and reasonable? Where necessary, are the assumptions identified for subsequent reverifications when the detailed design activities are completed?		✓
4.	Are the appropriate quality and quality assurance requirements specified?	✓	
5.	Are the applicable codes, standards and regulatory requirements including issue and addenda properly identified, and are their requirements for design met?		✓
6.	Have applicable construction and operating experience been considered?		✓
7.	Have the design interface requirements been satisfied?		✓
8.	Was an appropriate design method used?		✓
9.	Have the adjustment factors, uncertainties, and empirical correlations been correctly applied?		✓
10.	Is the output (results and conclusions) reasonable compared to inputs?		✓
11.	Are the specified parts, equipment, and processes suitable for the required application?		✓
12.	Are the specified materials compatible with each other and the design environmental conditions to which the material will be exposed?		✓
13.	Have adequate maintenance features and requirements been specified?		✓
14.	Are accessibility and other design provisions adequate for performance of needed maintenance and repair?		✓
15.	Has adequate accessibility been provided to perform the in-service inspection expected to be required during the plant life?		✓
16.	Has the design properly considered radiation exposure to the public and plant personnel?		✓

EXHIBIT 3.10-1

	OK	N/A
17. Are the acceptance criteria incorporated in the design documents sufficient to allow verification that design requirements have been satisfactorily accomplished?		✓
18. Have adequate pre-operational and subsequent periodic test requirements been appropriately specified?		✓
19. Are adequate handling, storage, cleaning and shipping requirements specified?		✓
20. Are adequate identification requirements specified?	✓	
21. Has an appropriate title page been used?	✓	
22. Are all pages sequentially numbered and marked with a valid number?	✓	
23. Is the presentation legible and reproducible?	✓	
24. Have all cross-outs or overstrikes in the documentation been initialed and dated by the author of the change?	✓	
25. Are requirements for record preparation review, approval, retention, etc., adequately specified?	✓	

Comments/Remarks: ____

MARTIN GREER / Martin Greer 4/28/93

Independent Reviewer: Name/Signature/Date

EXHIBIT 3.10-1

File No: 009-OPS92-204
Revision: 01
Page: 1 of 9

ABB COMBUSTION ENGINEERING
INSTRUMENT USE AND BASES TABLE COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

MODULE: 06
HOT LEG TEMP
HOT LEG TEMP - COLD LEG TEMP
HOT LEG TEMP - REPCET
REPCET

PREPARED BY: P. B. Kramarchyk
Cognizant Engineer (Print Name)
Paul D. Kramarchyk Date: 4/21/93
Cognizant Engineer (Signature)

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Roger Kirkpatrick | | 4/23/93
Name | Signature | Date
Independent Reviewer

APPROVED BY: J.R. Congdon
Cognizant Engineering Manager (Print Name)
Joseph R Congdon 4/23/93
Cognizant Engineering Manager (Signature) Date

RECORD OF REVISIONS

Rev	Date	Pages	Prepared by	Reviewed by	Approved by
00	12/17/92	ALL	J. Flaherty	S. Ryder	J.R.Congdon
01	04/21/93	ALL	P.B.Kramarchyk	R.Kirkpatrick	J.R.Congdon

Module #: 06

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
01	HOT LEG TEMP	NOT RISING NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To verify hot leg temperatures constant or decreasing as indication that single phase natural circulation is established.
01	HOT LEG TEMP	NOT RISING NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To verify that this parameter is not rising, in the verification of adequate natural circulation.
02	HOT LEG TEMP	< 350 deg F UL < 350 deg F	When T ave is < 350 deg F the Tech Specs require only one ECCS subsystem to be operable. It is conservatively assumed that T hot = T ave. Therefore, the UL for disabling a HPSI pump to prevent challenging the LTOP relief is < 350 deg F.	To initiate reducing the number of available HPSI pumps to within the design capacity of the LTOP relief valve.
03	HOT LEG TEMP	< 385 deg F UL 400 deg F	The Engineering limit is based on not exceeding the design temperature (400 deg F) of the Shutdown Cooling System.	To monitor cooldown and depressurization of the RCS to get on Shutdown Cooling (<385 deg F and <340 psia specified).
03	HOT LEG TEMP	< 385 deg F UL 400 deg F	The Engineering limit is based on not exceeding the design temperature (400 deg F) of the Shutdown Cooling System.	To verify shutdown cooling entry conditions are met (T-hot <385 deg F, PZR pressure <340 psia).
03	HOT LEG TEMP	< 385 deg F UL 400 deg F	The Engineering limit is based on not exceeding the design temperature (400 deg F) of the Shutdown Cooling System.	To evaluate sufficiency of the shutdown cooling success path, the need to go to another heat removal method.

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
04	HOT LEG TEMP	< 580 deg F <583 degF & CNTLD	The engineering limit is based on the minimum MSSV setpoint plus the maximum loop delta T coincident with initiation of natural circulation following a reactor trip. Thus, the MSSVs should not cycle open and control of RCS temperature is maintained.	To verify the existance of adequate RCS heat removal via at least one S/G (T-hot < 580 deg F and controlled).
04	HOT LEG TEMP	<580 &STBL OR DEC <583 degF & CNTLD	The engineering limit is based on the minimum MSSV setpoint plus the maximum loop delta T coincident with initiation of natural circulation following a reactor trip. Thus, the MSSVs should not cycle open and control of RCS temperature is maintained.	To verify the existance of adequate RCS heat removal via at least one S/G (T-hot < 580 deg F and controlled).
04	HOT LEG TEMP	<580 degF & CNTLD <583 degF & CNTLD	The engineering limit is based on the minimum MSSV setpoint plus the maximum loop delta T coincident with initiation of natural circulation following a reactor trip. Thus, the MSSVs should not cycle open and control of RCS temperature is maintained.	To verify the existance of adequate RCS heat removal via at least one S/G (T-hot < 580 deg F and controlled).
05	HOT LEG TEMP	> 325 deg F LL >287 degF(U-2)	The Technical Specifications require at least one overpressure protection system operable whenever cold leg temperature is less than or equal to 287 deg F (Unit 2) or 267 deg F (Unit 3).	To indicate when to evaluate placing LTOP in service.
5	HOT LEG TEMP	>325 deg F LL >267 degF(U-3)	The Technical Specifications require at least one overpressure protection system operable whenever cold leg temperature is less than or equal to 287 deg F (Unit 2) or 267 deg F (Unit 3).	To indicate when to evaluate placing LTOP in service.

Q.A. APPROVED TABLE

Module #: 06

Q.A. APPROVED TABLE

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
06	HOT LEG TEMP	< 530 deg F UL 540 deg F	Based on the possible lift pressure of the lowest MSSV (1089 PSIA/555 deg F. Post S/G isolation, T hot in both loops is expected to rise about 15 deg F). T hot <540 deg F before isolation will ensure MSSVs will not open after subsequent temp increase.	To verify T Hot is < 530 deg F to minimize the possibility of lifting the Main Steam Stafty Valves (MSSVs) after isolating the affected S/G, thus minimizing the chance of an unmonitored release.
06	HOT LEG TEMP	< 530 deg F UL 540 deg F	Based on the possible lift pressure of the lowest MSSV (1089 PSIA/555 deg F. Post S/G isolation, T hot in both loops is expected to rise about 15 deg F). T hot <540 deg F before isolation will ensure MSSVs will not open after subsequent temp increase.	To determine when corresponding S/G pressure and RCS heat removal requirements are low enough to allow placing a gag on the Main Steam Safety Valve(s) (MSSVs).
07	HOT LEG TEMP	>20<200 SM CURVES NOT APPLICABLE	ABB-CE has been directed by SCE not to supply engineering limits for this curve or table.	To verify that RCS temperature is within P/T limits.
01	HOT LEG TEMP - COLD LEG TEMP	< 10 deg F UL 10 deg F	The engineeering limit is based on engineering judgement. The value chosen is based on the maximum delta T expected following an uncomplicated reactor trip followed by cooldown with one S/G available and some allowance for other unavailable equipment.	To verify a small loop delta T (< 10 deg F) that would be expected following a relatively uncomplicated reactor trip, assuming RCPs are running.
01	HOT LEG TEMP - COLD LEG TEMP	< 10 deg F UL 10 deg F	The engineeering limit is based on engineering judgement. The value chosen is based on the maximum delta T expected following an uncomplicated reactor trip followed by cooldown with one S/G available and some allowance for other unavailable equipment.	To verify adequate (forced circulation) success path performance via Th - Tc < 10 deg F and not rising, T-avg < 555 deg F and not rising, etc.

Q.A. APPROVED TABLE

Module #: 06

Q.A. APPROVED TABLE

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
01	HOT LEG TEMP - COLD LEG TEMP	<10degF &NOT RSNG UL 10 deg F	The engineeering limit is based on engineering judgement. The value chosen is based on the maximum delta T expected following an uncomplicated reactor trip followed by cooldown with one S/G available and some allowance for other unavailable equipment.	To verify adequate (forced circulation) success path performance via Th - Tc < 10 deg F and not rising, T-avg < 555 deg F and not rising, etc.
02	HOT LEG TEMP - COLD LEG TEMP	< 58 deg F UL 58.2 deg F	Based on full power delta T derived from design T hot at 100% power = 611.2 deg F and design T cold at 100% power = 553 deg F. Loop delta T less than full power delta T is one indication that single phase natural circulation is established.	To verify loop delta T is less than full power delta T (<58 deg F) when single phase natural circulation is established.
02	HOT LEG TEMP - COLD LEG TEMP	<58degF &NOT RSNG UL 58.2 deg F	Based on full power delta T derived from design T hot at 100% power = 611.2 deg F and design T cold at 100% power = 553 deg F. Loop delta T less than full power delta T is one indication that single phase natural circulation is established.	To verify adequate (natural circulation) success path performance via Th - Tc < 58 deg F and not rising, T-avg < 580 deg F and not rising, etc.
01	HOT LEG TEMP - REPCET	16 deg F 0 deg F	The eng limit is based on CEN-152 which states that there should be no abnormal differences between T hot RTDs and the CETs when single phase nat circ flow is established in at least one loop. The hot leg RTDs should be approximately equal to the CETs.	To verify no abnormal diferences between Hot leg RTDs and CETs as indication that single phase natural circulation is established.

Module #: 06

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
01	HOT LEG TEMP - REPCET	< 16 deg F 0 deg F	The eng limit is based on CEN-152 which states that there should be no abnormal differences between T hot RTDs and the CETs when single phase nat circ flow is established in at least one loop. The hot leg RTDs should be approximately equal to the CETs.	To verify no abnormal diferences between Hot leg RTDs and CETs as indication that single phase natural circulation is established.
01	HOT LEG TEMP - REPCET	<= 16 deg F 0 deg F	The eng limit is based on CEN-152 which states that there should be no abnormal differences between T hot RTDs and the CETs when single phase nat circ flow is established in at least one loop. The hot leg RTDs should be approximately equal to the CETs.	To verify no abnormal diferences between Hot leg RTDs and CETs as indication that single phase natural circulation is established.
01	REPCET TEMP	< 700 deg F <666 &STBL OR DEC	Based on maximum expected CET with core covered. CET should always be <666 deg F (based on PZR safety valve S.P.). If core uncovers, the upper core region becomes superheated and CET will increase rapidly to > T sat for the existing PZR pressure.	To verify RCS inventory control Safety Function Status Checklist (SFSC) criteria are satisfied and the core remains covered.
01	REPCET TEMP	> 700 deg F <666 &STBL OR DEC	Based on maximum expected CET with core covered. CET should always be <666 deg F (based on PZR safety valve S.P.). If core uncovers, the upper core region becomes superheated and CET will increase rapidly to > T sat for the existing PZR pressure.	To determine if the operator should go to the Functional Recovery procedure, based on inadequate core heat removal via two phase natural circulation.

Q.A. APPROVED TABLE

Module #: 06

Q.A. APPROVED TABLE

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
01	REPCET TEMP	< 600 deg F <666 &STBL OR DEC	Based on maximum expected CET with core covered. CET should always be <666 deg F (based on PZR safety valve S.P.). If core uncovers, the upper core region becomes superheated and CET will increase rapidly to > T sat for the existing PZR pressure.	To determine if two phase natural circulation is adequate based upon REPCET temperature < 600 deg F.
01	REPCET TEMP	> 650 deg F <666 &STBL OR DEC	Based on maximum expected CET with core covered. CET should always be <666 deg F (based on PZR safety valve S.P.). If core uncovers, the upper core region becomes superheated and CET will increase rapidly to > T sat for the existing PZR pressure.	To determine if the operator should go to the Functional Recovery procedure, based on inadequate core heat removal via two phase natural circulation.
01	REPCET TEMP	< 700 deg F <666 &STBL OR DEC	Based on maximum expected CET with core covered. CET should always be <666 deg F (based on PZR safety valve S.P.). If core uncovers, the upper core region becomes superheated and CET will increase rapidly to > T sat for the existing PZR pressure.	To determine if the "ECCS + S/G" success path performance is adequate based upon REPCET Temperature < 700 deg F.
02	REPCET TEMP	STABLE OR RISING NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To determine (by trending) if an ESDE is isolated.
02	REPCET TEMP	LOWERING NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To determine if unisolated (least affected) SG is removing decay heat.

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
02	REPCET TEMP	STABLE OR LOWRNG NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To evaluate sufficiency of the shutdown cooling success path, the need to go to another heat removal method.
02	REPCET TEMP	STABLE OR LOWRNG NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To verify core heat removal.

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Revision: 00
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 06 Group 01 Engineering Limit and Bases

PARAMETER: HOT LEG TEMP

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 11/13/92

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

STEVEN C RYDER
Name
Independent Reviewer

Signature

11/13/1992
Date

APPROVED BY: J. R. CONGDON
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 12/11/92
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 06 **Group:** 01

Parameter: HOT LEG TEMP

Step Value(s):	**Use(s):**
NOT RISING	To verify hot leg temperatures constant or decreasing as indication that single phase natural circulation is established.
NOT RISING	To verify that this parameter is not rising, in the verification of adequate natural circulation.

Engineering Limit(s):

None

Bases for Engineering Limit(s):

There are no associated engineering limits for the trending of parameters. Since no value is specified in the trend, no value will be assigned to the engineering limit. Usually, when an operator is instructed to trend an indication, the indication is used in conjunction with other parameters to corroborate the condition of a safety function. An operator is not required to perform a safety related action on the trending of a single parameter by itself in the EOIs. Where the trending of a parameter is combined with specified operating limits on that parameter, the values given for the operating limits are evaluated for their engineering limits.

Assumptions:

None

References:

None

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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 06 Group 02 Engineering Limit and Bases

PARAMETER: HOT LEG TEMP

PREPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)

Paul B. Kramarchyk
Cognizant Engineer (Signature) Date: 4/21/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Roger Kirkpatrick	Roger M. Kirkpatrick	4/23/93
Name Independent Reviewer	Signature	Date

APPROVED BY: Joseph R. Congdon
Cognizant Engineering Manager (Print Name)

Joseph R Congdon
Cognizant Engineering Manager (Signature) 4/23/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 06 **Group:** 02

Parameter: HOT LEG TEMP

Step Value(s):	**Use(s):**
< 350°F	To initiate reducing the number of available HPSI pumps to within the design capacity of the LTOP relief valve.

| rev. 01

Engineering Limit(s):

Upper Limit: < 350°F

Bases for Engineering Limit(s):

When $T_{avg} \geq 350$°F, the Technical Specifications (Ref. 1 & 2) require that two ECCS subsystems be operable. When $T_{avg} < 350$°F, the Technical Specifications define as acceptable one operable ECCS subsystem. It is conservatively assumed that the hot leg temperature is equal to T_{avg}. Therefore, the upper engineering limit for disabling a HPSI pump to prevent challenging the LTOP relief is < 350°F.

| rev. 01

Additional Information

There is no apparent basis for disabling all but one HPSI pump when RCS temperature is less than the step value indicated above. The plant Technical Specifications Bases specify that the valve used to provide LTOP protection (the Shutdown Cooling System relief valve) has adequate relieving capacity to protect the RCS from overpressurization when the transient is limited to inadvertent safety injection actuation with two HPSI pumps injecting into a water-solid RCS with full charging capacity and letdown isolated (Ref. 1 & 2).

Assumptions:

1. T_{avg} = Hot Leg Temp

2. The number of available HPSI pumps must be lowered to one to prevent challenging LTOP.

3. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01
Ref: 1, 2

References:

1. San Onofre 2 Technical Specifications, Amendment 94, Sections 3.5.2, 3.5.3, and 3.4.8 Bases.

2. San Onofre 3 Technical Specifications, Amendment 84, Sections 3.5.2, 3.5.3, and 3.4.8 Bases.

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Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 06 Group 03 Engineering Limit and Bases

PARAMETER: HOT LEG TEMP

PREPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)

Paul B. Kramarchyk
Cognizant Engineer (Signature) Date: 4/16/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

ROGER KIRKPATRICK
Name
Independent Reviewer

Signature

4/23/93
Date

APPROVED BY: JOSEPH R CONGDON
Cognizant Engineering Manager (Print Name)

Joseph R Congdon
Cognizant Engineering Manager (Signature) 4/23/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 06 **Group:** 03

Parameter: HOT LEG TEMP

Step Value(s):	**Use(s):**
< 385°F	To monitor cooldown and depressurization of the RCS to get on Shutdown Cooling (<385°F and <340 psia specified).
< 385°F	To verify shutdown cooling entry conditions are met (T-hot <385°F, PZR pressure <340 psia).
< 385°F	To evaluate sufficiency of the shutdown cooling success path, the need to go to another heat removal method.

Engineering Limit(s):

Upper Limit: 400°F

Bases for Engineering Limit(s):

The design temperature of the shutdown cooling system components is 400°F (Ref. 1). During post accident conditions, the shutdown cooling system may be placed in operation at a hot leg temperature of 400°F. It should be noted that this temperature limit does not include considerations for instrument error. Additionally, if the shutdown cooling system is unable to maintain the temperature in the hot leg below the design limit, then the shutdown cooling success path must be terminated and another success path chosen.

Assumptions:

| rev. 01

In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license.
Ref: 1

References:

1. San Onofre 2 & 3 Updated Final Safety Analysis Report, Revision 8, Section 5.4.7.1., Tables 5.4-8, 5.4-9, and 6.3-2.

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Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 06 Group 04 Engineering Limit and Bases

PARAMETER: HOT LEG TEMP

PREPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)

Paul B. Kramarchyk
Cognizant Engineer (Signature) Date: 4/21/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Roger Kirkpatrick
Name
Independent Reviewer

Signature

4/23/93
Date

APPROVED BY: Joseph R Congdon
Cognizant Engineering Manager (Print Name)

Joseph R Congdon
Cognizant Engineering Manager (Signature) 4/23/93 Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 06 **Group:** 04

Parameter: HOT LEG TEMP

Step Value(s):	**Use(s):**	
< 580°F and CONTROLLED	To verify the existence of adequate RCS heat removal via at least one steam generator (T-hot < 580 °F and controlled).	| rev. 01
< 580 °F and STABLE OR DECREASING	To verify the existence of adequate RCS heat removal via at least one steam generator (T-hot < 580 °F and controlled).	| rev. 01
< 580°F	To verify the existence of adequate RCS heat removal via at least one steam generator (T-hot < 580 °F and controlled).	| rev. 01

Engineering Limit(s):

Limit: < 583°F and Controlled

Bases for Engineering Limit(s):

Ref. 1 states that RCS temperatures should be controlled by operation of the Steam Bypass Control System (SBCS) or the Atmospheric Dump Valves (ADVs). The SBCS is preferred because of the unmonitored release of radioactivity to the environment via the ADVs. Ref. 1 also specifies that RCS temperatures be controlled to distinguish between an uncontrolled cooldown with a stuck open Main Steam Safety Valve (MSSV). Therefore, the intent of limiting the hot leg temperature is to ensure that the MSSVs do not open.

The minimum MSSV setpoint is 1100 psia with a tolerance of ± 1% (Ref. 2 & 3). Therefore, the minimum possible setpoint is 1089 psia. The saturation temperature corresponding to this pressure is 555°F (Ref. 4).

During natural circulation conditions, it can be assumed that the cold leg temperature is equal to the saturation temperature in the steam generator. Therefore, the hot leg temperature is equal to the cold leg temperature plus the loop ΔT. The testing described in Ref. 5 shows that after a reactor trip from 80% power, the maximum ΔT is 28°F. Although the ΔT following a trip from 100% power with one steam generator isolated will be higher, it is conservative to assume that the maximum ΔT will be 28°F. Therefore, the hot leg temperature corresponding to the pressure setpoint of the MSSVs is 555°F + 28°F = 583°F. | rev. 01

| rev. 01 It is possible that the hot leg temperature could be maintained less than 583 °F with the MSSVs cycling opened and closed, particularly when the RCPs are operating and the SBCS or ADVs are not available. However, when these valves open, the pressure, and consequently the temperature, in the steam generator will drop quickly. When the valve closes, the temperature and pressure will rise. These temperature fluctuations will cause the hot and cold leg temperature to fluctuate. Therefore, to ensure that the MSSVs are not opening, the hot leg temperature must be controlled (i.e., stable or decreasing) and remain less than 583°F.

Assumptions:

1. $T_{S/G} = T_{Cold}$ during natural circulation.
2. The maximum ΔT will be 28°F | rev. 01

| rev. 01

In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license.
Ref: 2, 3

| rev. 01

The references noted below are assumed to be Secondary Design documents. This assumption is justified based on the fact that they describe strategies which have been reviewed and commented on by the NRC.
Ref: 1, 5

References:

1. CEN-152, Combustion Engineering Emergency Procedure Guidelines, Rev. 03.
2. San Onofre 2 Technical Specifications, Amendment 94, Section 3.7.1, Table 3.7-1, and Table 3.7-2.
3. San Onofre 3 Technical Specifications, Amendment 84, Section 3.7.1, Table 3.7-1, and Table 3.7-2.
4. ABB Steam Tables, 17th Printing.
5. CEN-259, An Evaluation of Natural Circulation Cooldown Test Performed at the San Onofre Nuclear Generating Station, January, 1984.

File No: 009-OPS92-161
Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 06 Group 05 Engineering Limit and Bases

PARAMETER: HOT LEG TEMP

PREPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)

Paul B. Kramarchyk
Cognizant Engineer (Signature) Date: 4/16/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

ROGER [illegible] Date 4/19/93
Name
Independent Reviewer
Signature

APPROVED BY: Joseph R Congdon
Cognizant Engineering Manager (Print Name)

Joseph R Congdon 4/21/93
Cognizant Engineering Manager (Signature) Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 06 **Group:** 05

Parameter: HOT LEG TEMP

Step Value(s):	**Use(s):**
> 325°F	To indicate when to evaluate placing LTOP in service.

Engineering Limit(s):

Lower Limit: > 287°F (Unit 2)

> 267°F (Unit 3)

Bases for Engineering Limit(s):

The Technical Specifications (Ref. 1 & 2) require at least one overpressure protection system operable whenever cold leg temperature is less than or equal to 287°F (Unit 2) or 267°F (Unit 3). In certain situations, it is possible for the hot leg temperature to be less than the cold leg temperature. During some natural circulation events or when only one RCP is operating, flow through one of the loops can be inverted which will cause hot leg temperature to be lower than cold leg temperature. Since it is possible for the hot leg temperature to be less than the cold leg temperature, this limit is applicable to hot leg temperatures. During all events, the lowest RCS temperature should be compared to the limit to ensure the Technical Specification requirements are not violated.

Assumptions:

1. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01
   Ref: 1, 2

References:

1. San Onofre 2 Technical Specifications, Amendment 94, Section 3.4.8.3.1 and Table 3.4-3.
2. San Onofre 3 Technical Specifications, Amendment 84, Section 3.4.8.3.1 and Table 3.4-3.

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Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 06 Group 06 Engineering Limit and Bases

PARAMETER: HOT LEG TEMP

PREPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)
Paul B. Kramarchyk
Cognizant Engineer (Signature) Date: 4/21/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Roger Kirkpatrick
Name
Independent Reviewer

Signature

4/23/93
Date

APPROVED BY: Joseph R Congdon
Cognizant Engineering Manager (Print Name)
Joseph R Congdon
Cognizant Engineering Manager (Signature) 4/23/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 06 **Group:** 06

Parameter: HOT LEG TEMP

Step Value(s):	**Use(s):**
< 530°F	To verify hot leg temperature is < 530°F to minimize the possibility of lifting the Main Steam Safety Valve(s) (MSSVs) after isolating the affected S/G, thus minimizing the chance of an unmonitored release.
< 530°F	To determine when corresponding S/G pressure and RCS heat removal requirements are low enough to allow placing a gag on the MSSVs.

| rev. 01

Engineering Limit(s):

Upper Limit: < 540°F

Bases for Engineering Limit(s):

The lowest Main Steam Safety Valve (MSSV) setpoint is 1100 psia with a tolerance of ± 1% (Ref. 1 & 2). Therefore, this safety valve may open at a steam generator pressure of 1089 psia. The saturation temperature at 1089 psia is 555°F (Ref. 3). In order to prevent the steam generator pressure from exceeding this MSSV setpoint, the temperature in the steam generator must remain less than 555°F. Assuming the hot leg temperature is equal to the steam generator saturation temperature, the hot leg temperature must also remain below 555°F.

Following the isolation of a steam generator, the hot leg temperature in both loops is expected to rise due to the increased heat removal load on the unisolated steam generator. Best estimate analyses have shown this rise may be as much as

15°F (Ref. 4). To ensure that the MSSVs do not open following this temperature rise, the hot leg temperature prior to isolation must be reduced by this amount. Therefore, the hot leg temperature prior to steam generator isolation which will ensure the MSSVs do not open after the subsequent increase in hot leg temperature is < 540°F.

Gagging the MSSVs is permissible as long as the pressure in the steam generator is expected to remain below the design pressure of the steam generator (1100 psia, Ref. 5). As discussed above, maintaining the hot leg temperature below 555°F will ensure the pressure stays below 1089 psia. Therefore, the engineering limit described above envelopes this use.

Assumptions:

1. Hot leg temperature = steam generator saturation temperature.

| rev. 01

2. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license.
   Ref: 1, 2, 5

| rev. 01

3. The references noted below are assumed to be Secondary Design documents. This assumption is justified based on the fact that they describe strategies which have been reviewed and commented on by the NRC.
   Ref: 4

References:

1. San Onofre 2 Technical Specifications, Amendment 94, Section 3.7.1 and Table 3.7-1.
2. San Onofre 3 Technical Specifications, Amendment 84, Section 3.7.1 and Table 3.7-1.
3. ABB Steam Tables, 17th Printing.
4. SONGS 2 & 3 Emergency Procedure Technical Guidelines, Rev. 01.
5. San Onofre Updated Final Safety Analysis Report, Rev. 8, Table 5.4-4.

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Revision: 00
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 06 Group 07 Engineering Limit and Bases

PARAMETER: HOT LEG TEMP

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 12/15/92

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

STEVEN C RYDER
Name
Independent Reviewer

Signature

12/16/92
Date

APPROVED BY: Joseph R Congdon
Cognizant Engineering Manager (Print Name)

Joseph R Congdon
Cognizant Engineering Manager (Signature) 12/16/92
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 06 **Group:** 07

Parameter: HOT LEG TEMP

Step Value(s):	**Use(s):**
> 20 < 200 Saturation Margin Curves (Post Accident Temperature Limits)	To verify that RCS temperature within P/T limits.

Engineering Limit(s):

Not Applicable

Bases for Engineering Limit(s):

ABB-CE has been directed by SCE not to supply engineering limits for these curves. See References 1 and 2.

Assumptions:

None

References:

1. Message, RCP NPSH Curves, W. Watson to P. Curry, 10/30/92
2. Message, RCP NPSH Curves, P. Curry to W. Watson, 11/02/92

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Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 06 Group 01 Engineering Limit and Bases

PARAMETER: HOT LEG TEMP - COLD LEG TEMP

PREPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)

Paul B. Kramarchyk
Cognizant Engineer (Signature) Date: 4/20/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Roger Kiewiewicz R. M. K
Name Signature Date 4/23/93
Independent Reviewer

APPROVED BY: Joseph R Congdon
Cognizant Engineering Manager (Print Name)

Joseph R. Congdon 4/23/93
Cognizant Engineering Manager (Signature) Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 06 **Group:** 01

Parameter: HOT LEG TEMP - COLD LEG TEMP

Step Value(s):	**Use(s):**	
< 10°F	To verify adequate (forced circulation) success path performance via ΔT < 10°F and not rising, T-avg < 555°F and not rising, etc.	rev. 01
< 10°F	To verify a small loop ΔT (< 10°F) that would be expected following a relatively uncomplicated reactor trip, assuming RCPs are running.	rev. 01
< 10°F and NOT RISING	To verify adequate (forced circulation) success path performance via ΔT < 10°F and not rising, T-avg < 555°F and not rising, etc.	

Engineering Limit(s):

Upper Limit: 10°F

Bases for Engineering Limit(s):

The engineering limit is based on engineering judgement. Ref. 1 provides simulator and computer analyses of various events at a "generic" Combustion Engineering plant. The ΔT following a relatively uncomplicated reactor trip (i.e., turbine trip event) is approximately 3°F following the initial stabilization of the plant. In events where only one steam generator is available, the ΔT would be approximately twice this value. Therefore, the value chosen for the engineering limit is based on the maximum ΔT expected during a cooldown with one steam generator available and some allowance for other unavailable equipment. This engineering limit will not allow an unacceptable condition to persist without operator action.

Assumptions:

| rev. 01

1. The references noted below are assumed to be Secondary Design documents. This assumption is justified based on the fact that they describe strategies which have been reviewed and commented on by the NRC.
   Ref: 1

References:

1. CEN-128, Response of Combustion Engineering Nuclear Steam Supply Systems to Transients and Accidents, April, 1980.

File No: 009-OPS92-152
Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 06 Group 02 Engineering Limit and Bases

PARAMETER: HOT LEG TEMP - COLD LEG TEMP

PREPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)

Paul B. Kramarchyk
Cognizant Engineer (Signature) Date: 4/16/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Roger Kirkpatrick
Name
Independent Reviewer

Signature

4/23/93
Date

APPROVED BY: Joseph R Congdon
Cognizant Engineering Manager (Print Name)

Joseph R. Congdon
Cognizant Engineering Manager (Signature)

4/23/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 06 **Group:** 02

Parameter: HOT LEG TEMP - COLD LEG TEMP

Step Value(s):	**Use(s):**
< 58°F	To verify loop ΔT is less than full power ΔT (58°F) when single phase natural circulation is established.
58°F & ot Rising	To verify adequate (natural circulation) success path performance via ΔT < 58°F and not rising, T-avg < 580°F and not rising, etc.

Engineering Limit(s):

Upper Limit: 58.2° F

Bases for Engineering Limit(s):

Single phase natural circulation can be verified by observing loop ΔT less than the normal full power ΔT in conjunction with hot and cold leg temperatures constant or decreasing and no abnormal differences between core exit temperatures and the hot leg temperatures. This criteria is based on analyses in Ref. 1 and the tests described in Ref. 2 and 3. In addition, Ref. 4, which has received interim approval from the NRC, has incorporated this criteria for verifying natural circulation.

The hot leg temperature at full power is 611.2°F and the cold leg temperature at full power is 553°F (Ref. 5). Therefore, full power ΔT is 58.2°F.

Assumptions:

| rev. 01

1. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license.
   Ref: 5

| rev. 01

2. The references noted below are assumed to be Secondary Design documents. This assumption is justified based on the fact that they describe strategies which have been reviewed and commented on by the NRC.
   Ref: 1, 2, 3, 4

References:

1. CE-NPSD-154, Natural Circulation Cooldown, October, 1981.
2. CEN-201 (S) and CEN-201 (S) Supplement, Natural Circulation Test Program, San Onofre Nuclear Generating Station Unit 2 Safety Evaluation, April 1982 & January 1983.
3. CEN-259, An Evaluation of Natural Circulation Cooldown Test Performed at the San Onofre Nuclear Generating Station, January, 1984.
4. CEN-152, Rev. 03, Combustion Engineering Emergency Procedure Guidelines.
5. San Onofre Updated Final Safety Analysis Report, Revision 8, Table 5.1-2.

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Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 06 Group 01 Engineering Limit and Bases

PARAMETER: HOT LEG TEMP - REPRESENTATIVE CET

PREPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)

Paul B. Kramarchyk
Cognizant Engineer (Signature) Date: 4/16/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

[illegible]		4/23/93
Name Independent Reviewer	Signature	Date

APPROVED BY: Joseph R Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/21/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 06 **Group:** 01

Parameter: HOT LEG TEMP - REPRESENTATIVE CET

Step Value(s):	**Use(s):**
≤ 16°F	To verify no abnormal differences between Hot leg RTDs and CETs as indication that single phase natural circulation is established.
< 16°F	To verify no abnormal differences between Hot leg RTDs and CETs as indication that single phase natural circulation is established.
16°F	To verify no abnormal differences between Hot leg RTDs and CETs as indication that single phase natural circulation is established.

Engineering Limit(s):

0°F

Bases for Engineering Limit(s):

Ref. 1 states the following:

"When single phase natural circulation flow is established in at least one loop, the RCS should indicate....no abnormal differences between T_H RTDs and core exit thermocouples. Hot leg RTD temperature should be consistent with the core exit thermocouple. Adequate natural circulation flow ensures that core exit thermocouple temperature will be approximately equal to the hot leg RTD temperature within the bounds of the instrument's accuracies."

This engineering limit does not include the potential effects of instrument inaccuracy on the measurement of the temperature differential. In addition, other operational factors can affect the temperature differential such as the cooldown rate, surge line flow, hot leg safety injection, inadequate flow mixing in the hot leg, and natural circulation within the reactor vessel (reactor vessel head to the core inlet). These factors should be considered in determining an operating limit.

Assumptions:

1. Ref. 1 has received interim approval from the NRC. The conclusions of this document are assumed to be valid.

| rev. 01

2. The references noted below are assumed to be Secondary Design documents. This assumption is justified based on the fact that they describe strategies which have been reviewed and commented on by the NRC.
   Ref: 1

References:

1. CEN-152, Revision 3, Combustion Engineering Emergency Procedure Guidelines.

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 06 Group 01 Engineering Limit and Bases

PARAMETER: REPCET

PREPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)

Paul B. Kramarchyk
Cognizant Engineer (Signature) **Date:** 4/21/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

[illegible] Name Independent Reviewer
Signature
4/23/93 Date

APPROVED BY: JOSEPH R CONGDON
Cognizant Engineering Manager (Print Name)

Joseph R Congdon
Cognizant Engineering Manager (Signature) 4/23/93 Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 06 **Group:** 01

Parameter: REPCET

Step Value(s):	**Use(s):**
< 700°F	To verify RCS inventory control Safety Function Status Checklist (SFSC) criteria are satisfied and the core remains covered.
> 700°F	To determine if the operator should go to the Functional Recovery procedure based on inadequate Core Heat Removal two phase natural circulation.
< 700°F	To determine if the 'ECCS + S/G' success path performance is adequate based upon REPCET temperature < 700°F.
< 600°F	To determine if two phase natural circulation is adequate based upon REPCET temperature < 600°F.
> 650°F	To determine if the operator should go to the Functional Recovery procedure based on inadequate Core Heat Removal via two phase natural circulation.

rev. 01

Engineering Limit(s):

Upper Limit: < 666°F and Stable or Decreasing

Bases for Engineering Limit(s):

The core heat removal process via two phase natural circulation is satisfactory if the representative core exit thermocouple is indicating less than superheated conditions. A superheated condition indicates that core uncovery has occurred and that the core heat removal process is no longer effective (Ref. 1).

The saturation margin at the core exit is dependent on the pressure in the RCS. The pressure in the RCS is limited by the pressurizer safety valves which have a setpoint of 2500 psia (± 1%) (Ref. 2 & 3). Conservatively assuming the maximum negative tolerance, the minimum opening pressure is 2475. The saturation temperature at this pressure is 666°F (Ref. 4). Therefore, any temperature indication greater than 666°F is an indication of superheated conditions and core uncovery.

Core uncovery can also occur at pressures below the relief valve setpoint pressure during events such as large break LOCAs. During these events, the saturation temperature is lower and consequently the core could uncover before the exit temperature reaches 666°F. However, since the fuel cladding temperature rises rapidly following core uncovery and heat is transferred to the steam as it passes the uncovered fuel, the temperature of the steam exiting the core will also rise rapidly. Therefore, a rapidly rising CET temperature indication which is not a direct result of an operator action to increase pressure can also be used as an indication of core uncovery.

Therefore, the engineering limit for the core exit thermocouples which ensures adequate core heat removal and that core uncovery has not taken place is a maximum temperature of 666°F in conjunction with a stable or decreasing temperature trend.

This engineering limit does not consider the effects of the lag time between the indication of superheated conditions and the initiation of core uncovery.

Assumptions:

1. Ref. 1 has received interim approval from the NRC. The conclusions of this document are assumed to be valid.

2. It is assumed that the pressure in the RCS is limited by the pressurizer safety valves. During certain hypothesized Anticipated Transient Without Scram events, the RCS pressure can be higher than pressurizer relief valve setpoint pressure. However, the operator will not pass the first step of the Standard Post Trip Actions without ensuring that a reactor trip has occurred. Therefore, it is very unlikely that the operator will be using this criteria to determine the adequacy of core heat removal or core uncovery when pressure is above 2500 psia. In addition, in any accident scenario, if the RCS pressure is above the design pressure, the core is not being adequately cooled.

3. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01
   Ref: 2, 3

4. The references noted below are assumed to be Secondary Design documents. This assumption is justified based on the fact that they describe strategies which have been reviewed and commented on by the NRC. | rev. 01
   Ref: 1

References:

1. CEN-152, Combustion Engineering Emergency Procedure Guidelines, Rev. 03.

2. San Onofre 2 Technical Specifications, Amendment 94, Section 3.4.2.

3. San Onofre 3 Technical Specifications, Amendment 84, Section 3.4.2.

4. ABB Steam Tables, 17th Printing.

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Revision: 00
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 06 Group 02 Engineering Limit and Bases

PARAMETER: REPCET

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 12/16/92

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

STEVEN C RYDER
Name
Independent Reviewer

Signature

12/16/92
Date

APPROVED BY: Joseph R Congdon
Cognizant Engineering Manager (Print Name)

Joseph R Congdon
Cognizant Engineering Manager (Signature) 12/16/92
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 06 **Group:** 02

Parameter: REPCET

Step Value(s):	**Use(s):**
STABLE OR RISING	To determine (by trending) if an ESDE is isolated.
LOWERING	To determine if unisolated (least affected) SG is removing decay heat.
STABLE OR LOWERING	To evaluate sufficiency of the shutdown cooling success path, the need to go to another heat removal method.
STABLE OR LOWERING	To verify core heat removal.

Engineering Limit(s):

None

Bases for Engineering Limit(s):

There are no associated engineering limits for the trending of parameters. Since no value is specified in the trend, no value will be assigned to the engineering limit. Usually, when an operator is instructed to trend an indication, the indication is used in conjunction with other parameters to corroborate the condition of a safety function. An operator is not required to perform a safety related action on the trending of a single parameter by itself in the EOIs. Where the trending of a parameter is combined with specified operating limits on that parameter, the values given for the operating limits are evaluated for their engineering limits.

Assumptions:

None

References:

None

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Revision: 01
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ABB COMBUSTION ENGINEERING
INSTRUMENT USE AND BASES TABLE COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

MODULE: 07 Pressurizer Level

PREPARED BY: P. Kramarchyk
Cognizant Engineer (Print Name)

Paul B. Kramarchyk Date: 5/3/93
Cognizant Engineer (Signature)

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists ______ of QAM-101.

John M. Flaherty 5/3/93
Name Signature Date
Independent Reviewer

APPROVED BY: J.R. Congdon
Cognizant Engineering Manager (Print Name)

Joseph R. Congdon 5/3/93
Cognizant Engineering Manager (Signature) Date

RECORD OF REVISIONS

Rev	Date	Pages	Prepared by	Reviewed by	Approved by
00	11/11/92	ALL	P. Kramarchyk	K. Faulkner	J.R.Congdon
01	04/29/93	ALL	P. Kramarchyk	J. Flaherty	J.R.Congdon

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
01	PZR LEVEL	10% TO 70% UL 78% LL 2%	78% is based on engineering judgement to establish a limit that will avoid solid water operations and provide sufficient steam space to assure normal pressure control. 2% is intended to be theoretical minimum detectable level.	To verify expected post-trip RCS inventory response (PZR level = 10% to 70%).
01	PZR LEVEL	10% TO 70% UL 78% LL 2%	78% is based on engineering judgement to establish a limit that will avoid solid water operations and provide sufficient steam space to assure normal pressure control. 2% is intended to be theoretical minimum detectable level.	To verify charging and/or SI pumps are maintaining PZR level between 10% and 70%.
01	PZR LEVEL	10% TO 70% UL 78% LL 2%	78% is based on engineering judgement to establish a limit that will avoid solid water operations and provide sufficient steam space to assure normal pressure control. 2% is intended to be theoretical minimum detectable level.	To verify that PZR level is in the appropriate band for the RCS Inventory Control SFSC, and direct event re-diagnosis if it is not.
01	PZR LEVEL	10% TO 70% UL 78% LL 2%	78% is based on engineering judgement to establish a limit that will avoid solid water operations and provide sufficient steam space to assure normal pressure control. 2% is intended to be theoretical minimum detectable level.	To verify charging and letdown are maintaining PZR level between 10% and 70%.

Q.A. APPROVED TABLE

Module #: 07

Q.A. APPROVED TABLE

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
01	PZR LEVEL	< 70% UL 78% LL 2%	78% is based on engineering judgement to establish a limit that will avoid solid water operations and provide sufficient steam space to assure normal pressure control. 2% is intended to be theoretical minimum detectable level.	To verify charging and/or SI pumps are maintaining PZR level between 10% and 70%.
01	PZR LEVEL	> 10% UL 78% LL 2%	78% is based on engineering judgement to establish a limit that will avoid solid water operations and provide sufficient steam space to assure normal pressure control. 2% is intended to be theoretical minimum detectable level.	To verify that the charging pumps are maintaining PZR level for RCS inventory control (>10%), to determine whether or not to stay with the present success path.
01	PZR LEVEL	<= 70% UL 78% LL 2%	78% is based on engineering judgement to establish a limit that will avoid solid water operations and provide sufficient steam space to assure normal pressure control. 2% is intended to be theoretical minimum detectable level.	To verify charging and/or SI pumps are maintaining PZR level between 10% and 70%.
01	PZR LEVEL	> 10 % UL 78% LL 2%	78% is based on engineering judgement to establish a limit that will avoid solid water operations and provide sufficient steam space to assure normal pressure control. 2% is intended to be theoretical minimum detectable level.	To verify charging and/or SI pumps are maintaining PZR level between 10% and 70%.

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
01	PZR LEVEL	> 70% UL 78% LL 2%	78% is based on engineering judgement to establish a limit that will avoid solid water operations and provide sufficient steam space to assure normal pressure control. 2% is intended to be theoretical minimum detectable level.	To compensate for void collapse.
02	PZR LEVEL	30% TO 60% UL 59% LL 21%	59% is based on ensuring that PZR water vol < T.S. 3/4.4.3 limit requiring that the PZR be OPERABLE with a water volume of <=900 cubic ft (Modes 1, 2 and 3). 21% is based on keeping the PZR heaters covered to preserve normal means of pressure control.	To verify PZR level is being controlled in the normal operating band of 30% to 60%.
02	PZR LEVEL	< 60% UL 59% LL 21%	59% is based on ensuring that PZR water vol < T.S. 3/4.4.3 limit requiring that the PZR be OPERABLE with a water volume of <=900 cubic ft (Modes 1, 2 and 3). 21% is based on keeping the PZR heaters covered to preserve normal means of pressure control.	To verify PZR level is being controlled in the normal operating band of 30% to 60%.
02	PZR LEVEL	> 30% UL 59% LL 21%	59% is based on ensuring that PZR water vol < T.S. 3/4.4.3 limit requiring that the PZR be OPERABLE with a water volume of <=900 cubic ft (Modes 1, 2 and 3). 21% is based on keeping the PZR heaters covered to preserve normal means of pressure control.	To verify PZR level is being controlled in the normal operating band of 30% to 60%.

SONGS 2/3 IS II PHASE II
INSTRUMENT USE AND BASES TABLE

Module #: 07

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
02	PZR LEVEL	30% UL 59% LL 21%	59% is based on ensuring that PZR water vol < T.S. 3/4.4.3 limit requiring that the PZR be OPERABLE with a water volume of <=900 cubic ft (Modes 1, 2 and 3). 21% is based on keeping the PZR heaters covered to preserve normal means of pressure control.	To monitor corrected PZR level > 30% during PZR cooldown using the fill and drain method.
02	PZR LEVEL	TREND 30% TO 60% UL 59% LL 21%	59% is based on ensuring that PZR water vol < T.S. 3/4.4.3 limit requiring that the PZR be OPERABLE with a water volume of <=900 cubic ft (Modes 1, 2 and 3). 21% is based on keeping the PZR heaters covered to preserve normal means of pressure control.	To verify PZR level is trending to the normal post-trip control band (30% to 60%).
02	PZR LEVEL	TREND 30% TO 60% UL 59% LL 21%	59% is based on ensuring that PZR water vol < T.S. 3/4.4.3 limit requiring that the PZR be OPERABLE with a water volume of <=900 cubic ft (Modes 1, 2 and 3). 21% is based on keeping the PZR heaters covered to preserve normal means of pressure control.	To verify that PZR level is in the appropriate band for the RCS Inventory Control SFSC, and direct event re-diagnosis if it is not.
02	PZR LEVEL	30% TO 60% UL 59% LL 21%	59% is based on ensuring that PZR water vol < T.S. 3/4.4.3 limit requiring that the PZR be OPERABLE with a water volume of <=900 cubic ft (Modes 1, 2 and 3). 21% is based on keeping the PZR heaters covered to preserve normal means of pressure control.	To verify the maintenance of normal post-trip PZR level control (30% to 60%).

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GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
03	PZR LEVEL	> 30% & NOT LWRG LL 21%	21% is based on the minimum pressurizer level required to keep the peripheral(outside) pressurizer heaters covered to prevent heater burn-out and maintain normal RCS pressure control.	To verify adequate RCS inventory control when checking HPSI Termination Criteria.
03	PZR LEVEL	>30% & CONTROLLED LL 21%	21% is based on the minimum pressurizer level required to keep the peripheral(outside) pressurizer heaters covered to prevent heater burn-out and maintain normal RCS pressure control.	To verify adequate RCS inventory control when checking HPSI Termination Criteria.
03	PZR LEVEL	>30% & STBL,RSNG LL 21%	21% is based on the minimum pressurizer level required to keep the peripheral(outside) pressurizer heaters covered to prevent heater burn-out and maintain normal RCS pressure control.	To verify charging pump throttling criteria.
03	PZR LEVEL	>30% & CONTROLLED LL 21%	21% is based on the minimum pressurizer level required to keep the peripheral(outside) pressurizer heaters covered to prevent heater burn-out and maintain normal RCS pressure control.	Used as criteria for HPSI throttle/stop (CET sat margin > 20 deg F, RVLMS >= 82%).
04	PZR LEVEL	30% TO 60% UL 59% LL 21%	59% is based on ensuring that PZR water vol < T.S. 3/4.4.3 limit requiring that the PZR be OPERABLE with a water volume of <=900 cubic ft (Modes 1, 2 and 3). 21% is based on keeping the PZR heaters covered to preserve normal means of pressure control.	To determine if PZR level is within the appropriate band for starting an RCP, without Reactor Vessel voiding and likely to remain there.

Q.A. APPROVED TABLE

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Q.A. APPROVED TABLE

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
04	PZR LEVEL	> 30% UL 59% LL 21%	59% is based on ensuring that PZR water vol < T.S. 3/4.4.3 limit requiring that the PZR be OPERABLE with a water volume of <=900 cubic ft (Modes 1, 2 and 3). 21% is based on keeping the PZR heaters covered to preserve normal means of pressure control.	To determine if PZR level is within the appropriate band for starting an RCP, without Reactor Vessel voiding and likely to remain there.
04	PZR LEVEL	> 30% & NOT LWRG UL 59% LL 21%	59% is based on ensuring that PZR water vol < T.S. 3/4.4.3 limit requiring that the PZR be OPERABLE with a water volume of <=900 cubic ft (Modes 1, 2 and 3). 21% is based on keeping the PZR heaters covered to preserve normal means of pressure control.	To determine if PZR level is within the appropriate band for starting an RCP, without Reactor Vessel voiding and likely to remain there.
05	PZR LEVEL	> 70% UL 78%	78% is based on engineering judgement such that solid water operation is avoided, sufficient steam space is maintained, and spray response time and other uncetainties are accounted for. Also, it bounds the highest PZR levels observed in best est anal.	To remind operator that the maximum PZR level of 70% may be exceeded if necessary to maintaining 20 deg F saturation margin or to compensate for void collapse.
06	PZR LEVEL	RISING NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To verify SITs are injecting water.
07	PZR LEVEL	< 60% UL 59%	59% is based on ensuring that pressurizer water volume is within the T.S. limit. T.S. 3/4.4.3 requires that the pressurizer be OPERABLE with a water volume of <= 900 cubic feet, when in Modes 1, 2 and 3.	To maintain PZR level below 60% while purging the VCT.

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
07	PZR LEVEL	< 60% UL 59%	59% is based on ensuring that pressurizer water volume is within the T.S. limit. T.S. 3/4.4.3 requires that the pressurizer be OPERABLE with a water volume of <= 900 cubic feet, when in Modes 1, 2 and 3.	To verify maximum desired Pressurizer Level during the raising of Core Exit Saturation Margin .
08	PZR LEVEL	< 33% UL 59%	59% is based on ensuring that pressurizer water volume is within the T.S. limit. T.S. 3/4.4.3 requires that the pressurizer be OPERABLE with a water volume of <= 900 cubic feet, when in Modes 1, 2 and 3.	To evaluate the capability of the PZR to absorb the possible insurge when starting the first RCP after all RCPs have been tripped if Tsg > Tc.
08	PZR LEVEL	< 61% UL 59%	59% is based on ensuring that pressurizer water volume is within the T.S. limit. T.S. 3/4.4.3 requires that the pressurizer be OPERABLE with a water volume of <= 900 cubic feet, when in Modes 1, 2 and 3.	To evaluate the capability of the PZR to absorb the possible insurge when starting the first RCP after all RCPs have been tripped if Tsg > Tc.
09	PZR LEVEL	41% LL 21%	The engineering limits for minimum PZR level are based on providing sufficient inventory to compensate for RCP restart void collapse with a known void in the reactor vessel. The engineering limit is calculated to prevent PZR heaters from uncovering.	To verify that Pressurizer inventory is sufficient to compensate for RCP restart void collapse with a void indicated by the RVLMS.
09	PZR LEVEL	46% LL 41%	The engineering limits for minimum PZR level are based on providing sufficient inventory to compensate for RCP restart void collapse with a known void in the reactor vessel. The engineering limit is calculated to prevent PZR heaters from uncovering.	To verify that Pressurizer inventory is sufficient to compensate for RCP restart void collapse with a void indicated by the RVLMS.

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
09	PZR LEVEL	62% LL 54%	The engineering limits for minimum PZR level are based on providing sufficient inventory to compensate for RCP restart void collapse with a known void in the reactor vessel. The engineering limit is calculated to prevent PZR heaters from uncovering.	To verify that Pressurizer inventory is sufficient to compensate for RCP restart void collapse with a void indicated by the RVLMS.
09	PZR LEVEL	74% LL 68%	The engineering limits for minimum PZR level are based on providing sufficient inventory to compensate for RCP restart void collapse with a known void in the reactor vessel. The engineering limit is calculated to prevent PZR heaters from uncovering.	To verify that Pressurizer inventory is sufficient to compensate for RCP restart void collapse with a void indicated by the RVLMS.
09	PZR LEVEL	87% LL 81%	The engineering limits for minimum PZR level are based on providing sufficient inventory to compensate for RCP restart void collapse with a known void in the reactor vessel. The engineering limit is calculated to prevent PZR heaters from uncovering.	To verify that Pressurizer inventory is sufficient to compensate for RCP restart void collapse with a void indicated by the RVLMS.
10	PZR LEVEL	LWNG/RSNG - CHARG NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To determine if a void exists in the reactor vessel by observing PZR level behavior while using aux spray or charging to the loop.
11	PZR LEVEL	LWNG/RSNG - SPRAY NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To determine if a void exists in the reactor vessel by observing PZR level behavior while using aux spray or charging to the loop.

Q.A. APPROVED TABLE

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Q.A. APPROVED TABLE

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
12	PZR LEVEL	STABLE NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To verify that this parameter is adjusted correctly to control Core Exit Saturation Margin.
13	PZR LEVEL	> 30% & NOT LWRG LL 21%	21% is based on the minimum pressurizer level required to keep the peripheral(outside) pressurizer heaters covered to prevent heater burn-out and maintain normal RCS pressure control.	To verify PZR level is above the heater low level cutoff (procedure specified value = 30%) and controlled.
13	PZR LEVEL	> 30% LL 21%	21% is based on the minimum pressurizer level required to keep the peripheral(outside) pressurizer heaters covered to prevent heater burn-out and maintain normal RCS pressure control.	To verify maximum desired Pressurizer Level during the raising of Core Exit Saturation Margin .
13	PZR LEVEL	> 30% LL 21%	21% is based on the minimum pressurizer level required to keep the peripheral(outside) pressurizer heaters covered to prevent heater burn-out and maintain normal RCS pressure control.	To verify desired Pressurizer Level during the raising of Core Exit Saturation Margin using PZR heaters.
13	PZR LEVEL	30% LL 21%	21% is based on the minimum pressurizer level required to keep the peripheral(outside) pressurizer heaters covered to prevent heater burn-out and maintain normal RCS pressure control.	To verify that corrected PZR level is being maintained above the low level heater cutoff (30% specified).

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GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
13	PZR LEVEL	>30% &STBL,RISING LL 21%	21% is based on the minimum pressurizer level required to keep the peripheral(outside) pressurizer heaters covered to prevent heater burn-out and maintain normal RCS pressure control.	To verify PZR level is above the heater low level cutoff (procedure specified value = 30%) and controlled.
13	PZR LEVEL	> 30% LL 21%	21% is based on the minimum pressurizer level required to keep the peripheral(outside) pressurizer heaters covered to prevent heater burn-out and maintain normal RCS pressure control.	Verify PZR level is above the heater low level cutoff.
13	PZR LEVEL	> 30% LL 21%	21% is based on the minimum pressurizer level required to keep the peripheral(outside) pressurizer heaters covered to prevent heater burn-out and maintain normal RCS pressure control.	To verify that corrected PZR level is being maintained above the low level heater cutoff (30% specified).
14	PZR LEVEL	STABLE OR RISING NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To confirm LOFW diagnosis in conjunction with EFAS actuation and feedwater less than the minimum required flow.
15	PZR LEVEL	65% TO 70% UL 78%	78% is based on engineering judgement such that solid water operation is avoided, sufficient steam space is maintained, and spray response time and other uncetainties are accounted for. Also, it bounds the highest PZR levels observed in best est anal.	To maintain corrected PZR level within the appropriate range (65% - 70%) during PZR cooldown using the fill and drain method.

Q.A. APPROVED TABLE

Module #: 07

Q.A. APPROVED TABLE

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
16	PZR LEVEL	< 70% UL 78%	78% is based on engineering judgement such that solid water operation is avoided, sufficient steam space is maintained, and spray response time and other uncetainties are accounted for. Also, it bounds the highest PZR levels observed in best est anal.	To determine if the plant should be in "solid" pressure control operations, or whether the present success path can be utilized.
17	PZR LEVEL	30% LL 21%	21% is based on the minimum pressurizer level required to keep the peripheral(outside) pressurizer heaters covered to prevent heater burn-out and maintain normal RCS pressure control.	To allow PZR level to lower to assist in PZR pressure reduction during cooldown without further compromising pressure control capability.
18	PZR LEVEL	< 100% UL 100%	100% is based on engineering judgement. 100% indicated level is the maximum level that can be used to determine if solid plant operations should be used for pressure control. If PZR level is <100% then means other than solid plant ops may be used.	To determine if the plant should be in "solid" pressure control operations, or whether the present success path can be utilized.
19	PZR LEVEL	< 70% UL 78%	78% is based on engineering judgement such that solid water operation is avoided, sufficient steam space is maintained, and spray response time and other uncetainties are accounted for. Also, it bounds the highest PZR levels observed in best est anal.	To determine if sprays can be used to control PZR pressure.
20	PZR LEVEL	> 30% UL 42%	42% is based on preventing the shutdown cooling relief valve PSV-9349 from lifting when placing the SDC system in service.	To to ensure Shutdown Cooling System operational limit is met.

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Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 07 Group 01 Engineering Limit and Bases

PARAMETER: PZR LEVEL

PREPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)
Paul B Kramarchyk
Cognizant Engineer (Signature) Date: 4/30/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

John M. Flaherty
Name
Independent Reviewer

John M Flaherty
Signature

4/30/93
Date

APPROVED BY: J.R. Congdon
Cognizant Engineering Manager (Print Name)
Joseph R Congdon
Cognizant Engineering Manager (Signature) 4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 07 **Group:** 01

Parameter: PZR LEVEL

Step Value(s):	**Use(s):**
10% TO 70%	To verify expected post-trip RCS inventory response (PZR Level = 10% to 70%).
	To verify charging and/or SI pumps are maintaining PZR level (between 10% and 70%).
	To verify that PZR level is in the appropriate band for the RCS Inventory Control SFSC, and direct event re-diagnosis if it is not.
	To verify charging and letdown are maintaining PZR level between 10% and 70%.
< 70%	To verify charging and/or SI pumps are maintaining PZR level between 10% and 70%.
> 10%	To verify that the charging pumps are maintaining PZR level for RCS inventory control (>10%), to determine whether or not to stay with the present success path.
<= 70%	To verify charging and/or SI pumps are maintaining PZR level between 10% and 70%.
> 10%	To verify charging and/or SI pumps are maintaining PZR level between 10% and 70%.
> 70%	To compensate for void collapse.

| rev. 01

Engineering Limit(s):

Upper Engineering Limit = 78% | rev. 01

Lower Engineering Limit = 2% | rev. 01

Bases for Engineering Limit(s):

78% is based on engineering judgement. The justification and bases given in references 1 and 2 support the following rational. 78% is based on establishing a limit that will:

- avoid solid water operations
- provide sufficient steam space to assure normal pressure control
- bound the highest PZR levels observed in best estimate analysis

| rev. 01

> **NOTE:** Per SCE Technical Specifications, 900 cubic feet (approx. 59% ref. 5) is the upper limit for PZR level in MODE 1, 2, and 3. The ACTION statement provides 6 hours to correct the problem, else enter MODE 4 within the following 6 hours. (ref. 3 & 4, LCO 3.4.3)

| rev. 01

2% is a theoretical minimum detectable level at which it is possible to observe a *change* in pressurizer level, either rising or lowering. Two percent does not account for instrument inaccuracies or the practical problem of discerning a change on any particular readout device. These factors should be considered when establishing an operational threshold for detecting a change in PZR level at very low levels. This engineering limit is based on engineering judgement and the justification and bases provided in references 1 and 2.

Assumptions:

Engineering Limit(s) are given as indicated level in accordance with the assumptions made in reference 5. | rev. 01

The engineering bases assumes the plant is in OPERATIONAL MODE 3, 4, or 5 as defined in the Technical Specifications.

In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

Ref: 3, 4

In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01

Ref: 1, 2

References:

1) SONGS Units 2&3, Bases And Deviation Documentation

2) C-E Letter S-CE-8660, Transmittal Of Documentation To Support SONGS 2&3 Plant Specific Guidelines, D. E. Nunn to SCE, July 22, 1983

3) San Onofre Unit 2 Technical Specifications, Amendment 94

4) San Onofre Unit 3 Technical Specifications, Amendment 84

5) NES&L Calculation Sheet Calc No. J-BBB-021
Sheets: 184, 185, 186, 187, 188, 189
Subject: TLU Calculation and Setpoint Verification for Pressurizer Level
Originator: B. Katebian, 2-19-93; IRE: J. Brannon, 2-28-93

| rev. 01

File No: 009-OPS92-108
Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 07 Group 02 Engineering Limit and Bases

PARAMETER: PZR LEVEL

PREPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)
Paul B. Kramarchyk
Cognizant Engineer (Signature) Date: 4/30/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

John M. Flaherty
Name
Independent Reviewer

Signature

4/30/93
Date

APPROVED BY: J.R. Congdon
Cognizant Engineering Manager (Print Name)
Joseph R. Congdon
Cognizant Engineering Manager (Signature) 4/30/93 Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 07

Group: 02

Parameter: PZR LEVEL

Step Value(s):	**Use(s):**
30% TO 60%	To verify PZR level is being controlled in the normal operating band of 30% to 60%.
<60%	To verify PZR level is being controlled in the normal operating band of 30% to 60%.
>30%	To verify PZR level is being controlled in the normal operating band of 30% to 60%.
	To monitor corrected PZR level > 30% during PZR cooldown using the fill and drain method.
TREND: 30% TO 60%	To verify PZR level is trending to the normal post-trip control band (30% to 60%).
TREND: 30% TO 60%	To verify that PZR level is in the appropriate band for the RCS Inventory Control SFSC, and direct event re-diagnosis if it is not.
30% TO 60%	To verify the maintenance of normal post-trip PZR level control (30% to 60%).

Engineering Limit(s):

Upper Limit	59%
Lower Limit	21%

Bases for Engineering Limit(s):

59% (ref 4) is based on ensuring that pressurizer water volume is within the Technical Specification (T.S.) limit. T.S. 3/4.4.3 requires that the pressurizer be OPERABLE with a water volume of less than or equal to 900 ft^3, when in MODEs 1, 2 and 3. The bases for these technical specifications are: | rev. 01

> "The limit on the maximum water volume in the pressurizer assures that the parameter is maintained within the normal steady-state envelope of operation assumed in the SAR (900 ft3 ref. 3). A steam bubble in the pressurizer ensures that the RCS is not a hydraulically solid system and is capable of accommodating pressure surges during operation. The steam bubble also protects the pressurizer code safety valves against water relief."

21% (ref 4) is based on keeping the pressurizer heaters covered to preserve normal means of RCS pressure control. | rev. 01

Assumptions:

Engineering Limit(s) are given as indicated level in accordance with the assumptions made in reference 4. | rev. 01

The engineering bases assumes the plant is in OPERATIONAL MODE 3, 4, or 5 as defined in the Technical Specifications.

In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

Ref: 1, 2 and 3

References:

1) San Onofre Unit 2 Technical Specifications, Amendment 94

2) San Onofre Unit 3 Technical Specifications, Amendment 84

3) San Onofre Unit 2&3 FSAR, Chapter 5 (Appendix 5.2A) Updated rev. 8

4) NES&L Calculation Sheet Calc No. J-BBB-021
Sheets: 184, 185, 186, 187, 188, 189 | rev. 01
Subject: TLU Calculation and Setpoint Verification for Pressurizer Level
Originator: B. Katebian, 2-19-93; IRE: J. Brannon, 2-28-93

File No: 009-OPS92-109
Revision: 01
Page: 1 of 3

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support

C-E JOB NUMBER: 2001216

DOCUMENT: Module 07 Group 03 Engineering Limit and Bases

PARAMETER: PZR LEVEL

PREPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)

Paul B. Kramarchyk
Cognizant Engineer (Signature) Date: 4/26/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists ______ of QAM-101.

John M. Flaherty
Name
Independent Reviewer

Signature

4/30/93
Date

PROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Joseph R Congdon
Cognizant Engineering Manager (Signature) 4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 07

Group: 03

Parameter: PZR LEVEL

| rev. 01

Step Value(s):	**Use(s):**
> 30% & CONTROLLED	To verify adequate RCS inventory control when checking HPSI Termination Criteria.
> 30% & NOT LOWERING	To verify adequate RCS inventory control when checking HPSI Termination Criteria.
> 30% & STABLE OR RISING	To verify charging pump throttling criteria.
> 30% & CONTROLLED	Used as criteria for HPSI throttle/stop (CET sat margin > 20°F, RVLMS > 82%).

Engineering Limit(s):

Lower Limit, 21%

| rev. 01

Bases for Engineering Limit(s): | rev. 01

21% (ref 1) is based on keeping the pressurizer heaters covered to preserve normal means of RCS pressure control.

Assumptions: | rev. 01

Engineering Limit(s) are given as indicated level in accordance with the assumptions made in reference 1.

The engineering bases assumes the plant is in OPERATIONAL MODE 3, 4, or 5 as defined in the Technical Specifications.

References:

1) NES&L Calculation Sheet Calc No. J-BBB-021 | rev. 01
Sheets: 184, 185, 186, 187, 188, 189
Subject: TLU Calculation and Setpoint Verification for Pressurizer Level
Originator: B. Katebian, 2-19-93; IRE: J. Brannon, 2-28-93

File No: 009-OPS92-110
Revision: 01
Page: 1 of 4

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 07 Group 04 Engineering Limit and Bases

PARAMETER: PZR LEVEL

PREPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)

Paul B. Kramarchyk
Cognizant Engineer (Signature) Date: 4/30/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

John M. Flaherty
Name
Independent Reviewer

John M. Flaherty
Signature

4/30/93
Date

APPROVED BY: T.R. Congdon
Cognizant Engineering Manager (Print Name)

Joseph R Congdon
Cognizant Engineering Manager (Signature)

4/30/~~8~~93
Date
mc
4/30/93

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 07 **Group:** 04

Parameter: PZR LEVEL

Step Value(s):	**Use(s):**
30% to 60%	To determine if PZR level is within the appropriate band for starting an RCP, without reactor vessel voiding, and likely to remain there.
> 30%	To determine if PZR level is within the appropriate band for starting an RCP, without reactor vessel voiding, and likely to remain there.
> 30% & NOT LOWERING	To determine if PZR level is within the appropriate band for starting an RCP, without reactor vessel voiding, and likely to remain there.

Engineering Limit(s):

Upper Limit, 59% | rev. 01

Lower Limit, 21% | rev. 01

Bases for Engineering Limit(s):

59% (ref 1) is based on ensuring that pressurizer water volume is within the Technical Specification (T.S.) limit. T.S. 3/4.4.3 requires that the pressurizer be OPERABLE with a water volume of less than or equal to 900 ft^3, when in MODEs 1, 2 and 3. The bases for these technical specifications are: | rev. 01

> "The limit on the maximum water volume in the pressurizer assures that the parameter is maintained within the normal steady-state envelope of operation assumed in the SAR (900 ft3 ref. 3). A steam bubble in the pressurizer ensures that the RCS is not a hydraulically solid system and is capable of accommodating pressure surges during operation. The steam bubble also protects the pressurizer code safety valves against water relief."

21% (ref 1) is based on keeping the pressurizer heaters covered to preserve normal means of RCS pressure control. | rev. 01

Assumptions:

Engineering Limit(s) are given as indicated level in accordance with the assumptions made in reference 1. | rev. 01

The engineering bases assumes the plant is in OPERATIONAL MODE 3, 4, or 5 as defined in the Technical Specifications.

In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

Ref: 2, 3 and 4

References:

1) NES&L Calculation Sheet Calc No. J-BBB-021
Sheets: 184, 185, 186, 187, 188, 189 | rev. 01
Subject: TLU Calculation and Setpoint Verification for Pressurizer Level
Originator: B. Katebian, 2-19-93; IRE: J. Brannon, 2-28-93

2) San Onofre Unit 2 Technical Specifications, Amendment 94

3) San Onofre Unit 3 Technical Specifications, Amendment 84

) San Onofre Unit 2&3 FSAR, Chapter 5 (Appendix 5.2A) Updated rev. 8

) Calculation Number S-PEC-157, rev. 01, 8/18/77 Pressurizer Level Control Program (see page 7, and Pressurizer Level vs. Volume Curve)

File No: 009-OPS92-111
Revision: 01
Page: 1 of 4

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support

C-E JOB NUMBER: 2001216

DOCUMENT: Module 07 Group 05 Engineering Limit and Bases

PARAMETER: PZR LEVEL

PREPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)

Paul B. Kramarchyk
Cognizant Engineer (Signature) Date: 4/30/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 1 of QAM-101.

John M. Flaherty
Name
Independent Reviewer

Signature

4/30/93
Date

APPROVED BY: J.R. Congdon
Cognizant Engineering Manager (Print Name)

Joseph R. Congdon
Cognizant Engineering Manager (Signature) 4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 07 **Group:** 05

Parameter: PZR LEVEL

Step Value(s):	**Use(s):**	
> 70%	To remind operator that the maximum PZR level of 70% may be exceeded if necessary to maintaining 20°F saturation margin or to compensate for void collapse.	| rev. 01

Engineering Limit(s):

Upper limit 78%

| rev. 01

Bases for Engineering Limit(s):

78% is the upper limit for the procedure step values of 70% and >70%, as they appear in the context of the use statement. 78% is based on engineering judgement and the justification found in references 1 and 2. 78% is a limit that: | rev. 01

- avoids solid water operations (ref. 1)
- provides sufficient steam space to assure normal pressure control (ref. 2)
- bounds the highest PZR levels observed in best estimate analysis (ref. 1)

NOTE: Per SCE Technical Specifications, 900 cubic feet (approx. 59% ref. 5) is the upper limit for PZR level in MODE 1, 2, and 3. The ACTION statement provides 6 hours to correct the problem, else enter MODE 4 within the following 6 hours. (ref. 3 & 4, LCO 3.4.3) | rev. 01

Assumptions:

Engineering Limit(s) are given as indicated level in accordance with the assumptions made in reference 5. | rev. 01

The engineering bases assumes the plant is in OPERATIONAL MODE 3, 4, or 5 as defined in the Technical Specifications.

In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

Ref: 3, 4

In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01
Ref: 1, 2

References:

1) SONGS Units 2&3, Bases And Deviation Documentation

2) C-E Letter S-CE-8660, Transmittal Of Documentation To Support SONGS 2&3 Plant Specific Guidelines, D. E. Nunn to SCE, July 22, 1983

3) San Onofre Unit 2 Technical Specifications, Amendment 94

4) San Onofre Unit 3 Technical Specifications, Amendment 84

5) NES&L Calculation Sheet Calc No. J-BBB-021
Sheets: 184, 185, 186, 187, 188, 189 | rev. 01
Subject: TLU Calculation and Setpoint Verification for Pressurizer Level
Originator: B. Katebian, 2-19-93; IRE: J. Brannon, 2-28-93

File No: 009-OPS92-140
Revision: 00
Page: 1 of 2

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3
PROJECT: ISOPS II Support
C-E JOB NUMBER: 2001216

DOCUMENT: Module 07 Group 06 Engineering Limit and Bases
PARAMETER: PZR LEVEL

PREPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)
Paul B. Kramarchyk
Cognizant Engineer (Signature) **Date:** 11/11/92

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Kenneth E. Faulkner
Name
Independent Reviewer
Kenneth E. Faulkner
Signature
11/11/92
Date

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)
Joseph R. Congdon
Cognizant Engineering Manager (Signature) 11/12/92
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 07

Group: 06

Parameter: PZR LEVEL

Step Value(s):

RISING

Use(s):

To verify SITs are injecting water.

Engineering Limit(s):

None

[illegible]es for Engineering Limit(s):

There are no associated engineering limits for the trending of parameters. Since no value is specified in the trend, no value will be assigned to the engineering limit. Usually, when an operator is instructed to trend an indication, the indication is used in conjunction with other parameters to corroborate the condition of a safety function. An operator is not required to perform a safety related action on the trending of a single parameter by itself in the EOIs. Where the trending of a single parameter is combined with specified operating limits on that parameter, the values given for the operating limits are evaluated for their engineering limits.

Assumptions:

None

eferences:

one

File No: 009-OPS92-112
Revision: 01
Page: 1 of 3

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 07 Group 07 Engineering Limit and Bases

PARAMETER: PZR LEVEL

PREPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)

Paul B Kramarchyk
Cognizant Engineer (Signature) Date: 4/30/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

John M. Flaherty
Name
Independent Reviewer

Signature

4/30/93
Date

APPROVED BY: J.R. Congdon
Cognizant Engineering Manager (Print Name)

Joseph R Congdon
Cognizant Engineering Manager (Signature) 4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 07

Group: 07

Parameter: PZR LEVEL

Step Value(s):	**Use(s):**
< 60%	To maintain PZR level below 60% while purging the VCT.
< 60%	To verify maximum desired Pressurizer Level during the raising of Core Exit Saturation Margin.

Engineering Limit(s):

Upper Limit 59%

| rev. 01

Bases for Engineering Limit(s):

59% (ref 5) is based on ensuring that pressurizer water volume is within the Technical Specification (T.S.) limit. T.S. 3/4.4.3 requires that the pressurizer be OPERABLE with a water volume of less than or equal to 900 ft^3, when in MODEs 1, 2 and 3. The bases for these technical specifications are: | rev. 01

> "The limit on the maximum water volume in the pressurizer assures that the parameter is maintained within the normal steady-state envelope of operation assumed in the SAR (900 ft3 ref. 3). A steam bubble in the pressurizer ensures that the RCS is not a hydraulically solid system and is capable of accommodating pressure surges during operation. The steam bubble also protects the pressurizer code safety valves against water relief."

Assumptions:

Engineering Limit(s) are given as indicated level in accordance with the assumptions made in reference 5. | rev. 01

The engineering bases assumes the plant is in OPERATIONAL MODE 3, 4, or 5 as defined in the Technical Specifications.

In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

Ref: 1, 2, 3

References:

.) San Onofre Unit 2 Technical Specifications, Amendment 94

2) San Onofre Unit 3 Technical Specifications, Amendment 84

3) San Onofre Unit 2&3 FSAR, Chapter 5 (Appendix 5.2A) Updated rev. 8

4) Calculation Number S-PEC-157, rev. 01, 8/18/77 Pressurizer Level Control Program (Pressurizer Level vs. Volume Curve)

5) NES&L Calculation Sheet Calc No. J-BBB-021
Sheets: 184, 185, 186, 187, 188, 189 | rev. 01
Subject: TLU Calculation and Setpoint Verification for Pressurizer Level
Originator: B. Katebian, 2-19-93; IRE: J. Brannon, 2-28-93

File No: 009-OPS92-103
Revision: 01
Page: 1 of 3

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 07 Group 08 Engineering Limit and Bases

PARAMETER: PZR LEVEL

PREPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)

Paul B.
Cognizant Engineer (Signature) Date: 4/30/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

John M. Flaherty
Name
Independent Reviewer

Signature

4/30/93
Date

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 07 **Group:** 08

Parameter: PZR LEVEL

Step Value(s):	**Use(s):** To evaluate the capability of the PZR to absorb the possible insurge when starting the first RCP after all RCPs have been tripped if Tsg > Tc.
< 61%	< 10 °F (Tsg-Tc) delta temperature
< 33%	10°F to 20°F (Tsg-Tc) delta temperature

Engineering Limit(s):

rev. 01

(Tsg - Tc) delta temperature less than 20 °F	upper limit for PZR level is 59%

Bases for Engineering Limit(s):

59% (ref 5) is based on ensuring that pressurizer water volume is within the Technical Specification (T.S.) limit. T.S. 3/4.4.3 requires that the pressurizer be OPERABLE with a water volume of less than or equal to 900 ft^3, when in MODEs 1, 2 and 3. The bases for these technical specifications are: rev. 01

> "The limit on the maximum water volume in the pressurizer assures that the parameter is maintained within the normal steady-state envelope of operation assumed in the SAR (900 ft3 ref. 3). A steam bubble in the pressurizer ensures that the RCS is not a hydraulically solid system and is capable of accommodating pressure surges during operation. The steam bubble also protects the pressurizer code safety valves against water relief."

