KEWAUNEE NUCLEAR POWER PLANT
DESIGN BASIS DATABASE LOAD FORM

	DOCUMENT INFORMATION	
6.2.1.1	Document Type	Calculation / Evaluation
6.2.1.2	Document ID	C11116
6.2.1.3	Document Title	Kewaunee Unit 1 Steam Generator Narrow Range Level Protection Channel Statistical Allowance (CSA) Calculation.
6.2.1.4	KPS Revision	0
6.2.1.5	Addendum	N/A
6.2.1.6	Document Date	10/14/2009
6.2.1.7	Topic	Development of the Steam Generator Narrow Range Level High Level Turbine Trip and Feedwater Isolation, Low Level Coincidence with Steam Flow Feed Flow Mismatch Reactor Trip, and the Low Low Level Reactor Trip Channel Statistical Allowances (CSA) to support Kewaunee's conversion to Improved Technical Specifications (ITS)
6.2.1.8	Document Status	Current
6.2.1.9	Superceded By	N/A
6.2.1.10	Attachments	Y
6.2.1.11	Safety Related	Y

	AUTHOR INFORMATION	
6.2.2.1	Author/Submitter	AW Baugus
6.2.2.2	Vendor	N/A
6.2.2.3	Vendor Author	N/A
6.2.2.4	Discipline	Instrument and Control

	DOCUMENT RELATIONSHIPS	
6.2.3.1	System(s)	05A-975
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6.2.3.4	Inputs	
6.2.3.5	Outputs	

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6.2.4.1	Comments	
6.2.4.2	Record Type	
6.2.4.3	Retention Period	
6.2.4.4	Software Application	
6.2.4.5	Vault Location	
6.2.4.6	Film Reel	
6.2.4.7	Reel Odometer	

Dominion

Calculation Cover Sheet

Station: Kewaunee – KPS	Unit(s): 1	System Code(s): 05A (Feedwater)
Calculation Number: C11116	Revision: 0	Addendum: N/A
Calculation Quality Class: ☒ Safety Related ☐ Non- Safety Related		Status: Current
Installation Verification Required: ☒ Yes ☐ No		Discipline: I&C
Keyword(s): CSA, Steam Generator Narrow Range Level		
Supersedes: C11116-1, Rev. 0, C11116-2, Rev. 1, C11116-3, Rev. 1, C11116-4, Rev. 0, C11116-10, Rev. 1.		
Subject (Calculation Title): Kewaunee Unit 1 Steam Generator Narrow Range Level Protection Channel Statistical Allowance (CSA) Calculation.		
Initiating Document: Kewaunee Improved Technical Specifications (ITS)		
CM-AA-CLC-301, Revision: 1(1)	CM-AA-CLC-301-1001, Revision: 1(1)	

Affected System(s), Structure(s), or Component(s) (Continued on Page 2)

Station:	Unit:	System:	Equipment Location (Mark Number):	Tag Number (If Applicable):
KPS	1	05A	24042	LT-461
KPS	1	05A	24043	LT-462
KPS	1	05A	24044	LT-463
KPS	1	05A	24046	LT-471

Objective: The objective of this calculation is to determine the Channel Statistical Allowance (CSA) value(s) associated with Kewaunee's Unit 1 Steam Generator Hi Level Turbine Trip and Feedwater Isolation, Low Level Coincidence with Steam Flow/Feed Flow Mismatch Reactor Trip, the Low-Low Reactor Trip functions and the AMSAC Low–Low Level Trip. This calculation supports Kewaunee's conversion to Improved Technical Specifications (ITS).

Conclusion: The Channel Statistical Allowance (CSA) values associated with the Steam Generator Narrow Range Level Trips are:

$CSA\text{-}NORMAL_{(Low\ Level\ Coincidence)}$ = - 0.681% Level to - 4.637% Level

$CSA\text{-}NORMAL_{(Low\ Low\ Level\ RX\ Trip)}$ = - 0.540% Level to - 4.496% Level

$CSA\text{-}NORMAL_{(AMSAC\ Low\ Low\ Level\ Turb/RX\ Trip)}$ = - 0.281% Level to - 4.535% Level

$CSA\text{-}NORMAL_{(Hi\ Level\ Turb\ Trip\ /\ FW\ Isol)}$ = + 3.967% Level to + 7.923% Level

Originator (Print): A. W. Baugus	Signature: A. W. Baugus	Date: 10/14/2009
Reviewer (Print): D.M.McGrath	Signature: Donald McGrath	Date: 10-14-09
Owners Review (Print): Victor Myers	Signature: Donald McGrath for Victor Myers per telecon	Date: 10-14-09
Approval (Print): B. R. Morrison	Signature: B R Morrison	Date: 10/15/09

(1) This is the revision of CM-AA-CLC-301 and CM-AA-CLC-301-1001 in effect at the time the calculation was initiated.

Affected Components (Cont.):

Station:	Unit:	System:	Equipment Location (Mark Number):	Tag Number (If Applicable):
KPS	1	05A	24047	LT-472
KPS	1	05A	24048	LT-473
KPS	1	05A	4848601	LQ-461
KPS	1	05A	4848401	LQ-462
KPS	1	05A	4845801	LQ-463
KPS	1	05A	4848301	LQ-471
KPS	1	05A	4848101	LQ-472
KPS	1	05A	4848201	LQ-473
KPS	1	05A	4848602	LC-461A/B
KPS	1	05A	4848402	LC-462A/B
KPS	1	05A	4845803	LC-463C/D
KPS	1	05A	4848302	LC-471A/B
KPS	1	05A	4848102	LC-472A/B
KPS	1	05A	4848202	LC-473C/D
KPS	1	05A	4848403	LC-462C
KPS	1	05A	4845802	LC-463E
KPS	1	05A	4848103	LC-472C
KPS	1	05A	4848203	LC-473E
KPS	1	05A	4848404	LM-462
KPS	1	047	4809808	LC-462G
KPS	1	05A	4845804	LM-463B
KPS	1	047	4809808	LC-463G
KPS	1	05A	4848104	LM-472
KPS	1	047	4809807	LC-472G
KPS	1	05A	4848204	LM-473B
KPS	1	047	4809807	LC-473G

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ATTACHMENTS

RECORD OF REVISION

Rev. 0 Original Issue. This calculation replaces Calculations C11116-1, Rev. 0, C11116-2, Rev. 1, C11116-3, Rev. 1, C11116-4, Rev. 0, and C11116-10, Rev. 1. This calculation is written as a Channel Statistical Allowance (CSA) Calculation versus a Setpoint Calculation.

1.0 PURPOSE

The purpose of this calculation is to determine the Channel Statistical Allowance (CSA) values associated with the Steam Generator Narrow Range Level Loops. The functions addressed in this calculation are the Steam Generator Low Level Coincident Reactor Trip, Steam Generator Hi Level Turbine Trip and Feedwater (FW) isolation, Steam Generator Lo-Lo Level Reactor Trip and ESFAS Initiation, and the AMSAC Low-Low Level Trip. The applicable instrumentation loops are L-461, L-462, L-463, L-471, L-472, and L-473. The loops are similar; therefore the CSA values presented in this calculation will be applicable for all of the loops.

2.0 METHOD OF ANALYSIS

This calculation uses the methodology presented in STD-EEN-0304, Revision 6, *Calculating Instrumentation Uncertainties by the Square Root of the Sum of the Squares Method* (Reference 5.1).