Assumptions:

Engineering Limit(s) are given as indicated level in accordance with the assumptions made in reference 5. | rev. 01

The engineering bases assumes the plant is in OPERATIONAL MODE 3, 4, or 5 as defined in the Technical Specifications.

In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

Ref: 1, 2, 3

References:

1) San Onofre Unit 2 Technical Specifications,
Amendment 94

2) San Onofre Unit 3 Technical Specifications,
Amendment 84

3) San Onofre Unit 2&3 FSAR, Chapter 5 (Appendix 5.2A)
Updated rev. 8

4) Calculation Number S-PEC-157, rev. 01, 8/18/77
Pressurizer Level Control Program (Pressurizer Level vs. Volume Curve)

5) NES&L Calculation Sheet Calc No. J-BBB-021
Sheets: 184, 185, 186, 187, 188, 189 | rev. 01
Subject: TLU Calculation and Setpoint Verification for Pressurizer Level
Originator: B. Katebian, 2-19-93; IRE: J. Brannon, 2-28-93

File No: 009-OPS92-070
Revision: 01
Page: 1 of 5

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3
PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 07 Group 09 Engineering Limit and Bases
PARAMETER: PZR LEVEL

PREPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)
Paul B Kramarchyk
Cognizant Engineer (Signature) Date: 4/30/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

John M. Flaherty
Name
Independent Reviewer

Signature

4/30/93
Date

APPROVED BY: J.R. Congdon
Cognizant Engineering Manager (Print Name)
Joseph R. Congdon
Cognizant Engineering Manager (Signature) 4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 07 **Group:** 09

Parameter: PZR LEVEL

Step Value(s):	**Use(s):**
41 %	To verify that Pressurizer inventory is sufficient to compensate for RCP restart void collapse with voids indicated on the RVLMS.
46 %	
62 %	
74 %	
87 %	

Engineering Limit(s):

rev. 01

STEP VALUE	RVLMS INDICATED LEVEL	ENGINEERING LIMIT MINIMUM PZR LEVEL TO PREVENT HEATER UNCOVERY (indicated PZR level per reference 5)
41 %	RVLMS Head 100%	21 % (assumes no void)*
46 %	RVLMS Head 48%	41 %
62 %	RVLMS Head 20%	54 %
74 %	RVLMS Head 0%	68 %
87 %	RVLMS Plenum 82%	81 %

Bases for Engineering Limit(s):

| rev. 01

The engineering limit for minimum PZR level is based on providing sufficient inventory to compensate for RCP restart void collapse with a known void in the reactor vessel, and, keep the PZR heaters covered after the void collapse. The engineering limit assumes the actual reactor vessel level is at the indicated level above the fuel alignment plate (FAP) in accordance with reference 4. It should be noted that these levels are at the midpoint between adjacent heated junction thermocouples (HJTC) and that the compensation volumes assume these intermediate levels and not the sensor level.

The PZR level engineering limit is found by adding the volume needed to cover the PZR heaters to the reactor vessel void volume given in reference 4. Then finding the corresponding PZR level in tables 8.21-2 and 8.21-4 in reference 5.

The PZR level engineering limit must be compensated for fluid density and other configuration discrepancies not in accordance with references 4 and 5.

* Twenty-one percent PZR level is given as a minimum level, and assumes no void above sensor no. 1 (the highest level HJTC). A more conservative level should be calculated which assumes that sensor no. 1 is just covered (100% indicated), but the rest of the remaining vessel volume is voided.

Method and Data:

| rev. 01

Uncovered Sensor (HJTC)	Indicated Level (assumes higher numbered sensors are covered)	Vessel Void Vol. ft3 (ref. 4)	Vessel Void Vol. (ft3) + PZR Heater Vol. (ft3) (ref. 5)		PZR Indicated Level ref. 5, tables: 8.21-2 Unit 2 8.21-4 Unit 3	
			Unit 2 (333.07 ft3)	Unit 3 (338.35 ft3)	Unit 2 2LT-0110-1	Unit 3 3LT-0110-1
1	48 %	276.	609.	614.	41%	41%
2	20 %	466.	799.	804.	54%	54%
3	0 % head ------------------ 100 % plenum	677.	1010.	1015.	68%	68%
4	82 %	866.	1199.	1204.	81% estimated	81% estimated

Method and Data: (cont.) | rev. 01

81% Estimate -- Reference 5 does not include information for PZR level greater than 80%. Therefore a precise void compensation level can not be given for RVLMS Plenum level of 82%. The 81% estimated level is calculated as follows:

Unit 2, from ref. 5 table 8.21-1
2LT-0110-1 = (108.28 gal/%)/(7.4805 gal/ft3) = 14.47 ft3 per %
866 ft3 /(14.47 ft3 per %) + 21% heater level = 81 %

Unit 3, from ref. 5 table 8.21-1
3LT-0110-1 = (107.73 gal/%)/(7.4805 gal/ft3) = 14.40 ft3 per %
866 ft3 /(14.40 ft3 per %) + 21% heater level = 81 %

Assumptions:

Engineering Limits are given as indicated level in accordance with the assumptions made in references 4 and 5. | rev. 01

Twenty-one percent PZR level engineering limit assumes no void above sensor no. 1 (the highest level HJTC). | rev. 01

In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01

Ref: 3, 4

References:

1) C-E Calculation 1370-ICE-36181, HJTCS Reactor Vessel Level Constants For SONGS Unit 2 QSPDS, 11/15/83

2) C-E Calculation 1470-ICE-36181, HJTCS Reactor Vessel Level Constants For SONGS Unit 3 QSPDS, 11/21/83

3) Letter Southern California Edison Units 2&3 - HJTC Sensor Locations , P. Hellandbrand to G. W. Starkweather, 4/5/82

4) Letter, S-PSAE-84-012, SONGS 2&3 Void Volumes for RVLMS Indication (609253), March 28, 1984, M. F. Strollo to W. R. Hayes

5) NES&L Calculation Sheet Calc No. J-BBB-021 | rev. 01
Sheets: 187 through 199
Subject: TLU Calculation and Setpoint Verification for Pressurizer Level
Originator: B. Katebian, 4-14-93; IRE: J. Brannon, 4-14-93

File No: 009-OPS92-054
Revision: 01
Page: 1 of 2

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

LIENT: Southern California Edison **PLANT:** San Onofre 2&3
OJECT: ISOPS II Support
C-E JOB NUMBER: 2001216

CUMENT: Module 07 Group 10 Engineering Limit and Bases
RAMETER: PZR LEVEL

PARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)
Paul B. Kramarchyk
Cognizant Engineer (Signature) Date: 4/29/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists ______ of QAM-101.

John M. Flaherty
Name
Independent Reviewer

Signature

4/30/93
Date

ED BY: J.R. Congdon
Cognizant Engineering Manager (Print Name)
Joseph R Congdon
Cognizant Engineering Manager (Signature) 4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 07

Group: 10

Parameter: PZR LEVEL

Step Value(s):

response while charging - Lowering or Rising

Use(s):

To determine if a void exists in the reactor vessel by observing PZR level behavior while using aux spray or charging to the loop.

| rev. 01

Engineering Limit(s):

e

Bases for Engineering Limit(s):

There are no associated engineering limits for the trending of parameters. Since no value is specified in the trend, no value will be assigned to the engineering limit. Usually, when an operator is instructed to trend an indication, the indication is used in conjunction with other parameters to corroborate the condition of a safety function. An operator is not required to perform a safety related action on the trending of a single parameter by itself in the EOIs. Where the trending of a single parameter is combined with specified operating limits on that parameter, the values given for the operating limits are evaluated for their engineering limits.

ssumptions:

one

eferences:

one

File No: 009-OPS92-049
Revision: 01
Page: 1 of 2

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 07 Group 11 Engineering Limit and Bases

PARAMETER: PZR LEVEL

PREPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)
Paul B Kramarchyk
Cognizant Engineer (Signature) Date: 4/29/93

VERIFICATION STATUS: COMPLETE

The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

John M. Flaherty
Name
Independent Reviewer

John M Flaherty
Signature

4/30/93
Date

APPROVED BY: J.R. Condon
Cognizant Engineering Manager (Print Name)
Joseph R Condon
Cognizant Engineering Manager (Signature) 4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 07

Group: 11

Parameter: PZR LEVEL

Step Value(s):	**Use(s):**
response while spraying - Lowering or Rising	To determine if a void exists in the reactor vessel by observing PZR level behavior while using aux spray or charging to the loop.

Engineering Limit(s):

Nc | rev. 01

ases for Engineering Limit(s):
here are no associated engineering limits for the trending of
arameters. Since no value is specified in the trend, no value
ill be assigned to the engineering limit. Usually, when an
perator is instructed to trend an indication, the indication is
sed in conjunction with other parameters to corroborate the
ndition of a safety function. An operator is not required to
rform a safety related action on the trending of a single
rameter by itself in the EOIs. Where the trending of a single
rameter is combined with specified operating limits on that
rameter, the values given for the operating limits are
aluated for their engineering limits.

umptions:

e

rences:

File No: 009-OPS92-050
Revision: 00
Page: 1 of 2

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 07 Group 12 Engineering Limit and Bases

PARAMETER: PZR LEVEL

PREPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)

Paul B. Kramarchyk
Cognizant Engineer (Signature) Date: 11/11/92

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Kenneth E. Faulkner
Name
Independent Reviewer

Kenneth E. Faulkner
Signature

11/12/92
Date

APPROVED BY: J. L. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 11/12/92
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 07

Group: 12

Parameter: PZR LEVEL

Step Value(s): STABLE

Use(s): To verify that this parameter is adjusted correctly to control Core Exit Saturation Margin.

Engineering Limit(s):
None

Bases:
There are no associated engineering limits for the trending of parameters. Since no value is specified in the trend, no value will be assigned to the engineering limit. Usually, when an operator is instructed to trend an indication, the indication is used in conjunction with other parameters to corroborate the condition of a safety function. An operator is not required to perform a safety related action on the trending of a single parameter by itself in the EOIs. Where the trending of a single parameter is combined with specified operating limits on that parameter, the values given for the operating limits are evaluated for their engineering limits.

Assumptions:
None

References:
None

File No: 009-OPS92-051
Revision: 01
Page: 1 of 3

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3
PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 07 Group 13 Engineering Limit and Bases
PARAMETER: PZR LEVEL

REPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)
Paul B. Kramarchyk
Cognizant Engineer (Signature) Date: 4/30/90

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

John M. Flaherty
Name
Independent Reviewer

Signature

4/30/93
Date

ROVED BY: J.M. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 07

Group: 13

Parameter: PZR LEVEL

Step Value(s):	**Use(s):**
> 30%	To verify desired Pressurizer Level during the raising of Core Exit Saturation Margin using PZR heaters.
30%	To verify that corrected PZR level is being maintained above the low level heater cutoff (30% specified). | rev. 01
30%	Verify PZR level is above the heater low level cutoff. | rev. 01
> 30% and Stable or Rising	To verify PZR level is above the heater low level cutoff (procedure specified value = 30%) and controlled. | rev. 01
> 30% and Not Lowering	To verify PZR level is above the heater low level cutoff (procedure specified value = 30%) and controlled. | rev. 01
> 30%	To verify that corrected PZR level is being maintained above the low level heater cutoff (30% specified). | rev. 01
> 30%	To verify maximum desired Pressurizer Level during the raising of Core Exit Saturation Margin .

Engineering Limit(s):

Lower limit = 21%

Bases for Engineering Limit(s):

| rev. 01

21% (ref 1) is based on keeping the pressurizer heaters covered to preserve normal means of RCS pressure control.

Assumptions:

| rev. 01

Engineering Limit(s) are given as indicated level in accordance with the assumptions made in reference 1.

The engineering bases assumes the plant is in OPERATIONAL MODE 3, 4, or 5 as defined in the Technical Specifications.

The engineering limit assumes that it is desirable to maintain the option for normal RCS pressure control and therefore attempts to protect the PZR heaters from burn-out.

References:

1) NES&L Calculation Sheet Calc No. J-BBB-021 | rev. 01
Sheets: 184, 185, 186, 187, 188, 189
Subject: TLU Calculation and Setpoint Verification for Pressurizer Level
Originator: B. Katebian, 2-19-93; IRE: J. Brannon, 2-28-93

File No: 009-OPS92-052
Revision: 00
Page: 1 of 2

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

ROJECT: ISOPS II Support

C-E JOB NUMBER: 2001216

OCUMENT: Module 07 Group 14 Engineering Limit and Bases

ARAMETER: PZR LEVEL

EPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)
Paul B. Kramarchyk
Cognizant Engineer (Signature) Date: 11/11/92

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Kenneth E. Faulkner
Name
Independent Reviewer

Kenneth E. Faulkner
Signature

11/12/92
Date

OVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 11/12/92
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 07

Group: 14

Parameter: PZR LEVEL

Step Value(s):	**Use(s):**
STABLE OR RISING	To confirm LOFW diagnosis.

Engineering Limit(s):

None

ases:

here are no associated engineering limits for the trending of parameters. Since no value is specified in the trend, no value will be assigned to the engineering limit. Usually, when an operator is instructed to trend an indication, the indication is used in conjunction with other parameters to corroborate the condition of a safety function. An operator is not required to perform a safety related action on the trending of a single parameter by itself in the EOIs. Where the trending of a single parameter is combined with specified operating limits on that parameter, the values given for the operating limits are evaluated for their engineering limits.

Assumptions:

None

References:

None

File No: 009-OPS92-053
Revision: 01
Page: 1 of 4

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 07 Group 15 Engineering Limit and Bases

PARAMETER: PZR LEVEL

PREPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)

Paul B Kramarchyk
Cognizant Engineer (Signature) Date: 4/28/93

VERIFICATION STATUS: COMPLETE

The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

John M. Flaherty
Name
Independent Reviewer

Signature

4/29/93
Date

APPROVED BY: J.R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 07

Group: 15

Parameter: PZR LEVEL

Step Value(s):

65% TO 70%

Use(s):

To maintain corrected PZR level within the appropriate range (65% - 70%) during PZR cooldown using the fill and drain method.

Engineering Limit(s):

Upper limit = 78%

| rev. 01

Bases for Engineering Limit(s):
78% is based on engineering judgement. References 1, and 2 support the following rational: 78% is based on establishing a limit that will:

- avoid solid water operations
- provide sufficient steam space to assure normal pressure control
- bound the highest PZR levels observed in best estimate analysis
- account for spray response and other uncertainties

In some cases it may be necessary to fill the pressurizer solid in order to achieve adequate subcooling. In this case, the upper limit on pressurizer level may be exceeded if pressure control is accomplished by means other than spray.

NOTE: Per SCE Technical Specifications, 900 cubic feet (approx. 59% ref. 5) is the upper limit for PZR level in MODE 1, 2, and 3. The ACTION statement provides 6 hours to correct the problem, else enter MODE 4 within the following 6 hours. (ref. 3 & 4, LCO 3.4.3) | rev. 01

Assumptions:

Engineering Limit(s) are given as indicated level in accordance with the assumptions made in reference 5. | rev. 01

The engineering bases assumes the plant is in OPERATIONAL MODE 3, 4, or 5 as defined in the Technical Specifications.

In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

Ref: 3, 4

In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01

Ref: 1, 2

ferences:

SONGS Units 2&3, Bases And Deviation Documentation

C-E Letter S-CE-8660, Transmittal Of Documentation To Support SONGS 2&3 Plant Specific Guidelines, D. E. Nunn to SCE, July 22, 1983

San Onofre Unit 2 Technical Specifications, Amendment 94 | rev. 01

San Onofre Unit 3 Technical Specifications, Amendment 84 | rev. 01

NES&L Calculation Sheet Calc No. J-BBB-021
Sheets: 184, 185, 186, 187, 188, 189 | rev. 01
Subject: TLU Calculation and Setpoint Verification for Pressurizer Level
Originator: B. Katebian, 2-19-93; IRE: J. Brannon, 2-28-93

File No: 009-OPS92-035
Revision: 01
Page: 1 of 3

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support

C-E JOB NUMBER: 2001216

DOCUMENT: Module 07 Group 16 Engineering Limit and Bases

PARAMETER: PZR LEVEL

PREPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)

Paul B. Kramarchyk
Cognizant Engineer (Signature) Date: 4/26/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

John M. Flaherty
Name
Independent Reviewer

Signature

4/29/93
Date

PROVED BY: J.R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 07

Group: 16

Parameter: PZR LEVEL

Step Value(s):

< 70%

Use(s):

To determine if the plant should be in "solid" pressure control operations, or whether the present success path can be utilized.

Engineering Limit(s):

Upper limit = 78%

| rev. 01

Bases for Engineering Limit(s):
78% is based on engineering judgement. References 1, and 2 support the following rational: 78% is based on establishing a limit that will:

- avoid solid water operations
- provide sufficient steam space to assure normal pressure control
- bound the highest PZR levels observed in best estimate analysis
- account for spray response and other uncertainties

In some cases it may be necessary to fill the pressurizer solid in order to achieve adequate subcooling. In this case, the upper limit on pressurizer level may be exceeded if pressure control is accomplished by means other than spray.

NOTE: Per SCE Technical Specifications, 900 cubic feet (approx. 59% ref. 5) is the upper limit for PZR level in MODE 1, 2, and 3. The ACTION statement provides 6 hours to correct the problem, else enter MODE 4 within the following 6 hours. (ref. 3 & 4, LCO 3.4.3) | rev. 01

Assumptions:

Engineering Limit(s) are given as indicated level in accordance with the assumptions made in reference 5. | rev. 01

The engineering bases assumes the plant is in OPERATIONAL MODE 3, 4, or 5 as defined in the Technical Specifications.

In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

Ref: 3, 4

In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01

Ref:1, 2

References:

1) SONGS Units 2&3, Bases And Deviation Documentation

2) C-E Letter S-CE-8660, Transmittal Of Documentation To Support SONGS 2&3 Plant Specific Guidelines, D. E. Nunn to SCE, July 22, 1983

3) San Onofre Unit 2 Technical Specifications, Amendment 94 | rev. 01

4) San Onofre Unit 3 Technical Specifications, Amendment 84 | rev. 01

5) NES&L Calculation Sheet Calc No. J-BBB-021
Sheets: 184, 185, 186, 187, 188, 189 | rev. 01
Subject: TLU Calculation and Setpoint Verification for Pressurizer Level
Originator: B. Katebian, 2-19-93; IRE: J. Brannon, 2-28-93

File No: 009-OPS92-036
Revision: 01
Page: 1 of 2

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 07 Group 17 Engineering Limit and Bases

PARAMETER: PZR LEVEL

PREPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)
Paul B. Kramarchyk
Cognizant Engineer (Signature) Date: 4/30/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

John M. Hallworty
Name
Independent Reviewer

Signature

4/30/93
Date

APPROVED BY: J.R. Congdon
Cognizant Engineering Manager (Print Name)
Cognizant Engineering Manager (Signature) 4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 07

Group: 17

Parameter: PZR LEVEL

Step Value(s):

30%

Use(s):

To allow PZR level to lower to assist in PZR pressure reduction during cooldown without further compromising pressure control capability.

Engineering Limit(s):

Lower limit 21%

Bases for Engineering Limit(s): | rev. 01

21% (ref 1) is based on keeping the pressurizer heaters covered to preserve normal means of RCS pressure control. | rev. 01

Assumptions:

Engineering Limit(s) are given as indicated level in accordance with the assumptions made in reference 1. | rev. 01

The engineering bases assumes the plant is in OPERATIONAL MODE 3, 4, or 5 as defined in the Technical Specifications.

The engineering limit(s) assume that it is desirable to maintain the option for normal RCS pressure control and therefore attempts to protect the PZR heaters.

References:

1) NES&L Calculation Sheet Calc No. J-BBB-021
Sheets: 184, 185, 186, 187, 188, 189
Subject: TLU Calculation and Setpoint Verification for Pressurizer Level | rev. 01
Originator: B. Katebian, 2-19-93; IRE: J. Brannon, 2-28-93

File No: 009-OPS92-032
Revision: 01
Page: 1 of 3

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support

C-E JOB NUMBER: 2001216

DOCUMENT: Module 07 Group 18 Engineering Limit and Bases

PARAMETER: PZR LEVEL

PREPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)

Paul B. Kramarchyk
Cognizant Engineer (Signature) Date: 4/30/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

John M. Flaherty
Name
Independent Reviewer

Signature

4/30/93
Date

APPROVED BY: J.R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 07

Group: 18

Parameter: PZR LEVEL

Step Value(s):

< 100%

Use(s):

To determine if the plant should be in "solid" pressure control operations, or whether the present success path can be utilized.

gineering Limit(s):

p limit = 100%

| rev. 01

ses for Engineering Limit(s):

0% is based on engineering judgement. The engineering | rev. 01
dgement rational is as follows: 100% indicated level is the
imum level that can be used to determine if solid plant
rations should be used for pressure control. In accordance
h the use statement, <100% is a decision point. If
ssurizer level is <100%, then means other than solid plant
rations may be used for plant pressure control. If the level
≥100%, then solid plant pressure control should be used to
tore core exit saturation margin to ≥20°F as per reference 1.

NOTE: At 100% indicated level there may still be some steam space volume remaining above the high level tap. Therefore, solid water pressure response will not occur until this additional free volume is full. | rev. 01

Assumptions:

Engineering Limit(s) are given as indicated level in accordance with the assumptions made in reference 3. | rev. 01

The engineering bases assumes the plant is in OPERATIONAL MODE 3, 4, or 5 as defined in the Technical Specifications, and RCS pressure control can not be established through normal pressure control methods.

In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01

Ref: 1, 2

References:

1) SONGS Emergency Procedure Technical Guidelines, rev. 01
Safety Function: RCS Pressure Control
Success Path: RCS pressure control using charging system, PC-2

2) SONGS Functional Recovery Emergency Operating Instruction, rev. 5, Attachment 23, Post Accident P/T Limits

3) NES&L Calculation Sheet Calc No. J-BBB-021
Sheets: 184, 185, 186, 187, 188, 189 | rev. 01
Subject: TLU Calculation and Setpoint Verification for Pressurizer Level
Originator: B. Katebian, 2-19-93; IRE: J. Brannon, 2-28-93

File No: 009-OPS92-033
Revision: 01
Page: 1 of 3

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 07 Group 19 Engineering Limit and Bases

PARAMETER: PZR LEVEL

PREPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)
Paul B. Kramarchyk
Cognizant Engineer (Signature) Date: 4/28/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

John M. Flaherty
Name
Independent Reviewer

Signature

4/29/93
Date

APPROVED BY: J.R. Congdon
Cognizant Engineering Manager (Print Name)
Cognizant Engineering Manager (Signature) 4/30/93 Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 07

Group: 19

Parameter: PZR LEVEL

Step Value(s):

< 70%

Use(s):

To determine if sprays can be used to control PZR pressure.

Engineering Limit(s):

Upper limit = 78%

| rev. 01

ases for Engineering Limit(s):
78% is based on engineering judgement. References 1, and 2 support the following rational: 78% is based on establishing a limit that will:

- avoid solid water operations
- provide sufficient steam space to assure normal pressure control
- bound the highest PZR levels observed in best estimate analysis
- account for spray response and other uncertainties

In some cases it may be necessary to fill the pressurizer solid in order to achieve adequate subcooling. In this case, the upper limit on pressurizer level may be exceeded if pressure control is accomplished by means other than spray.

NOTE: Per SCE Technical Specifications, 900 cubic feet (approx. 59% ref. 5) is the upper limit for PZR level in MODE 1, 2, and 3. The ACTION statement provides 6 hours to correct the problem, else enter MODE 4 within the following 6 hours. (ref. 3 & 4, LCO 3.4.3) | rev. 01

Assumptions:
Engineering Limit(s) are given as indicated level in accordance with the assumptions made in reference 5. | rev. 01

The engineering bases assumes the plant is in OPERATIONAL MODE 3, 4, or 5 as defined in the Technical Specifications.

In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

Ref: 3, 4

In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01

Ref: 1, 2

References:

1) SONGS Units 2&3, Bases And Deviation Documentation

2) C-E Letter S-CE-8660, Transmittal Of Documentation To Support SONGS 2&3 Plant Specific Guidelines, D. E. Nunn to SCE, July 22, 1983

3) San Onofre Unit 2 Technical Specifications, Amendment 94 | rev. 01

4) San Onofre Unit 3 Technical Specifications, Amendment 84 | rev. 01

5) NES&L Calculation Sheet Calc No. J-BBB-021
Sheets: 184, 185, 186, 187, 188, 189
Subject: TLU Calculation and Setpoint Verification for Pressurizer Level | rev. 01
Originator: B. Katebian, 2-19-93; IRE: J. Brannon, 2-28-93

File No: 009-OPS92-034
Revision: 01
Page: 1 of 3

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 07 Group 20 Engineering Limit and Bases

PARAMETER: PZR LEVEL

PREPARED BY: Paul B. Kramarchyk
Cognizant Engineer (Print Name)

Paul B. Kramarchyk
Cognizant Engineer (Signature) Date: 4/29/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 1 9 of QAM-101.

John M. Flaherty
Name
Independent Reviewer

Signature

4/29/93
Date

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 07

Group: 20

Parameter: PZR LEVEL

Step Value(s):	**Use(s):**
> 30%	To ensure Shutdown Cooling System operational limit is met.

Engineering Limit(s):

Upper limit = 42% level as a percentage of tap to tap span.

Bases for Engineering Limit(s):

42% is based on the PZR level given in ref. 1 to prevent lifting shutdown cooling relief valve PSV-9349. Additional relevant assumptions in ref. 1 are:

- PZR pressure of 361 psi
- ± 16 psi pressure instrument inaccuracy
- for purposes of elevation head calculation a water column temperature of 130 °F is assumed
- PSV-9349 nominal relief setpoint of 402 psig

To derive a corresponding indicated level, the engineering limit must be compensated for fluid density, lower tap standpipe offset, and any other configuration discrepancies not in accordance with ref. 1.

Assumptions:
The engineering limit is given as percent of tap to tap span in accordance with the assumptions made in reference 1. | rev. 01

The engineering bases assumes the plant is in OPERATIONAL MODE 4 or 5 as defined in the Technical Specifications, and is preparing to enter shutdown cooling.

References:

1) Calculation Number S-PEC-359, rev. 00, 7/6/81
SDCS: Instrument Tolerances/Shutdown Cooling System Test Acceptance Criteria

File No: 009-OPS92-179
Revision: 01
Page: 1 of 13

ABB COMBUSTION ENGINEERING
INSTRUMENT USE AND BASES TABLE COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

MODULE: 08 Pressurizer Pressure

PREPARED BY: L. Wild
Cognizant Engineer (Print Name)

L. A. Wild
Cognizant Engineer (Signature) Date: 4/30/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREEN
Name
Independent Reviewer

Martin Green
Signature

4/30/93
Date

APPROVED BY: J.R. Congdon
Cognizant Engineering Manager (Print Name)

Joseph R Congdon
Cognizant Engineering Manager (Signature) 4/30/93 Date

RECORD OF REVISIONS

Rev	Date	Pages	Prepared by	Reviewed by	Approved by
00	01/12/92	ALL	L. Wild	J. Flaherty	J.R.Congdon
01	04/29/93	5,13	L. Wild	M. Greer	J.R.Congdon

Q.A. APPROVED TABLE

SONGS 2/3 ISOP II PHASE II
INSTRUMENT USE AND BASES TABLE

Module #: 08

DATE: 04/30/93
REVISION: 01

Q.A. APPROVED TABLE

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
01	PZR PRESSURE	<50 PSID RUPT S/G +/- 50 PSI of S/G	The eng limit is based on the maintaining the RCS pressure approx equal (+/-50 psi) to the isolated S/G pressure. This will minimize primary to secondary leakage and possible S/G overfill, as well as minimize RCS boron dilution by the secondary fluid.	To verify PZR pressure is reduced to within 50 psi of the isolated (ruptured) S/G pressure.
01	PZR PRESSURE	> S/G PRESSURE +/- 50 PSI of S/G	The eng limit is based on the maintaining the RCS pressure approx equal (+/-50 psi) to the isolated S/G pressure. This will minimize primary to secondary leakage and possible S/G overfill, as well as minimize RCS boron dilution by the secondary fluid.	To ensure RCS pressure remains higher than ruptured S/G pressure in order to minimize RCS dilution due to backflow.
01	PZR PRESSURE	PZR P < S/G P +/- 50 PSI of S/G	The eng limit is based on the maintaining the RCS pressure approx equal (+/-50 psi) to the isolated S/G pressure. This will minimize primary to secondary leakage and possible S/G overfill, as well as minimize RCS boron dilution by the secondary fluid.	To monitor lowering RCS Pressure to < S/G Pressure to restore the isolated S/G level to less than 80% NR.
01	PZR PRESSURE	+/- 50 PSI ISO SG +/- 50 PSI of S/G	The eng limit is based on the maintaining the RCS pressure approx equal (+/-50 psi) to the isolated S/G pressure. This will minimize primary to secondary leakage and possible S/G overfill, as well as minimize RCS boron dilution by the secondary fluid.	To verify PZR pressure is reduced to within 50 psi of the isolated (ruptured) S/G pressure.

SONGS 2/3 ISOP II PHASE II
INSTRUMENT USE AND BASES TABLE

DATE: 04/30/93
REVISION: 01

Q.A. APPROVED TABLE

Module #: 08

Q.A. APPROVED TABLE

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
02	PZR PRESSURE	> 100 PSIA LL 165 PSIA	The eng limit is based on seal manufacturer requirement to provide at least 50 PSI RCS pressure for each stage of the RCP seals.	To verify PZR pressure is high enough (> 100 psia) to force RCS fluid through the seals prior to opening the RCP seal bleedoff path.
03	PZR PRESSURE	> 200 PSIA & CONT UL 200 PSIA	The eng limit is based on the shutoff head of the LPSI pumps (200 PSIA). Operation of the LPSI pumps at RCS pressures above this value will not result in delivery.	To verify PZR pressure > the shutoff head of the LPSI pumps (200 psia stated) and controlled.
03	PZR PRESSURE	< 200 PSIA UL 200 PSIA	The eng limit is based on the shutoff head of the LPSI pumps (200 PSIA). Operation of the LPSI pumps at RCS pressures above this value will not result in delivery.	To verify Pzr Pressure is less than the shutoff head of LPSI pumps to establish LPSI flow into RCS.
04	PZR PRESSURE	< 250 PSIA UL 270 PSIA	The engineering limit is based on the shutoff head of the CS pumps which is 575 feet. This is equivalent to 255.26 psig (270 psia nominal).	To verify PZR pressure is below the shutoff head of the containment spray pumps (250 psia stated).
05	PZR PRESSURE	< 340 PSIA UL 376 PSIA	The eng limit is based on a permissive signal which prevents opening SDC suction line isolation valves until PZR pressure is <376 PSIA. This action is intended to prevent exceeding the design pressure of the SDC system.	To monitor cooldown and depressurization of the RCS to get on Shutdown Cooling (<385 deg F and <340 psia specified).
05	PZR PRESSURE	< 340 PSIA UL 376 PSIA	The eng limit is based on a permissive signal which prevents opening SDC suction line isolation valves until PZR pressure is <376 PSIA. This action is intended to prevent exceeding the design pressure of the SDC system.	To verify shutdown cooling entry conditions are met (T-hot <385 deg F, PZR pressure <340 psia).

Q.A. APPROVED TABLE

SONGS 2/3 ISOP II PHASE II
INSTRUMENT USE AND BASES TABLE

DATE: 04/30/93
REVISION: 01

Module #: 08

Q.A. APPROVED TABLE

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
06	PZR PRESSURE	< 395 PSIA UL <400 LL >=300	To prevent an unwanted SIAS during forced cooldown. Tech. Specs. and FSAR state that the low pressure trip signal can not be bypassed until PZR Pressure <400 PSIA. Tech. Specs. also state that the lowest allowed trip setpoint is 300 PSIA.	To verify criteria for bypassing SIAS (395 psia).
07	PZR PRESSURE	< 395 PSIA LL 370 PSIA	To prevent inadvertent discharge of the SIT water volume to the RCS followed by SIT Nitrogen cover gas entering the RCS. The Eng limit is based on the upper end of the SIT Nitrogen overpressure control band required to be established during a cooldown.	To verify that PZR pressure is < 395 to allow isolation of the SITs.
07	PZR PRESSURE	< 395 PSIA LL 370 PSIA	To prevent inadvertent discharge of the SIT water volume to the RCS followed by SIT Nitrogen cover gas entering the RCS. The Eng limit is based on the upper end of the SIT Nitrogen overpressure control band required to be established during a cooldown.	To initiate action to isolate SITs to prevent inadvertent discharge.
08	PZR PRESSURE	< 395 PSIA UL 420.7 PSIA	The eng limit is based on the S.P. of the LTOP relief (406 +/- 10 psig). It is only applicable when LTOP is in service. The number of available HPSI pumps is reduced to one in order to ensure that the design capacity of the LTOP relief is not exceeded.	To initiate reducing the number of available HPSI pumps to within the design capacity of the LTOP relief valve.

SONGS 2/3 ISOP II PHASE II
INSTRUMENT USE AND BASES TABLE

Q.A. APPROVED TABLE

Module #: 08

Q.A. APPROVED TABLE

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
09	PZR PRESSURE	< 395 PSIA UL 400 PSIA	The eng limit is based on operational requirements contained in the "CVCS Charging and Letdown" operating instruction. No primary references to support a technical bases for the procedural requirements could be located.	To specify the setpoint to allow lowering the charging pump discharge dampener pressure to 200 psig.
10	PZR PRESSURE	<= 500 PSIA 500 PSIA	The eng limit was selected because at RCS pressures >500 PSIA, indicated HPSI flow is expected to be very low and therefore inaccurate. >500 PSIA Hot and Cold Leg HPSI flows can not be accuratly adjusted and are not throttled. <500 PSIA they can be.	To verify adequate HPSI flow during hot and cold leg injection.
10	PZR PRESSURE	> 500 PSIA 500 PSIA	The eng limit was selected because at RCS pressures >500 PSIA, indicated HPSI flow is expected to be very low and therefore inaccurate. >500 PSIA Hot and Cold Leg HPSI flows can not be accuratly adjusted and are not throttled. <500 PSIA they can be.	To aid in the selection of the appropriate lineup when initiating hot and cold leg injection.
11	PZR PRESSURE	<= 615 PSIA UL 615 PSIA	The engineering limit is based on the lowest pressure allowed in the SITs by the Technical Specifications. The specific limit for each tank which will result in flow to the RCS is dependent on the actual pressure in that tank.	To check PZR Pressure < 615 PSIA to ensure flow from SITs to RCS.

Module #: 08

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
12	PZR PRESSURE	< 715 PSIA LL 655 PSIA	The eng limit is based on the highest allowed Nitrogen cover-pressure in the SITs. To prevent Nitrogen injection into RCS or overpressurization of the SDC system during RCS cooldown/depressurization, RCS pressure sould be maintained > SIT pressure.	To avoid inadvertent discharge of the SITs (below 650 psia).
12	PZR PRESSURE	< 715 PSIA LL 655 PSIA	The eng limit is based on the highest allowed Nitrogen cover-pressure in the SITs. To prevent Nitrogen injection into RCS or overpressurization of the SDC system during RCS cooldown/depressurization, RCS pressure sould be maintained > SIT pressure.	To determine when to depressurize the SITs.
12	PZR PRESSURE	< 650 PSIA LL 655 PSIA	The eng limit is based on the highest allowed Nitrogen cover-pressure in the SITs. To prevent Nitrogen injection into RCS or overpressurization of the SDC system during RCS cooldown/depressurization, RCS pressure sould be maintained > SIT pressure.	To initiate action to lower SIT pressure to avoid inadvertant discharge to the RCS.
13	PZR PRESSURE	< 1000 PSIA UL 1088 PSIA	The purpose of the engineering limit is to reduce the probability of a ruptured and isolated S/Gs MSSV(s) opening. It is based on the nominal setpoint for the lowest set MSSV (1100 psia +/-1%).	To determine during an SGTR if PZR pressure requires shifting from maintaining +/-50 psid (primary to secondary), to maintaining RCP NPSH and CET SAT Margin >20 F.
13	PZR PRESSURE	< 1000 PSIA UL 1088 PSIA	The purpose of the engineering limit is to reduce the probability of a ruptured and isolated S/Gs MSSV(s) opening. It is based on the nominal setpoint for the lowest set MSSV (1100 psia +/-1%).	To verify PZR pressure is < 1000 psia to minimize the possiblity of lifting the Main Steam Safety Valves (MSSVs) on the isolated S/G.