The CSA determined in this calculation is a derivation of the following generic equation presented in STD-EEN-0304, Revision 6, Section 6.1:

$$CSA = SE \pm \sqrt{[EA^2 + PMA^2 + PEA^2 + (SCA + SMTE)^2 + SD^2 + SPE^2 + STE^2 + SPSE^2 + (M1 + M1MTE)^2 + (M2 + M2MTE)^2 + ...+ (Mn + MnMTE)^2 + RD^2 + RTE^2 + RRA^2]}$$

(Equation 1)

The terms M1 through Mn refer to individual rack modules within the Steam Generator Narrow Range Level Loops. The term MnMTE refers to the Module Measuring and Test Equipment where n is the module number as shown on the Functional Block Diagram in Section 7.0. Finally, the EA term will be removed from the equation for normal conditions since there is no environmental allowance for non-harsh conditions. These changes result in the following equation.

For normal conditions:

$$CSA = SE \pm \sqrt{[PMA^2 + PEA^2 + (SCA + SMTE)^2 + SD^2 + SPE^2 + STE^2 + SPSE^2 + (M1 + M1MTE)^2 + (M2 + M2MTE)^2 + ...+ (Mn + MnMTE)^2 + RD^2 + RTE^2 + RRA^2]}$$

(Equation 2)

The error terms in the equations above are consistent with standard industry definitions and are described in Section 8.0 and in detail in Reference 5.1.

2.1 Process Measurement Accuracy (PMA) Terms

The Process Measurement Accuracy Terms used in this calculation are extracted from Calculation C11116-5, Rev. 0, Attachment 4 (Ref 5.19). Because they are applied deterministically as process measurement bias to the Channel Statistical Allowance, no additional uncertainty is added to these biases. For conservatism, the PMA is ignored when evaluating low or low-low level trips when the resultant CSA is a net positive (i.e. Actual level is

higher than indicated level), correspondingly the PMA is ignored when evaluating high level trips when the resultant CSA is a net negative (i.e. Actual level is lower than indicated level).
The PMA terms from Attachment 1 include downcomer affects, mid deck plate affects, and Fluid Velocity effects at the lower tap. The reference leg temperature effect was determined at 95°F and per Reference 5.18, page 17 the maximum temperature could be 120°F and the minimum temperature could be 40°F. The reference leg temperature variation for 120°F and 40°F was determined in Reference 5.21 to be +0.74% of span and – 0.83% of span.

Table 2-1

Function	MDP + TH (1) % span	Reference Leg Temperature Error (2) % span	Total PMA % span
Low Level 25.5% Level Setpoint	- 1.8291%(3)	- 0.83%	- 2.659
Low Low Level 17% Level Setpoint	- 1.6875%(4)	- 0.83%	- 2.518
AMSAC Low Low Level 13% Level Setpoint	-1.5781%(5)	-0.83%	-2.408
Hi Hi Level 66.5% Level Setpoint	+ 5.2050 %(6)	+ 0.74%	+ 5.945

(1) MDP + TH is the combination of the mid deck plate and thermal & hydraulic errors as shown on Attachment 1, "SG Narrow Range Level, PMA Calculation".

(2) Reference Leg Temperature Error is derived from Calculation CN-SSO-02-8, Rev. 1, page 17. The values above are for the two temperature extremes of 40°F and 120°F.

(3) The value for the Low Level Setpoint @ 25.5% is the bounding value between the Hi Tave 0% TP, Lo Setpoint 25.5% value and the Low Tave, 10% TP Lo Setpoint 25.5% value (Ref. pg 17 of 23 of Attachment 1).

(4) The value for the Low Low Level Setpoint @ 17.0% is the bounding value between the Hi Tave 0% TP, Lo-Lo Setpoint 17.0% value and the Low Tave, 10% TP Lo-Lo Setpoint 17.0% value (Ref. pg 11 of 23 of Attachment 1).

(5) The value for the AMSAC Low Low Level Setpoint @ 13.0% is the bounding value between the Hi Tave 0% TP, Lo-Lo Setpoint 13.0% value and the Low Tave, 10% TP Lo-Lo Setpoint 13.0% value (Ref. pg 11 of 23 of Attachment 1).

(6) The value for the Hi Hi Level Setpoint @ 66.5% is the bounding value between the Hi Tave 0% TP, Hi-Hi Setpoint 66.5% value and the Low Tave, 10% TP Hi-Hi Setpoint 66.5% value (Ref. pg 7 of 23 of Attachment 1).

3.0 DESIGN INPUTS

The design inputs are manufacturer's published data sheets, active (current) calculations, station controlled drawings and other controlled documents as listed in Section 5.0, References.

4.0 ASSUMPTIONS

4.1 The Environmental Allowance (EA) term is assumed to be zero for Normal (non-accident) conditions. This term includes the effects due to degradation of cable insulation (IR) and the effects of high temperatures and radiation during an accident. The Steam Pressure/Temperature Effect (SPTE) has also been assumed to exist only during exposure to the temperature pressure profile.

4.2 Based on Reference 5.15, all test data is referenced to the rack 10 Ω Test Point Resistor (TPR), therefore the errors associated with the installed DB Box resistors used to convert the loop current to an applied input voltage to the Foxboro or NUS module under test is included in the overall error of the Foxboro or NUS module as referenced to the rack TPR.

4.3 According to References 5.14 and 5.15, a Fluke 45 Digital Multimeter (DMM) is used to perform the transmitter and rack module calibration. According to Reference 5.13, the DC Voltage accuracies for the ranges of interest are as follows:

Range	Desired	Acceptance Range
300 mV	300 mV	**299.92 to 300.08 mV**
3 V	3 V	**2.9992 to 3.0008 V**
30 V	**30 V**	**29.992 to 30.008 V**

Range	Desired	Acceptance Range
1000 mV	900 mV	**899.76 to 900.24**
10 V	**9 V**	**8.9976 to 9.0024**

At Kewaunee, there are six possible voltage spans that could be present in the Reactor Protection System; i.e., 40 to 200 mVDC, 100 to 500 mVDC, 1 to 5 VDC, 0.4 to 12.4 VDC, 2 to 10 VDC, and 0 to 10 VDC. The DC voltage accuracies converted to % of span are given below.

<u>100 to 500 mVDC (1000 mV range)</u>

accuracy = (0.24 mVDC / 400 mVDC) * 100% = 0.06% of span

<u>0.4 to 12.4 VDC (30 V range)</u>

accuracy = (0.008 VDC / 12 VDC) * 100% = 0.07% of span

<u>2 to 10 VDC (30 V range)</u>

accuracy = (0.008 VDC / 8 VDC) * 100% = 0.10% of span

<u>0 to 10 VDC (30 V range)</u>

accuracy = (0.008 VDC / 10 VDC) * 100% = 0.08% of span

40 to 200 mVDC (300 mVDC range)
accuracy = (0.08 mVDC / 160 mVDC) * 100% = 0.05% of span

1 to 5 VDC (10 V range)

accuracy = (0.0024 VDC / 4 VDC) * 100% = 0.06% of span

This calculation will be bounded using an accuracy of ± 0.1% of span for the Fluke 45 DMM for all possible conditions for ranges 30 VDC or less. It is acceptable for the calibration procedures to use a DMM with accuracy specifications equal to or better than the Fluke 45 DMM.

4.4 For this calculation, when terms are treated as a bias or the net CSA is made up of two values, then a net (+) means that the actual process is higher than the indicated value and a net (-) means that the actual process is lower than the indicated value.

5.0 REFERENCES

5.1 Dominion Standard, STD-EEN-0304, Revision 6, "Calculating Instrumentation Uncertainties by the Square Root of the Sum of the Squares Method".

5.2 Kewaunee Updated Safety Analysis Report (USAR), Chapters 7, 10, and 14.

5.3 Kewaunee Technical Specifications, Section 2.3.a.5, Table TS 3.5-2, Table TS 3.5-3, and Table TS 3.5-4.

5.4 Kewaunee Vendor Technical Manual KW-VTM-000-FOXBO-0031 (100-1762-1), Revision 15, Nuclear Energy Systems – Instrumentation Reference Manual.

5.5 Kewaunee Vendor Technical Manual KW-VTM-000-FOXBO-0015 (100-1744-1), Revision 10, Instrumentation Documentation.

5.6 Kewaunee Vendor Technical Manual KW-VTM-000-NUSIN-0017 (240730), Revision 2, NUS Instruments Series SPS500 Power Supply.

5.7 Kewaunee Vendor Technical Manual KW-VTM-000-NUSIN-0022 (C-N-430-9), Revision 4, SAM504-3 Single & DAM504-3 Dual Alarm Module IOM.

5.8 Kewaunee Vendor Technical Manual KW-VTM-000-ROSEM-0006 (2566-1), Rosemount Instruction Manual, Rosemount 1154 Alphaline Nuclear Pressure Transmitter, Product Manual 00809-0100-4514, Rev. AA, June 1999.

5.9 Kewaunee Instrument and Control Procedure ICP-82B-137, Revision 6, ICE – "Precision Test Resistor Calibration".

5.10 Kewaunee General Instrument Procedure GIP-007, Revision E, "Protection Loop mV Data Collection".

5.11 Kewaunee Instrument and Control Procedure ICP-82B-168, Revision 3, ICE – Heise PTE-1 Calibrator and HQS-2 Pressure Module Calibration.

5.12 Kewaunee Instrument and Control Procedure ICP-82B-06, Revision T, ICE – Pressure Gauge Calibration.

5.13 Kewaunee Instrument and Control Procedure ICP-82B-129, Revision 10, ICE – Fluke 45 Dual Display Multimeters Calibration.

5.14 Instrument Surveillance Procedure MA-KW-ISP-FW-028A, Rev. 0, "Steam Generator Level Transmitters Calibration".

5.15 Instrument Surveillance Procedures:

- SP-05A-028B-1, Rev. B, "Steam Generator Level Instrument Channel 461 (Red) Calibration".
- SP-05A-028B-2, Rev. B, "Steam Generator Level Instrument Channel 462 (Blue) Calibration".
- SP-05A-028B-3, Rev. 3, "Steam Generator Level Instrument Channel 463 (Yellow) Calibration".
- SP-05A-028B-5, Rev. B, "Steam Generator Level Instrument Channel 472 (Red) Calibration".
- SP-05A-028B-6, Rev. B, "Steam Generator Level Instrument Channel 473 (White) Calibration".
- SP-05A-028B-4, Rev. 3, "Steam Generator Level Instrument Channel 471 (Yellow) Calibration".

5.16 Interconnecting Wiring Diagrams:
- XK-100-622, Rev. 2M
- XK-100-663, Rev. 2Q

5.17 Station Drawings:
- XK-100-554, Rev. 2B
- XK-100-149, Rev. 4K
- E-3602, Rev. H

5.18 Kewaunee Power Station Environmental Qualification Plan, Rev. 27.

5.19 Kewaunee Calculation C11116-5, Rev. 0, "Steam Generator NR Level, Control Room Indication".

5.20 Kewaunee DCR 2939, "Replace all Six Narrow Range Steam Generator Level Transmitters 24042 (LT-461), 24043 (LT-462), 24044 (LT-463), 24046 (LT-471), 24047 (LT-472), 24048 (LT-473)".

5.21 Kewaunee Calculation CN-SSO-02-08, Rev. 1, Kewaunee Steam Generator Water Level Trip Setpoints Uncertainty Calculations for 7.4% Power Uprate, Replacement Steam Generators and WCAP-15821, Rev. 0.

5.22 Kewaunee Calculation C10746, Revision 0, Addendum A, “Instrument Loop Calibration Resistor Check”.

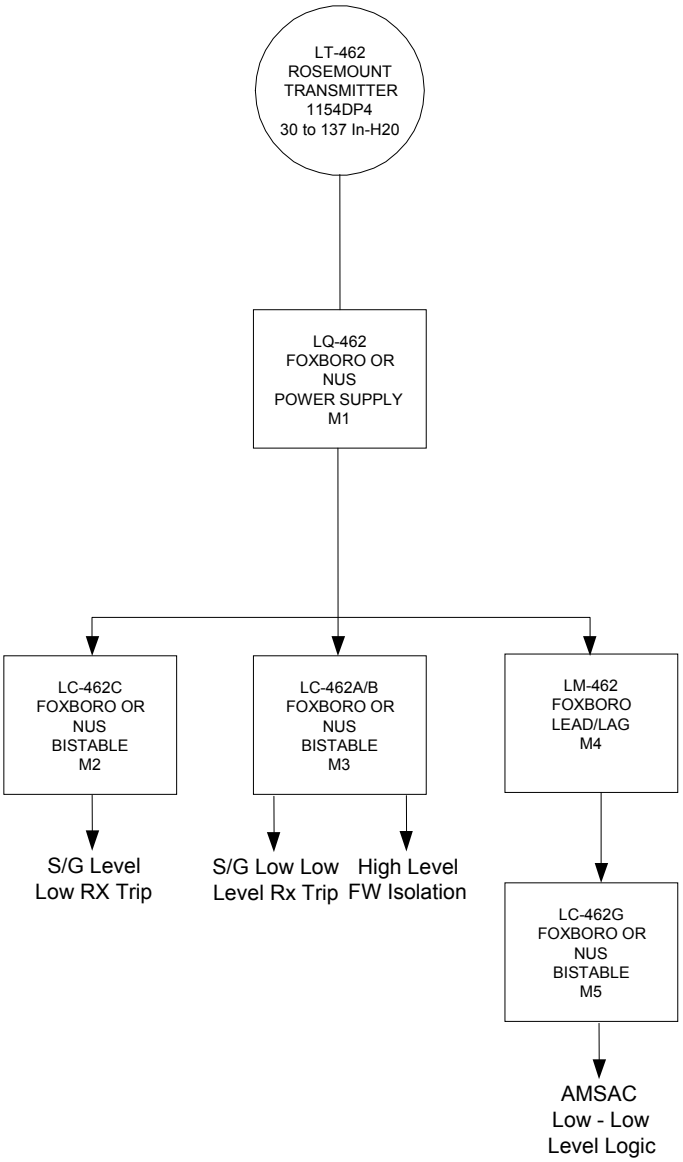
5.23 Instrument Surveillance Procedure SP-47-281, Rev. 14, “AMSAC Quarterly Functional Test”.

5.24 Kewaunee Vendor Technical Manual KW-VTM-000-NUSIN-0010, Revision 0, NUS Instruments Series 500 Analog Isolator Module Operations & Maintenance Manual.

6.0 COMPUTER CODES

No computer codes were used to perform this calculation. All calculations were performed by hand using the method described in Section 2.0.