SONGS 2/3 ISOP II PHASE II
INSTRUMENT USE AND BASES TABLE

Module #: 08

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
13	PZR PRESSURE	> 1000 PSIA UL 1088 PSIA	The purpose of the engineering limit is to reduce the probability of a ruptured and isolated S/Gs MSSV(s) opening. It is based on the nominal setpoint for the lowest set MSSV (1100 psia +/-1%).	To determine during an SGTR (w/ T-hot <530 F and S/G Level rapidly trending >90%) if PZR press requires shifting from maintaining RCP NPSH & CET SAT Margin >20 F to maintaining S/G d/p +/-50 psid.
14	PZR PRESSURE	< 1400 PSIA UL 1514.7 PSIA	The eng limit is based on the capacity of the intermediate pressure letdown relief valve which is equal to the capacity of one letdown control valve in the wide open position during normal operation.	To verify Pressurizer Pressure is < 1400 PSIA, which is a prerequisite for aligning both letdown flow control valves during a Cooldown/Depressurization.
14	PZR PRESSURE	> 1400 PSIA UL 1514.7 PSIA	The eng limit is based on the capacity of the intermediate pressure letdown relief valve which is equal to the capacity of one letdown control valve in the wide open position during normal operation.	To confirm that only one letdown flow control valve is unisolated (> 1400 psia).
15	PZR PRESSURE	> 1430 PSIA LL 1361 PSIA	The eng limit is derived from CEN-268 which describes the strategy for tripping all four RCPs following a small break LOCA to avoid a degradation in core cooling. 1361 PSIA is based on results of a 3410 MWt plant best estimate analysis.	Used in the determination to trip all RCPs in the event of a LOCA.
15	PZR PRESSURE	> 1430 PSIA LL 1361 PSIA	The eng limit is derived from CEN-268 which describes the strategy for tripping all four RCPs following a small break LOCA to avoid a degradation in core cooling. 1361 PSIA is based on results of a 3410 MWt plant best estimate analysis.	To determine if two RCPs must be stopped.

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
15	PZR PRESSURE	<= 1430 PSIA LL 1361 PSIA	The eng limit is derived from CEN-268 which describes the strategy for tripping all four RCPs following a small break LOCA to avoid a degradation in core cooling. 1361 PSIA is based on results of a 3410 MWt plant best estimate analysis.	To determine if at least one RCP in each loop must be stopped.
15	PZR PRESSURE	> 1430 PSIA LL 1361 PSIA	The eng limit is derived from CEN-268 which describes the strategy for tripping all four RCPs following a small break LOCA to avoid a degradation in core cooling. 1361 PSIA is based on results of a 3410 MWt plant best estimate analysis.	To verify the number of RCPs allowed to be running.
16	PZR PRESSURE	< 1500 PSIA UL 1493 PSIA	The engineering limit is based on the maximum HPSI pump shutoff head per pump specifications and does not account for any uncertainties.	To ensure PZR pressure is at or below the shutoff head of the HPSI pumps (procedure specified number is 1500 psia).
17	PZR PRESSURE	CNTLD 1740 - 2380 UL 2375, LL 1740	The upper limit is based on the High Pressurizer Pressure Reactor Trip setpoint. The lower limit is based on the Low Pressurizer Reactor Trip setpoint and the Safety Injection Actuation Signal (SIAS).	To verify expected post-trip reactor pressure response (PZR pressure between 1740 psia and 2380 psia).
17	PZR PRESSURE	CNTRLD <2380 PSIA UL 2375, LL 1740	The upper limit is based on the High Pressurizer Pressure Reactor Trip setpoint. The lower limit is based on the Low Pressurizer Reactor Trip setpoint and the Safety Injection Actuation Signal (SIAS).	To verify that PZR pressure is controlled.

Module #: 08

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
18	PZR PRESSURE	< 1740 PSIA LL 1740 PSIA	The eng limit is based on the Safety Injection Actuation Signal (SIAS) and Pressurizer Pressure - Low trip setpoint. Uncertainties associated with the actuation function of the pressure channel are included, those associated with the indicator are not.	To ensure SIAS is actuated if PZR Pressure < 1740 PSIA.
18	PZR PRESSURE	> 1740 PSIA LL 1740 PSIA	The eng limit is based on the Safety Injection Actuation Signal (SIAS) and Pressurizer Pressure - Low trip setpoint. Uncertainties associated with the actuation function of the pressure channel are included, those associated with the indicator are not.	To verify PZR Pressure is greater than the Low PZR Pressure trip setpoint and SIAS setpoint.
19	PZR PRESSURE	TREND:2000-2275 UL 2300, LL 2200	The eng limits are based on the normal PZR pressure control band using sprays and heaters, including the backup heaters. If RCS pressure is being controlled by the PZR Pressure Control System, then pressure should be in or trending to the specified band.	To verify expected post-trip RCS pressure response (PZR pressure trending to between 2000 psia and 2275 psia).
20	PZR PRESSURE	>20<200 SM CURVES NOT APPLICABLE	ABB-CE has been directed by SCE not to supply engineering limits for this curve or table.	To verify that PZR Pressure is between the 20 deg F and 200 deg F Post Accident P/T limit curves.
20	PZR PRESSURE	> RCP NPSH CURVES NOT APPLICABLE	ABB-CE has been directed by SCE not to supply engineering limits for this curve or table.	To confirm available NPSH for operating the RCP(s).

Q.A. APPROVED TABLE

SONGS 2/3 ISUP II PHASE II
INSTRUMENT USE AND BASES TABLE

Module #: 08

Q.A. APPROVED TABLE

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
20	PZR PRESSURE	>20<200 SM CURVES NOT APPLICABLE	ABB-CE has been directed by SCE not to supply engineering limits for this curve or table.	To maintain saturation margin while performing controlled primary plant depressurization and cooldown.
20	PZR PRESSURE	>20<200 SM CURVES NOT APPLICABLE	ABB-CE has been directed by SCE not to supply engineering limits for this curve or table.	To assist in PZR pressure reduction during cooldown.
20	PZR PRESSURE	>20<200 SM CURVES NOT APPLICABLE	ABB-CE has been directed by SCE not to supply engineering limits for this curve or table.	To verify that PZR pressure is within the post accident P/T limits to determine success path performance.
21	PZR PRESSURE	STOP LOWERING NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To prevent void formation.
21	PZR PRESSURE	LOWERING NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To verify PZR pressure is reduced to within 50 psi of the isolated (ruptured) S/G pressure.
21	PZR PRESSURE	ACCEP RATE OF CHG NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To determine if the rate of PZR pressure change is acceptable during PZR spray or heater operation.
21	PZR PRESSURE	STABLE OR RISING NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To confirm LOFW diagnosis in conjunction with EFAS actuation and feedwater less than the minimum required flow.

SONGS 2/3 ISOP II PHASE II
INSTRUMENT USE AND BASES TABLE

Q.A. APPROVED TABLE

Module #: 08

Q.A. APPROVED TABLE

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
21	PZR PRESSURE	STBL/RSNG & CNTRL NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To verify that RCS pressure is controlled.
21	PZR PRESSURE	RAPIDLY LOWERING NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To identify the type of event and location when Pressurizer Pressure is rapidly decreasing, using the "Break Identification Chart".
21	PZR PRESSURE	STABLE NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To achieve control of CET Sat Margin by stabilizing pressurizer pressure and level.
21	PZR PRESSURE	LOWERING NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To verify expected RCS depressurization as S/G steaming and feeding continue.
21	PZR PRESSURE	MAINTAINED NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To verify that RCS pressure is controlled.
22	PZR PRESSURE	PER TABLE NOT APPLICABLE	ABB-CE has been directed by SCE not to supply engineering limits for this curve or table.	To verify adequate HPSI flow during hot and cold leg injection.

Q.A. APPROVED TABLE

SONGS 2/ SOP II PHASE II
INSTRUMENT USE AND BASES TABLE

Module #: 08

DATE: 04/30/93
REVISION: 01

Q.A. APPROVED TABLE

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
23	PZR PRESSURE	< 2275 PSIA & DEC UL 2275 PSIA	The engineering limit is based on the Pressurizer Pressure Control System (PPCS) signal for operation of the Pressurizer Sprays. Spray valves receive a signal to close when PZR pressure decreases below 2275 psia.	To ensure normal and auxiliary spray valves are closed.

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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support

C-E JOB NUMBER: 2001216

DOCUMENT: Module 08 Group 01 Engineering Limit and Bases

PARAMETER: Pressurizer Pressure

PREPARED BY:

L. A. Wild
Cognizant Engineer (Print Name)

L A Wild
Cognizant Engineer (Signature) Date: 4/29/93

VERIFICATION STATUS: COMPLETE

The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREER
Name
Independent Reviewer

Martin Green
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4/30/93
Date

APPROVED BY:

J. R. Congdon
Cognizant Engineering Manager (Print Name)

Joseph R Congdon
Cognizant Engineering Manager (Signature)

4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 08

Group: 01

Parameter: Pressurizer Pressure

Step Value(s):	**Use(s):**
< 50 psid rupt S/G	To verify PZR pressure is reduced to within 50 psi of the isolated (ruptured) S/G pressure.
± 50 psi iso S/G	To verify PZR pressure is reduced to within 50 psi of the isolated (ruptured) S/G pressure.
> S/G Pressure	To ensure RCS pressure remains higher than ruptured S/G pressure in order to minimize RCS dilution due to backflow.
< S/G Pressure	To monitor lowering RCS Pressure to < S/G pressure to restore the isolated S/G level to less than 80% NR.

Engineering Limit(s):

Upper Limit 50 psi greater than S/G Pressure

Lower Limit 50 psi less than S/G Pressure

Bases for Engineering Limit(s):

Maintaining the RCS pressure approximately equal (± 50 psi) to the isolated steam generator pressure will accomplish two goals:

1) minimize the loss of primary fluid to the secondary side and the possibility of overfilling the isolated steam generator;

2) minimize the amount of unborated water flowing into the RCS from the steam generator which could reduce the RCS boron concentration.

Reference 1 recognized that maintaining the differential pressure at the tube break at exactly 0 psid would be impossible given the limitations of the instrumentation and the availability of personnel.

Therefore, based on analyses described in Reference 2, a tolerance on the differential pressure of ± 50 psi was specified in Reference 1 (which has received interim approval by the NRC).

The upper limit allows the operator to maintain the pressurizer pressure greater than steam generator pressure to permit flow of RCS fluid into the steam generator. Maintaining the RCS pressure approximately equal to the isolated S/G pressure (+ 50 psi) will minimize the loss of primary fluid to the secondary side (Ref. 1). Alternately, the pressure is lowered to less than S/G pressure to control level in the steam generator (Ref. 2). This is discussed further below.

This lower limit allows the operator to maintain pressurizer pressure less than steam generator pressure to permit backflow of steam generator fluid into the RCS to help reduce steam generator level. This helps prevent steam generator overfill and possible damage to the main steam lines and main steam safety valves. Reference 2 presents calculations which demonstrate that, if the RCS could be instantly and homogeneously diluted by the entire mass of a non-borated steam generator, other effects on reactivity would prevent a reactor restart. Reference 2 concludes that the flowrate established by a 50 psid differential pressure will not threaten the maintenance of adequate shutdown margin. Therefore, the lower engineering limit for pressurizer pressure will equal the steam generator pressure less 50 psi.

ssumptions:

- The reference noted below is assumed to be a Secondary Design document. This assumption is justified based on the fact that it describes strategies which have been reviewed and commented on by the NRC.

  Ref: 1 | rev. 01

  In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The reference noted below is formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Its use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01

  ef: 2 | rev. 01

| rev. 01

References:

1. Emergency Procedure Guidelines, CEN-152, Revision 03, Bases for SGTR Guideline, Step 12, page 6-60.
2. CE-NPSD-407, NSSS Response to Operator Actions During Postulated Events for Resolution of C-E Emergency Procedure Guidelines SER Items, March 1987.

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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 08 Group 02 Engineering Limit and Bases

PARAMETER: Pressurizer Pressure

PREPARED BY: L. A. Wild
Cognizant Engineer (Print Name)

L. A. Wild
Cognizant Engineer (Signature) Date: 4/29/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREER
Name
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4/30/93
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APPROVED BY: J. R. Congdon
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Cognizant Engineering Manager (Signature) 4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 08

Group: 02

Parameter: Pressurizer Pressure

Step Value(s):	**Use(s):**
> 100 psia	To verify PZR pressure is high enough (> 100 psia) to force RCS fluid through the seals prior to opening the RCP seal bleedoff path.

Engineering Limit(s):

Lower Limit 165 psia

B[illegible]s for Engineering Limit(s):

The minimum acceptable pressure for the RCP seals is 50 psi per stage (Ref. 1). The controlled bleedoff is between third stage and the fourth (vapor seal) stage. Therefore the minimum RCS pressure would be 150 psig (3 x 50 psi) or 165 psia (nominal).

ssumptions:

- The seals currently installed are those specified in the reference report.
- In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The reference noted below is formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Its use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01

Ref: 1

| rev. 01

References:

1. "Reactor Coolant Pump Seal Improvement Evaluation Program," CE NPSD-394, January 1987, Table 1 and Attachment 1, (CDCC # 57701, Category 2).

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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 08 Group 03 Engineering Limit and Bases

PARAMETER: Pressurizer Pressure

PREPARED BY: L. A. Wild
Cognizant Engineer (Print Name)
L. A. Wild
Cognizant Engineer (Signature) Date: 4/29/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREEN Martin Green 4/30/93
Name Signature Date
Independent Reviewer

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)
Joseph R Congdon
Cognizant Engineering Manager (Signature) 4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 08 **Group:** 03

Parameter: Pressurizer Pressure

Step Value(s):	**Use(s):**
> 200 & CONTROLLED	To verify pressurizer (PZR) pressure is greater than the shutoff head of the LPSI pumps (200 psia stated) and controlled.
< 200 psia	To verify PZR pressure is less than the shutoff head of LPSI pumps to establish LPSI flow into RCS. | rev. 01

Engineering Limit(s):

Upper Limit 200 psia

Bases for Engineering Limit(s):

The Engineering Limit is based on the shutoff head of the LPSI pumps.

For those EOI steps which require the use of the LPSI pumps, the pressure must be lowered to less than the shutoff head. For example if pressure is greater than the shutoff head of the pump (nominally 200 psia Reference 1 and 2) then the RCS pressure must be lowered to a point where the pumps are effective in fulfilling the safety function involved.

For those EOI steps in which a decision is required as to whether continued operation of the LPSI pumps is desired, the pumps are stopped if RCS pressure is greater than shutoff and is expected to remain at such pressure. For example, if RCS pressure is stable above 200 psia or controlled greater than 200 psia, then the LPSI pumps should be stopped as specified in the steps which use this value. The pressure specified is essentially the shutoff head of the LPSI pumps (Reference 1 and 2). Therefore at RCS pressures at or above 200 psia, the LPSI pumps are not providing flow to the RCS and are not contributing to maintaining the safety functions.

Assumptions:

1. The FSAR (Reference 3) specifies that the shutoff head is 460 feet (199.43 psi assuming water at 60°F; i.e., 200 psi nominal). An increase in suction pressure above that used to determine the shutoff head of the pump would increase the discharge pressure. Therefore the engineering limit assumes that suction pressure does not contribute significantly to the output pressure of the LPSI pump.

2. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The reference noted below is formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Its use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists.

   Ref: 1 and 2 | rev. 01

3. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the reference noted below is considered to be a Secondary Design document. Its use as a reference document for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

   Ref: 3 | rev. 01

| rev. 01

References:

1. Letter from V. C. Hall (CE) to D. E. Nunn (SCE), serial S-CE-8660, dated July 22, 1983, "Transmittal of Documentation to support SONGS 2 & 3 Plant Specific Technical Guidelines."
2. SONGS Plant Specific Technical Guidelines, Revision 01, LOCA Guideline, pages 5-34 through 5-36.
3. Updated FSAR, through revision 8, Table 6.3-2.

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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3
PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 08 Group 04 Engineering Limit and Bases
PARAMETER: Pressurizer Pressure

PREPARED BY: L. A. Wild
Cognizant Engineer (Print Name)
L. A. Wild
Cognizant Engineer (Signature) Date: 4/29/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREER
Name
Independent Reviewer

Martin Greer
Signature

4/30/93
Date

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)
Joseph R Congdon
Cognizant Engineering Manager (Signature) 4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 08

Group: 04

Parameter: Pressurizer Pressure

Step Value(s):	**Use(s):**
< 250 psia	To verify PZR pressure is below the shutoff head of the containment spray (CS) pumps (250 psia stated).

Engineering Limit(s):

Upper Limit for CS Pumps = 270 psia.

Bases for Engineering Limit(s):

The Engineering Limit is based on the shutoff head of the CS pumps. The RCS pressure must be below the shutoff head of the pump for it to contribute to the safety function involved. The shutoff head of the CS pumps is 270 psia.

Assumptions:

1. The FSAR (Reference 1) specifies that the shutoff head of the CS pumps is 575 feet. This is equivalent to 255.26 psig (270 psia nominal) using the following relationship:

$$P_d = (\text{Shutoff head} + \text{Suction head}) \times \frac{\rho}{144}$$

where:

P_d = *Pump discharge pressure in psig*

Shutoff head = Head developed across the pump at zero flow

Suction head = Head supplied at the pump suction

ρ = *density of water at 62°F (62.3 lb/ft³)*

144 = conversion from square feet to square inches

A nominal 15 feet was assumed for suction head. This is slightly above the maximum NPSH limit shown in the FSAR (Ref. 2). A suction head other than that assumed would change the discharge pressure of the pump.

2. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license.

   Ref: 1 and 2

| rev. 01

| rev. 01

References:

1. Updated FSAR, through revision 8, Section 6.2.2.1.2.2.A and Table 6.2-29.
2. Updated FSAR, through revision 8, Figures 6.2-47 through 6.2-50.

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Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support

C-E JOB NUMBER: 2001216

DOCUMENT: Module 08 Group 05 Engineering Limit and Bases

PARAMETER: Pressurizer Pressure

PREPARED BY:

L. A. Wild
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L. A. Wild
Cognizant Engineer (Signature) Date: 4/29/93

VERIFICATION STATUS: COMPLETE

The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREER
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4/30/93
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Joseph R Congdon
Cognizant Engineering Manager (Signature)

4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 08

Group: 05

Parameter: Pressurizer Pressure

Step Value(s):	**Use(s):**
< 340 psia	To monitor cooldown and depressurization of the RCS to get on Shutdown Cooling (< 385°F and < 340 psia specified). To verify shutdown cooling conditions are met (T-hot < 385°F, PZR pressure < 340 psia).

Engineering Limit(s):

Upper Limit 376 psia

Bases for Engineering Limit(s):

The limit is based on a permissive signal which allows operations to open isolation valves in the shutdown cooling suction lines when PZR pressure is < 376 psia (Ref. 1). This prevents exceeding the design pressure of the shutdown cooling (SDC) system (435 psig) (Ref. 2). Pressure must be reduced to less than the interlock setpoint for SDC to be placed in service.

Additional Discussion

Pressures above the Engineering Limit would be allowable while still remaining within the design pressure of the limiting portion of the SDC system (limiting design pressure is 435 psig as shown in Reference 2, Section C-8).

Assumptions:

1. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license.

   Ref: 1 and 2 | rev. 01

References:

1. Updated FSAR, through revision 8, Section 7.6.1.1.1.
2. Updated FSAR, through revision 8, Figure 6.3-5 (2), Drawing number 40112B.

File No: 009-OPS92-136
Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 08 Group 06 Engineering Limit and Bases

PARAMETER: Pressurizer Pressure

PREPARED BY: L. A. Wild
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L. A. Wild
Cognizant Engineer (Signature) Date: 4/29/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREER
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Martin Greer
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4/30/93
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APPROVED BY: J. R. Congdon
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Joseph R Congdon
Cognizant Engineering Manager (Signature)

4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 08 **Group:** 06

Parameter: Pressurizer Pressure

Step Value(s):	**Use(s):**
< 395 psia	To specify the setpoint to allow bypassing SIAS (395 psia).

| rev. 01

Engineering Limit(s):

Upper Limit < 400 psia

Lower Limit ≥ 300 psia

Bases for Engineering Limit(s):

The Engineering Limit is based on the pressure for the low pressurizer pressure trip signal (Ref. 1 and 2). A previous EOI step in the attachment which uses this step value specifies to reset the pressurizer low pressure trip setpoint during controlled cooldown. The resetting of this trip is as allowed by References 1 through 4.

In order to prevent an unwanted SIAS as the cooldown proceeds, the trip must be manually bypassed (or the setpoint must be further lowered) before reaching the existing setpoint. The lowest setpoint allowed is 300 psia (Ref. 1 through 4). This is the lower limit for bypassing the low pressurizer trip.

The trip may not be manually bypassed until RCS pressure is less than 400 psia (Ref. 1 through 5). This is the upper limit for bypassing the low pressurizer pressure trip.

Assumptions:

1. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

   Ref: 1 through 5

| rev. 01

References:

1. SONGS Units 2 Technical Specifications, through Amendment 94, Table 3.3-4.
2. SONGS Units 3 Technical Specifications, through Amendment 84, Table 3.3-4.
3. Updated FSAR, through revision 8, Section 7.2.1.1.1.6.
4. Updated FSAR, through revision 8, Section 7.3.1.1.1.
5. Updated FSAR, through revision 8, Section 7.2.1.1.5.1.

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Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 08 Group 07 Engineering Limit and Bases

PARAMETER: Pressurizer Pressure

PREPARED BY: L. A. Wild
Cognizant Engineer (Print Name)
L. A. Wild Date: 4/29/93
Cognizant Engineer (Signature)

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREEN	Mart Green	4/30/93
Name Independent Reviewer	Signature	Date

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)
Joseph R Congdon 4/30/93
Cognizant Engineering Manager (Signature) Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 08 **Group:** 07

Parameter: Pressurizer Pressure

Step Value(s):	**Use(s):**
< 395 psia	To verify that PZR pressure is < 395 to allow isolation of the Safety Injection Tanks (SITs). To initiate action to isolate SITs to prevent inadvertent discharge.

| rev. 01

Engineering Limit(s):

Lower Limit = 370 psia

Bases for Engineering Limit(s):

In order to prevent inadvertent discharge of the SITs to the RCS they must be isolated before RCS pressure is less than SIT pressure. References 1, 2 and 3 specify that it is undesirable to allow the nitrogen cover gas in the SITs to enter the RCS. The Engineering Limit is based on the pressure band to which the SIT nitrogen overpressure is reduced during an RCS cooldown (350 psia to 370 psia).

Assumptions:

.. It is assumed that process uncertainties in P_{PZR} and P_{SIT} have not been accounted for. In particular, the pressure associated with the difference in elevation head between the SIT and the pressurizer has not been considered. When operating within the EOIs a stable pressurizer level is unlikely and therefore no specific level has been assumed on which such a pressure differential could be calculated.

As noted above, the SIT nitrogen overpressure is reduced in a previous EOI step. The upper limit of that step value is ssumed to exist in the SITs at this point in the procedure. he actual RCS pressure limit for each tank is dependent on the actual pressure in that tank.

3. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the reference noted below is considered to be a Secondary Design document. Its use as a reference document for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

   Ref: 1 | rev. 01

4. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01

   Ref: 2 and 3 | rev. 01

eferences:

1. "Emergency Procedure Guidelines," CEN-152, Revision 03, Page 5-111, Bases for LOCA Step 39.

2. SONGS "Emergency Procedure Technical Guidelines," Revision 01, June 1984, SGTR Guideline, page 6-34.

3. SONGS "Emergency Procedure Technical Guidelines," Revision 01, June 1984, Appendix A, page A-52.

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Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 08 Group 08 Engineering Limit and Bases

PARAMETER: Pressurizer Pressure

PREPARED BY: L. A. Wild
Cognizant Engineer (Print Name)
L. A. Wild
Cognizant Engineer (Signature) Date: 4/29/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREER
Name
Independent Reviewer

Martin Greer
Signature

4/30/93
Date

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)
Joseph R Congdon
Cognizant Engineering Manager (Signature) 4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 08 **Group:** 08

Parameter: Pressurizer Pressure

Step Value(s):	**Use(s):**
< 395 psia	To initiate reducing the number of available HPSI pumps to within the design capacity of the LTOP relief valve.

Engineering Limit(s):

Upper Limit 420.7 psia (nominal) - Note: Applicable only when LTOP is in service.

Bases for Engineering Limit(s):

The Engineering Limit is based on the setpoint of the LTOP relief valve 406 ± 10 psig (Ref 1 and 2). If the LTOP relief valve is on line, the available HPSI pumps is reduced to one in order to ensure that the design capacity of the LTOP relief valve is not exceeded. (LTOP is required to be in service when $T_{cold} \leq 287°F$, Unit 2, or $\leq 267°F$, Unit 3.)

Additional Discussion

There is no apparent basis for disabling all but one HPSI pump when RCS pressure is less than the step value indicated above. The plant Technical Specifications Bases specify that the valve used to provide LTOP protection (the Shutdown Cooling System relief valve) has adequate relieving capacity to protect the RCS from overpressurization when the transient is limited to inadvertent safety injection actuation with two HPSI pumps injecting into a water-solid RCS with full charging capacity and letdown isolated (Ref. 3 and 4). However, limiting the available pumps to one, ensures that if the third HPSI pump is inadvertently energized, then this condition will be within the pacity of the LTOP relief valve.

Assumptions:

1. The available HPSI pumps must be lowered to one to prevent challenging LTOP.

2. It is assumed that process uncertainties in P_{PZR} have not been accounted for. In particular, the pressure associated with the difference in elevation head between the LTOP (SCS relief) valve and the pressurizer has not been considered. When operating within the EOIs a stable pressurizer level is unlikely and therefore no specific level has been assumed on which such a pressure differential could be calculated.

3. The FSAR notes that the relief is set under conditions other than the valve would experience under normal operation. The assumed set pressure at the SCS design temperature would be 402 psig. (Reference 5.) The effects of ambient conditions on the relief valve setting have not been accounted for.

4 In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

Ref: 1 through 5 | rev. 01

References:

1. SONGS Units 2 Technical Specifications, through Amendment 94, Section 3.4.8.3.1.

2. SONGS Units 3 Technical Specifications, through Amendment 84, Section 3.4.8.3.1.

3. SONGS Units 2 Technical Specifications, through Amendment 94, Bases Section 3/4.4.8.

4. SONGS Units 3 Technical Specifications, through Amendment 84, Bases Section 3/4.4.8.

5. Updated FSAR, through Revision 8, Section 5.2.2.11.2.2.

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Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 08 Group 09 Engineering Limit and Bases

PARAMETER: Pressurizer Pressure

PREPARED BY: L. A. Wild
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L A Wild
Cognizant Engineer (Signature) Date: 4/29/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREEN Martin Green 4/30/93
Name Signature Date
Independent Reviewer

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 08 **Group:** 09

Parameter: Pressurizer Pressure

Step Value(s):	**Use(s):**
< 395 psia	To specify the setpoint to allow lowering the charging pump discharge dampener pressure to 200 psig.

Engineering Limit(s):

Upper Limit 400 psia

Bases for Engineering Limit(s):

Nitrogen precharge pressure should be kept at approximately 60% of system operating pressure (Ref 1). Reference 1 also specifies that the charging pump discharge dampeners should be adjusted for a 200 psig precharge when RCS pressure is lowered to 400 psia during cooldown. This apparently is an operational consideration. References 2 and 3 do not provide any restrictions or instructions on adjusting the pressure of the discharge pulsation dampeners. No basis for the operational limit contained in Reference 1 has been identified. Reference 4 requested additional data to support a bases for this use.

Assumptions:

1. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01

   Ref: 1, 3, and 4 | rev. 01

2. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the reference noted below is considered to be a Secondary

Design document. Its use as a reference document for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license.

Ref: 2 | rev. 01

References: | rev. 01

1. SONGS Unit 2 and 3 Operating Instruction S023-3-2.1, Revision 12, Effective Date April 2, 1987, "CVCS Charging and Letdown."
2. Updated FSAR, through revision 8, Table 9.3-7.
3. "System Description for Chemical and Volume Control System for Southern California Edison San Onofre Units 2 and 3," 1370-PE-SD20, Revision 00, 1/21/77 (CDCC Number 21622, Category 2).
4. Message, "Request for Charging Pump Pulsation Dampener Data," Bill Watson (ABB C-E) to Paul Curry (SCE), 12/01/92.

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Page: 1 of 3

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 08 Group 10 Engineering Limit and Bases

PARAMETER: Pressurizer Pressure

PREPARED BY: L. A. Wild
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Cognizant Engineer (Signature) Date: 4/24/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREER
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4/30/93
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APPROVED BY: J. R. Congdon
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Cognizant Engineering Manager (Signature) 4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 08 **Group:** 10

Parameter: Pressurizer Pressure

Step Value(s):	**Use(s):**
≤ 500 psia	To verify adequate HPSI flow during hot and cold leg injection.
> 500 psia	To aid in the selection of the appropriate lineup when initiating hot and cold leg injection.

Engineering Limit(s):

500 psia

Bases for Engineering Limit(s):

At RCS pressures greater than 500 psia the HPSI flow through the individual cold leg injection paths is expected to be in the extreme low end of the cold leg indicator scale. Therefore, the indicated flows at RCS pressure ≥ 500 psia are not expected to be accurate. (Reference 1, Attachment (2) & (3).) Since with pressure greater the 500 psia the operators cannot accurately determine combined flow to the cold leg injection paths and thereby accurately adjust the split between hot and cold leg flows, throttling to set these flows is not used. At pressures less than 500 psia a table is provided in the applicable EOIs to specify the flow split between the hot legs and the combined cold leg injection flow paths.

Additional Discussion

As discussed in Reference 1, in addition to the accuracy consideration discussed above, at RCS pressures ≥ 500 psia backpressure conditions prevent excessive runout flow and the resistance characteristics of the flow paths ensure that the HPSI flow split between RCS hot and cold legs is acceptable. As the RCS is depressurized, HPSI pump flow and the difference between hot and cold side injection flows will increase. To prevent excessive pump flow and ensure acceptable hot leg and cold leg flows, the cold leg injection valves are throttled. (Reference 1, Attachment (2) & (3).)

Below 500 psia the flow split is as specified in the EOIs. The minimum hot and cold leg flows are specified in Figure 5.19 provided in Reference 1. The flow rates are required to ensure adequate flushing of the reactor vessel based on pressure in the RCS. The figure also specifies that total flow in excess of 910 gpm is not permitted. The information provided in Figure 5.19 of Reference 1 was apparently incorporated in the EOI's as the table in the indicated attachments. Reference 2 is consistent with the total flow which would be obtained by adding the hot/cold leg flows of Figure 5.19 or the table in the EOI's.

Assumptions:

1. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01

   Ref: 1 and 2

| rev. 01

References:

1. Letter V. C. Hall (C-E) to D. P. Brieg (SCE), serial S-CE-9704, dated November 21, 1984, "C-E Review of Upgraded Emergency Operating Instructions, PO M4100001."
2. SONGS "Emergency Procedure Technical Guidelines," Revision 01, June 1984, LOCA Guideline, Figure 5-20, page 5-94.

File No: 009-OPS92-195
Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 08 Group 11 Engineering Limit and Bases

PARAMETER: Pressurizer Pressure

PREPARED BY: L. A. Wild
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L. A. Wild
Cognizant Engineer (Signature) Date: 4/29/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREER
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4/30/93
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Cognizant Engineering Manager (Signature) 4/30/93
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SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 08

Group: 11

Parameter: Pressurizer Pressure

Step Value(s):	**Use(s):**
≤ 615 psia	To check PZR Pressure < 615 PSIA to ensure flow from the safety injection tanks (SITs) to the RCS.

Engineering Limit(s):

Upper Limit 615 psia

Bases for Engineering Limit(s):

The upper limit on RCS pressure is based on the lowest pressure allowed in the SITs by the Technical Specifications (Ref. 1 & 2). The specific limit for each tank which will result in flow to the RCS is dependent on the actual pressure in that tank.

Assumptions:

1. It is assumed that process uncertainties in P_{PZR} and P_{SIT} have not been accounted for. In particular, the pressure associated with the difference in elevation head between the SIT and the pressurizer has not been considered. When operating within the EOIs a stable pressurizer level is unlikely and therefore no specific level has been assumed on which such a pressure differential could be calculated.

2. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

   Ref: 1 and 2

| rev. 01

References:

1. SONGS Units 2 Technical Specifications, through Amendment 94, Section 3/4.5.1. | rev. 01

2. SONGS Units 3 Technical Specifications, through Amendment 84, Section 3/4.5.1. | rev. 01

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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 08 Group 12 Engineering Limit and Bases

PARAMETER: Pressurizer Pressure

PREPARED BY: L. A. Wild
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L. A. Wild
Cognizant Engineer (Signature) Date: 4/29/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREER
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4/30/93
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APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 08 **Group:** 12

Parameter: Pressurizer Pressure

Step Value(s):	**Use(s):**
< 715 psia	To avoid inadvertent discharge of the SITs (below 650 psia). To determine when to depressurize the SITs.
< 650 psia	To initiate action to lower SIT pressure to avoid inadvertent discharge to the RCS.

Engineering Limit(s):

Lower Limit = 655 psia

Bases for Engineering Limit(s):

The lower limit on RCS pressure is based on the pressure in the SITs. References 1, 2 and 3 specify that it is undesirable to allow the nitrogen cover gas in the SITs to enter the RCS. In addition, References 4 and 5 specify that the pressure in the tanks is reduced to prevent overpressurization of the shutdown cooling system. In order to prevent inadvertent discharge of the SITs to the RCS the pressure in the tanks must be lowered before the RCS pressure goes below the pressure in the SITs. The pressure in the tanks is lowered when the RCS pressure reaches the value specified in the EOIs. The required pressure in the tanks in Modes 1, 2, and 3 is specified in Reference 6 which is the bases for the Engineering Limit.

Assumptions:

1. It is assumed that process uncertainties in P_{PZR} and P_{SIT} have not been accounted for. In particular, the pressure associated with the difference in elevation head between the SIT and the pressurizer has not been considered. When operating within the EOIs a stable pressurizer level is unlikely and therefore no specific level has been assumed on which such a pressure differential could be calculated.

2. The lower limit is based on the highest allowable pressure in the SITs by the Technical Specifications (Ref. 6 and 7). The actual RCS pressure limit for each tank is dependent on the actual pressure in that tank.

3. The reference noted below is assumed to be a Secondary Design document. This assumption is justified based on the fact that it describes strategies which have been reviewed and commented on by the NRC.

   Ref: 1 | rev. 01

4. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01

   Ref: 2 and 3 | rev. 01

5. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

   Ref: 4 through 7 | rev. 01

References: | rev. 01

1. "Emergency Procedure Guidelines," CEN-153, Revision 03, Page 5-111, Bases for LOCA Step 39.
2. SONGS "Emergency Procedure Technical Guidelines," Revision 01, June 1984, SGTR Guideline, page 6-34.
3. SONGS "Emergency Procedure Technical Guidelines," Revision 01, June 1984, Appendix A, page A-52.
4. Updated FSAR, through revision 8, Section 6.3.2.2.1.
5. Updated FSAR, through revision 8, Section 6.3.2.9.7.
6. SONGS Units 2 Technical Specifications, through Amendment 94, Section 3/4.5.1.

| rev. 01

7. SONGS Units 3 Technical Specifications, through Amendment 84, Section 3/4.5.1. | rev. 01

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Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support

C-E JOB NUMBER: 2001216

DOCUMENT: Module 08 Group 13 Engineering Limit and Bases

PARAMETER: PZR PRESSURE

PREPARED BY: L. A. Wild
Cognizant Engineer (Print Name)

L. A. Wild
Cognizant Engineer (Signature) Date: 4/29/93

VERIFICATION STATUS: COMPLETE

The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREER
Name
Independent Reviewer

Martin Greer
Signature

4/30/93
Date

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 08

Group: 13

Parameter: PZR PRESSURE

Step Value(s):	**Use(s):**
< 1000 psia	To determine during an SGTR if PZR pressure requires shifting from maintaining +/-50 psid (primary to secondary), to maintaining RCP NPSH and CET SAT Margin >20°F. To verify PZR pressure is < 1000 psia to minimize the possibility of lifting the Main Steam Safety Valves (MSSVs) on the isolated S/G.
> 1000 psia	To determine during an SGTR (w/ T-hot <530°F and S/G Level rapidly trending >90%) if PZR press requires shifting from maintaining RCP NPSH & CET SAT Margin >20°F to maintaining S/G Δp ±50 psid.

Engineering Limit(s):

Upper Limit: 1088 psia

Bases for Engineering Limit(s):

From Reference 1, the purpose of the step value of 1000 psia is to reduce the probability of a ruptured and isolated steam generator's Main Steam Safety Valve(s) (MSSV) opening. Such an opening would cause a radiological release to the environment.

Reference 1 also states that the basis for the step value is the nominal setpoint for the lowest set MSSV. From References 2 & 3, the lowest relief setting is 1100 psia ±1%. This results in a lowest possible relieving pressure of 1089 psia. The upper engineering limit is therefore selected to be 1088 psia.

Assumptions:

1. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The reference noted below is formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Its use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists.

   Ref: 1 | rev. 01

2. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

   Ref: 2 and 3 | rev. 01

References: | rev. 01

1) Operating Instruction SO23-14-4, SGTR Deviation Justification and Bases Document, Rev. 0, page 48 of 197.
2) San Onofre 2 Technical Specification, Amendment 94, Table 3.7-1.
3) San Onofre 3 Technical Specification, Amendment 84, Table 3.7-1.

Ref. 1

SGTR DEVIATION JUSTIFICATION AND BASES

EOI STEP: CONTINUE LOWERING RCS PRESSURE EPG STEP: 12 AND 13

DEVIATIONS:

1. EOI step 16b (both A/ER and RNO columns) corresponds to the Pressure-Temperature limits of EPG step 13.

2. A plant specific value of 1000 psia is used for the bracketed value in the EPGs for the preferred maximum RCS pressure following affected S/G isolation.

3. EOI Step 16 does not discuss lowering RCS pressure to approximately the isolated steam generator's indicated pressure as EPG step 12 discusses.

JUSTIFICATIONS:

1. In any pressure reduction scheme for reducing the steam generator tube rupture leak rate, it remains of primary concern to maintain subcooled conditions in the reactor core.