7.0 Functional Block Diagram



This drawing is representative of Loop A Channel 3. Loop A Channel 4 and Loop B Channels 1 and 2 are similar. Loop A Channel 1 and Loop B Channel 2 are similar to the other Channels with the exception of the Steam Generator Low Level Reactor Trip, and the AMSAC Low-Low Level Turbine Trip / Reactor trip.

The channels listed below (Table 7-1) develop the Steam Generator Low Level Coincidence Reactor Trip, Low Low Level Reactor Trip, the High Level Turbine Trip & Feedwater Isolation, and the AMSAC Low-Low Level Trip. This calculation is applicable for all four Steam Generator Level Channels.

TABLE 7-1

Channel	Tag/ Mark No.	Tag/ Mark No.	Tag/ Mark No.	Tag/ Mark No.	Tag/ Mark No.	Tag/ Mark No.
SG "A" Level Channel 1 (Red)	LT-461 (24042)	LQ-461 (4848601)	LC-461A/B (4848602)			
SG "A" Level Channel 3 (Blue)	LT-462 (24043)	LQ-462 (4848401)	LC-462A/B (4848402)	LC-462C (4848403)	LM-462 (4848404)	LC-462G (4809808)
SG "A" Level Channel 4 (Yellow)	LT-463 (24044)	LQ-463 (4845801)	LC-463C/D (4845803)	LC-463E (4845802)	LM-463B (4845804)	LC-463G (4809808)
SG "B" Level Channel 1 (Red)	LT-472 (24047)	LQ-472 (4848101)	LC-472A/B (4848102)	LC-472C (4848103)	LM-472 (4848104)	LC-472G (4809807)
SG "B" Level Channel 2 (White)	LT-473 (24048)	LQ-473 (4848201)	LC-473C/D (4848202)	LC-473E (4848203)	LM-473B (4809807)	LC-473G (4809807)
SG "B" Level Channel 4 (Yellow)	LT-471 (24046)	LQ-471 (4848301)	LC-471A/B (4848302)			

8.0 CALCULATION

SE = Systematic Error

No Systematic Error has been identified for these loops.

SE = 0.000% of span

PMA = Process Measurement Accuracy

The PMA terms from Section 2.1 are given below for the various loop functions considered in the calculation.

PMA_1 (Low Level Coincidence)

Section 2.0, Table 2-1 shows a PMA value of - 1.8291 % of span for the Low Level Coincidence circuit. This PMA value is based on Low Tave, 10% tube plugging, Low Setpoint of 25.5% Level and 100% power. For conservatism, the above is the most bounding PMA value between the Hi Tave 0% tube plugging, low setpoint of 25.5% and the Low Tave 10% tube plugging, low setpoint of 25.5% level. This value will be added to the Reference Leg Temperature error (from Table 2-1) to determine the overall PMA to be applied to the Steam Generator Low Level Coincidence Trip Function.

PMA_2 (Low Low Level ESFAS Initiation)

Section 2.0, Table 2-1 shows a PMA value of - 1.6875 % of span for the Low Low Level ESFAS Initiation circuit. This PMA value is based on Hi Tave, 0% tube plugging, Low Low Setpoint of 17.0% Level and 100% power. For conservatism, the above is the most bounding PMA value between the Hi Tave 0% tube plugging, Lo-Lo setpoint of 17.0% and the Low Tave 10% tube plugging, Lo-Lo setpoint of 17.0% level. This value will be added to the Reference Leg Temperature error (from Table 2-1) to determine the overall PMA to be applied to the Steam Generator Low Level Coincidence Trip Function.

PMA_3 (Hi Level Turbine Trip / Feedwater Isolation)

Section 2.0, Table 2-1 shows a PMA value of + 5.2050 % of span for the Hi Hi Turbine Trip & Feedwater Isolation circuit. This PMA value is based on Hi Tave, 0% tube plugging, Hi Hi Setpoint of 66.5% Level and 100% power. For conservatism, the above is the most bounding PMA value between the Hi Tave 0% tube plugging, Hi Hi setpoint of 66.5% and the Low Tave 10% tube plugging, Hi Hi setpoint of 66.5% level. This value will be added to the Reference Leg Temperature error (from Table 2-1) to determine the overall PMA to be applied to the Steam Generator Low Level Coincidence Trip Function.

PMA_4 (AMSAC Low Low Level Turbine Trip / Reactor Trip)

Section 2.0, Table 2-1 shows a PMA value of - 1.5781 % of span for the AMSAC Low Low Level Turbine Trip / Reactor Trip. This PMA value is based on Hi Tave, 0% tube plugging, Lo- Lo

Setpoint of 13.0% Level (AMSAC) and 100% power. For conservatism, the above is the most bounding PMA value between the Hi Tave 0% tube plugging, Lo-Lo setpoint of 13.0% and the Low Tave 10% tube plugging, Lo-Lo setpoint of 13.0% level. This value will be added to the Reference Leg Temperature error (from Table 2-1) to determine the overall PMA to be applied to the Steam Generator Low Level Coincidence Trip Function.

PMA_1 = - 2.659% of span

PMA_2 = - 2.518% of span

PMA_3 = + 5.945% of span

PMA_4 = -2.408% of span

PEA = Primary Element Accuracy

PEA is not applicable for this loop configuration.

PEA = ± 0.000% of span

SCA = Sensor Calibration Accuracy

Reference 5.14 provides a transmitter calibration accuracy of ± 0.25% of span.

SCA = ± 0.250% of span (Reference 5.14)

SMTE = Sensor Measuring and Test Equipment

The following Measuring and Test Equipment or its equivalent is used for calibration of the Transmitters:

1) $SMTE_1$ = DMM, Fluke Model 45 or equivalent

   $SMTE_1$ = ± 0.100% of span **(**Assumption 4.3)

2) $SMTE_2$ = 10 Ω Precision Test Resistor with an accuracy of ± 0.01% of span

   $SMTE_2$ = ± 0.010% of span (Reference 5.9)

3) Reference 5.14 states that a pressure measuring device with an accuracy of ± 0.2 in-H2O or better is used for the calibration of the Steam Generator Level transmitters.

   $SMTE_3$ = 100% * 0.2 "H_2O / 107 "H_2O = 0.187% of span

   $SMTE_3$ = ± 0.187% of span

The Transmitter Measuring and Test Equipment (SMTE) accuracy is equal to:

$SMTE = [(SMTE_1 + SMTE_2)^2 + SMTE_3^2]^{1/2}$

$SMTE = [(0.1 + 0.01)^2 + (0.187)^2]^{1/2}$

SMTE = ± 0.217% of span

SD = Sensor Drift

The sensors are Rosemount Model 1154DP4 transmitters (Ref. 5.20). The calibration span of the instrument is 107" W.C. (Ref. 5.15). Based on Reference 5.8, the Rosemount Model 1154 transmitter has a drift value of ± 0.2% of the upper range limit (URL) for a 30-month period following calibration. For a calibration cycle up to 30 months the drift value is:

SD = ± 0.2% of the URL per 30 Months, URL = 150" W.C.

SD = ± {[(0.2% / 100%) * 150" W.C.] / 107" W.C.} * 100

SD = ± 0.280% of span

SPE = Sensor Pressure Effect

The Sensor Pressure effect (SPE) will have two components, Static Pressure Zero (SPZ) effect and Static Pressure Span (SPS) effect. SPE will have a random component derived from the Static Pressure Zero (SPZ) effect and the Static Pressure Span (SPS) effect uncertainty i.e. the generally accepted value of SPE is computed for a pressure max of 1020 psia (Attachment 1).

Per Reference 5.8, the URL for the Rosemount Series D transmitter (Range Code 4) is 150" W.C. Also per Reference 5.8, the Static Pressure Zero (SPZ) effect is ± 0.2% of URL per 1000 psi for model 1154DP range code 4 transmitters. The Static Pressure Span uncertainty effect is ± 0.5% of input per 1000 psi.

The maximum operating pressure of the main steam header, as shown in Attachment 1 is 1020 psia. From Reference 5.14 the calibration span of the sensor is 107" W.C.

SPZ = {{[(0.2% / 100%) * 150" W.C.] / 107" W.C.} * 100%} * (1005.3 psig / 1000 psig)

SPZ = ± 0.282% of span

Per Reference 5.19 the Rosemount transmitters have been corrected for a static pressure of 785 psig. Per Reference 5.8 this correction has an uncertainty of ± 0.5% of input per 1000 psi.

SPS = ± 0.5% of input per 1000 psi

SPS = 0.5% * (1005.3 psig / 1000 psig)

SPS = ± 0.503% of span

The overall Transmitter Sensor Pressure Effect (SPE1) term is equal to:

$SPE = (SPZ^2 + SPS^2)^{1/2}$

$SPE = (0.282^2 + 0.503^2)^{1/2}$

SPE = ± 0.577% of span

STE = Sensor Temperature Effect

Rosemount Instruction Manual (Ref. 5.8) states the temperature effect for Range Code 4 is:

± (0.75% of URL + 0.5% span) / 100°F (Reference 5.8)

Upper Range Limit = 150" W.C.
Transmitter Span = 107" W.C.
Temperature Span = 80°F (Based on the EZD Zone L02 (Ref. 5.18) minimum temperature of 40°F and Maximum temperature of 120°F)

STE = [(0.75% * 150" W.C / 107" W.C.) + 0.5%] * (80°F / 100°F)

STE = ± 1.241% of span

SPSE = Sensor Power Supply Effect

According to Reference 5.20, Rosemount Model 1154DP4 differential pressure transmitters are used for the Steam Generator Level Channels. According to Reference 5.8, the Sensor Power Supply Effect for this model is less than 0.005% of output span per volt. The nominal load resistance for the Steam Generator Level Channels is approximately 650 Ω (Reference 5.15). Based on Figure 2-3 in Reference 5.8, the nominal power supply voltage at 650 Ω at 20 mA is 25.4 VDC. From Figure 2-3, the high end qualified power supply voltage is 45 VDC and the low end voltage is 13.5 VDC.

Based on References 5.14 and 5.15, the power supply output voltage is not checked during the performance of the Channel Calibration Procedure or the Steam Generator Level Transmitter Calibration Procedure, therefore to bound all possible conditions, a power supply output tolerance of ± 11.9 VDC (i.e. 25.4 VDC – 13.5 VDC) will be used to determine the Sensor Power Supply Effect.

SPSE = ± [(0.005% / 100%) * (11.9 VDC / 1.0 VDC)] * 100% = 0.060%

SPSE = ± 0.060% of span

M1 = Foxboro / NUS Loop Power Supply Model 610AC-0/SPS500

According to References 5.15 and 5.16, the loop power supply is either a Foxboro H/610AC-0 or a NUS Instruments SPS500. Based on References 5.14 and 5.15, these power supplies are not used as a current to voltage converters. Therefore, the accuracy for M1 is ± 0.0 % of span.

M1 = ± 0.000% of span

M1MTE = Loop Power Supply Measuring and Test Equipment

According to References 5.15 and 5.16, the loop power supply is either a Foxboro H/610AC-0 or a NUS Instruments SPS500. Based on References 5.14 and 5.15, these power supplies are not used as a current to voltage converters. Therefore, the accuracy for M1MTE is ± 0.0 % of span.

M1MTE = 0.000% of span

M2 = Foxboro/NUS Bistable Module Model 63U-AC-OHBA/SAM504-3

Based on Reference 5.16, either a Foxboro Model M/63U-BC or NUS Instruments Model SAM504-3 may be installed as a Steam Generator Low Level bistable. The calibrated accuracy is ± 0.500 % of span.

(Reference 5.15)

M2 = ± 0.500% of span

M2MTE = Foxboro/NUS Bistable Module Model 63U-AC-OHBA/SAM504-3 Measuring and Test Equipment

Based on Reference 5.15, the following M&TE is used to calibrate the bistable:

M2MTE = ± (Fluke + TPR)

Fluke Accuracy = ± 0.100% of span (Assumption 4.3)

Test Point Resistor Accuracy = ± 0.100% of span (Reference 5.22)

M2MTE = ± (0.100 + 0.100) = ± 0.200% of span

M2MTE = ± 0.200% of span

M3 = Foxboro/NUS Bistable Module Model 63U-AC-OHBA/DAM504-3

Based on Reference 5.16, either a Foxboro Model M/63U-BC or NUS Instruments Model DAM504-3 may be installed for the Steam Generator Level Low- Low and Hi Level bistable. The calibrated accuracy is ± 0.500 % of span.

(Reference 5.15)

M3 = ± 0.500% of span

M3MTE = Foxboro/NUS Bistable Module Model 63U-AC-OHBA/DAM504-3 Measuring and Test Equipment

Based on Reference 5.15, the following M&TE is used to calibrate the bistable:

M3MTE = ± (Fluke + TPR)

Fluke Accuracy = ± 0.100% of span (Assumption 4.3)

Test Point Resistor Accuracy = ± 0.100% of span (Reference 5.22)

M3MTE = ± (0.100 + 0.100) = ± 0.200% of span

M3MTE = ± 0.200% of span

M4 = Foxboro/NUS Signal Converter I/I Module Model M/66BC-0/ OCA504

Based on Reference 5.16 and 5.24, either a Foxboro Model M/63U-BC or NUS Instruments Model OCA504 may be installed for the Steam Generator Signal Converter Module. The calibrated accuracy is ± 0.500 % of span.

(Reference 5.23)

M4 = ± 0.500% of span

M4MTE = Foxboro/NUS Signal Converter I/I Module Model M/66BC-0/OCA504 Measuring and Test Equipment

Based on Reference 5.15, the following M&TE is used to calibrate the Signal Converter Module:

M4MTE = $\pm \sqrt{(\text{Fluke} + \text{TPR})^2 + (\text{Fluke} + \text{TPR})^2}$

Fluke Accuracy = ± 0.100% of span (Assumption 4.3)

Test Point Resistor Accuracy = ± 0.100% of span (Reference 5.22)

M4MTE = $\pm \sqrt{(0.100 + 0.100)^2 + (0.100 + 0.100)^2} = \pm 0.283\%$ of span

M4MTE = ± 0.283% of span

M5 = Allen Bradley Processor Mini PLC-2

Based on Reference 5.17, an Allen Bradley Mini PLC-2 is installed for use as the Steam Generator AMSAC Low-Low Level trip function. The calibrated accuracy is ± 0.500 % of span.

(References 5.17 & 5.23)

M5 = ± 0.500% of span

M5MTE = Allen Bradley PLC Module Measuring and Test Equipment

Based on Reference 5.15, the following M&TE is used to calibrate the Allen Bradley PLC AMSAC Low-Low Level trip function:

M5MTE = ± (Fluke + TPR)

Fluke Accuracy = ± 0.100% of span (Assumption 4.3)

Test Point Resistor Accuracy = ± 0.100% of span (Reference 5.22)

M5MTE = ± (0.100 + 0.100) = ± 0.200% of span

M5MTE = ± 0.200% of span

RD = Rack Drift

The superseded calculations specified a drift value derived from previous testing. However, that data is not current and Kewaunee is replacing Foxboro rack modules with NUS Instruments equivalents where sufficient drift trends have not been established. Therefore, the standard and conservative value of ± 1.0% of span as referenced in STD-EEN-0304, Revision 6 will be used in this calculation.