2. Lowest set MSSV nominal See Tech Specs setpoint is ~~1085~~ psia. This reduces the probability of the affected and isolated S/G's MSSVs opening. Such an opening would result in a radiological release to the environment. 1000 psia, as a setpoint, conservatively addresses PZR pressure instrument inaccuracies and MSSV lift setpoint inaccuracies.

3. EOI step 17 which initiates deliberate continued RCS cooldown references Attachment 13, PZR Pressure and Level Control Table. Attachment 13 includes guidance of attempting to establish primary pressure in a ±50 psi pressure band with the isolated S/G. EOI step 20 specifically addresses the pressure differential across tube ruptures.

BASES:

Lowering RCS pressure below 1000 psia will reduce the probability of the affected and isolated S/G's MSSVs opening. Such an opening would result in a radiological release to the environment. This setpoint of 1000 psia is adequately below the lowest MSSV setpoint of 1085 psia to address inaccuracies in pressurizer level instrumentation and MSSV setpoints. However, RCS pressure below 1000 psia are only allowed if core exit subcooled margin minimum limits can be maintained. 20°F minimum subcooled limit is based on SCE letter AD-20 to NRC, dated October 31, 1986.

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Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support

C-E JOB NUMBER: 2001216

DOCUMENT: Module 08 Group 14 Engineering Limit and Bases

PARAMETER: Pressurizer Pressure

PREPARED BY:

L. A. Wild
Cognizant Engineer (Print Name)

L. A. Wild
Cognizant Engineer (Signature) Date: 4/29/93

VERIFICATION STATUS: COMPLETE

The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREER
Name
Independent Reviewer

Martin Greer
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4/30/93
Date

APPROVED BY:

J. R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature)

4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 08

Group: 14

Parameter: Pressurizer Pressure

Step Value(s):	**Use(s):**
< 1400 psia	To verify Pressurizer Pressure is < 1400 PSIA, which is a prerequisite for aligning both letdown flow control valves during cooldown/depressurization.
> 1400 psia	To confirm that only one letdown flow control valve is unisolated (> 1400 psia).

Engineering Limit(s):

Upper Limit 1514.7 psia

Bases for Engineering Limit(s):

This limit is based on the capacity of the intermediate pressure letdown relief valve. The relief valve downstream of the letdown control valves protects the intermediate pressure letdown piping and heat exchanger from overpressure. The valve capacity is equal to the capacity of one letdown control valve in the wide open position during normal operation. The other letdown control valve must be closed and isolated before plant pressure exceeds 1500 lb/in.^{2}g. The relief valve set pressure is equal to the design pressure of the intermediate pressure letdown piping and letdown heat exchanger (Ref. 1).

Assumptions:

1. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the reference noted below is considered to be a Secondary Design document. Its use as a reference document for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license.

   Ref: 1

| rev. 01

| rev. 01

References:

1. Updated FSAR, through revision 8, Section 9.3.4.3.2, "Overpressure Protection.".

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Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 08 Group 15 Engineering Limit and Bases

PARAMETER: PRESSURIZER PRESSURE

PREPARED BY: L. A. Wild
Cognizant Engineer (Print Name)

L. A. Wild
Cognizant Engineer (Signature) Date: 4/29/93

VERIFICATION STATUS: COMPLETE

The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 4 of QAM-101.

MARTIN GREEN
Name
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Martin Green
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4/30/93
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APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature)

4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 08

Group: 15

Parameter: PRESSURIZER PRESSURE

Step Value(s):	**Use(s):**
≤ 1430 PSIA	To determine if at least one RCP in each loop must be stopped.
> 1430 PSIA	To determine if two RCPs must be stopped.
> 1430 PSIA	To verify the number of RCPs allowed to be running.
> 1430 PSIA	Used in the determination to trip all RCPs in the event of a LOCA.

Engineering Limit(s):

Lower Limit = 1361 PSIA

Bases for Engineering Limit(s):

The engineering limit of 1361 psia is derived from CEN-268 (Reference 1) which describes the strategy for tripping all four RCPs following a small break LOCA to avoid a degradation in core cooling. The referenced analysis were based on the concept of tripping all four RCPs at a pressure setpoint which is lower than the Safety Injection Actuation Signal (SIAS) pressure but high enough to assure tripping of all RCPs for a LOCA. The setpoint for SONGS 2 & 3 is based on results of a 3410 MWt plant best estimate analysis for the pressure at which RCPs should be tripped using the Trip 2/Leave 2 RCP trip scheme.

Reference 1 specifies that 1361 psia does not include instrument inaccuracies. According to Reference 2, the step value of 1430 psia was determined by adding an approximate 75 psi normal environment instrument uncertainty to the base value of 1361 psia.

Assumptions:

1. The reference noted below is assumed to be a Secondary Design document. This assumption is justified based on the fact

that it describes strategies which have been reviewed and commented on by the NRC.

Ref: 1 | rev. 01

2. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The reference noted below is formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Its use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01

Ref: 2 | rev. 01

References: | rev. 01

1) CEN-268, Justification of Trip Two/Leave Two Reactor Coolant Pump Trip Strategy During Transients, March 1984, pages A-1 and A-2.

2) Operating Instruction SO23-14-9, Functional Recovery Deviation Justification and Bases, Rev. 01, pages 9 through 12 of 771.

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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 08 Group 16 Engineering Limit and Bases

PARAMETER: PRESSURIZER PRESSURE

PREPARED BY: L. A. Wild
Cognizant Engineer (Print Name)
L. A. Wild
Cognizant Engineer (Signature) Date: 4/29/93

VERIFICATION STATUS: COMPLETE

The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREER
Name
Independent Reviewer

Martin Greer
Signature

4/30/93
Date

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 08

Group: 16

Parameter: PRESSURIZER PRESSURE

Step Value(s):	**Use(s):**
< 1500 PSIA	To ensure PZR pressure is at or below the shutoff head of the HPSI pumps (procedure specified number is 1500 psia).

Engineering Limit(s):

Upper Limit = 1493 PSIA

Bases for Engineering Limit(s):

According to Reference 1, the step value of 1500 psia is used as the shutoff head pressure for the HPSI pumps. It quotes S-CE-8660(Reference 2) which states,

> *"This value is the calculated HPSI shutoff head rounded off in the conservative direction (FSAR Table 6.3-2)."*

FSAR Table 6.3-2 (Reference 3) lists the HPSI pump shutoff head as 3450 ft. (maximum). From Reference 4, for water at 68°F, converting to psia units yields:

(3450 ft.)(0.432781 psi/ft.) = 1493 psia

From the above, it appears that the step value is <u>less</u> conservative than 1493 psia with regards to HPSI delivery to the RCS. Furthermore, 1493 psia is the maximum pump shutoff head per the HPSI pump specifications and does not account for situation specific values of suction head, resistance coefficients, or instrument and elevation uncertainties.

It should be noted that LOCA analysis HPSI delivery curve data (Reference 5) shows shutoff head conditions (i.e., no flow) at pressures as low as 1375.5 psia.

Assumptions:

1. The Reference 3 HPSI pump specification for shutoff head (3450 ft.) is based on water at standard temperature (68°F).

2. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01

   Ref: 1 and 2

   | rev. 01

3. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the reference noted below is considered to be a Secondary Design document. Its use as a reference document for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

   Ref: 3

   | rev. 01

References:

1) Operating Instruction SO23-14-9, Functional Recovery Deviation Justification and Bases, Rev. 0, page 307 of 771.

2) Letter S-CE-8660, Documentation of SONGS Technical Guidelines, July 22, 1983.

3) San Onofre 2 & 3 Updated FSAR, Table 6.3-2, Safety Injection System Components Parameters, Rev. 5, 2/89.

4) Crane Technical Paper No. 410, Flow of Fluids Through Valves, Fittings, and Pipe, Nineteenth Printing, 1980.

5) S-LOCA-83-005, ECCA Request for HPSI Delivery Curve Confirmation for SONGS Unit 2 by Plant Engineering, May 18, 1983.

File No: 009-OPS92-200
Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison

PLANT: San Onofre 2&3

PROJECT: ISOPS II Support

C-E JOB NUMBER: 2001216

DOCUMENT: Module 08 Group 17 Engineering Limit and Bases

PARAMETER: Pressurizer Pressure

PREPARED BY:

L. A. Wild
Cognizant Engineer (Print Name)

L. A. Wild
Cognizant Engineer (Signature) Date: 4/29/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREER
Name
Independent Reviewer

Martin Greer
Signature

4/30/93
Date

APPROVED BY:

J. R. Congdon
Cognizant Engineering Manager (Print Name)

Joseph R. Congdon
Cognizant Engineering Manager (Signature)

4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 08 **Group:** 17

Parameter: Pressurizer Pressure

Step Value(s):	**Use(s):**
Controlled < 2380 PSIA	To verify RCS pressure controlled.
Controlled 1740 to 2380 psia	To verify expected post-trip reactor pressure response (PZR pressure between 1740 psia and 2380 psia).

Engineering Limit(s):

Upper Limit 2375 psia

Lower Limit 1740 psia

Bases for Engineering Limit(s):

The control of RCS pressure is indicated by pressure being within the band of the selected step values as indicated in References 1 and 2. In effect, the pressure band provides a bases for evaluating whether adequate pressure control exists.

The upper limit is based on the High Pressurizer Pressure Reactor Trip setpoint (Ref. 1 and 2).

The lower limit is based on the Low Pressurizer Reactor Trip setpoint and the Safety Injection Actuation Signal (SIAS) Pressurizer Pressure Low setpoint (Ref. 1 and 2). The step value specified is the current setpoint for these signals (Ref. 3 and 4).

Assumptions:

1. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The reference noted below is formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Its use as reference material is justified when the basis for the engineering

limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists.

Ref: 1 | rev. 01

2. The reference noted below is assumed to be a Secondary Design document. This assumption is justified based on the fact that it describes strategies which have been reviewed and commented on by the NRC. | rev. 01

Ref: 2 | rev. 01

3. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

Ref: 3 and 4 | rev. 01

References: | rev. 01

1. SONGS "Emergency Procedure Technical Guidelines," Revision 01, June 1984, Appendix A, Paragraphs 2.13, 2.14, 4.17 and 4.31.
2. "Emergency Procedure Guidelines," CEN-152, Revision 3, Bases for SPTA Step 5, and Reactor Trip Step 4 and SFSC 4.
3. SONGS Units 2 Technical Specifications, through Amendment 94, Table 2.2-1.
4. SONGS Units 3 Technical Specifications, through Amendment 84, Table 2.2-1.

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Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support

C-E JOB NUMBER: 2001216

DOCUMENT: Module 08 Group 18 Engineering Limit and Bases

PARAMETER: PRESSURIZER PRESSURE

PREPARED BY: L. A. Wild
Cognizant Engineer (Print Name)

L. A. Wild
Cognizant Engineer (Signature) Date: 4/29/93

VERIFICATION STATUS: COMPLETE

The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREER
Name
Independent Reviewer

Martin Greer
Signature

4/30/93
Date

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 08

Group: 18

Parameter: PRESSURIZER PRESSURE

Step Value(s):	**Use(s):**
> 1740	To verify PZR Pressure is greater than the low PZR Pressure trip setpoint and SIAS setpoint.
< 1740	To ensure SIAS is actuated if PZR Pressure < 1740 PSIA.

Engineering Limit(s):

Lower limit = 1740 PSIA

Bases for Engineering Limit(s):

The basis for the step value is the Safety Injection Actuation Signal (SIAS) Pressurizer Pressure - Low setpoint as listed in References 1 & 2.

Assumptions:

1. The engineering limit includes the instrument uncertainties associated with the SIAS actuation function of the pressurizer pressure channel.

   | rev. 01

   Differences between the SIAS actuation instrument uncertainty and the instrument uncertainty of the indicator portion of the pressurizer pressure channel have not been considered.

2. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license.

   Ref: 1 and 2 | rev. 01

| rev. 01

References:

1) SONGS Unit 2 Technical Specifications, Table 3.3-4, Amendment 88.

2) SONGS Unit 3 Technical Specifications, Table 3.3-4, Amendment 78.

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Revision: 01
Page: 1 of 3

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 08 Group 19 Engineering Limit and Bases

PARAMETER: Pressurizer Pressure

PREPARED BY: L. A. Wild
Cognizant Engineer (Print Name)
L. A. Wild
Cognizant Engineer (Signature) Date: 4/29/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREER Martin Greer 4/30/93
Name Signature Date
Independent Reviewer

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/30/93 Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 08 **Group:** 19

Parameter: Pressurizer Pressure

Step Value(s):	**Use(s):**
TRENDING TO: 2000 TO 2275 psia	To verify expected post-trip RCS pressure response (PZR pressure trending to between 2000 psia and 2275 psia).

Engineering Limit(s):

Upper Limit 2300 psia

Lower Limit 2200 psia

Bases for Engineering Limit(s):

There are normally no associated Engineering Limits for the trending of parameters, since no value is specified in the trend. An operator is not required to perform a safety related action on the trending of a single parameter by itself in the EOIs. Where the trending of a parameter is combined with specified operating limits on that parameter, the values given for the operating limit are evaluated for their engineering limits.

The engineering limits are based on the normal control span for sprays and heaters, including the backup heaters, which are used to control pressurizer pressure (Ref. 1). If the RCS pressure is being controlled by the pressurizer pressure control system, then the pressure should be trending to the band specified for that system. (Ref. 1 through 3)

Assumptions:

1. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering

limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01

Ref: 1 | rev. 01

2. The reference noted below is assumed to be a Secondary Design document. This assumption is justified based on the fact that it describes strategies which have been reviewed and commented on by the NRC. | rev. 01

   Ref: 3 | rev. 01

References:

1. San Onofre Unit 2 & 3, Instrument Setpoint Study, Document No. 1370-ICE-9901-09, dated March 22,1984, CDCC #59383 (Category 2).

2. Control System Setpoint Requirements for San Onofre Generating Station, Unit 2, 1370-PE-ST, Rev. 00, April 2, 1984, CDCC # 25220 (Category 2).

   CEN-152, Rev. 03, Emergency Procedure Guidelines, Bases, pages 2-14, 4-24, and 4-32.

File No: 009-OPS92-194
Revision: 01
Page: 1 of 3

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 08 Group 20 Engineering Limit and Bases

PARAMETER: Pressurizer Pressure

PREPARED BY: L. A. Wild
Cognizant Engineer (Print Name)
L. A. Wild
Cognizant Engineer (Signature) Date: 4/29/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREER Mort Greer 4/30/93
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APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)
Joseph R. Congdon
Cognizant Engineering Manager (Signature) 4/30/93 Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 08 **Group:** 20

Parameter: Pressurizer Pressure

Step Value(s):	**Use(s):**
>20 <200 SATURATION MARGIN LIMITS (POST ACCIDENT PRESSURE/TEMPERATURE LIMITS)	To verify that PZR Pressure is between the 20°F and 200°F Post Accident P/T limit curves. To maintain saturation margin while performing controlled primary plant depressurization and cooldown. To assist in the PZR pressure reduction during cooldown. To verify that PZR pressure is within the Post Accident P/T limits to determine success path performance.
> RCP NPSH CURVE (POST ACCIDENT PRESSURE/TEMPERATURE LIMITS)	To confirm available NPSH for operating the RCP(s).

Engineering Limit(s):

Not Applicable (See Bases)

Bases for Engineering Limit(s):

ABB-CE has been directed by SCE not to supply engineering limits for curves similar to the ones referenced in the applicable EOI steps. See References 1 through 3.

Assumptions:

1. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering

limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01

Ref: 1, 2, and 3 | rev. 01

References:

1. Message, Minimum Expected Hot/Cold Leg Injection Curves, P. Curry to W. Watson, 11/4/92.
2. Message, RCP NPSH CURVES, W. Watson to P. Curry, 10/30/92
3. Message, RCP NPSH CURVES, P. Curry to W. Watson, 11/2/92

File No: 009-OPS92-192
Revision: 00
Page: 1 of 3

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 08 Group 21 Engineering Limit and Bases

PARAMETER: Pressurizer Pressure

PREPARED BY: L. A. Wild
Cognizant Engineer (Print Name)
L. a. Wild
Cognizant Engineer (Signature) Date: 1/11/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 5 , of QAM-101.

John M. Flaherty
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Independent Reviewer

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1/12/93
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APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)
Joseph R Congdon
Cognizant Engineering Manager (Signature) 1/13/93 Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 08 **Group:** 21

Parameter: Pressurizer Pressure

Step Value(s):	**Use(s):**
Stop Lowering	To prevent void formation.
Lowering	To verify PZR pressure is being reduced to within 50 psi of the isolated (ruptured) S/G pressure.
Acceptable Rate of Change	To determine if the rate of PZR pressure change is acceptable during PZR spray or heater operation.
Stable or Rising	To confirm LOFW diagnosis.
Stable or Rising and Controlled	To verify that RCS pressure is controlled.
Stable	To achieve control of CET Sat Margin by stabilizing pressurizer pressure and level.
Maintained	To verify that RCS pressure is controlled.
Rapidly Lowering	To identify the type of event and location when Pressurizer Pressure is rapidly decreasing, using the "Break Identification Chart."
Lowering	To verify expected RCS depressurization as S/G steaming and feeding continue.

Engineering Limit(s):

None

Bases for Engineering Limit(s):

There are no associated Engineering Limits for the trending of parameters. Since no value is specified in the trend, no value will be assigned to the engineering limit. Usually when an operator is instructed to trend an indication, the indication is used in conjunction with other parameters to corroborate the condition of a safety function. An operator is not required to perform a safety related action on the trending of a single parameter by itself in the EOIs. Where the trending of a parameter is combined with specified operating limits on that parameter, the values given for the operating limit are evaluated for their engineering limits.

Assumptions:

None

References:

None

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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 08 Group 22 Engineering Limit and Bases

PARAMETER: Pressurizer Pressure

PREPARED BY: L. A. Wild
Cognizant Engineer (Print Name)
L. A. Wild
Cognizant Engineer (Signature) Date: 4/29/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREER Martin Greer 4/30/93
Name Signature Date
Independent Reviewer

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)
Joseph R Congdon 4/30/93
Cognizant Engineering Manager (Signature) Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 08 **Group:** 22

Parameter: Pressurizer Pressure

Step Value(s):	**Use(s):**
Per Table	To verify adequate HPSI flow during hot and cold leg injection.

Engineering Limit(s):

Not Applicable (see bases)

Bases for Engineering Limit(s):

ABB-CE has been directed by SCE not to supply engineering limits for this table. See Reference 1.

Assumptions:

1. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The reference noted below is formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Its use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01

   Ref: 1 | rev. 01

References:

1. E-Mail Message, Subject: Minimum Expected Hot/Cold Leg Injection Curves, from Paul Curry to Bill Watson, 11/4/92.

File No: 009-OPS93-004
Revision: 00
Page: 1 of 3

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 08 Group 23 Engineering Limit and Bases

PARAMETER: Pressurizer Pressure

PREPARED BY: L. A. Wild
Cognizant Engineer (Print Name)
L. A. Wild
Cognizant Engineer (Signature) Date: 4/29/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREER
Name
Independent Reviewer

Signature

4/30/93
Date

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/30/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 08 **Group:** 23

Parameter: Pressurizer Pressure

Step Value(s):	**Use(s):**
< 2275 psia and decreasing	Ensure normal and auxiliary spray valves closed.

Engineering Limit(s):

Upper Limit 2275 psia

Bases for Engineering Limit(s):

The engineering limit is based on the normal signal for the operation of the sprays which are used to control pressurizer pressure (Ref. 1). If the RCS pressure is being controlled by the pressurizer pressure control system, then the pressure should be trending to the band specified for that system. (Ref. 1 and 2.) When the pressure decreases to the limit shown the spray valves should be closed.

Assumptions:

1. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists.

   Ref: 1 and 2

References:

1. San Onofre Unit 2 & 3, Instrument Setpoint Study, Document No. 1370-ICE-9901-09, dated March 22,1984, CDCC #59383 (Category 2).

2. Control System Setpoint Requirements for San Onofre Generating Station, Unit 2, 1370-PE-ST, Rev. 00, April 2, 1984, CDCC # 25220 (Category 2).

File No: 009-OPS92-113
Revision: 01
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ABB COMBUSTION ENGINEERING
INSTRUMENT USE AND BASES TABLE COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

MODULE: 09
REACTOR HEAD SATURATION MARGIN
SATURATION MARGIN
SATURATION MARGIN BY CET

PREPARED BY: Joseph R. Congdon
Cognizant Engineer (Print Name)

Joseph R Congdon
Cognizant Engineer (Signature) Date: 4/27/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREER	Martin Greer	4/28/93
Name Independent Reviewer	Signature	Date

APPROVED BY: J.R. Congdon
Cognizant Engineering Manager (Print Name)

Joseph R Congdon
Cognizant Engineering Manager (Signature) 4/28/93
Date

RECORD OF REVISIONS

Rev	Date	Pages	Prepared by	Reviewed by	Approved by
00	11/23/92	ALL	G.Bernsten	S.Ryder	J.R.Congdon
01	04/27/93	1,7,9	J.Congdon	M.Greer	J.R.Congdon

SONGS 2/3 ISOP II PHASE II
INSTRUMENT USE AND BASES TABLE

Module #: 09

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
01	REACTOR HEAD SAT MARGIN	> 0 deg F LL 1 deg F	Saturation margins greater than 0 deg F equate to unsaturated (subcooled) coolant. Therefore 1 deg F is the lower engineering limit.	To check saturation margin in the reactor vessel head region is > 0 deg F to prevent void formation.
02	REACTOR HEAD SAT MARGIN	> 20 deg F LL 1 deg F	Saturation margins greater than 0 deg F equate to subcooled coolant (i.e. verification of level). Therefore, it can be inferred that the absence of subcooled coolant in the RV head is indicative of reactor vessel level less then 100%.	Used for alternate reactor vessel level indication.
02	SATURATION MARGIN	> 20 deg F LL 1 deg F	Saturation margins greater than 0 deg F equate to subcooled coolant (i.e. verification of level). Therefore, it can be inferred that the absence of subcooled coolant in the hot legs is indicative of RV Plenum level being < 82%.	Used for alternate reactor vessel level indication.
03	SATURATION MARGIN	>160 degF & RISNG UL 200 deg F	This limit provides a convenient way to define acceptable combinations of low temperature and high pressure to avoid Pressurized Thermal Shock (PTS) the RCS. 200 deg F is based on existing plant thermal-hydraulic and fracture mechanics analyses.	To determine if RCS repressurization needs to be limited to prevent pressurized thermal shock (PTS).
01	SATURATION MARGIN BY CET	> 20 deg F LL 1 UL 200 deg F	Sat margins > 0 deg F equate to subcooled coolant. Therefore, only 1 deg F margin is needed to provide subcooled coolant in the RCS. 200 deg F is based on engineering judgement and existing plant analysis to avoid Pressurized Thermal Shock (PTS).	To ensure reactor coolant is in the desired state (> 20 deg F subcooled) to remove core heat.

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
01	SATURATION MARGIN BY CET	> 20 deg F LL 1 UL 200 deg F	Sat margins > 0 deg F equate to subcooled coolant. Therefore, only 1 deg F margin is needed to provide subcooled coolant in the RCS. 200 deg F is based on engineering judgement and existing plant analysis to avoid Pressurized Thermal Shock (PTS).	To ensure RCS is > 20 deg F subcooled as indication that single phase natural circulation is established.
01	SATURATION MARGIN BY CET	20 TO 200 deg F LL 1 UL 200 deg F	Sat margins > 0 deg F equate to subcooled coolant. Therefore, only 1 deg F margin is needed to provide subcooled coolant in the RCS. 200 deg F is based on engineering judgement and existing plant analysis to avoid Pressurized Thermal Shock (PTS).	To ensure RCS pressure control by verifying Saturation Margin maintained between the minimum and maximum values (20 deg F and 200 deg F).
01	SATURATION MARGIN BY CET	> 20 deg F LL 1 UL 200 deg F	Sat margins > 0 deg F equate to subcooled coolant. Therefore, only 1 deg F margin is needed to provide subcooled coolant in the RCS. 200 deg F is based on engineering judgement and existing plant analysis to avoid Pressurized Thermal Shock (PTS).	Used as criteria for HPSI throttle/stop (CET sat margin > 20 deg F, RVLMS >= 82%).
01	SATURATION MARGIN BY CET	< 200 deg F LL 1 UL 200 deg F	Sat margins > 0 deg F equate to subcooled coolant. Therefore, only 1 deg F margin is needed to provide subcooled coolant in the RCS. 200 deg F is based on engineering judgement and existing plant analysis to avoid Pressurized Thermal Shock (PTS).	To verify that saturation margin is being maintained less than the 200 deg F concern for PTS.

SONGS 2/3 ISOP II PHASE II
INSTRUMENT USE AND BASES TABLE

Module #: 09

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
01	SATURATION MARGIN BY CET	> 20 deg F LL 1 UL 200 deg F	Sat margins > 0 deg F equate to subcooled coolant. Therefore, only 1 deg F margin is needed to provide subcooled coolant in the RCS. 200 deg F is based on engineering judgement and existing plant analysis to avoid Pressurized Thermal Shock (PTS).	To verify RCS inventory control Safety Function Status Checklist (SFSC) criteria are satisfied and the core remains covered.
01	SATURATION MARGIN BY CET	> 20 deg F LL 1 UL 200 deg F	Sat margins > 0 deg F equate to subcooled coolant. Therefore, only 1 deg F margin is needed to provide subcooled coolant in the RCS. 200 deg F is based on engineering judgement and existing plant analysis to avoid Pressurized Thermal Shock (PTS).	To verify appropriate Shutdown Cooling entry conditions (e.g. 20 deg F subcooling, RVLMS = 100%, etc.).
01	SATURATION MARGIN BY CET	> 20 deg F LL 1 UL 200 deg F	Sat margins > 0 deg F equate to subcooled coolant. Therefore, only 1 deg F margin is needed to provide subcooled coolant in the RCS. 200 deg F is based on engineering judgement and existing plant analysis to avoid Pressurized Thermal Shock (PTS).	To verify CET saturation margin is >20 deg F to enhance natural circulation.
01	SATURATION MARGIN BY CET	> 20 deg F LL 1 UL 200 deg F	Sat margins > 0 deg F equate to subcooled coolant. Therefore, only 1 deg F margin is needed to provide subcooled coolant in the RCS. 200 deg F is based on engineering judgement and existing plant analysis to avoid Pressurized Thermal Shock (PTS).	When EDG is loaded, to direct overriding and energizing Class 1E Pressurizer Backup Heaters to maintain Core Exit Saturation Margin >20 deg F.

SONGS 2/3 ISOP II PHASE II
INSTRUMENT USE AND BASES TABLE

Module #: 09

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
01	SATURATION MARGIN BY CET	< 20 deg F LL 1 UL 200 deg F	Sat margins > 0 deg F equate to subcooled coolant. Therefore, only 1 deg F margin is needed to provide subcooled coolant in the RCS. 200 deg F is based on engineering judgement and existing plant analysis to avoid Pressurized Thermal Shock (PTS).	To determine actions to be taken if saturation margin is < 20 deg F.
01	SATURATION MARGIN BY CET	> 20 deg F LL 1 UL 200 deg F	Sat margins > 0 deg F equate to subcooled coolant. Therefore, only 1 deg F margin is needed to provide subcooled coolant in the RCS. 200 deg F is based on engineering judgement and existing plant analysis to avoid Pressurized Thermal Shock (PTS).	To maintain saturation margin while performing controlled primary plant depressurization and cooldown.
01	SATURATION MARGIN BY CET	>= 20 deg F LL 1 UL 200 deg F	Sat margins > 0 deg F equate to subcooled coolant. Therefore, only 1 deg F margin is needed to provide subcooled coolant in the RCS. 200 deg F is based on engineering judgement and existing plant analysis to avoid Pressurized Thermal Shock (PTS).	To maintain saturation margin while performing controlled primary plant depressurization and cooldown.
01	SATURATION MARGIN BY CET	> 20 deg F LL 1 UL 200 deg F	Sat margins > 0 deg F equate to subcooled coolant. Therefore, only 1 deg F margin is needed to provide subcooled coolant in the RCS. 200 deg F is based on engineering judgement and existing plant analysis to avoid Pressurized Thermal Shock (PTS).	Used as the minimum indication that the core is covered with subcooled liquid.

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
01	SATURATION MARGIN BY CET	> 20 deg F LL 1 UL 200 deg F	Sat margins > 0 deg F equate to subcooled coolant. Therefore, only 1 deg F margin is needed to provide subcooled coolant in the RCS. 200 deg F is based on engineering judgement and existing plant analysis to avoid Pressurized Thermal Shock (PTS).	To determine if saturation margin is being maintained above the minimum acceptable (>20 deg F) to determine if PZR heaters need to be energized during diesel generator loading operations.
01	SATURATION MARGIN BY CET	> 20 deg F LL1 UL 200 deg F	Sat margins > 0 deg F equate to subcooled coolant. Therefore, only 1 deg F margin is needed to provide subcooled coolant in the RCS. 200 deg F is based on engineering judgement and existing plant analysis to avoid Pressurized Thermal Shock (PTS).	To determine if the operator should go to the Functional Recovery procedure.
01	SATURATION MARGIN BY CET	< 20 deg F LL 1 UL 200 deg F	Sat margins > 0 deg F equate to subcooled coolant. Therefore, only 1 deg F margin is needed to provide subcooled coolant in the RCS. 200 deg F is based on engineering judgement and existing plant analysis to avoid Pressurized Thermal Shock (PTS).	To determine if CET Sat Margin requires SIT makeup to the RCS (< 20 deg F specified).
01	SATURATION MARGIN BY CET	> 20 deg F LL 1 UL 200 deg F	Sat margins > 0 deg F equate to subcooled coolant. Therefore, only 1 deg F margin is needed to provide subcooled coolant in the RCS. 200 deg F is based on engineering judgement and existing plant analysis to avoid Pressurized Thermal Shock (PTS).	To verify charging and/or SI pumps are maintaining Core Exit Saturation Margin - greater than 20 deg F.

SONGS 2/3 ISOP II PHASE II
INSTRUMENT USE AND BASES TABLE

Module #: 09

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
01	SATURATION MARGIN BY CET	> 20 deg F LL 1 UL 200 deg F	Sat margins > 0 deg F equate to subcooled coolant. Therefore, only 1 deg F margin is needed to provide subcooled coolant in the RCS. 200 deg F is based on engineering judgement and existing plant analysis to avoid Pressurized Thermal Shock (PTS).	To maintain CET Saturation Margin > 20 deg F by operating AFW and available ADVs.
01	SATURATION MARGIN BY CET	> 20 deg F LL 1 UL 200 deg F	Sat margins > 0 deg F equate to subcooled coolant. Therefore, only 1 deg F margin is needed to provide subcooled coolant in the RCS. 200 deg F is based on engineering judgement and existing plant analysis to avoid Pressurized Thermal Shock (PTS).	To determine whether or not to stay with the present success path (i.e. CET sat margin > 20 deg F, RVLMS plenum >= 82%).
01	SATURATION MARGIN BY CET	> 20 deg F LL 1 UL 200 deg F	Sat margins > 0 deg F equate to subcooled coolant. Therefore, only 1 deg F margin is needed to provide subcooled coolant in the RCS. 200 deg F is based on engineering judgement and existing plant analysis to avoid Pressurized Thermal Shock (PTS).	To evaluate the performance of the success path (i.e. CET sat margin > 20 deg F, RVLMS plenum >= 82%).
01	SATURATION MARGIN BY CET	> 20 deg F LL 1 UL 200 deg F	Sat margins > 0 deg F equate to subcooled coolant. Therefore, only 1 deg F margin is needed to provide subcooled coolant in the RCS. 200 deg F is based on engineering judgement and existing plant analysis to avoid Pressurized Thermal Shock (PTS).	To verify charging pump throttling criteria.

SONGS 2/3 ISOP II PHASE II
INSTRUMENT USE AND BASES TABLE

DATE: 04/27/93
REVISION: 01

Module #: 09

NOT A Q.A. DOCUMENT

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
01	SATURATION MARGIN BY CET	> 20 deg F LL 1 UL 200 deg F	Sat margins > 0 deg F equate to subcooled coolant. Therefore, only 1 deg F margin is needed to provide subcooled coolant in the RCS. 200 deg F is based on engineering judgement and existing plant analysis to avoid Pressurized Thermal Shock (PTS).	To verify adequate RCS heat removal.
01	SATURATION MARGIN BY CET	> 20 deg F LL 1 UL 200 deg F	Sat margins > 0 deg F equate to subcooled coolant. Therefore, only 1 deg F margin is needed to provide subcooled coolant in the RCS. 200 deg F is based on engineering judgement and existing plant analysis to avoid Pressurized Thermal Shock (PTS).	To verify shutdown cooling conditions are met (CET saturation margin > 20 deg F, RVLMS = 100%).
01	SATURATION MARGIN BY CET	> 20 deg F LL 1 UL 200 deg F	Sat margins > 0 deg F equate to subcooled coolant. Therefore, only 1 deg F margin is needed to provide subcooled coolant in the RCS. 200 deg F is based on engineering judgement and existing plant analysis to avoid Pressurized Thermal Shock (PTS).	To verify saturation margin is above the minimum acceptable value during RCS void elimination.
1	SATURATION MARGIN BY CET	< 20 deg F LL 1 UL 200 deg F	Sat margins > 0 deg F equate to subcooled coolant. Therefore, only 1 deg F margin is needed to provide subcooled coolant in the RCS. 200 deg F is based on engineering judgement and existing plant analysis to avoid Pressurized Thermal Shock (PTS).	To alert operator not to initiate Degas or Letdown any time Core Exit Saturation Margin has lowered below 20 deg F while conducting a Cooldown/Depressuration evolution.

SONGS 2/3 ISOP II PHASE II
INSTRUMENT USE AND BASES TABLE

Module #: 09

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
01	SATURATION MARGIN BY CET	20 deg F LL 1 UL 200 deg F	Sat margins > 0 deg F equate to subcooled coolant. Therefore, only 1 deg F margin is needed to provide subcooled coolant in the RCS. 200 deg F is based on engineering judgement and existing plant analysis to avoid Pressurized Thermal Shock (PTS).	To determine during an SGTR (with T-hot <530 F and PZR press >1000 psia) if rapidly inc S/G level requires shifting from maintaining RCP NPSH and CET SAT Margin >20 F to reducing PZR Pres to +/-50 of S/G
02	SATURATION MARGIN BY CET	< 160 deg F LL 1 UL 200 deg F	Saturation margins > 0 deg F equate to subcooled coolant. Therefore 1 deg F is the lower eng limit. The upper limit is based on avoiding PTS of the RCS. 80 to 160 is the optimal post-shutdown band and 20 to 160 is the optimal band during SGTR.	To verify CET Saturation Margin is less than 160 deg F and if not, to initiate corrective action to reduce it.
02	SATURATION MARGIN BY CET	< 80 deg F LL 1 UL 200 deg F	Saturation margins > 0 deg F equate to subcooled coolant. Therefore 1 deg F is the lower eng limit. The upper limit is based on avoiding PTS of the RCS. 80 to 160 is the optimal post-shutdown band and 20 to 160 is the optimal band during SGTR.	To verify CET Saturation Margin is > 80 deg F, and if it is not, to initiate corrective action to raise it.
02	SATURATION MARGIN BY CET	> 160 deg F LL 1 UL 200 deg F	Saturation margins > 0 deg F equate to subcooled coolant. Therefore 1 deg F is the lower eng limit. The upper limit is based on avoiding PTS of the RCS. 80 to 160 is the optimal post-shutdown band and 20 to 160 is the optimal band during SGTR.	To determine actions to be taken if saturation margin is > 160 deg F.

Module #: 09

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
02	SATURATION MARGIN BY CET	> 80 deg F LL1 UL 200 deg F	Saturation margins > 0 deg F equate to subcooled coolant. Therefore 1 deg F is the lower eng limit. The upper limit is based on avoiding PTS of the RCS. 80 to 160 is the optimal post-shutdown band and 20 to 160 is the optimal band during SGTR.	To verify CET Saturation Margin is > 80 deg F, and if it is not, to initiate corrective action to raise it.
02	SATURATION MARGIN BY CET	< 80 deg F LL 1 UL 200 deg F	Saturation margins > 0 deg F equate to subcooled coolant. Therefore 1 deg F is the lower eng limit. The upper limit is based on avoiding PTS of the RCS. 80 to 160 is the optimal post-shutdown band and 20 to 160 is the optimal band during SGTR.	To determine actions to be taken if saturation margin is < 80 deg F.
02	SATURATION MARGIN BY CET	20 TO 160 deg F LL 1 UL 200 deg F	Saturation margins > 0 deg F equate to subcooled coolant. Therefore 1 deg F is the lower eng limit. The upper limit is based on avoiding PTS of the RCS. 80 to 160 is the optimal post-shutdown band and 20 to 160 is the optimal band during SGTR.	To determine actions to be taken if saturation margin is not within the optimal band of 20 deg F to 160 deg F.
2	SATURATION MARGIN BY CET	80 TO 160 deg F LL 1 UL 200 deg F	Saturation margins > 0 deg F equate to subcooled coolant. Therefore 1 deg F is the lower eng limit. The upper limit is based on avoiding PTS of the RCS. 80 to 160 is the optimal post-shutdown band and 20 to 160 is the optimal band during SGTR.	To determine actions to be taken if saturation margin is not within the optimal band of 80 deg F to 160 deg F.