RD = ± 1.000% of span (Reference 5.1)

RTE = Rack Temperature Effect

For Kewaunee calculations the Rack Temperature Effect term was either assumed to be embedded in the Rack Drift term or set to zero percent of span. However, the effects of rack temperature changes have not been monitored or documented. Therefore, the standard and conservative value of ± 0.5% of span as referenced in STD-EEN-0304, Revision 6 will be used for this calculation.

RTE = ± 0.500% of span **(**Reference 5.1)

RRA = Rack Readability Allowance

Rack Readability Allowance (RRA) is applicable for the indication portion of the loops. This calculation is determining the CSA value associated with the applicable trips and not the indication. Thus,

RRA = ± 0.000% of span **(**Reference 5.1)

Steam Generator Low Level Coincidence Reactor Trip Uncertainty (Normal Conditions)

The Channel Uncertainty for the Steam Generator Low Level Coincident Reactor Trip based on NORMAL conditions is given by the following equation:

$$CSA = SE + PMA_1 \pm [PEA^2 + (SCA + SMTE)^2 + SD^2 + SPE^2 + STE^2 + SPSE^2 + (M1 + M1MTE)^2 + (M2 + M2MTE)^2 + RD^2 + RTE^2]^{1/2}$$

Where:

SE = 0.000% of span
PMA_1 = - 2.659% of span
PEA = 0.000% of span
SCA = 0.250% of span
SMTE = 0.217% of span
SD = 0.280% of span
SPE = 0.577% of span
STE = 1.241% of span
SPSE = 0.060% of span
M1 = 0.000% of span
M1MTE = 0.000% of span
M2 = 0.500% of span
M2MTE = 0.200% of span
RD = 1.000% of span
RTE = 0.500% of span

$$CSA = 0.0 - 2.659 \pm [0.0^2 + (0.25 + 0.217)^2 + 0.28^2 + 0.577^2 + 1.241^2 + 0.060^2 + (0.0 + 0.0)^2 + (0.50 + 0.20)^2 + 1.00^2 + 0.50^2]^{1/2}$$

CSA-NORMAL (SG Low Level Coincidence) = - 0.681% of span to - 4.637% of span = - 0.681% Level to - 4.637% Level

Note: When the resultant CSA is a net negative (-) the actual level is lower than indicated level.

Steam Generator Low Low Level Reactor Trip Uncertainty (Normal Conditions)

The Channel Uncertainty for the Steam Generator Low Low Level Reactor Trip based on NORMAL conditions is given by the following equation:

$$CSA = SE + PMA_2 \pm [PEA^2 + (SCA + SMTE)^2 + SD^2 + SPE^2 + STE^2 + SPSE^2 + (M1 + M1MTE)^2 + (M3 + M3MTE)^2 + RD^2 + RTE^2]^{1/2}$$

Where:

SE = 0.000% of span
PMA_2 = - 2.518% of span
PEA = 0.000% of span
SCA = 0.250% of span
SMTE = 0.217% of span
SD = 0.280% of span
SPE = 0.577% of span
STE = 1.241% of span
SPSE = 0.060% of span
M1 = 0.000% of span
M1MTE = 0.000% of span
M3 = 0.500% of span
M3MTE = 0.200% of span
RD = 1.000% of span
RTE = 0.500% of span

$$CSA = 0.0 - 2.518 \pm [0.0^2 + (0.25 + 0.217)^2 + 0.28^2 + 0.577^2 + 1.241^2 + 0.060^2 + (0.0 + 0.0)^2 + (0.50 + 0.20)^2 + 1.00^2 + 0.50^2]^{1/2}$$

$CSA\text{-}NORMAL_{(SG\ Lo\text{-}1\ Level)}$ = - 0.540% of span to - 4.496% of span = - 0.540% Level to -4.496% Level

Note: When the resultant CSA is a net negative (-) the actual level is lower than indicated level.

Steam Generator Hi Level Turbine Trip & FW Isolation Uncertainty (Normal Conditions)

The Channel Uncertainty for the Steam Generator Hi Level Turbine Trip / FW Isolation for NORMAL conditions is given by the following equation:

$$CSA = SE + PMA_3 \pm [PEA^2 + (SCA + SMTE)^2 + SD^2 + SPE^2 + STE^2 + SPSE^2 + (M1 + M1MTE)^2 + (M3 + M3MTE)^2 + RD^2 + RTE^2]^{1/2}$$

Where:

SE = 0.000% of span
PMA_3 = +5.945% of span
PEA = 0.000% of span
SCA = 0.250% of span
SMTE = 0.217% of span
SD = 0.280% of span
SPE = 0.577% of span
STE = 1.241% of span
SPSE = 0.060% of span
M1 = 0.000% of span
M1MTE = 0.000% of span
M3 = 0.500% of span
M3MTE = 0.200% of span
RD = 1.000% of span
RTE = 0.500% of span

$$CSA = 0.0 + 5.945 \pm [0.0^2 + (0.25 + 0.217)^2 + 0.28^2 + 0.577^2 + 1.241^2 + 0.060^2 + (0.0 + 0.0)^2 + (0.50 + 0.20)^2 + 1.00^2 + 0.50^2]^{1/2}$$

CSA-NORMAL (Hi Level Turb Trip/FW Isol) = + 3.967% of span to + 7.923% of span = + 3.967% Level to + 7.923% Level

Note: When the resultant CSA is a net positive (+) the actual level is higher than indicated level.

Steam Generator AMSAC Low Low Level Turbine Trip / Reactor Trip Uncertainty (Normal Conditions)

The Channel Uncertainty for the Steam Generator AMSAC Low Low Level Turbine Trip / Reactor Trip based on NORMAL conditions is given by the following equation:

$$CSA = SE + PMA_4 \pm [PEA^2 + (SCA + SMTE)^2 + SD^2 + SPE^2 + STE^2 + SPSE^2 + (M1 + M1MTE)^2 + (M4 + M4MTE)^2 + (M5 + M5MTE)^2 + RD^2 + RTE^2]^{1/2}$$

Where:

SE = 0.000% of span
PMA_4 = - 2.408% of span
PEA = 0.000% of span
SCA = 0.250% of span
SMTE = 0.217% of span
SD = 0.280% of span
SPE = 0.577% of span
STE = 1.241% of span
SPSE = 0.060% of span
M1 = 0.000% of span
M1MTE = 0.000% of span
M4 = 0.500% of span
M4MTE = 0.283% of span
M5 = 0.500% of span
M5MTE = 0.200% of span
RD = 1.000% of span
RTE = 0.500% of span

$$CSA = 0.0 - 2.408 \pm [0.0^2 + (0.25 + 0.217)^2 + 0.28^2 + 0.577^2 + 1.241^2 + 0.060^2 + (0.0 + 0.0)^2 + (0.50 + 0.283)^2 + (0.50 + 0.20)^2 + 1.00^2 + 0.50^2]^{1/2}$$

$CSA\text{-}NORMAL_{(SG\ Lo\text{-}1\ Level)}$ = - 0.281% of span to - 4.535% of span = - 0.281% Level to - 4.535% Level

Note: When the resultant CSA is a net negative (-) the actual level is lower than indicated level.