SONGS 2/3 ISOP II PHASE II
INSTRUMENT USE AND BASES TABLE

Module #: 09

DATE: 04/27/93
REVISION: 01

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
02	SATURATION MARGIN BY CET	80 TO 160 deg F LL 1 UL 200 deg F	Saturation margins > 0 deg F equate to subcooled coolant. Therefore 1 deg F is the lower eng limit. The upper limit is based on avoiding PTS of the RCS. 80 to 160 is the optimal post-shutdown band and 20 to 160 is the optimal band during SGTR.	To determine if Core Exit Saturation Margin is within the optimal band (80 - 160 deg F) specified.
02	SATURATION MARGIN BY CET	PER ATT 24 LL 1 UL 200 deg F	Saturation margins > 0 deg F equate to subcooled coolant. Therefore 1 deg F is the lower eng limit. The upper limit is based on avoiding PTS of the RCS. 80 to 160 is the optimal post-shutdown band and 20 to 160 is the optimal band during SGTR.	To evaluate the required trend for PZR pressure to determine subsequent course within the procedure.
03	SATURATION MARGIN BY CET	MAINTAIN NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To maintain saturation margin while performing controlled primary plant depressurization and cooldown.
03	SATURATION MARGIN BY CET	STEADY OR RISING NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To maintain saturation margin while performing controlled primary plant depressurization and cooldown.
03	SATURATION MARGIN BY CET	STABLE NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To verify proper core heat removal (via trending the parameter).

NOT A Q.A. DOCUMENT

SONGS 2/3 ISOP II PHASE II
INSTRUMENT USE AND BASES TABLE

Module #: 09

DATE: 04/27/93
REVISION: 01

NOT A Q.A. DOCUMENT

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
04	SATURATION MARGIN BY CET	> 20 deg F LL 1 deg F	Saturation margins > 0 deg F equate to subccoled coolant (i.e. verification of level). Therefore, it can be inferred that the absence of subcooled coolant at the elevation of the CETs is indicative of the core being uncovered.	Used for alternate reactor vessel level indication.
05	SATURATION MARGIN BY CET	> RCP NPSH CURVE NOT APPLICABLE	ABB-CE has been directed by SCE not to supply engineering limits for this curve or table.	To confirm available NPSH for operating the RCP(s).
05	SATURATION MARGIN BY CET	> RCP NPSH CURVE NOT APPLICABLE	ABB-CE has been directed by SCE not to supply engineering limits for this curve or table.	To maintain RCP NPSH for given temperature and pressure conditions.

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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 09 Group 01 Engineering Limit and Bases

PARAMETER: REACTOR HEAD SAT MARGIN

PREPARED BY: Joseph R. Congdon
Cognizant Engineer (Print Name)

Joseph R Congdon
Cognizant Engineer (Signature) Date: 4/17/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREEN
Name
Independent Reviewer

Martin Green
Signature

4/28/93
Date

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Joseph R Congdon
Cognizant Engineering Manager (Signature) 4/29/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 09 **Group:** 01

Parameter: REACTOR HEAD SAT MARGIN

Step Value(s):	Use(s):
	| rev. 01
> 0 deg F	To check saturation margin in the reactor vessel head region is > 0 deg F to prevent void formation.

Engineering Limit(s):

Lower limit = 1 deg F

Bases for Engineering Limit(s):

Among the indications to monitor for voids in the RCS, Reference 1 contains the following bracketed statement:

> *"HJTC unheated thermocouple temperature indicates saturated conditions in the reactor vessel upper head."*

Saturation margins greater than 0°F equate to unsaturated (subcooled) coolant. Therefore 1°F is the lower engineering limit.

Reference 2 justifies the step value selection of > 0°F by stating:

> *"If the saturation margin is greater than 0°F, then saturation conditions do not exist and voiding does not exist in the reactor vessel head."*

Assumptions:

The lower engineering limit of 1°F does not include instrument uncertainties, process uncertainties, or operating margin.

The references noted below are assumed to be Secondary Design documents. This assumption is justified based on the fact that they describe strategies which have been reviewed and commented on by the NRC. | rev. 01

Ref: 1

In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01

Ref: 2

References:

1) CEN-152, Rev. 03, Combustion Engineering Emergency Procedure Guidelines, page 5-22.
2) Operating Instruction SO23-14-3, Rev. 0, Bases and Deviation Document for Loss of Coolant, page 122 of 162.

File No: 009-OPS92-093
Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 09 Group 02 Engineering Limit and Bases

PARAMETER: REACTOR HEAD SAT MARGIN

PREPARED BY: Joseph R. Congdon
Cognizant Engineer (Print Name)

Joseph R Congdon
Cognizant Engineer (Signature) Date: 4/26/93

VERIFICATION STATUS: COMPLETE

The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 5 of QAM-101.

MARTIN GREER
Name
Independent Reviewer

Martin Greer
Signature

4/28/93
Date

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Joseph R. Congdon
Cognizant Engineering Manager (Signature)

4/28/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 09

Group: 02

Parameter: REACTOR HEAD SAT MARGIN

Step Value(s):

> 20 deg F

Use(s):

Used for alternate reactor vessel level indication.

Engineering Limit(s):

Lower limit = 1 deg F

Bases for Engineering Limit(s):

All of the optimal EOIs contain a floating step for "Determining RVLMS Operability"(example, Reference 1, page 38 of 84). If both RVLMS channels are found to be inoperable, the operator is directed to an attachment for "Alternate Reactor Vessel Level Verification" (example, Reference 1, page 56 of 84) which contains the step value for Reactor Head Saturation Margin of greater than 20°F.

Reference 2 states:

> *"If the Reactor Head Saturation Margin is less than 20°F, then Reactor Vessel level (head) would be confirmed at less than 100%."*

Although no further explanation for the step value selection is given, it can be inferred that the absence of subcooled coolant in the reactor vessel head is indicative of reactor vessel level less than 100%.

Since saturation margins greater than 0°F equate to subcooled coolant (i.e. verification of level), 1°F is the lower engineering limit.

Assumptions:

For Alternate Reactor Vessel Level Verification (Reference 1), a Reactor Head Saturation Margin greater than 20°F was selected to indicate subcooled coolant in the reactor vessel head.

The lower engineering limit of 1°F does not include instrument uncertainties, process uncertainties, or operating margin.

In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01

Ref: 2

References:

1) Emergency Operating Instruction SO23-12-6, Rev. 06, Loss of Feedwater, pages 38 and 56 of 84 (included for example purposes only).

2) Operating Instruction SO23-14-6, Rev. 0, Bases and Deviation Document for Loss of Feedwater, page 132 of 162. | rev. 01

File No: 009-OPS92-117
Revision: 01
Page: 1 of 3

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support

C-E JOB NUMBER: 2001216

DOCUMENT: Module 09 Group 02 Engineering Limit and Bases

PARAMETER: SATURATION MARGIN

PREPARED BY: Joseph R. Congdon
Cognizant Engineer (Print Name)

Joseph R Congdon
Cognizant Engineer (Signature) Date: 4/26/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREER
Name
Independent Reviewer

Signature

4/28/93
Date

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Joseph R Congdon
Cognizant Engineering Manager (Signature) 4/26/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 09

Group: 02

Parameter: SATURATION MARGIN

Step Value(s):	**Use(s):**
> 20 deg F	Used for alternate reactor vessel level indication.

Engineering Limit(s):

Lower limit = 1 deg F

Bases for Engineering Limit(s):

All of the optimal EOIs contain a floating step for "Determining RVLMS Operability"(example, Reference 1, page 38 of 84). If both RVLMS channels are found to be inoperable, the operator is directed to an attachment for "Alternate Reactor Vessel Level Verification" (example, Reference 1, page 56 of 84) which contains the step value for RCS Saturation Margin of greater than 20°F.

Reference 2 states:

> *"RCS Saturation Margin is calculated from QSDPS or manually using available T_H indications and PZR pressure indication. If RCS Saturation Margin is greater than 20°F, then Reactor Vessel level (plenum) is greater than 82%."*

Although no further explanation for the value selection is given, it can be inferred that since an RCS Saturation Margin greater than 20°F indicates subcooled coolant in the plenum, Reactor Vessel level is greater than 82%.

Since saturation margins greater than 0°F equate to subcooled coolant, 1°F is the lower engineering limit.

Assumptions:

For Alternate Reactor Vessel Level Verification (Reference 1), an RCS Saturation Margin greater than 20°F was selected to indicate subcooled coolant in the plenum.

The lower engineering limit of 1°F does not include instrument uncertainties, process uncertainties, or operating margin.

| rev. 01

In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists.

Ref: 2

References:

1) Emergency Operating Instruction SO23-12-6, Rev. 06, Loss of Feedwater, pages 38 and 56 of 84 (included for example purposes only). | rev. 01

2) Operating Instruction SO23-14-6, Rev. 0, Bases and Deviation Document for Loss of Feedwater, page 132 of 162.

File No: 009-OPS92-118
Revision: 01
Page: 1 of 3

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison
PLANT: San Onofre 2&3
PROJECT: ISOPS II Support
C-E JOB NUMBER: 2001216

DOCUMENT: Module 09 Group 03 Engineering Limit and Bases
PARAMETER: SATURATION MARGIN

PREPARED BY: Joseph R. Congdon
Cognizant Engineer (Print Name)

Joseph R Congdon
Cognizant Engineer (Signature) Date: 4/27/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREER
Name
Independent Reviewer

Martin Greer
Signature

4/28/93
Date

APPROVED BY: J. R. CONGDON
Cognizant Engineering Manager (Print Name)

Joseph R Congdon
Cognizant Engineering Manager (Signature) 4/28/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 09

Group: 03

Parameter: SATURATION MARGIN

Step Value(s):	**Use(s):**
> 160 deg F and RISING	To determine if RCS repressurization needs to be limited to prevent pressurized thermal shock (PTS).

Engineering Limit(s):

Upper limit = 200 deg F

Bases for Engineering Limit(s):

The upper subcooling limit has a basis in Reference 1, Section 13.5.2. This limit exists to provide a convenient way to define acceptable combinations of low temperature and high pressure to avoid Pressurized Thermal Shock (PTS) of the RCS. The value of 200°F is based on existing plant thermal-hydraulic and fracture mechanics analyses and is judged to provide a sufficient operating band in order not to interfere with the operator's ability to control the plant.

From Reference 2, 160°F corresponds to the upper value of saturation margin measurements that would be seen during a normal post-shutdown RCS cooldown to shutdown cooling entry conditions. Reference 2 also notes that 160°F is well within the Reference 1 limit of 200°F.

There are no associated engineering limits for the trending of parameters. Since no value is specified in the trend, no value will be assigned to the engineering limit. Usually, when an operator is instructed to trend an indication, the indication is used in conjunction with other parameters to corroborate the condition of a safety function. An operator is not required to perform a safety related action on the trending of a single parameter by itself in the EOIs. Where the trending of a single parameter is combined with specified operating limits on that parameter, the values given for the operating limits are evaluated for their engineering limits.

Assumptions:

No instrument inaccuracies are accounted for in the engineering limit.

The references noted below are assumed to be Secondary Design documents. This assumption is justified based on the fact that they describe strategies which have been reviewed and commented on by the NRC. | rev. 01

Ref: 1

In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01

Ref: 2

References:

1) CEN-152, Rev. 03, Combustion Engineering Emergency Procedure Guidelines, pages 13-22 through 13-27.

2) Operating Instruction SO23-14-5, Rev. 0, Bases and Deviation Document for Excess Steam Demand Event, page 35 of 154.

File No: 009-OPS92-087
Revision: 01
Page: 1 of 5

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support

C-E JOB NUMBER: 2001216

DOCUMENT: Module 09 Group 01 Engineering Limit and Bases

PARAMETER: SATURATION MARGIN BY CET

PREPARED BY: Joseph R. Congdon
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 4/27/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREER
Name
Independent Reviewer

Signature

4/28/93
Date

APPROVED BY: J.R. CONGDON
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/28/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 09

Group: 01

Parameter: SATURATION MARGIN BY CET

Step Value(s):

> 20°F

Use(s):

When EDG is loaded, to direct overriding and energizing Class 1E Pressurizer Backup Heaters to maintain Core Exit Saturation Margin > 20°F.

To maintain saturation margin while performing controlled primary plant depressurization and cooldown.

Used as the minimum indication that the core is covered with subcooled liquid.

To determine if saturation margin is being maintained above the minimum acceptable (> 20°F) to determine if PZR heaters need to be energized during diesel generator loading operations.

To verify charging and/or SI pumps are maintaining Core Exit Saturation Margin - greater than 20°F.

To maintain CET Saturation Margin > 20°F by operating AFW and available ADVs.

To determine if the operator must go to the Functional Recovery procedure.

To determine whether or not to stay with the present success path (i.e. CET sat margin > 20°F, RVLMS plenum > 82%).

To evaluate the performance of the success path (i.e. CET sat margin > 20°F, RVLMS plenum > 82%)

> 20°F (continued)

To verify charging pump throttling criteria.

To verify adequate RCS heat removal.

To verify shutdown cooling conditions are met (CET saturation margin > 20°F, RVLMS > 82%).

To ensure reactor coolant is in the desired state (> 20°F subcooled) to remove core heat.

To ensure RCS is > 20°F subcooled as indication that single phase natural circulation is established.

Used as criteria for HPSI throttle/stop (CET sat margin > 20°F, RVLMS > 82%).

To verify RCS inventory control Safety Function Status Checklist (SFSC) criteria are satisfied and the core remains covered.

To verify CET saturation margin is > 20°F to enhance natural circulation.

To verify appropriate Shutdown Cooling entry conditions (e.g. 20°F subcooling, RVLMS > 82%, etc.).

| rev. 01

20°F

To verify saturation margin is above? the minimum acceptable value during RCS void elimination.

0°F

To maintain saturation margin while performing controlled primary plant depressurization and cooldown.

To determine if CET Sat Margin requires SIT makeup to the RCS (< 20°F specified).

To determine actions to be taken if saturation margin is < 20°F.

To alert operator not to initiate Degas or Letdown any time Core Exit Saturation Margin is below 20°F while conducting a Cooldown/Depressuration evolution. | rev. 01

20°F TO 200°F

To ensure RCS pressure control by verifying Saturation Margin maintained between the maximum and minimum values (20°F and 200°F).

< 200°F

To verify that saturation margin is being maintained less than the 200°F concern for PTS.

)°F

To determine during a SGTR (with T-hot < 530°F and RZR pressure > 1000 psia) if rapidly increasing S/G level requires shifting from maintaining RCP NPSH and CET SAT Margin > 20°F to reducing PZR pressure to within +/- 50 psi of S/G pressure.

gineering Limit(s): | rev. 01

ver limit = 1°F

er limit = 200°F

es for Engineering Limit(s):

uration margins greater than 0°F equate to subcooled coolant.
efore 1°F is the lower engineering limit.

lower limit on subcooling contained in the EPGs is,
nally, 20°F (Reference 1). Reference 1 explains that this
rical value is based on engineering judgement. According to
rences 2 and 3, subcooled margin should be maintained greater
20°F (plus inaccuracies) during cooldown. Reference 3
ides the following basis for this limit:

> *"The subcooled margin value of 20°F is based on a minimum tolerance margin below saturation that C-E believes should be maintained to preclude the possibility of inadvertently reaching saturation conditions in the reactor coolant flow pa[illegible]. Technically, only 1°F margin is needed to provide subcooled coolant in the RCS."*

The upper subcooling limit has a basis in Reference 1, Section 13.5.2. This limit exists to provide a convenient way to define acceptable combinations of low temperature and high pressure to avoid Pressurized Thermal Shock (PTS) of the RCS. The value of 200°F was selected by collective engineering judgement based on existing plant thermal-hydraulic and fracture mechanics analyses and was judged to provide a sufficient operating band in order not to interfere with the operator's ability to control the plant. There is no supporting calculation for the value of 200°F saturation margin.

Assumptions:

The 20°F numerical value used in Reference 3 provides operating margin only.

The lower engineering limit does not include instrument uncertainties, process uncertainties, or operating margin.

No instrument inaccuracies are accounted for in the upper engineering limit.

The references noted below are assumed to be Secondary Design documents. This assumption is justified based on the fact that they describe strategies which have been reviewed and commented on by the NRC.

Ref: 1, 2, and 3

| rev. 01

References:

1) CEN-152, Rev. 03, Combustion Engineering Emergency Procedure Guidelines, pages 13-22 through 13-27.

2) CEN-259, An Evaluation of the Natural Circulation Cooldown Test Performed at the San Onofre Nuclear Generating Station, pages 82 and 109.

3) CE-NPSD-154, Natural Circulation Cooldown Task 430 Final Report, page 5-20.

File No: 009-OPS92-084
Revision: 01
Page: 1 of 5

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support

C-E JOB NUMBER: 2001216

DOCUMENT: Module 09 Group 02 Engineering Limit and Bases

PARAMETER: SATURATION MARGIN BY CET

PREPARED BY: Joseph R. Congdon
Cognizant Engineer (Print Name)

Joseph R. Congdon
Cognizant Engineer (Signature) Date: 4/27/93

VERIFICATION STATUS: COMPLETE

The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists No 9 of QAM-101.

MARTIN GREEN
Name
Independent Reviewer

Martin Green
Signature

4/28/93
Date

APPROVED BY: J.R. Congdon
Cognizant Engineering Manager (Print Name)

Joseph R. Congdon
Cognizant Engineering Manager (Signature) 4/28/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 09

Group: 02

Parameter: SATURATION MARGIN BY CET

Step Value(s):	**Use(s):**
> 80°F	To verify CET Saturation Margin is > 80°F, and if it is not, to initiate corrective action to raise it.
< 80°F	To determine actions to be taken if saturation margin < 80°F.
	To verify CET Saturation Margin is > 80°F, and if it is not, to initiate corrective action to raise it.
> 160°F	To determine actions to be taken if saturation margin > 160°F.
80°F TO 160°F	To determine actions to be taken if saturation margin is not within the optimal band of 80°F to 160°F.
	To determine if Core Exit Saturation Margin is within the optimal band (80 - 160°F) specified.
< 160°F	To verify CET Saturation Margin is less than 160°F and if not, to initiate corrective action to reduce it.
PER ATT 24 (of Functional Recovery Proc.)	To evaluate the required trend for PZR pressure to determine subsequent course within the procedure.
20°F TO 160°F	To determine actions to be taken if saturation margin is not within the optimal band of 20°F to 160°F.

Engineering Limit(s):

Lower limit = 1°F

Upper limit = 200°F

Bases for Engineering Limit(s):

Saturation margins greater than 0°F equate to subcooled coolant. Therefore 1°F is the lower engineering limit.

The lower limit on subcooling contained in the EPGs is, nominally, 20°F (Reference 1). Reference 1 explains that this numerical value is based on engineering judgement. According to References 2 and 3, subcooled margin should be maintained greater than 20°F (plus inaccuracies) during cooldown. Reference 3 provides the following basis for this limit:

> *"The subcooled margin value of 20°F is based on a minimum tolerance margin below saturation that C-E believes should be maintained to preclude the possibility of inadvertently reaching saturation conditions in the reactor coolant flow path. Technically, only 1°F margin is needed to provide subcooled coolant in the RCS."*

The upper subcooling limit has a basis in Reference 1, Section 13.5.2. This limit exists to provide a convenient way to define acceptable combinations of low temperature and high pressure to avoid Pressurized Thermal Shock (PTS) of the RCS. The value of 200°F was selected by collective engineering judgement based on existing plant thermal-hydraulic and fracture mechanics analyses and was judged to provide a sufficient operating band in order not to interfere with the operator's ability to control the plant. There is no supporting calculation for the value of 200°F saturation margin.

Reference 4 states that the optimal band of 80°F to 160°F corresponds to saturation margin measurements that would be seen during a normal post-shutdown RCS cooldown to shutdown cooling entry conditions. Reference 4 also notes that these values are well within the Reference 1 limits of 20°F and 200°F.

Reference 5 states an optimal band of 20°F to 160°F for the steam generator tube rupture scenario. The associated Bases and Deviation Document (Reference 6) explains that a preferred core exit saturation margin of as low as 20°F is allowed in order to minimize the pressure differential between the isolated affected steam generator and the RCS.

Attachment 24 of the Functional Recovery procedure (Reference 7) also defines an optimal band of 20°F to 160°F.

Assumptions:

The 20°F numerical value used in Reference 3 provides operating margin only.

The lower engineering limit does not include instrument uncertainties, process uncertainties, or operating margin.

No instrument inaccuracies are accounted for in the upper engineering limits.

The Deviation and Bases document for Reference 7 does not explain the selection of 20°F to 160 °F for an optimal band of core exit saturation margin. It is assumed these values were selected for inventory control concerns as in Reference 5.

The references noted below are assumed to be Secondary Design documents. This assumption is justified based on the fact that they describe strategies which have been reviewed and commented on by the NRC.

Ref: 1, 2, and 3 | rev. 01

In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists.

Ref: 4 and 6

References:

| rev. 01

1) CEN-152, Rev. 03, Combustion Engineering Emergency Procedure Guidelines, pages 13-22 through 13-27.

2) CEN-259, An Evaluation of the Natural Circulation Cooldown Test Performed at the San Onofre Nuclear Generating Station, pages 82 and 109.

3) CE-NPSD-154, Natural Circulation Cooldown Task 430 Final Report, page 5-20.

4) Operating Instruction SO23-14-6, Rev. 0, Bases and Deviation Document for Loss of Feedwater, page 34 of 142.

5) Emergency Operating Instruction SO23-12-4, Rev. 03, Steam Generator Tube Rupture, step 17k (included for example purposes only). | rev. 01

6) Operating Instruction SO23-14-4, Rev. 0, Bases and Deviation Document, page 59 of 185.

7) Emergency Operating Instruction SO23-12-9, Rev. 05, Functional Recovery, Attachment 24, Core Exit Saturation Margin Control (included for example purposes only). | rev. 01

File No: 009-OPS92-082
Revision: 00
Page: 1 of 2

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3
PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 09 Group 03 Engineering Limit and Bases
PARAMETER: SATURATION MARGIN BY CET

PREPARED BY: George P. Berntsen
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 10/30/92

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Patrick J Fennell
Name
Independent Reviewer

Signature

11-10-92
Date

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 11/20/92
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 09

Group: 03

Parameter: SATURATION MARGIN BY CET

Step Value(s):	**Use(s):**
STABLE	To verify proper core heat removal (via trending the parameter).
STEADY OR RISING MAINTAIN	To maintain saturation margin while performing controlled primary plant depressurization and cooldown.

Engineering Limit(s):
None

Bases:
There are no associated engineering limits for the trending of parameters. Since no value is specified in the trend, no value will be assigned to the engineering limit. Usually, when an operator is instructed to trend an indication, the indication is used in conjunction with other parameters to corroborate the condition of a safety function. An operator is not required to perform a safety related action on the trending of a single parameter by itself in the EOIs. Where the trending of a single parameter is combined with specified operating limits on that parameter, the values given for the operating limits are evaluated for their engineering limits.

Assumptions:
None

References:
None

File No: 009-OPS92-154
Revision: 01
Page: 1 of 3

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support

C-E JOB NUMBER: 2001216

DOCUMENT: Module 09 Group 04 Engineering Limit and Bases

PARAMETER: SATURATION MARGIN BY CET

PREPARED BY: Joseph R. Congdon
Cognizant Engineer (Print Name)

Joseph R. Congdon
Cognizant Engineer (Signature) Date: 4/22/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists NO 9 of QAM-101.

MARTIN GREER
Name
Independent Reviewer

Martin Greer
Signature

4/28/93
Date

APPROVED BY: J. R. CONGDON
Cognizant Engineering Manager (Print Name)

Joseph R. Congdon
Cognizant Engineering Manager (Signature) 4/28/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 09 **Group:** 04

Parameter: SATURATION MARGIN BY CET

Step Value(s):	**Use(s):**
> 20°F	Used for alternate reactor vessel level indication.

Engineering Limit(s):

Lower limit = 1°F

Bases for Engineering Limit(s):

All of the optimal EOIs contain a floating step for "Determining RVLMS Operability"(example, Reference 1, page 38 of 84). If both RVLMS channels are found to be inoperable, the operator is directed to an attachment for "Alternate Reactor Vessel Level Verification" (example, Reference 1, page 57 of 84) which contains the step value for CET Saturation Margin of greater than 20°F.

From Reference 2, the purpose of this value is to confirm core exit subcooling. Since saturation margins greater than 0°F equate to subcooled coolant, 1°F is the lower engineering limit.

Assumptions:

The lower engineering limit of 1°F does not include instrument uncertainties, process uncertainties, or operating margin.

In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE.

Their use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists.

Ref: 2 | rev. 01

References:

1) Emergency Operating Instruction SO23-12-6, Rev. 06, Loss of Feedwater (included for example purposes only).
2) Operating Instruction SO23-14-6, Rev. 0, Bases and Deviation Document for Loss of Feedwater, page 132 of 142. | rev. 01

File No: 009-OPS92-174
Revision: 00
Page: 1 of 2

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 09 Group 05 Engineering Limit and Bases

PARAMETER: SATURATION MARGIN BY CET

PREPARED BY: George P. Berntsen
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 11/23/92

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Kenneth E. Faulkner
Name
Independent Reviewer

Kenneth E. Faulkner
Signature

11/24/92
Date

APPROVED BY: J.R. Congdon
Cognizant Engineering Manager (Print Name)

Joseph R Congdon
Cognizant Engineering Manager (Signature)

11/24/92
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 09 **Group:** 05

Parameter: SATURATION MARGIN BY CET

Step Value(s):	**Use(s):**
> RCP NPSH CURVE (Post Accident Pressure-Temperature Limits)	To confirm available NPSH for operating the RCP(s). To maintain RCP NPSH for given temperature and pressure conditions.

Engineering Limit(s):

Not Applicable (see bases)

Bases for Engineering Limit(s):

ABB-CE has been directed by SCE not to supply engineering limits for this curve. See References 1 and 2.

References:

1) E-Mail from J. Congdon to P. Curry, RCP NPSH Curves, 10/30/92.

2) E-Mail from P. Curry to W. Watson, 11/2/92.

File No: 009-OPS92-153
Revision: 01
Page: 1 of 10

ABB COMBUSTION ENGINEERING
INSTRUMENT USE AND BASES TABLE COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

MODULE: 10 REACTOR POWER
CEA POSITION
REACTOR VESSEL LEVEL (HEAD)
REACTOR VESSEL LEVEL (PLENUM)
REACTOR VESSEL UPPER HEAD TEMPERATURE
STARTUP RATE

PREPARED BY: J. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 4/26/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Roger Kievenaar
Name
Independent Reviewer

Signature

4/26/93
Date

APPROVED BY: J.R. Congdon
Cognizant Engineering Manager (Print Name)

Joseph R Congdon
Cognizant Engineering Manager (Signature) 4/27/93
Date

RECORD OF REVISIONS

Rev	Date	Pages	Prepared by	Reviewed by	Approved by
00	11/19/92	ALL	J. Flaherty	K.Faulkner	J.R.Congdon
01	04/26/93	ALL	J. Flaherty	R.Kirkpatrick	J.R.Congdon

Q.A. APPROVED TABLE

SONGS 2/3 II PHASE II
INSTRUMENT USE AND BASES TABLE

Module #: 10

Q.A. APPROVED TABLE

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
01	CEA POSITION	INSERTED EXCEPT 1 UL INSRTD EXCPT 1	This engineering limit was chosen because it is one of the General Design Criteria. It is also contained in the T.S. definition for shutdown margin and the LCO for reactivity control.	To determine if all but one CEAs are inserted as part of the verification of adequate reactivity control.
01	REACTOR POWER	LOWERING NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To confirm that the reactor is under control.
01	REACTOR POWER	STABLE/LOWERING NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To confirm that the reactor is under control.
02	REACTOR POWER	<1E-4%& STBL,LWRG LWRG,STBL&<1E-4%	1E-4% power was chosen based on engineering judgement. 1E-4% is sufficiently below the point of adding heat to the RCS to permit operator response prior to significant heat addition for anticipated occurrences involving a return to criticality.	To confirm that the reactor is under control.
03	REACTOR POWER	STABLE OR LWRNG NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To verify boron addition via decreasing reactor power indication.
03	REACTOR POWER	LOWERING NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To verify boron addition via decreasing reactor power indication.

Q.A. APPROVED TABLE

Module #: 10

Q.A. APPROVED TABLE

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
01	REACTOR VESSEL LEVEL (HEAD)	100% LL 100%	A lower limit of 100% is based on the physical location of the highest HJTCS sensor, which is 39 inches from the top of the RV Head. When the highest sensor is covered (i.e. 100% indicated level), no significant voiding exists in the RV Head region.	To ensure no substantial void formed in the head and evaluate charging requirements following an RCP restart.
01	REACTOR VESSEL LEVEL (HEAD)	100% LL 100%	A lower limit of 100% is based on the physical location of the highest HJTCS sensor, which is 39 inches from the top of the RV Head. When the highest sensor is covered (i.e. 100% indicated level), no significant voiding exists in the RV Head region.	To determine if steps to collapse a void in the reactor vessel should be initiated.
01	REACTOR VESSEL LEVEL (HEAD)	< 100% LL 100%	A lower limit of 100% is based on the physical location of the highest HJTCS sensor, which is 39 inches from the top of the RV Head. When the highest sensor is covered (i.e. 100% indicated level), no significant voiding exists in the RV Head region.	To determine if steps to collapse a void in the reactor vessel should be initiated.
01	REACTOR VESSEL LEVEL (HEAD)	100% LL 100%	A lower limit of 100% is based on the physical location of the highest HJTCS sensor, which is 39 inches from the top of the RV Head. When the highest sensor is covered (i.e. 100% indicated level), no significant voiding exists in the RV Head region.	To determine if pressurizer level needs to be raised proir to RCP restart to compensate for void collapse.

SONGS 2/3 II PHASE II
INSTRUMENT USE AND BASES TABLE

Module #: 10

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
02	REACTOR VESSEL LEVEL (HEAD)	100% NONE	In developing the correlation between PZR level and RV level, the latter is the independent variable upon which the required PZR level depends. Therefore, no eng limits can be assigned. See File #009-OPS92-070 for the corresponding PZR lvl eng limits.	To verify that Pressurizer inventory is sufficient to compensate for RCP restart void collapse with a void indicated by the RVLMS.
02	REACTOR VESSEL LEVEL (HEAD)	48% NONE	In developing the correlation between PZR level and RV level, the latter is the independent variable upon which the required PZR level depends. Therefore, no eng limits can be assigned. See File #009-OPS92-070 for the corresponding PZR lvl eng limits.	To verify that Pressurizer inventory is sufficient to compensate for RCP restart void collapse with a void indicated by the RVLMS.
02	REACTOR VESSEL LEVEL (HEAD)	20% NONE	In developing the correlation between PZR level and RV level, the latter is the independent variable upon which the required PZR level depends. Therefore, no eng limits can be assigned. See File #009-OPS92-070 for the corresponding PZR lvl eng limits.	To verify that Pressurizer inventory is sufficient to compensate for RCP restart void collapse with a void indicated by the RVLMS.
02	REACTOR VESSEL LEVEL (HEAD)	0% NONE	In developing the correlation between PZR level and RV level, the latter is the independent variable upon which the required PZR level depends. Therefore, no eng limits can be assigned. See File #009-OPS92-070 for the corresponding PZR lvl eng limits.	To verify that Pressurizer inventory is sufficient to compensate for RCP restart void collapse with a void indicated by the RVLMS.

Q.A. APPROVED TABLE

SONGS 2/3 II PHASE II
INSTRUMENT USE AND BASES TABLE

Module #: 10

DATE: 04/26/93
REVISION: 01

Q.A. APPROVED TABLE

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
03	REACTOR VESSEL LEVEL (HEAD)	< 100% NONE	RV level can be estimated using SMM and temp sensors in the RV and hot legs to draw a correlation to RV level. There is no eng limit for the correlation between these parameters since no specific operator action is included in the use statement.	Used for alternate reactor vessel level indication.
04	REACTOR VESSEL LEVEL (HEAD)	< 100% UL 48%	The HJTCS provides descrete level indications depending on which of its 8 sensors (3 in the head) are uncovered. When sensor #1 is uncovered, the Reactor Vessel Level Monitoring System provides a reactor vessel head level indication of 48%.	To verify that a void exists in the reactor vessel prior to raising pressure to collapse the void.
05	REACTOR VESSEL LEVEL (HEAD)	RISING OR STABLE NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To verify SITs are injecting water.
01	REACTOR VESSEL LEVEL (PLENUM)	>= 82% LL 82%	CEN-152 requires that the Reactor Vessel level be at least at the top of the hot leg nozzles in addition to > 30% level in the PZR to demonstrate that inventory control has been established prior to allowing HPSI flow to be throttled or stopped.	Used as criteria for HPSI throttle/stop (CET sat margi > 20 deg F, RVLMS >= 82%).
01	REACTOR VESSEL LEVEL (PLENUM)	>= 82% LL 82%	CEN-152 requires that the Reactor Vessel level be at least at the top of the hot leg nozzles in addition to > 30% level in the PZR to demonstrate that inventory control has been established prior to allowing HPSI flow to be throttled or stopped.	To verify charging and/or SI pumps are maintaining Reactor Vessel level (plenum) >= 82%.

Module #: 10

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
01	REACTOR VESSEL LEVEL (PLENUM)	>= 82% LL 82%	CEN-152 requires that the Reactor Vessel level be at least at the top of the hot leg nozzles in addition to > 30% level in the PZR to demonstrate that inventory control has been established prior to allowing HPSI flow to be throttled or stopped.	To verify charging pump throttling criteria.
02	REACTOR VESSEL LEVEL (PLENUM)	>= 82% LL 82%	Sensor #5 in the HJTCS is located at the top of the hot leg lip and indicates that the plenum level is >=82%. The engineering limit is based on the requirement to keep the RCS loops filled so that subcooled natural circulation may proceed normally.	To verify absence of voids in reactor vessel head and plenum region which could stop single phase natural circulation flow.
02	REACTOR VESSEL LEVEL (PLENUM)	>= 82% LL 82%	Sensor #5 in the HJTCS is located at the top of the hot leg lip and indicates that the plenum level is >=82%. The engineering limit is based on the requirement to keep the RCS loops filled so that subcooled natural circulation may proceed normally.	To verify that reactor vessel level (plenum) is adequate to support single phase natural circulation (>= 82%).
02	REACTOR VESSEL LEVEL (PLENUM)	82% LL 82%	Sensor #5 in the HJTCS is located at the top of the hot leg lip and indicates that the plenum level is >=82%. The engineering limit is based on the requirement to keep the RCS loops filled so that subcooled natural circulation may proceed normally.	To determine when to inititate steps to collapse a void in the reactor vessel during a natural circulation cooldown while depressurizing to enter shutdown cooling.

SONGS 2/3 II PHASE II
INSTRUMENT USE AND BASES TABLE

Module #: 10

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
03	REACTOR VESSEL LEVEL (PLENUM)	< 82% NONE	RV level can be estimated using SMM and temp sensors in the RV and hot legs to draw a correlation to RV level. There is no eng limit for the correlation between these parameters since no specific operator action is included in the use statement.	Used for alternate reactor vessel level indication.
03	REACTOR VESSEL LEVEL (PLENUM)	>= 82% NONE	RV level can be estimated using SMM and temp sensors in the RV and hot legs to draw a correlation to RV level. There is no eng limit for the correlation between these parameters since no specific operator action is included in the use statement.	Used for alternate reactor vessel level indication.
04	REACTOR VESSEL LEVEL (PLENUM)	>= 82% LL 21%	Sensor #8 is the lowest sensor in the HJTCS and is located just above the fuel alignment plate. If sensor #8 is covered with water, the RVLMS will show that the level is >=21%. >=21% is positive indication that the core is covered.	To verify RCS inventory control Safety Function Status Checklist (SFSC) criteria are satisfied and the core remains covered.
04	REACTOR VESSEL LEVEL (PLENUM)	>= 82% LL 21%	Sensor #8 is the lowest sensor in the HJTCS and is located just above the fuel alignment plate. If sensor #8 is covered with water, the RVLMS will show that the level is >=21%. >=21% is positive indication that the core is covered.	To determine whether or not to stay with the present success path (i.e. CET sat margin > 20 deg F, RVLMS plenum >= 82%).

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
04	REACTOR VESSEL LEVEL (PLENUM)	>= 82% LL 21%	Sensor #8 is the lowest sensor in the HJTCS and is located just above the fuel alignment plate. If sensor #8 is covered with water, the RVLMS will show that the level is >=21%. >=21% is positive indication that the core is covered.	To evaluate the performance of the success path (i.e. CET sat margin > 20 deg F, RVLMS plenum >= 82%).
05	REACTOR VESSEL LEVEL (PLENUM)	100% LL 100% (PLENUM)	Sensor #4 of the RVLMS is located approxomately 5 inches below the bottom of the UGSSP. If sensor #4 is covered, then the indicated Plenum level will be 100%. An indication of 100% plenum level indicates that the plenum is free of voids.	To ensure no void formed in the Plenum and evaluate charging requirements following an RCP restart.
05	REACTOR VESSEL LEVEL (PLENUM)	100% LL 100% (PLENUM)	Sensor #4 of the RVLMS is located approxomately 5 inches below the bottom of the UGSSP. If sensor #4 is covered, then the indicated Plenum level will be 100%. An indication of 100% plenum level indicates that the plenum is free of voids.	To determine if steps to collapse a void in the reactor vessel should be initiated.
05	REACTOR VESSEL LEVEL (PLENUM)	100% LL 100% (PLENUM)	Sensor #4 of the RVLMS is located approxomately 5 inches below the bottom of the UGSSP. If sensor #4 is covered, then the indicated Plenum level will be 100%. An indication of 100% plenum level indicates that the plenum is free of voids.	To determine if pressurizer level needs to be raised prior to RCP restart to compensate for void collapse.