9.0 CONCLUSIONS

The results of this calculation are summarized below:

Steam Generator Low Level Coincidence

CSA-NORMAL (Low Level Coincidence) = - 0.681% Level to - 4.637% Level

Steam Generator Low-Low Level Reactor Trip

CSA-NORMAL (Low Low Level RX Trip) = - 0.540% Level to - 4.496% Level

Steam Generator Hi Level Turbine Trip & FW Isolation

CSA-NORMAL (Hi Level Turb Trip / FW Isol) = + 3.967% Level to + 7.923% Level

Steam Generator AMSAC Low-Low Level Reactor Trip

CSA-NORMAL (AMSAC Low Low Level Turb/RX Trip) = - 0.281% Level to - 4.535% Level

CALCULATION NO:	C11116-5	*ORIGINATOR:*	PDesotelle	*DATE:*	5/6/2004
CALCULATION REV:	0	*REVIEWER:*	JWerner	*DATE:*	5/11/2004

Attachment 4

SG Narrow Range Level, PMA Calculation

Pages: 22

CALCULATION NO:	C11116-5	*ORIGINATOR:*	PDesotelle	*DATE:*	5/6/2004
CALCULATION REV:	0	*REVIEWER:*	JWerner	*DATE:*	5/11/2004

Actual vs. Indicated S/G Level and PMA Calculation for KNPP 7.4% Power Uprate

Purpose:

Determine the Process Measurement Accuracy (PMA) for the Narrow Range Steam Generator Level setpoints and indication The PMA will be used in Loop Accuracy Calculations to determine Total Loop Error.

References:

1 Westinghouse Calculation No. CN-OPES(99)-025, Actual vs. Indicated S/G Level and PMA Input Calculations for Kewaunee RSG.

2. Westinghouse Nuclear Safety Advisory Letter NSAL-02-3, S/G Mid-deck Plate Pressure Loss Issue.

3. Westinghouse Nuclear Safety Advisory Letter NSAL-02-4, Maximum Reliable Indicated S/G Water Level.

4. Westinghouse Nuclear Safety Advisory Letter NSAL-02-5, S/G Water Level Control System Uncertainty Issue.

5. Westinghouse I&CE/POED(02)-49 Maximum Reliable Indicated Level (MIRL) for Kewaunee 7.4% Uprating. April 5, 2002

6. Westinghouse I&CE/POED(02)-32 Rev.-1 Thermal and Hydrolic Parameters Input for Steam Generator Level Process Measurement Accuracy for Kewaunee Power Uprate and RTSR Program. July 11, 2002

7. Westinghouse CN-SSO-02-8 Rev. 0 Kewaunee Steam Generator Water Level Trip Setpoints Uncertainty Calculations for 7.4% Power Uprate, Repacement Steam Generators, and WCAP-15821, Rev.0

Background Notes:

This calculation uses the same methodology as Reference 1. Combining of the PMA uncertainties in an Excel spread sheet to determine bounding PMA values for KNPP Steam generator level setpoint calculations. Reference 1 was accomplished for the Steam Generator Replacement(SGR) project and Reference 7 was accomplished for the KNPP 7.4% Power Uprate. This KNPP generated PMA calculation will use parameters from both Westinghouse generated calculations.

This calculation will use a transmitter calibration curve determined through an iterative process using the PMA calculation to evaluate a best fit and minimize errors.

The (W) Power uprate PMA calculation used High Tave. (573^{O}F) with 0% Tube Plugging and Low Tave. (556 3^{O}F) with 10% tube plugging as bounding conditions and calculated the PMA for a HI-HI and LO-LO setpoint of 78% and 10% respectively.
This calculation will determine the PMA for 78%, 10%, a programmed level of 44%, the KNPP Tech. Spec. value of 15% and KNPP setpoints of 66.5%, 25.5%, 20% and 19% for the bounding conditions. The 78% level is 6 inches above the mid deck plate and is the maximum recommended level. Reference 5.

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Method of Analysis:

The analysis will largely use an Excel spreadsheet to calculate the actual vs. indicated levels. The methodology is similar to that used in Reference 1.

Computer Code used:

The computer code used is Microsoft Excel 97 SR-2 for Windows 95

The steam table conditions were obtained from an Excel add-in called Winsteam from Techware Engineering applications inc., desk top version 3.1.

Inputs / calculations:

Tap to tap height plus thermal expansion, Reference 1

Thermal and Hydraulic parameters, Reference 6

Maximum Reliable Indicated Level (MRIL), Reference 5

Nerative (-) error = actual level lower than indicated
Positive (+) error = actual level higher than indicated

Linear interpolation of the Downcommer temperature (TDC) parameter is used to determine those temperatures for specific levels not included in reference 6.

The Following is a column by column description of the spread sheet

A. Power Level
B. Inches of water above the lower tap
C. Percent level in decimal form.
D. Steam flow (PPH x10E6) from. Reference 6
E. Steam pressure (PSIA) at the tube bundle. Reference 6.
F. Temperature
G. Specific volume of saturated fluid at specified pressure (col.-E) from Winsteam add in.
H. Specific volume of saturated gas at specified pressure (col.-E) from Winsteam add in.
I. Specific volume of the downcommer water at pressure (col.-E) and temperature (col.-F) from Winsteam add in.
J. Differential pressure (PSI) across Mid Deck Plate (MDP) Reference 6.
K. Velocity Head Effect, flow past lower level tap. Reference 6, Square of flow interpolation.
L. Specific volume of the Reference Leg water at pressure (col-E) and temperature 95^{O}F from Winsteam add in
M. Reference Leg Pressure (PSI) = 144.53/(Col-L*1728)
N. Sub-cooled region Process Leg Pressure (PL-1) = 30.27/(Col-I*1728)
O. Saturated water region Process Leg Pressure (PL-2) = (Col-B-30.27)/(Col-G*1728)
P. Saturated Steam region Process Leg Pressure (PL-3) = (144.53-Col-B)/(Col-H*1728)
Q. PL-Total (PSI) Total Process Leg Pressure = SUM(Col-N thru Col-P)

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R. Differential Pressure (DP) across the Xmtr at specified level (PSI) = (Col-M)-(Col-Q) This is the DP due to the differences in Density and height of water between the RL and PL.

S. Xmtr DP minus the MDP effect Plus Velocity effect (PSI)(DP) = (Col-R) - (Col-J) + (Col-K) The MDP has a negative effect and the velocity a positive effect. This is the combined or resultant DP across the Xmtr for the given conditions.