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
06	REACTOR VESSEL LEVEL (PLENUM)	82% NONE	In developing the correlation between PZR level and RV level, the latter is the independent variable upon which the required PZR level depends. Therefore, no eng limits can be assigned. See File #009-OPS92-070 for the corresponding PZR lvl eng limits.	To verify that Pressurizer inventory is sufficient to compensate for RCP restart void collapse with a void indicated by the RVLMS.
07	REACTOR VESSEL LEVEL (PLENUM)	100% LL 82%	82% is based on a recommendation that the indicated reactor vessel level be at least 82% in the plenum, which corresponds to a level at the top of the hot legs, prior to entering shutdown cooling.	To verify appropriate Shutdown Cooling entry conditions (e.g. 20 deg F subcooling, RVLMS = 100%, etc.).
07	REACTOR VESSEL LEVEL (PLENUM)	100% LL 82%	82% is based on a recommendation that the indicated reactor vessel level be at least 82% in the plenum, which corresponds to a level at the top of the hot legs, prior to entering shutdown cooling.	To verify shutdown cooling conditions are met (CET saturation margin > 20 deg F, RVLMS = 100%).
01	REACTOR VESSEL UPPER HEAD TEMP	100 deg F/HR UL 100 deg F/HR	The maximum cooldown rate for the RCS is 100 deg F/hr when RC cold leg temperature is greater than 145 deg F as defined by the Technical Specifications.	To ensure that the maximum cooldown rate for the Reactor Vessel Upper Head is not exceeded.
01	STARTUP RATE	NEGATIVE UL <0 DPM	A negative SUR is an indication that reactor power is decreasing and that the reactor is subcritical.	To verify reactivity control is established and the reactor is subcritical.

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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 10 Group 01 Engineering Limit and Bases

PARAMETER: CEA POSITION

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

John M Flaherty
Cognizant Engineer (Signature) Date: 4/22/93

VERIFICATION STATUS: COMPLETE

The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

[illegible]		4/26/93
Name Independent Reviewer	Signature	Date

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Joseph R Congdon
Cognizant Engineering Manager (Signature) Date 4/27/93

SONGS 2&3 INSTRUMENT SUITABILITY STUDY EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 10

Group: 01

Parameter: CEA POSITION

Step Value(s):	**Use(s):**
INSERTED EXCEPT 1	To determine if all but one CEAs are inserted as part of the verification of adequate reactivity control.

Engineering Limit(s):

Upper Limit: The highest worth CEA fully withdrawn and all other CEAs fully inserted

Bases for Engineering Limit(s):

No more than one CEA not fully inserted is one of the acceptance criteria listed in the Standard Post Trip Actions and the Safety Function Status Checks in Ref. 1. This acceptance criteria is chosen because it is one of the General Design Criteria (Ref. 2). The Technical Specifications (Ref. 3 & 4) require that a minimum shutdown margin of 5.15 delta k/k be maintained at all times while operating in Modes 1,2,3, and 4. Shutdown margin is defined in the Technical Specifications (Ref. 3 & 4) as the instantaneous amount of reactivity by which the reactor is subcritical or would be subcritical from its present condition assuming all full length control element assemblies (shutdown and regulating) are fully inserted except for the single assembly of highest reactivity worth which is assumed to be fully withdrawn. Ref. 5 provides a procedure for determining shutdown margin and is based on data found in Ref. 6 & 7. The data included in Ref. 6 & 7 considers the possibility of the worst rod stuck out and provides the necessary data accordingly. | rev. 01

Assumptions:

1. The references noted below are assumed to be Secondary Design documents. This assumption is justified based on the fact that they describe strategies which have been reviewed and commented on by the NRC. | rev. 01

   Ref: 1

2. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

   Ref: 2,3,4

References:

1. CEN-152, Rev. 03, Combustion Engineering Emergency Procedure Guidelines.
2. San Onofre 2 & 3 FSAR, Updated, Para. 4.3.1.9, 4.3.1.10, 3.1.3.7, 3.1.3.8.
3. San Onofre 2 Technical Specifications, Amendment 94, Section 3.1.1 and Bases, and Definition 1.27. | rev. 01
4. San Onofre 3 Technical Specifications, Amendment 84, Section 3.1.1 and Bases, and Definition 1.27. | rev. 01
5. Surveillance Operating Instruction SO23-3-3.29, Determination of Reactor Shutdown Margin. | rev. 01
6. Plant Physics Data Book, San Onofre Unit 2, Document # M38097, Rev. 19. | rev. 01
7. Plant Physics Data Book, San Onofre Unit 3, Document # M38098, Rev. 13. | rev. 01

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 10

Group: 01

Parameter: REACTOR POWER

Step Value(s):	**Use(s):**
Lowering	To confirm the reactor is under control.
Lowering/Stable	To confirm the reactor is under control.

Engineering Limit(s):

None

Ba[illegible] for Engineering Limit(s):

There are no associated engineering limits for the trending of
arameters. Since no value is specified in the trend, no value
ill be assigned to the engineering limit. Usually, when an
perator is instructed to trend an indication, the indication is
sed in conjunction with other parameters to corroborate the
ondition of a safety function. An operator is not required to
erform a safety related action on the trending of a single
arameter by itself in the EOIs. Where the trending of a
arameter is combined with specified operating limits on that
arameter, the values given for the operating limits are
valuated for their engineering limits.

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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 10 Group 02 Engineering Limit and Bases

PARAMETER: REACTOR POWER

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 4/22/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

ROGER KIRKPATRICK Date 4/26/93
Name Signature Date
Independent Reviewer

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) Date 4/27/93

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 10

Group: 02

Parameter: REACTOR POWER

Step Value(s):

$< 1x10^{-4}\%$ and Stable or Lowering

Use(s):

To confirm that the reactor is under control.

Engineering Limit(s):

Reactor Power Level Lowering, or Stable and $< 1x10^{-4}\%$

Bases for Engineering Limit(s):

To ensure the success of any emergency procedure, the reactor must be controlled to minimize the heat input into the RCS. Verification of reactor control can be accomplished by observing the power level and its rate of change. However, the acceptance criteria for this safety function varies depending on the elapsed time since the reactor trip.

Immediately following a reactor trip, power decrease is rapid. Power level following a trip is governed by the rate of decay of delayed neutron precursors and the effects of source neutrons. Source neutron effects will not be discernable until reactor power has decreased to approximately $10^{-6}\%$ power (depending on shutdown margin and the amount of source neutrons). At the power level at which the effects of source neutrons become discernible, the rate of reactor power decrease will slow and reactor power will eventually stabilize as a result of subcritical multiplication. The operator should anticipate the stabilization of reactor power and not consider this stabilization to be a return to power. Therefore, the engineering limit selected is dependent on the power level of the reactor.

A decreasing power level is always an indication that the reactor is under control. A stable power level is only acceptable when the power level has decreased substantially. The point at which a stable power level is an acceptable indication of a controlled reactor is 1x10^{-4}%. This power level is chosen based on engineering judgement. 1x10^{-4}% is sufficiently below the point of adding heat to the RCS to permit operator response prior to significant heat addition for anticipated occurrences involving a return to criticality. In addition, the power level of 1x10^{-4}% of rated thermal power (determined by neutron flux and not including decay heat) is the point below which the local power density trip and the low Departure from Nucleate Boiling Ratio (DNBR) trip may be bypassed (Ref. 1 & 2).

Assumptions:

1. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

   Ref: 1,2

References:

1. San Onofre 2 Technical Specifications, Amendment 94, Table 2.2-1.
2. San Onofre 3 Technical Specifications, Amendment 84, Table 2.2-1.

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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 10 Group 03 Engineering Limit and Bases

PARAMETER: REACTOR POWER

PREPARED BY: John M Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 10/12/92

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Kenneth E. Faulkner
Name
Independent Reviewer

Kenneth E. Faulkner
Signature

10/16/92
Date

APPROVED BY: Joseph R Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 10/19/92
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 10 **Group:** 03

Parameter: REACTOR POWER

Step Value(s):	**Use(s):**
STABLE OR LOWERING	To verify boron addition via decreasing reactor power indication.
LOWERING	To verify boron addition via decreasing reactor power indication.

Engineering Limit(s):

None

Bases for Engineering Limit(s):

There are no associated engineering limits for the trending of parameters. Since no value is specified in the trend, no value will be assigned to the engineering limit. Usually, when an operator is instructed to trend an indication, the indication is used in conjunction with other parameters to corroborate the condition of a safety function. An operator is not required to perform a safety related action on the trending of a single parameter by itself in the EOIs. Where the trending of a parameter is combined with specified operating limits on that parameter, the values given for the operating limits are evaluated for their engineering limits.

Assumptions:

None

References:

None

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Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 10 Group 01 Engineering Limit and Bases

PARAMETER: REACTOR VESSEL LEVEL HEAD

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 4/22/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Roger Kirkpatrick 4/26/93
Name Signature Date
Independent Reviewer

PROVED BY: J.R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/22/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 10

Group: 01

Parameter: REACTOR VESSEL LEVEL HEAD

Step Value(s):	Use(s):	
100%	To ensure no substantial void formed in the head and evaluate charging requirements following an RCP restart.	| rev. 01
100%	To determine if steps to collapse a void in the reactor vessel should be initiated.	| rev. 01
< 100%	To determine if steps to collapse a void in the reactor vessel should be initiated.	| rev. 01
100%	To determine if pressurizer level needs to be raised prior to RCP restart to compensate for void collapse.	| rev. 01

Engineering Limit(s):

Lower Limit: 100%

Bases for Engineering Limit(s):

The Heated Junction Thermocouple System (HJTCS) is designed to detect voids in the reactor vessel head. The HJTCS provides discrete level indications based on the number of sensors covered by water (Ref. 1). If the highest sensor is covered, then the indicated level will be 100%. However, it is possible for a void to exist with the highest sensor covered since the highest sensor is located 39 inches below the top of the reactor vessel head (Ref. 2). Since the Saturation Margin Monitor (SMM) depends on the unheated thermocouples in the HJTCS to determine saturation | rev. 01

margin in the upper head, it is also limited by the location of the highest sensor. Therefore, it is possible for the RVLMS to indicate 100% reactor vessel level while a void exists in the reactor vessel head. However, a void smaller than the volume above the highest HJTCS sensor will not affect the operator's ability to cool the core, it will not have a substantial effect on pressurizer level indications during changes in RCS pressure or following an RCP restart, and natural circulation can not be interupted by a void of this size. Therefore, the safety significance of a void above the highest sensor for the uses stated above is negligible since any effect on the operation of the plant is negligible. Therefore, no action by the operator is required to elimate a potential void of this size nor is there a need for the operator to compensate for it.

Assumptions:

1. A void smaller than the volume above the highest HJTCS sensor will not affect the operator's ability to cool the core, it will not have a substantial effect on pressurizer level indications during changes in RCS pressure or following an RCP restart, and natural circulation can not be interupted by a void of this size. Therefore, the safety significance of a void above the highest sensor for the uses stated above is negligible since any effect on the operation of the plant is negligible. This assumption is based on engineering judgement. | rev. 01

2. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

   Ref: 1

References:

1. San Onofre 2 & 3, Updated Final Safety Analysis Report, Revision 8, Section 7.5.3.3.
2. Dwg. J-1370-165-502, HJTC Probe Installation, Rev. 01.

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Revision: 00
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison

PROJECT: ISOPS II Support **PLANT:** San Onofre 2&3

C-E JOB NUMBER: 2001216

DOCUMENT: Module 10 Group 02 Engineering Limit and Bases

PARAMETER: REACTOR VESSEL LEVEL HEAD

PREPARED BY:

John M. Flaherty
Cognizant Engineer (Print Name)

John M Flaherty
Cognizant Engineer (Signature) Date: 11/16/92

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Kenneth E. Faulkner
Name
Independent Reviewer

Kenneth E. Faulkner
Signature

11/16/92
Date

PPROVED BY:

J. R. Longdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 11/17/92
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 10

Group: 02

Parameter: REACTOR VESSEL LEVEL HEAD

Step Value(s):	**Use(s):**
100%	To verify that Pressurizer inventory is sufficient to compensate for RCP restart void collapse with a void indicated by the RVLMS.
48%	To verify that Pressurizer inventory is sufficient to compensate for RCP restart void collapse with a void indicated by the RVLMS.
20%	To verify that Pressurizer inventory is sufficient to compensate for RCP restart void collapse with a void indicated by the RVLMS.
0%	To verify that Pressurizer inventory is sufficient to compensate for RCP restart void collapse with a void indicated by the RVLMS.

Engineering Limit(s):

None

Bases for Engineering Limit(s):

RVLMS level may be correlated to a minimum pressurizer level to compensate for void collapse following a reactor coolant pump restart. In developing this correlation, reactor vessel level is taken as the independent parameter upon which the required pressurizer level depends. Therefore, engineering limits have not been established for this use of reactor vessel level indication. See File #009-OPS92-070 for the pressurizer level engineering limits.

Assumptions:

None

References:

None

File No: 009-OPS92-058
Revision: 00
Page: 1 of 2

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 10 Group 03 Engineering Limit and Bases

PARAMETER: REACTOR VESSEL LEVEL HEAD

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 11/17/92

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Kenneth E. Faulkner
Name
Independent Reviewer

Kenneth E. Faulkner
Signature

11/17/92
Date

APPROVED BY: J.R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 11/18/92
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 10

Group: 03

Parameter: REACTOR VESSEL LEVEL HEAD

Step Value(s):

< 100%

Use(s):

Used for alternate reactor vessel level indication.

ineering Limit(s):

None

Bases for Engineering Limit(s):

The Reactor Vessel level can be conservatively estimated using the saturation margin at the locations of the various temperature sensors in the reactor vessel and the hot legs. The level determined by the correlation between saturation margin and RVLMS indication has many specific uses. However, there is no engineering limit for the correlation between these two arameters. Only when a parameter is used to direct an operator ction is an engineering limit provided. Since no specific ction is provided in this use, no engineering limit can be pecified.

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one

ferences:

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File No: 009-OPS92-057
Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support

C-E JOB NUMBER: 2001216

DOCUMENT: Module 10 Group 04 Engineering Limit and Bases

PARAMETER: REACTOR VESSEL LEVEL HEAD

PREPARED BY:

John M. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 4/22/93

VERIFICATION STATUS: COMPLETE

The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Roger [illegible]
Name
Independent Reviewer

Signature

4/26/93
Date

ROVED BY:

J.R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/27/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 10

Group: 04

Parameter: REACTOR VESSEL LEVEL HEAD

Step Value(s):

< 100%

Use(s):

To verify that a void exists in the reactor vessel prior to raising pressure to collapse the void.

Engineering Limit(s):

Upper Limit: 48%

Bases for Engineering Limit(s):

The Heated Junction Thermocouple System (HJTCS) provides discrete level indications depending on which of its 8 sensors (3 sensors in the head) are uncovered (Ref. 1). Changes in level above the highest sensor or between the sensor locations cannot be detected by the HJTCS. Therefore, in order to have a positive indication of a void in the reactor vessel head, sensor #1 must be uncovered. When sensor #1 is uncovered, the Reactor Vessel Level Monitoring System provides a reactor vessel head level indication of 48% (Ref. 2 & 3). Therefore, the upper engineering limit is 48% level in the head.

Assumptions:

1. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

   Ref: 1

References:

1. San Onofre Units 2 & 3 Final Safety Analysis Report, Updated, Revision 8, Section 7.5.3.3.
2. C-E Calculation 1370-ICE-36181, HJTCS Reactor Vessel Level Constants For SONGS Unit 2 QSPDS, 11/15/83, Category 3.
3. C-E Calculation 1470-ICE-36181, HJTCS Reactor Vessel Level Constants For SONGS Unit 3 QSPDS, 11/21/83, Category 3.

File No: 009-OPS92-056
Revision: 00
Page: 1 of 2

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 10 Group 05 Engineering Limit and Bases

PARAMETER: REACTOR VESSEL LEVEL (HEAD)

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

John M Flaherty Date: 11/6/92
Cognizant Engineer (Signature)

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Kenneth E. Faulkner	Kenneth E. Faulkner	11/11/92
Name Independent Reviewer	Signature	Date

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Joseph R Congdon 11/13/92
Cognizant Engineering Manager (Signature) Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 10

Group: 05

Parameter: REACTOR VESSEL LEVEL (HEAD)

Step Value(s):	**Use(s):**
RISING OR STABLE	To verify SITs are injecting water.

Engineering Limit(s):

None

Bases for Engineering Limit(s):

There are no associated engineering limits for the trending of parameters. Since no value is specified in the trend, no value will be assigned to the engineering limit. Usually, when an operator is instructed to trend an indication, the indication is used in conjunction with other parameters to corroborate the condition of a safety function. An operator is not required to perform a safety related action on the trending of a single parameter by itself in the EOIs. Where the trending of a parameter is combined with specified operating limits on that parameter, the values given for the operating limits are evaluated for their engineering limits.

Assumptions:

None

References:

None

File No: 009-OPS92-127
Revision: 01
Page: 1 of 4

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 10 Group 01 Engineering Limit and Bases

PARAMETER: REACTOR VESSEL LEVEL PLENUM

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

John M Flaherty
Cognizant Engineer (Signature) Date: 4/22/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Roger Kirkpatrick
Name
Independent Reviewer

Signature

4/26/93
Date

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Joseph R Congdon
Cognizant Engineering Manager (Signature) 4/27/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 10 **Group:** 01

Parameter: REACTOR VESSEL LEVEL PLENUM

Step Value(s):	**Use(s):**	
≥ 82%	Used as criteria for HPSI throttle/stop (CET sat margin > 20°F, RVLMS >= 82%).	| rev. 01
≥ 82%	To verify charging and/or SI pumps are maintaining Reactor Vessel level (plenum) >= 82%.	| rev. 01
≥ 82%	To verify charging pump throttling criteria.	| rev. 01

Engineering Limit(s):

Lower Limit: 82%

Bases for Engineering Limit(s):

Ref. 1 requires an indication that the Reactor Vessel level is at least at the top of the hot leg nozzles. This indication is taken in conjunction with a pressurizer level above the heaters to demonstrate that inventory control has been established sufficiently to allow HPSI flow to be throttled or stopped. In addition to RCS inventory control, Ref. 1 requires a minimum subcooling be indicated by CET (i.e. RCS pressure control) and that at least one steam generator be available for heat removal. These indications provide assurance that the RCS is stabilized and that once HPSI is terminated, forced or natural circulation can be used to remove heat through at least one steam generator. (Ref. 2) The criteria used for termination of the charging flow is the same as that for the HPSI flow. When the Safety Injection System and the charging system are both being used to maintain or restore RCS inventory, pressure or heat removal, the termination criteria for each should be similar. (Ref. 3)

The Reactor Vessel Level Monitoring System (RVLMS) provides an indication of level based on which sensors are covered with water. Sensor #5 in the Heated Junction Thermocouple System (HJTCS) is located at the top of the hot leg lip (Ref. 4). If sensor #5 is covered, the RVLMS will show that the plenum level is ≥ 82% (Ref. 5 & 6). Therefore, an RVLMS indication of ≥ 82% in the plenum is a positive indication that the hot legs are filled.

Assumptions:

1. The generic limit of pressurizer level greater than [100"] in Ref. 1 can be translated as pressurizer heaters covered.

2. The references noted below are assumed to be Secondary Design documents. This assumption is justified based on the fact that they describe strategies which have been reviewed and commented on by the NRC. | rev. 01

   Ref: 1

3. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01

   Ref: 2,3

References:

1. CEN-152, Combustion Engineering Emergency Procedure Guidelines.
2. Letter S-CE-9434, V. C. Hall to M. L. Merlo, Transmittal of Revision 01 to the Southern California Edison SONGS Units 2 and 3 Emergency Procedure Technical Guidelines, July 16, 1984.
3. Letter S-CE-9704, V. C. Hall to D. P. Brieg, C-E Review of Upgraded Emergency Operating Instructions, November 21, 1984.
4. Drawing J-1370-165-502, HJTC Probe Installation, Rev. 01.
5. Calculation 1370-ICE-36181, HJTCS Reactor Vessel Level Constants for SONGS Unit 2 QSPDS, Rev. 02. (Category 3)
6. Calculation 1470-ICE-36181, HJTCS Reactor Vessel Level Constants for SONGS Unit 3 QSPDS, Rev. 00. (Category 3)

File No: 009-OPS92-119
Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support

C-E JOB NUMBER: 2001216

DOCUMENT: Module 10 Group 02 Engineering Limit and Bases

PARAMETER: REACTOR VESSEL LEVEL PLENUM

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 4/22/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Roger Kirkpatrick
Name
Independent Reviewer

Signature

4/26/93
Date

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/27/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 10

Group: 02

Parameter: REACTOR VESSEL LEVEL PLENUM

Step Value(s):	**Use(s):**	
≥ 82%	To verify absence of voids in reactor vessel head and plenum region which could stop single phase natural circulation flow.	| rev. 01
≥ 82%	To verify that reactor vessel level (plenum) is adequate to support single phase natural circulation (≥ 82%).	| rev. 01
82%	To determine when to initiate steps to collapse a void in the reactor vessel during a natural circulation cooldown while depressurizing to enter shutdown cooling.	| rev. 01

Engineering Limit(s):

Lower Limit: 82%

Bases for Engineering Limit(s):

Reactor Vessel level is required to be greater than or equal to the top of the hot leg nozzles in the upper plenum region in order to assure that the RCS is filled. The RCS loops being filled is an indication that subcooled natural circulation is proceeding normally (Ref. 1). Sensor #5 in the Heated Junction Thermocouple System is located at the top of the hot leg lip (Ref. 2). The Reactor Level Monitoring System (RVLMS) provides an indication of level based on which sensors are covered with water. If sensor #5 is covered, the RVLMS will show that the plenum level is ≥ 82% (Ref. 3 & 4). Therefore, an RVLMS indication of ≥ 82% in the plenum is a positive indication that the hot legs are filled.

Assumptions:

1. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01

   Ref: 1

References:

1. Letter S-CE-9434, V. C. Hall to M. L. Merlo, Transmittal of Revision 01 to the Southern California Edison SONGS Units 2 and 3 Emergency Procedure Technical Guidelines, July 16, 1984.
2. Drawing J-1370-165-502, HJTC Probe Installation, Rev. 01.
3. Calculation 1370-ICE-36181, HJTCS Reactor Vessel Level Constants for SONGS Unit 2 QSPDS, Rev. 02. (Category 3)
4. Calculation 1470-ICE-36181, HJTCS Reactor Vessel Level Constants for SONGS Unit 3 QSPDS, Rev. 00. (Category 3)

File No: 009-OPS92-120
Revision: 01
Page: 1 of 2

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 10 Group 03 Engineering Limit and Bases

PARAMETER: REACTOR VESSEL LEVEL PLENUM

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 4/22/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

[illegible]
Name
Independent Reviewer

Signature

4/22/93
Date

APPROVED BY: J.R. Congdon
Cognizant Engineering Manager (Print Name)

Joseph R Congdon
Cognizant Engineering Manager (Signature) 4/27/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 10 **Group:** 03

Parameter: REACTOR VESSEL LEVEL PLENUM

Step Value(s):	Use(s):
≥ 82%	Used for alternate reactor vessel level indication. | rev. 01
< 82%	Used for alternate reactor vessel level indication.

Engineering Limit(s):

None

Bases for Engineering Limit(s):

The Reactor Vessel level can be conservatively estimated using the saturation margin at the locations of the various temperature sensors in the reactor vessel and the hot legs. The level determined by the correlation between saturation margin and RVLMS indication has many specific uses. However, there is no engineering limit for the correlation between these two parameters. Only when a parameter is used to direct an operator action is an engineering limit provided. Since no specific action is provided in this use, no engineering limit can be specified.

Assumptions:

None

References:

None

File No: 009-OPS92-125
Revision: 01
Page: 1 of 3

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3
PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 10 Group 04 Engineering Limit and Bases
PARAMETER: REACTOR VESSEL LEVEL PLENUM

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 4/22/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

ROGER KIRKPATRICK
Name
Independent Reviewer

Signature

4/26/93
Date

APPROVED BY: J.R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/27/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 10 **Group:** 04

Parameter: REACTOR VESSEL LEVEL PLENUM

Step Value(s):	**Use(s):**	
≥ 82%	To determine whether or not to stay with the present success path (i.e. CET sat margin > 20°F, RVLMS plenum ≥ 82%).	| rev. 01
≥ 82%	To evaluate the performance of the success path (i.e. CET sat margin > 20°F, RVLMS plenum ≥ 82%).	| rev. 01
≥ 82%	To verify RCS inventory control Safety Function Status Check (SFSC) criteria are satisfied and the core remains covered.	| rev. 01

Engineering Limit(s):

Lower Limit: 21%

Bases for Engineering Limit(s):

To ensure that the integrity of the fuel cladding is not compromised, the core must remain covered. This requirement is reflected in the acceptance criteria for the Inventory Control Safety Function Status Checks provided in Ref. 1. In conjunction with indications that the level is above the core, Ref. 1 requires that RCS conditions indicate that the inventory has stabilized or is being restored.

Sensor #8 is the lowest sensor in the Heated Junction Thermocouple System (HJTCS) and is located above the top of the fuel alignment plate (Ref. 2). The Reactor Vessel Level

Monitoring System (RVLMS) provides an indication of level based on which sensors are covered with water. If sensor #8 is covered, the RVLMS will show that the level is ≥ 21% (Ref. 3 & 4). Therefore, an RVLMS indication of ≥ 21% is a positive indication that the core is covered. Therefore, the safety function acceptance criteria and the performance of the success paths in the Functional Recovery are satisfied if the reactor vessel plenum level is ≥ 21%.

Assumptions:

1. The references noted below are assumed to be Secondary Design documents. This assumption is justified based on the fact that they describe strategies which have been reviewed and commented on by the NRC. | rev. 01

   Ref: 1

References:

1. CEN-152, Combustion Engineering Emergency Procedure Guidelines.
2. Drawing J-1370-165-502, HJTC Probe Installation, Rev. 01.
3. Calculation 1370-ICE-36181, HJTCS Reactor Vessel Level Constants for SONGS Unit 2 QSPDS, Rev. 02. (<u>Category 3</u>)
4. Calculation 1470-ICE-36181, HJTCS Reactor Vessel Level Constants for SONGS Unit 3 QSPDS, Rev. 00. (<u>Category 3</u>)

File No: 009-OPS92-121
Revision: 01
Page: 1 of 3

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 10 Group 05 Engineering Limit and Bases

PARAMETER: REACTOR VESSEL LEVEL PLENUM

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 4/22/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Roger [illegible]
Name
Independent Reviewer

Signature

4/26/93
Date

APPROVED BY: J.R. Congdon
Cognizant Engineering Manager (Print Name)

Joseph R. Congdon
Cognizant Engineering Manager (Signature)

4/26/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 10 **Group:** 05

Parameter: REACTOR VESSEL LEVEL PLENUM

Step Value(s):	**Use(s):**	
100%	To determine if steps to collapse a void in the reactor vessel should be initiated.	| rev. 01
100%	To ensure no void formed in the Plenum and evaluate charging requirements following an RCP restart.	
100%	To determine if pressurizer level needs to be raised prior to RCP restart to compensate for void collapse.	| rev. 01

Engineering Limit(s):

Lower Limit: 100% Plenum Level

Bases for Engineering Limit(s):

The Reactor Vessel Level Monitoring System (RVLMS) uses 5 sensors between the fuel alignment plate and the Upper Guide Structure Support Plate (UGSSP) to provide discrete indications of the level in the plenum. The level indication changes only when a sensor becomes uncovered. Variations of level between sensors are not detected by the RVLMS (Ref. 1).

Sensor #4 is located approximately 5 inches below the bottom of the UGSSP (Ref. 2). (Note: the sensor location is determined by the location of the heated thermocouple, Ref. 3) If sensor #4 is covered, then the indicated Plenum level will be 100% (Ref. 4 & 5). Although it is possible that a void could form in the space between the UGSSP and sensor #4 without uncovering the sensor, the safety significance of a void in this small space is negligible. This is true since any use which required the plenum to be completely full would also require an indicated level > 0% in the head region. Therefore, an indication of 100% plenum level indicates that the plenum is free of voids.

Assumptions:

1. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

   Ref: 1

References:

1. San Onofre 2 & 3 Updated Final Safety Analysis Report, Revision 8, Section 7.5.3.3.
2. Drawing J-1370-165-502, HJTC Probe Installation, Rev. 01.
3. Drawing E-1370-165-501, Heated Junction T/C Probe Assy, Rev. 07.
4. Calculation 1370-ICE-36181, HJTCS Reactor Vessel Level Constants for SONGS Unit 2 QSPDS, Rev. 02. (<u>Category 3</u>)
5. Calculation 1470-ICE-36181, HJTCS Reactor Vessel Level Constants for SONGS Unit 3 QSPDS, Rev. 00. (<u>Category 3</u>)

File No: 009-OPS92-080
Revision: 00
Page: 1 of 2

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison
PLANT: San Onofre 2&3
PROJECT: ISOPS II Support
C-E JOB NUMBER: 2001216

DOCUMENT: Module 10 Group 06 Engineering Limit and Bases
PARAMETER: REACTOR VESSEL LEVEL PLENUM

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)
John M Flaherty
Cognizant Engineer (Signature) Date: 11/16/92

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Kenneth E. Faulkner
Name
Independent Reviewer

Kenneth E. Faulkner
Signature

11/17/92
Date

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)
Joseph R Congdon
Cognizant Engineering Manager (Signature) 11/17/92
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 10 **Group:** 06

Parameter: REACTOR VESSEL LEVEL PLENUM

Step Value(s):	**Use(s):**
82% Plenum	To verify that Pressurizer inventory is sufficient to compensate for RCP restart void collapse with a void indicated by the RVLMS.

Engineering Limit(s):

None

Bases for Engineering Limit(s):

RVLMS level may be correlated to a minimum pressurizer level to compensate for void collapse following a reactor coolant pump restart. In developing this correlation, reactor vessel level is taken as the independent parameter upon which the required pressurizer level depends. Therefore, engineering limits have not been established for this use of reactor vessel level indication. See File #009-OPS92-070 for the pressurizer level engineering limits.

Assumptions:

None

References:

None

File No: 009-OPS92-126
Revision: 01
Page: 1 of 3

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 10 Group 07 Engineering Limit and Bases

PARAMETER: REACTOR VESSEL LEVEL PLENUM

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 4/22/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Roger Kleemann
Name
Independent Reviewer

Signature

4/22/93
Date

APPROVED BY: J.R. CONGDON
Cognizant Engineering Manager (Print Name)

Joseph R Congdon
Cognizant Engineering Manager (Signature) 4/27/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 10

Group: 07

Parameter: REACTOR VESSEL LEVEL PLENUM

Step Value(s):	**Use(s):**	
100%	To verify appropriate Shutdown Cooling entry conditions (e.g. 20°F subcooling, RVLMS = 100%, etc.).	rev. 01
100%	To verify shutdown cooling conditions are met (CET saturation margin > 20°F, RVLMS = 100%).	rev. 01

Engineering Limit(s):

Lower Limit: 82%

Bases for Engineering Limit(s):

Ref. 1 recommends that the indicated reactor vessel level be at least 82% in the plenum, which corresponds to a level at the top of the hot legs. (Note: No information was found which would support a reactor vessel level less than 82% without the possibility of pump suction vortexing at the flowrates required to remove all decay heat six hours following reactor shutdown.)

Assumptions:

1. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01

   Ref: 1

References:

1. Letter S-CE-9434, V. C. Hall to M. L. Merlo, Transmittal of Revision 01 to the Southern California Edison SONGS Units 2 and 3 Emergency Procedure Technical Guidelines, July 16, 1984.

File No: 009-OPS92-123
Revision: 01
Page: 1 of 2

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 10 Group 01 Engineering Limit and Bases

PARAMETER: REACTOR VESSEL UPPER HEAD TEMP

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 4/22/93

VERIFICATION STATUS: COMPLETE

The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Roger Kirkpatrick
Name
Independent Reviewer

Signature

4/26/93
Date

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/27/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 10

Group: 01

Parameter: REACTOR VESSEL UPPER HEAD TEMP

Step Value(s):	**Use(s):**
100°F/HR	To ensure that the maximum cooldown rate for the Reactor Vessel Upper Head is not exceeded.

Engineering Limit(s):

Upper Limit: 100°F/hr

Bases for Engineering Limit(s):

The maximum cooldown rate for the RCS is 100°F/hr when RCS cold leg temperature is greater than 145°F (Unit 2) or greater than 126°F (Unit 3) as defined by the Technical Specifications (Ref. 1 & 2). | rev. 01

Assumptions:

1. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

   Ref: 1,2

References:

1. San Onofre 2 Technical Specifications, Amendment 94, Section 3.4.8.1.
2. San Onofre 3 Technical Specifications, Amendment 84, Section 3.4.8.1.

File No: 009-OPS92-124
Revision: 00
Page: 1 of 2

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3
PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 10 Group 01 Engineering Limit and Bases
PARAMETER: STARTUP RATE

PREPARED BY:
John M. Flaherty
Cognizant Engineer (Print Name)

John M Flaherty
Cognizant Engineer (Signature) Date: 11/16/92

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Kenneth E. Faulkner
Name
Independent Reviewer

Kenneth E. Faulkner
Signature

11/17/92
Date

APPROVED BY:
J. R. Congdon
Cognizant Engineering Manager (Print Name)

Joseph R Congdon
Cognizant Engineering Manager (Signature) 11/18/92
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 10 **Group:** 01

Parameter: STARTUP RATE

Step Value(s):	**Use(s):**
NEGATIVE	To verify reactivity control is established and the reactor is subcritical.

Engineering Limit(s):

Upper Limit: < 0 DPM

Bases for Engineering Limit(s):

A negative startup rate is an indication that reactor power is decreasing and that the reactor is subcritical. Increasing reactor power following a reactor trip indicates that reactivity control has not been established. Reactor power being stable in the initial post-trip stages of an event is also an indication that reactivity control has not been established. Therefore, the engineering limit is a startup rate less than zero.

Assumptions:

None

References:

None

File No: 009-OPS92-077
Revision: 03
Page: 1 of 7

ABB COMBUSTION ENGINEERING
INSTRUMENT USE AND BASES TABLE COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

MODULE: 11 S/G PRESSURE

PREPARED BY: John Flaherty
Cognizant Engineer (Print Name)

John W Flaherty
Cognizant Engineer (Signature) Date: 4/23/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

R. Kirkpatrick
Name
Independent Reviewer

Signature

4/23/93
Date

APPROVED BY: Joseph R. Congdon
Cognizant Engineering Manager (Print Name)

Joseph R Congdon
Cognizant Engineering Manager (Signature) 4/26/93
Date

RECORD OF REVISIONS

Rev	Date	Pages	Prepared by	Reviewed by	Approved by
00	10/22/92	ALL	J.Flaherty	G.Bernsten	J.R.Congdon
01	01/12/93	6	J.Flaherty	L.Wild	J.R.Congdon
02	03/02/93	7	J.Flaherty	P.B.Kramarchyk	J.R.Congdon
03	04/23/93	ALL	J.Flaherty	R.Kirkpatrick	J.R.Congdon

SONGS 2/3 .I PHASE II
INSTRUMENT USE AND BASES TABLE

Module #: 11

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
01	S/G E-088 PRESSURE	> 740 PSIA LOW LIM 741 PSIA	The lower engineering limit is based on the T.S. setpoint (s.p.) for MSIS and low S/G pressure trip s.p., >=741 psia. The T.S. s.p is based on the engineering analysis value and includes instrument uncertainty and response times.	To confirm LOFW diagnosis.
01	S/G E-088 PRESSURE	STABLE OR RISING LOW LIM 741 PSIA	The lower engineering limit is based on the T.S. setpoint (s.p.) for MSIS and low S/G pressure trip s.p., >=741 psia. The T.S. s.p is based on the engineering analysis value and includes instrument uncertainty and response times.	To confirm LOFW diagnosis.
01	S/G E-089 PRESSURE	> 740 PSIA LOW LIM 741 PSIA	The lower engineering limit is based on the T.S. setpoint (s.p.) for MSIS and low S/G pressure trip s.p., >=741 psia. The T.S. s.p is based on the engineering analysis value and includes instrument uncertainty and response times.	To confirm LOFW diagnosis.
01	S/G E-089 PRESSURE	STABLE OR RISING LOW LIM 741 PSIA	The lower engineering limit is based on the T.S. setpoint (s.p.) for MSIS and low S/G pressure trip s.p., >=741 psia. The T.S. s.p is based on the engineering analysis value and includes instrument uncertainty and response times.	To confirm LOFW diagnosis.

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
01	S/G PRESSURE	> 740 PSIA LOW LIM 741 PSIA	The lower engineering limit is based on the T.S. setpoint (s.p.) for MSIS and low S/G pressure trip s.p., >=741 psia. The T.S. s.p is based on the engineering analysis value and includes instrument uncertainty and response times.	To verify expected post-trip S/G pressure response or to alert the operator that an over-cooling event is in progress and to initiate MSIS.
02	S/G PRESSURE	APPROX 1000 PSIA U=1088,L=741 PSIA	The UL is based on the lowest lift pressure of the MSSVs, 1089 psia (1100 -1%). The LL is based on the MSIS Trip Setpoint, >=741 psia. The SBCS is designed to control S/G pressure at ~1000 psia. The UL & LL occur where automatic functions take over.	To ensure an operable SG for controlled heat removal by verifying SBCS operational and controlling at setpoint (1000 PSIA).
03	S/G PRESSURE	ABNORMALLY LOW LOW LIM 741 PSIA	The lower engineering limit is based on the T.S. setpoint (s.p.) for MSIS and low S/G pressure trip s.p., >=741 psia. The T.S. s.p is based on the engineering analysis value and includes instrument uncertainty and response times.	To identify the type of event and location when Pressurizer Pressure is rapidly decreasing, using the "Break Identification Chart".
04	S/G PRESSURE	<50 PSID PZR PRES S/G +/-50 PSI PZR	Keeping RCS pressure about equal to S/G pressure will 1) minimize RCS to S/G leak rate, 2) minimize the amount of unborated water flowing from the S/Gs to the RCS. Since it is difficult for the operator to maintain 0 psid, CEN-152 recommends +/-50 psid.	To verify PZR pressure is reduced to within 50 psi of the isolated (ruptured) S/G pressure.
05	S/G PRESSURE	LOWERING NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To verify isolated S/G pressure decreases as plant cooldown continues.

Module #: 11

Q.A. APPROVED TABLE

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
05	S/G PRESSURE	MONITOR NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To verify isolated S/G pressure decreases as plant cooldown continues.
06	S/G PRESSURE	S/G P > PZR P S/G 50 PSI >PZR P	The operator is normally instructed to attempt to control S/G pressure about equal to PZR Pressure (+/-50 psid). If S/G overfill is probable, CE-NPSD-407 shows that -50 psid will not threaten the maintenance of adequate shutdown margin.	To monitor lowering RCS Pressure to < S/G Pressure to restore the isolated S/G level to less than 80% NR.
07	S/G PRESSURE	> 740 PSIA 741 PSIA	The lower engineering limit is based on the T.S. setpoint (s.p.) for MSIS and low S/G pressure trip s.p., >=741 psia. The T.S. s.p is based on the engineering analysis value and includes instrument uncertainty and response times.	To determine if S/G pressure is above the MSIS setpoint, or ensure MSIS is actuated.
08	S/G PRESSURE	STABLE OR RISING NONE	There are no engineering limits for the trending or monitoring of parameters. Since no value is specified in the trend, no engineering limits apply.	To determine (by trending) if an ESDE is isolated.
9	S/G PRESSURE	< MFP DISCH S/G<MFP+26.88 PSI	Flow into S/G will occur whenever MFP disch > S/G pressure by an amount = elevation head. The elevation difference between the MFP and S/G feedring is 62 feet. 62 feet head = 26.88 PSI. Therefore, MFP must exceed S/G by > 26.88 PSI to have flow.	To verify MFW Pump operating and feeding S/G.

Q.A. APPROVED TABLE

SONGS 2/3 ((PHASE II
INSTRUMENT USE AND BASES TABLE

Module #: 11

DATE: 04/26/93
REVISION: 03

Q.A. APPROVED TABLE

GRP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
10	S/G PRESSURE	APPROX 1100 PSIG 1089 - 1139 PSIA	Hi or Lo S/G pressure may be indicative of improperly operating MSSVs. Tech Specs allow operation with the 4 lowest lifting MSSVs isolated. The max lift setting of the #5 MSSV = 1128 +1% = 1139 psia. Lowest lifting MSSV = 1100 -1% = 1089 psia.	To verify the MSSVs are controlling S/G pressure in the event that S/G pressure can not be controlled using the ADVs.
11	S/G PRESSURE	< 50 PSIA UL 69.76 PSIA	The engineering limit is based on the condensate transfer pump developing sufficient head greater than the combined resistance of steam generator pressure and the elevation difference between the feedwater spargers and the condensate storage tank level.	To permit use of alternate low pressure feedwater source.
12	S/G PRESSURE	< 500 PSIA 662.67 PSIA	The engineering limit is based on the condensate pump developing sufficient head to overcome the combined resistance from the steam generator pressure and the elevation difference between the feedwater spargers and the condensate hotwell level.	To permit use of alternate low pressure feedwater source.
3	S/G PRESSURE	< COND PUMP DSCHG S/G<CP+26.88 PSI	Flow into S/G will occur whenever cond pump disch > S/G press by an amount = elev head. The elevation difference between cond pump and S/G feedring is 62 feet. 62 feet head = 26.88 PSI. Therefore, cond pump must exceed S/G by > 26.88 PSI to have flow.	To verify feedwater supply to S/Gs.

Module #: 11

Q.A. APPROVED TABLE

RP	PARAMETER	STEP VALUE/ ENG. LIMIT	BASES	USE
14	S/G PRESSURE	> 100 PSIA > 60 PSIA	The FSAR states that the steam driven AFW pump can operate at a steam inlet pressure of as low as 60 psia. This engineering limit does not guarantee a minimum flow into the S/G, only that the turbine will operate.	To verify adequate steam supply pressure for operation of steam driven AFW pump.
15	S/G PRESSURE	< PZR PRESSURE S/G +/-50 PSI PZR	Keeping RCS pressure about equal to S/G pressure will 1) minimize RCS to S/G leak rate, 2) minimize the amount of unborated water flowing from the S/Gs to the RCS. Since it is difficult for the operator to maintain 0 psid, CEN-152 recommends +/-50 psid.	To ensure RCS pressure remains higher than ruptured S/G pressure in order to minimize RCS dilution due to backflow.

File No: 009-OPS92-022
Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 11 Group 01 Engineering Limit and Bases

PARAMETER: Steam Generator Pressure

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 4/22/93

VERIFICATION STATUS: COMPLETE

The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Roger [illegible]
Name
Independent Reviewer

Signature

4/23/93
Date

APPROVED BY: J.R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/26/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 11 **Group:** 01

Parameter:

S/G E-088 PRESSURE
S/G E-089 PRESSURE
S/G PRESSURE

Step Value(s):	**Use(s):**
> 740 PSIA STABLE OR RISING	To confirm LOFW diagnosis. To verify expected post-trip S/G pressure response or to alert the operator that an over-cooling event is in progress and to initiate MSIS.

Engineering Limit(s):

Lower Limit: 741 psia and Stable or Rising

Bases for Engineering Limit(s):

| rev. 01

The setpoint used in the plant engineering analyses for MSIS and RPS trip is 678 psia (Ref. 1 & 4). The Technical Specification setpoint for MSIS and RPS trip is ≥ 741 psia (Ref. 2 & 3). The Technical Specification setpoint is based on the engineering analysis value and includes instrument uncertainty and response times. Since the MSIS setpoint can not be any lower than the Technical Specification limit and since the operator actions are affected by whether the MSIS has actuated, the engineering limit chosen for this use is equal to the Technical Specification nit.

The basis for the RPS setpoint states that this setpoint is sufficiently below the full load operating point of approximately 900 psia so as not to interfere with normal operation, but still high enough to provide the required protection in the event of excessively high steam flow (Ref. 2 & 3). Since the RPS setpoint and the MSIS setpoint are identical and they are designed to protect the plant for the same type of event, it is assumed that the basis for the MSIS setpoint is the same since the MSIS basis is not specifically stated.

If an excess steam demand event had occurred, the trend of stable or rising is an indication that it has been terminated.

Assumptions:

1. It is assumed that the bases for the RPS and the MSIS setpoints are the same.

2. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01

   Ref: 1

3. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

   Ref: 2,3

References:

1. J. G. Pigott, "Plant Protection System Setpoints Used in Plant Engineering Analyses", Memo S-PSA-224 to P. C. Newcomb, December 19, 1978.
2. San Onofre 2 Technical Specifications Amendment 94, Section 3.3.2, Table 3.3-4, Table 2.2.1, and Bases for Safety Limits and Limiting Safety System Settings.
3. San Onofre 3 Technical Specifications Amendment 84, Section 3.3.2, Table 3.3-4, Table 2.2.1, and Bases for Safety Limits and Limiting Safety System Settings.
4. Calculation 1370-TS-096, 1470-TS-043, Rev. 01, SONGS, Units 2 and 3, Plant Protection System Setpoints Calculation, 8/22/89 (Category 3).

File No: 009-OPS92-023
Revision: 01
Page: 1 of 4

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support

C-E JOB NUMBER: 2001216

DOCUMENT: Module 11 Group 02 Engineering Limit and Bases

PARAMETER: Steam Generator Pressure

PREPARED BY:

John M. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 4/22/93

VERIFICATION STATUS: COMPLETE

The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

[illegible]
Name
Independent Reviewer

Signature

4/23/93
Date

APPROVED BY:

J. R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/26/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 11 **Group:** 02

Parameter: S/G PRESSURE

Step Value(s):	**Use(s):**
APPROX 1000 PSIA	To ensure an operable SG for controlled heat removal by verifying SBCS operational and controlling at setpoint (1000 PSIA)

Engineering Limit(s):

Upper Limit: 1088 psia

Lower Limit: 741 psia

Bases for Engineering Limit(s):

The steam bypass control system (SBCS) is designed to maintain steam generator pressure at the zero power value during hot standby (Ref. 1). The steam pressure at zero power is approximately 1000 psia (Ref. 2). SBCS is designed to control steam generator pressure and to avoid excessively high or low steam pressure. The engineering limits establish the high and low pressures at which automatic or mechanical pressure controls activate to backup SBCS and prevent excessive pressure increases or decreases. | rev. 01

The SBCS is designed to avoid opening of the MSSVs. The lowest relief setting on the MSSVs is 1100 psia (Ref. 3 & 4). The tolerance of this relief setting is ±1%. Therefore, the lowest possible relieving pressure is 1089 psia and the upper engineering limit is 1088 psia.

The SBCS is also designed to remove decay heat and sensible heat (Ref. 4) without overcooling the RCS. A properly operating SBCS will prevent the steam generator pressure from dropping below the point where excess cooling can occur. The setpoint used in the plant engineering analyses for MSIS and RPS trip is 678 psia (Ref. 5 & 6) and the safety analyses determined that this setpoint was adequate to prevent overcooling of the RCS. The Technical Specification setpoint, which is based on the engineering analysis value and includes instrument uncertainty and response times, is ≥ 741 psia (Ref. 3 & 4) for MSIS and RPS trip. If the steam generator pressure drops below the MSIS trip setpoint (≥741 psia), the steam generator will be isolated and the operator will lose the condenser as a heat sink. Since this is not desirable, the lower engineering limit for a properly operating SBCS is equal to the minimum MSIS setpoint as defined by the Technical Specifications (741 psia).

The basis for the RPS setpoint states that this setpoint is sufficiently below the full load operating point of approximately 900 psia so as not to interfere with normal operation, but still high enough to provide the required protection in the event of excessively high steam flow (Ref. 3 & 4). Since the RPS setpoint and the MSIS setpoint are identical and since they are designed to protect the plant for the same type of event, it is assumed that the basis for the MSIS setpoint is the same since the MSIS basis is not specifically stated.

Assumptions:

1. It is assumed that the bases for the RPS and the MSIS setpoints are the same.

2. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

   Ref: 1,2,3,4

3. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering | rev. 01

limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists.

Ref: 6

References:

1. San Onofre 2 & 3 FSAR, Updated, Volume 15, Section 7.7.1.4.1, Page 7.7-5.
2. San Onofre 2 & 3 FSAR, Updated, Volume 17, Section 10.2, Figure 10.2-1.
3. San Onofre 2 Technical Specifications, Amendment 94, Section 3.7.1.1, Table 3.7-1, Section 3.3.2, Table 3.3-4, Table 2.2-1, and Bases for Safety Limits and Limiting Safety System Settings.
4. San Onofre 3 Technical Specifications, Amendment 84, Section 3.7.1.1, Table 3.7-1, Section 3.3.2, Table 3.3-4, Table 2.2-1, and Bases for Safety Limits and Limiting Safety System Settings.
5. Calculation 1370-TS-096, 1470-TS-043, Rev. 01, SONGS, Units 2 and 3, Plant Protection System Setpoints Calculation, 8/22/89 (Category 3).
6. J. G. Pigott, "Plant Protection System Setpoints Used in Plant Engineering Analyses", Memo S-PSA-224 to P. C. Newcomb, December 19, 1978.

File No: 009-OPS92-029
Revision: 01
Page: 1 of 4

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 11 Group 03 Engineering Limit and Bases

PARAMETER: Steam Generator Pressure

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 4/22/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Roger Kirkpatrick
Name
Independent Reviewer

Signature

4/23/93
Date

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/26/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 11 **Group:** 03

Parameter: S/G Pressure

Step Value(s):	**Use(s):**
ABNORMALLY LOW	To identify the type of event and location when the Pressurizer Pressure is rapidly decreasing, using the "Break Identification Chart".

Engineering Limit(s):

Lower Limit: 741 psia

Bases for Engineering Limit(s):

An abnormally low steam generator pressure would indicate an excess steam demand event which can result in the overcooling of the reactor. The setpoint used in the plant engineering analyses for MSIS and RPS trip is 678 psia (Ref. 1 & 2) and the safety analyses determined that this setpoint was adequate to prevent overcooling of the RCS. The Technical Specification setpoint, which is based on the engineering analysis value and includes instrument uncertainty and response times, is ≥ 741 psia (Ref. 3 & 4) for MSIS and RPS trip. Since the MSIS setpoint can not be any lower than the Technical Specification limit and since the operator actions are affected by whether the MSIS has actuated, the engineering limit chosen for this use is equal to the Technical Specification limit. | rev. 01

The basis for the RPS setpoint states that this setpoint is sufficiently below the full load operating point of approximately 900 psia so as not to interfere with normal operation, but still high enough to provide the required protection in the event of excessively high steam flow (Ref. 3 & 4). Since the RPS setpoint and the MSIS setpoint are identical and since they are designed to protect the plant for the same type of event, it is assumed that the basis for the MSIS setpoint is the same since the MSIS basis is not specifically stated.

Assumptions:

1. It is assumed that the bases for the RPS and the MSIS setpoints are the same.

2. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01

   Ref: 2

3. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

   Ref: 3,4

References:

1. Calculation 1370-TS-096, 1470-TS-043, Rev. 01, SONGS, Units 2 and 3, Plant Protection System Setpoints Calculation, 8/22/89 (Category 3).

2. J. G. Pigott, "Plant Protection System Setpoints Used in Plant Engineering Analyses", Memo S-PSA-224 to P. C. Newcomb, December 19, 1978.

3. San Onofre 2 Technical Specifications Amendment 94, Section 3.3.2, Table 3.3-4, Table 2.2.1, and Bases for Safety Limits and Limiting Safety System Settings.

4. San Onofre 3 Technical Specifications Amendment 84, Section 3.3.2, Table 3.3-4, Table 2.2.1, and Bases for Safety Limits and Limiting Safety System Settings.

File No: 009-OPS92-028
Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 11 Group 04 Engineering Limit and Bases

PARAMETER: Steam Generator Pressure

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 4/22/93

VERIFICATION STATUS: COMPLETE

The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

[illegible]
Name
Independent Reviewer

Signature

4/23/93
Date

APPROVED BY: J.K. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/26/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 11 **Group:** 04

Parameter: S/G Pressure

Step Value(s):	**Use(s):**
< 50 PSID PZR PRESSURE	To verify PZR pressure is reduced to within 50 psi of the isolated (ruptured) S/G pressure.

Engineering Limit(s):

Lower Limit: S/G PRESSURE = PZR PRESSURE - 50 PSI

Upper Limit: S/G PRESSURE = PZR PRESSURE + 50 PSI

Bases for Engineering Limit(s):

Maintaining the RCS pressure approximately equal (± 50 psi) to the isolated steam generator pressure will accomplish two goals: 1) minimize the loss of primary fluid to the secondary side and the possibility of overfilling the isolated steam generator; 2) minimize the amount of unborated water flowing into the RCS from the steam generator which could reduce the RCS boron concentration. Ref. 1 recognized that maintaining the differential pressure at the tube break at exactly 0 psid would be impossible given the limitations of the instrumentation and the availability of personnel. Therefore, based on analyses described in Ref. 2, a tolerance on the differential pressure of ± 50 psi was recommended in Ref. 1 (which has received interim approval by the NRC). Therefore, based on Ref. 1 and Ref. 2, the lower engineering limit for steam generator pressure is 50 psi less than the pressurizer pressure and the upper engineering limit is 50 psi greater than pressurizer pressure.

Assumptions:

1. The references noted below are assumed to be Secondary Design documents. This assumption is justified based on the fact that they describe strategies which have been reviewed and commented on by the NRC. | rev. 01

   Ref: 1,2

References:

1. CEN-152, Rev. 03, Combustion Engineering Emergency Procedure Guidelines.

1. CE-NPSD-407, NSSS Response to Operator Actions During Postulated Events for Resolution of C-E Emergency Procedure Guidelines SER Items, March, 1987.

File No: 009-OPS92-024
Revision: 00
Page: 1 of 2

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 11 Group 05 Engineering Limit and Bases

PARAMETER: Steam Generator Pressure

PREPARED BY: John M Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 10/13/92

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Kenneth E. Faulkner Kenneth E. Faulkner 10/14/92
Name Signature Date
Independent Reviewer

APPROVED BY: JOSEPH R. CONGDON
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 10/14/92
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 11 **Group:** 05

Parameter: S/G PRESSURE

Step Value(s):	**Use(s):**
LOWERING and MONITOR	To verify isolated S/G pressure decreases as plant cooldown continues.

Engineering Limit(s):

None

Bases for Engineering Limit(s):

There are no associated engineering limits for the trending of parameters. Since no value is specified in the trend, no value will be assigned to the engineering limit. Usually, when an operator is instructed to trend an indication, the indication is used in conjunction with other parameters to corroborate the condition of a safety function. An operator is not required to perform a safety related action on the trending of a single parameter by itself in the EOIs. Where the trending of a parameter is combined with specified operating limits on that parameter, the values given for the operating limits are evaluated for their engineering limits.

Assumptions:

None

References:

None

File No: 009-OPS92-030
Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 11 Group 06 Engineering Limit and Bases

PARAMETER: Steam Generator Pressure

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 4/22/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

[illegible]
Name
Independent Reviewer

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4/23/93
Date

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Joseph R. Congdon
Cognizant Engineering Manager (Signature) 4/24/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 11 **Group:** 06

Parameter: S/G Pressure

Step Value(s):	**Use(s):**
> PZR PRESSURE	To monitor lowering RCS Pressure to < S/G Pressure to restore the isolated S/G level to less than 80% NR.

Engineering Limit(s):

Upper Limit: S/G PRESSURE = PZR PRESSURE + 50 PSI

Bases for Engineering Limit(s):

Maintaining the RCS pressure approximately equal (± 50 psi) to the isolated steam generator pressure will accomplish two goals: 1) minimize the loss of primary fluid to the secondary side and the possibility of overfilling the isolated steam generator; 2) minimize the amount of unborated water flowing into the RCS from the steam generator which could reduce the RCS boron concentration. Ref. 1 recognized that maintaining the differential pressure at the tube break at exactly 0 psid would be impossible given the limitations of the instrumentation and the availability of personnel. Therefore, based on analyses described in Ref. 2, a tolerance on the differential pressure of ± 50 psi was recommended in Ref. 1 (which has received interim approval by the NRC).

This use allows the operator to maintain pressurizer pressure less than steam generator pressure to permit backflow of steam generator fluid into the RCS to help reduce steam generator level. This helps prevent steam generator overfill and possible damage to the main steam lines and main steam safety valves. Ref. 2 presents calculations which demonstrate that, if the RCS could be instantly and homogeneously diluted by the entire mass of a non-borated steam generator, other effects on reactivity would prevent a reactor restart. Ref. 2 concludes that the flowrate established by a 50 psid differential pressure will not threaten the maintenance of adequate shutdown margin. Therefore, the upper engineering limit for steam generator pressure will equal the pressurizer pressure plus 50 psi.

Assumptions:

1. The references noted below are assumed to be Secondary Design documents. This assumption is justified based on the fact that they describe strategies which have been reviewed and commented on by the NRC. | rev. 01

   Ref: 1,2

References:

1. CEN-152, Rev. 03, Combustion Engineering Emergency Procedure Guidelines.
2. CE-NPSD-407, NSSS Response to Operator Actions During Postulated Events for Resolution of C-E Emergency Procedure Guidelines SER Items, March, 1987.

File No: 009-OPS92-026
Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison

PLANT: San Onofre 2&3

PROJECT: ISOPS II Support

C-E JOB NUMBER: 2001216

DOCUMENT: Module 11 Group 07 Engineering Limit and Bases

PARAMETER: Steam Generator Pressure

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 4/22/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Roger Kirkpatrick
Name
Independent Reviewer

Signature

4/23/93
Date

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/21/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 11 **Group:** 07

Parameter: S/G Pressure

Step Value(s):	**Use(s):**
>740 PSIA	To determine if S/G pressure is above MSIS setpoint, or ensure MSIS is actuated.

Engineering Limit(s):

Lower Limit: 741 PSIA

Bases for Engineering Limit(s):

The MSIS setpoint, as defined by the Technical Specifications, is ≥ 741 psia (Ref. 1 & 2).

Assumptions:

1. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

   Ref: 1,2

References:

1. San Onofre 2 Technical Specifications Amendment 94, Table 3.3-4.
2. San Onofre 3 Technical Specifications Amendment 84, Table 3.3-4.

File No: 009-OPS92-025
Revision: 00
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support

C-E JOB NUMBER: 2001216

DOCUMENT: Module 11 Group 08 Engineering Limit and Bases

PARAMETER: Steam Generator Pressure

PREPARED BY: John M. Flaherty
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John M. Flaherty
Cognizant Engineer (Signature) Date: 10/13/92

VERIFICATION STATUS: COMPLETE

The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Kenneth E. Faulkner
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Joseph R Congdon
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10/13/92
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 11 **Group:** 08

Parameter: S/G Pressure

Step Value(s):	**Use(s):**
STABLE OR RISING	To determine (by trending) if an ESDE is isolated.

Engineering Limit(s): None

Bases for Engineering Limit(s):

There are no associated engineering limits for the trending of parameters. Since no value is specified in the trend, no value will be assigned to the engineering limit. Usually, when an operator is instructed to trend an indication, the indication is used in conjunction with other parameters to corroborate the condition of a safety function. An operator is not required to perform a safety related action on the trending of a single parameter by itself in the EOIs. Where the trending of a parameter is combined with specified operating limits on that parameter, the values given for the operating limits are evaluated for their engineering limits.

Assumptions:

None

References:

None

File No: 009-OPS92-068
Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 11 Group 09 Engineering Limit and Bases

PARAMETER: Steam Generator Pressure

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 4/22/93

VERIFICATION STATUS: COMPLETE

The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Roger Kirkpatrick
Name
Independent Reviewer

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4/23/93
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APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/26/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 11 **Group:** 09

Parameter: S/G Pressure

Step Value(s):	**Use(s):**
< MFP DISCH	To verify MFW Pump operating and feeding S/G.

Engineering Limit(s):

Upper Limit: S/G PRESSURE < MFP Disch + 26.88 psi | rev. 01

Bases for Engineering Limit(s):

Flow into the steam generator will be present if the main feedwater pump discharge pressure is greater than the steam generator pressure plus the head losses due to elevation differences and flow. At the point where flow commences, the flow losses will be zero. Therefore, flow will occur whenever the main feedwater pump discharge pressure is greater than the steam generator pressure by an amount equal to the elevation head. The main feedwater pump discharge is at approximately the 10' (Figure 1.2-10, Ref. 1) elevation and the feedwater sparger is at approximately the 72' (Figure 5.1-4, Ref. 1) elevation. Therefore, the elevation difference between the pump and the sparger is 62 feet. The differential pressure (psi) created by the elevation difference can be determined by the following expression: $\Delta p = (1/v_f)*g*h/144$ where g=1 and h is the difference in elevation (ft). At 41°F, the specific volume (v_f) = .016019 ft^3/lbm (Ref. 2). From this, $\Delta p = 26.88$ psi. Therefore, the main feedwater pump discharge pressure must exceed the steam generator pressure by more than 26.88 psi in order for any flow to exist. | rev. 01

Assumptions:

1. The temperature of the feedwater is conservatively assumed to be 41°F, which is approximately the temperature at which the density of water is the highest. The temperature of the water in the condensate storage tank is dependent on the outside temperature. | rev. 01

2. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

   Ref: 1

References:

1. San Onofre 2 & 3 Final Safety Analysis Report, Updated, Figure 1.2-10, Figure 5.1-4.
2. ASME Steam Tables, Third Edition.

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Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 11 Group 10 Engineering Limit and Bases

PARAMETER: Steam Generator Pressure

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 4/22/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

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Name
Independent Reviewer

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4/23/93
Date

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/26/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 11 **Group:** 10

Parameter: S/G Pressure

Step Value(s):	**Use(s):**
APPROX 1100 PSIG	To verify the MSSV's are controlling S/G pressure in the event that S/G pressure can not be controlled using the ADV's.

Engineering Limit(s):

Upper Limit: 1139 PSIA

Lower Limit: 1089 PSIA

Bases for Engineering Limit(s):

An excessively high or low steam pressure may be indicative of improperly operating MSSVs. Therefore, the engineering limits must be the highest and lowest possible steam generator pressures expected with properly operating MSSVs.

From Table 3.7-2, Ref. 1 & 2, it is shown that up to 4 MSSVs can be isolated per steam generator during normal operation. In determining the upper limit, the most extreme case will have the four MSSVs with the lowest relief settings isolated on a steam generator. Section 3.7.1.1, Ref. 1 & 2, indicates that one MSSV per steam generator is capable of providing adequate decay heat removal. Table 3.7-1, Ref. 1 & 2, shows that the fifth MSSV (the lowest setpoint, unisolated MSSV) lift setting (± 1%) is 1128 psia. This table also shows that the setpoint has a tolerance of ± 1%. Therefore, this yields a maximum possible lift setting of 1139 psia.

In determining the lower limit, the most extreme case will have the MSSV with the lowest setpoint relieving system pressure. Table 3.7-1, Ref. 1 & 2, lists this pressure at 1100 PSIA. Again, this lift setting could be 1% lower. Therefore, the lower limit is 1089 PSIA.

Assumptions:

1. It is assumed that sufficient steam can pass through the safety valves at their relief setpoint. Ref. 3 states that the MSSVs have an accumulation of 3%, which means that the valve does not fully open until the pressure in the line is 3% greater than the setpoint. Not including the accumulation is conservative because it results in a narrower acceptable pressure range.

2. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

   Ref: 1,2,3

References:

1. San Onofre 2 Technical Specifications Amendment No. 94, Section 3.7.1.1 Bases, Table 3.7-1, and Table 3.7-2.

2. San Onofre 3 Technical Specifications Amendment No. 84, Section 3.7.1.1 Bases, Table 3.7-1, and Table 3.7-2.

3. San Onofre 2 & 3 FSAR, Section 10.3.2.2 and Table 10.3-1, Vol 17.

ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 11 Group 11 Engineering Limit and Bases

PARAMETER: Steam Generator Pressure

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 4/22/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Roger [illegible] Name Independent Reviewer
Signature
4/23/93 Date

APPROVED BY: J R Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/26/93 Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 11 **Group:** 11

Parameter: S/G Pressure

Step Value(s):	**Use(s):**
< 50 PSIA	To permit the use of alternate low pressure feedwater source.

Engineering Limit(s):

Upper Limit: 69.76 PSIA

| rev. 01

Bases for Engineering Limit(s):

| rev. 01

Flow into the steam generator will be present if the condensate transfer pump developed head is greater than the combined resistance from the steam generator pressure and the elevation difference between the feedwater spargers and the condensate storage tank level. At the point where flow commences, the flow losses will be zero. Assuming the condensate storage tank is almost empty, the level in the condensate storage tank will be at approximately the 29' elevation (Ref.1). The feedwater sparger is at approximately the 72' elevation (Ref. 1). Therefore, the elevation difference between the condensate storage tank level and the sparger is 43'. The shutoff head from the pump is 170' (Ref. 2). Therefore, the net available head at no flow conditions is 127'. This net available head is converted to psi using the following expression: $\Delta p = (1/v_f)*g*h/144$ where g=1 and h is the net available head (ft). At 41°F, the specific volume (v_f) = .016019 ft^3/lbm (Ref. 3). From this, $\Delta p = 55.06$ psi. Assuming the pressure in the condensate storage tank is

14.7 psia, the steam generator pressure must be less than 69.76 psia in order for flow from the condensate transfer pumps to reach the steam generator.

Assumptions:

1. The temperature of the feedwater is conservatively assumed to be 41°F, which is approximately the temperature at which the density of water is the highest. The temperature of the water in the condensate storage tank is dependent on the outside temperature. | rev. 01

2. It is conservatively assumed that the condensate storage tank is empty in order to determine the maximum possible system resistance due to elevation differences. NPSH requirements were not considered in this analysis.

3. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

   Ref: 1

References:

1. San Onofre 2 & 3 Final Safety Analysis Report, Updated, Revision 8, Figures 1.2-11 and 5.1-4.

2. Bechtel Centrifugal Pump Data Sheet, Condensate Transfer Pump, Job No. 10079-003.

3. ASME Steam Tables, Third Edition.

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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 11 Group 12 Engineering Limit and Bases

PARAMETER: Steam Generator Pressure

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 4/22/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Roger Kirkpatrick
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Independent Reviewer

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4/23/93
Date

APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 11 **Group:** 12

Parameter: S/G Pressure

Step Value(s):	**Use(s):**
< 500 PSIA	To permit use of alternate low pressure feedwater source.

Engineering Limit(s):

Upper Limit: 662.67 PSIA

Bases for Engineering Limit(s):

rev. 01

Flow into the steam generator will be present if the condensate pump developed head is greater than the combined resistance from the steam generator pressure and the elevation difference between the feedwater spargers and the condensate hotwell level. At the point where flow commences, the flow losses will be zero. Assuming the condenser hotwell level is at the bottom of the hotwell (11' elevation, Ref. 1) and the feedwater sparger is at approximately the 72' (Ref. 2) elevation, the elevation difference between the hotwell level and the sparger is 61'. The total developed head from the pump is 1600' (Ref. 3, See Assumption 2). Therefore, the net available head at no flow conditions is 1539'. Assuming a perfect vacuum in the condenser, the maximum steam generator pressure for allowing condensate pump flow into the steam generator can be determined by the following expression: $\Delta p = (1/v_f)*g*h/144$ where $g=1$ and h is the net available head (ft). At 99.3°F (Ref. 4), the specific volume $(v_f) = .016128\ ft^3/lbm$ (Ref. 5). From this, $\Delta p = 662.67$ psia. Therefore, the steam generator pressure must be less than 662.67 psia in order for flow from the condensate pump to reach the steam generator.

Assumptions:

1. The condenser hotwell level is conservatively assumed to be at the bottom of the hotwell. NPSH requirements for the condensate pumps are not included in this analysis.

2. References 3 and 4 provided different values for the condensate pump shutoff head. The more conservative number from the pump curve was chosen for this analysis.

3. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

   Ref: 2

4. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, documents that are not Primary or Secondary Design documents may be used as reference documents if justification is provided. The references noted below are formal engineering correspondence between the design principals (e.g., NSSS vendor architect, etc,) and SCE. Their use as reference material is justified when the basis for the engineering limit is "operational experience" or "engineering judgement", and no Primary or Secondary Design Document exists. | rev. 01

   Ref: 3

References:

1. Ingersoll Rand Dwg N4-96RBB4-501X1, Rev. 26, General Arrangement of Tandem 96-RBB4-49.17 S.P.V.D. Surf. Cond.

2. San Onofre 2 & 3, Final Safety Analysis Report, Updated, Revision 8, Figure 5.1-4.

3. Letter BC-778, J. D. Houchen to R. W. Devane, FSAR Data-Mass/Energy Source Terms for Containment Analysis, August 26, 1975.

4. Bechtel Centrifugal Pump Data Sheet, Condensate Pumps, Rev. 1, 6-26-81, Job #10079.

5. ASME Steam Tables, Third Edition.

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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 11 Group 13 Engineering Limit and Bases

PARAMETER: Steam Generator Pressure

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

John M. Flaherty
Cognizant Engineer (Signature) Date: 4/22/93

VERIFICATION STATUS: COMPLETE

The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

Roger [illegible]
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4/23/93
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APPROVED BY: J. R. Congdon
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/26/93
Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 11 **Group:** 13

Parameter: S/G Pressure

Step Value(s):	**Use(s):**
< COND PUMP DSCHG	To verify feedwater supply to S/Gs.

Engineering Limit(s):

Upper Limit: S/G PRESSURE < Cond Pump Disch + 26.88 psi | rev. 01

Bases for Engineering Limit(s):

| rev. 01

Flow into the steam generator will be present if the condensate pump discharge pressure is greater than the steam generator pressure plus the head losses due to elevation differences and flow. At the point where flow commences, the flow losses will be zero. Therefore, flow will occur whenever the condensate pump discharge pressure is greater than the steam generator pressure by an amount equal to the elevation head. The condensate pump discharge is at approximately the 10' (Figure 1.2-12, Ref. 1) elevation and the feedwater sparger is at approximately the 72' (Figure 5.1-4, Ref. 1) elevation. Therefore, the elevation difference between the pump and the sparger is 62 feet. At 41°F, the specific volume (v_f) = .016019 ft^3/lbm (Ref. 2). The differential pressure (psi) created by the elevation difference can be determined by the following expression: $\Delta p=(1/v_f)*g*h/144$ where g=1 and h is the difference in elevation (ft). From this equation, Δp = 26.88 psi. Therefore, the condensate pump discharge pressure must exceed the steam generator pressure by more than 26.88 psi in order for any flow to exist.

Assumptions:

1. The temperature of the feedwater is conservatively assumed to be 41°F, which is approximately the temperature at which the density of water is the highest. The temperature of the water in the condensate storage tank is dependent on the outside temperature. | rev. 01

2. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

   Ref: 1

References:

1. San Onofre 2 & 3 Final Safety Analysis Report, Updated, Figure 1.2-12, Figure 5.1-4.

2. ASME Steam Tables, Third Edition.

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Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 11 Group 14 Engineering Limit and Bases

PARAMETER: Steam Generator Pressure

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 4/22/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

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Name
Independent Reviewer

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4/23/93
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APPROVED BY: [illegible]
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/26
Date

File No: 009-OPS92-~~222~~ 220
Revision: 01
Page: 2 of 2

4/28/93

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 11 **Group:** 14

Parameter: S/G Pressure

Step Value(s):	**Use(s):**
> 100 PSIA	To verify adequate steam supply pressure for operation of steam driven AFW pump.

Engineering Limit(s): > 60 PSIA

Bases for Engineering Limit(s):

Ref. 1 states that the turbine driven auxiliary feedwater pumps can operate at a steam inlet pressure of as low as 60 psia. This engineering limit does not guarantee a minimum flow into the steam generator, only that the turbine will operate. The adequacy of the auxiliary feedwater pump operation is verified in the safety function status checks.

Assumptions:

1. Pressure drop due to velocity losses in the steam turbine supply line are not included in the engineering limit.
2. In accordance with NES&L Quality Procedure SO23-XXIV-7-15, the references noted below are considered to be Secondary Design documents. Their use as reference documents for the engineering limit basis is assumed to be justified based on ensuring that the engineering limit is consistent with the current design basis and operating license. | rev. 01

   Ref: 1

References:

1. San Onofre 2 & 3 FSAR, Updated, Rev. 8, 10.4.9.2.2.2.

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Revision: 01
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ABB COMBUSTION ENGINEERING
ENGINEERING LIMIT DOCUMENT COVER SHEET

CLIENT: Southern California Edison **PLANT:** San Onofre 2&3

PROJECT: ISOPS II Support **C-E JOB NUMBER:** 2001216

DOCUMENT: Module 11 Group 15 Engineering Limit and Bases

PARAMETER: Steam Generator Pressure

PREPARED BY: John M. Flaherty
Cognizant Engineer (Print Name)

Cognizant Engineer (Signature) Date: 4/22/93

VERIFICATION STATUS: COMPLETE
The Safety-Related design information contained in this document has been verified to be correct by means of Design Review using Checklists 9 of QAM-101.

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Independent Reviewer

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4/23/93 Date

APPROVED BY: [illegible]
Cognizant Engineering Manager (Print Name)

Cognizant Engineering Manager (Signature) 4/26/93 Date

SONGS 2&3 INSTRUMENT SUITABILITY STUDY
EMERGENCY OPERATING PROCEDURES

ENGINEERING LIMIT BASES DOCUMENT

Module: 11 **Group:** 15

Parameter: S/G Pressure

Step Value(s):	**Use(s):**
< PZR PRESSURE	To ensure RCS pressure remains higher than ruptured S/G pressure in order to minimize RCS dilution due to backflow.

Engineering Limit(s):

Lower Limit: S/G PRESSURE = PZR PRESSURE - 50 PSI

Bases for Engineering Limit(s):

Maintaining the RCS pressure approximately equal (± 50 psi) to the isolated steam generator pressure will accomplish two goals: 1) minimize the loss of primary fluid to the secondary side and the possibility of overfilling the isolated steam generator; 2) minimize the amount of unborated water flowing into the RCS from the steam generator which could reduce the RCS boron concentration. Ref. 1 recognized that maintaining the differential pressure at the tube break at exactly 0 psid would be impossible given the limitations of the instrumentation and the availability of personnel. Therefore, based on analyses described in Ref. 2, a tolerance on the differential pressure of ± 50 psi was recommended in Ref. 1 (which has received interim approval by the NRC).

This use allows the operator to maintain pressurizer pressure greater than the steam generator pressure in order to minimize backflow and the potential of boron dilution. Ref. 2 concludes that the maintainance of the differential pressure (pressurizer - steam generator pressure) less than 50 psi in conjunction with occasional, deliberate backflow will prevent the overfill of the steam generator secondary side. Therefore, the lower engineering limit is a steam generator pressure 50 psi less than the pressurizer pressure.

Assumptions:

| rev. 01

1. The references noted below are assumed to be Secondary Design documents. This assumption is justified based on the fact that they describe strategies which have been reviewed and commented on by the NRC.

   Ref: 1,2

References:

1. CEN-152, Rev. 03, Combustion Engineering Emergency Procedure Guidelines.

2. CE-NPSD-407, NSSS Response to Operator Actions During Postulated Events for Resolution of C-E Emergency Procedure Guidelines SER Items, March, 1987.