T. The actual water level in the steam generator when the indicated level is at the specified level. The actual DP, Col-S is calculated for a specific height of water and since the actual DP will likely differ from the Xmtr calibrated DP for the specific level. The error is calculated as follows.
The Indicated level is calculated based on the calibrated DP span using the actual DP. [(Col:M,Row:38)-(Col:S)] / (Col:M,Row:39) the result is a % of calibrated span.
This result is then subtracted from the specified % level, the resultant difference will be a positive or negative value. This difference or error is then algebraically added to the specified % level to obtain the actual level when the indicated level is equal to the specified level. IE for a specified level of 78% (78%+(78%-((Col:M,Row:38-Col:S)/Col:M,Row:39)))*100

U. Xmtr calibrated DP for the specified Level. (M38)-(0.78*M39)
Where (M38) = calibration 0% DP, spread sheet location
(M39) = Calibration Span, Spread sheet location

V. Thermal Hydraulic DP error. (Col:R-Col:U)

W. MDP + Velocity DP error. (Col:S - Col:R)

X. MDP + Velocity + thermal Hydrolic errors combined. (Col:S -Col:U)

Y. Thermal Hydrolic % error. (Col:V / M39)

Z. MDP + Velocity % error. (Col:W / M39)

AA. MDP + Velacity + Thermal Hydraulic Errors combined. (Col:X / M39)

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	SG Tap to Tap Includes thermal Expansion(inches)								144 53		Reference 1		
2													
3	Elevation of lower Tap from top of tube sheet(inches)								441 08		Reference 1		
4													
5	Elevation of feeding J-Tube discharge from top of tube sheet(inches)								471 24		Reference 1		
6													
7	Elevation of upper Tap from top of tube sheet(inches)								585 08		Reference 1		
8													
9	Reference Leg Temperature (°F)								95		Reference 5	Assumption	
10													
11	DP for Mid-Deck Plate (psi) worst case 100% power								0 164		Reference 2		
12													
13	Lower Tap to J-Tube Discharge (471 24" - 441 08")+ 11 for thermal expansion								30 27"		Reference 1		
14													
15	Programmed water Level 44% (144 53 * 44) = 63 5932								504 6748		Reference 1		
16													
17	Conversion Factor used to convert from density to pressure psi								1728		Reference 1		
18													
19	Conversion Factor to convert from pressure psi to calibration "H_2O @ 68°F (psi * 27 729648)								27 729648		Reference 1		
20													
21	**Specific Volumes at specified pressures**												
22													
23	Pressure (psia)		200	300	400	500	600	700	800	900	1020		
24													
25	@ 95°F	Ref Leg	0 016105	0 016101	0 016096	0 016091	0 016086	0 016081	0 016076	0 016071	0 016066		
26	V-F	@sat	0 018387	0 018897	0 019343	0 019752	0 020140	0 020514	0 020879	0 021240	0 021672		
27	V-G	@sat	2 288035	1 543446	1 161596	0 928152	0 770162	0 655866	0 569179	0 501069	0 436300		
28													
29	**Reference Leg (RL) and Process Leg (PL) pressures**												
30													
31	RL		5 1933	5 1949	5 1964	5 1980	5 1996	5 2012	5 2027	5 2043	5 206183		
32	PL - High	100% Lvl	4 5489	4 4261	4 3241	4 2344	4 1530	4 0773	4 0059	3 9379	3 859409		
33	PL - Low	0% Lvl	0 0366	0 0542	0 0720	0 0901	0 1086	0 1275	0 1469	0 1669	0 191703		
34													XMTR calibration
35	**Differential Pressure (DP) psi**												
36													
37	DP - High	100% Lvl	0 6444	0 7687	0 8723	0 9636	1 0466	1 1239	1 1968	1 2664	1 3468		1 0818745
38	DP - Low	0% Lvl	5 1567	5 1407	5 1244	5 1079	5 0910	5 0736	5 0558	5 0374	5 0145		4 9405604
39		Span	4 5123	4 3720	4 2521	4 1443	4 0444	3 9498	3 8590	3 7709	3 6677		3 8586858
40													
41	**Differential Pressure (DP) "H2O**												
42													
43	DH - High	100% Lvl	17 8685	21 3163	24 1888	26 7195	29 0229	31 1645	33 1865	35 1179	37 3456		30
44	DH - Low	0% Lvl	142 9943	142 5491	142 0989	141 6404	141 1715	140 6903	140 1952	139 6848	139 0498		137
45													
46	**Calibration error at 44% level indicated for specified pressures**												3 2427386
47													
48	Actual Lvl	%	42 4167	43 4116	44 2531	45 0052	45 6996	46 3546	46 9824	47 5914	48 3065		
49	Error	%	-1 5833	-0 5884	0 2531	1 0052	1 6996	2 3546	2 9824	3 5914	4 3065		

	A	B	C	D	E	F	G	H	I	J	K	L	M
50													
51	**Hi Tave, 0% TP, MRIL, 78%**												
52													
53										Mid-Deck	Velocity		RL
54	POWER	SG LEVEL	SG Level	STM Flow	P-STM	TDC	V-F	V-G	V-DC	DP	Effect	V=RL	pressure
55	%	" above LT	%	PPH x 10E6	PSIA	DEG F	@ P-STM	@ P-STM		PSI	PSI		PSI
56													
57	100	112 7334	0 78	3 883	793 5	499 22	0 020855	0 574175	0 020397	0 164	0 0010422	0 016076	5 20263
58	90	112 7334	0 78	3 46	809 9	501 64	0 020915	0 561718	0 020451	0 147	0 0008275	0 016076	5 20289
59	80	112 7334	0 78	3 041	826 9	504 32	0 020976	0 549306	0 020512	0 129	0 0006392	0 016075	5 20316
60	70	112 7334	0 78	2 629	844 5	507 32	0 021040	0 536961	0 020582	0 111	0 0004777	0 016074	5 20343
61	60	112 7334	0 78	2 22	863 5	510 62	0 021108	0 524176	0 020661	0 094	0 0003407	0 016073	5 20373
62	50	112 7334	0 78	1 82	883 1	514 32	0 021179	0 511540	0 020751	0 077	0 0002290	0 016072	5 20404
63	40	112 7334	0 78	1 421	903 5	518 04	0 021253	0 498947	0 020844	0 060	0 0001396	0 016071	5 20436
64	30	112 7334	0 78	1 037	926 2	522 62	0 021334	0 485559	0 020963	0 044	0 0000743	0 016070	5 20471
65	20	112 7334	0 78	0 674	950 0	528 24	0 021420	0 472181	0 021114	0 029	0 0000314	0 016069	5 20509
66	10	112 7334	0 78	0 322	976 9	534 82	0 021517	0 457811	0 021299	0 014	0 0000072	0 016068	5 20551
67	0	112 7334	0 78	0	1020 0	547	0 021672	0 436300	0 021670	0 000	0 0000000	0 016066	5 20618
68													
69													
70	**HI T Ave, 0% TP, HI-HI Setpoint 66 5%**												
71													
72										Mid-Deck	Velocity		RL
73	POWER	SG LEVEL	SG Level	STM Flow	P-STM	TDC	V-F	V-G	V-DC	DP	Effect	V=RL	pressure
74	%	" above LT	%	PPH x 10E6	PSIA	DEG F	@ P-STM	@ P-STM		PSI	PSI		PSI
75													
76	100	96 1125	0 665	3 883	793 5	498 8	0 020855	0 574175	0 020386	0 164	0 0010422	0 016076	5 20263
77	90	96 1125	0 665	3 46	809 9	501 2	0 020915	0 561718	0 020441	0 147	0 0008275	0 016076	5 20289
78	80	96 1125	0 665	3 041	826 9	503 9	0 020976	0 549306	0 020501	0 129	0 0006392	0 016075	5 20316
79	70	96 1125	0 665	2 629	844 5	506 9	0 021040	0 536961	0 020571	0 111	0 0004777	0 016074	5 20343
80	60	96 1125	0 665	2 22	863 5	510 2	0 021108	0 524176	0 020649	0 094	0 0003407	0 016073	5 20373
81	50	96 1125	0 665	1 82	883 1	513 9	0 021179	0 511540	0 020739	0 077	0 0002290	0 016072	5 20404
82	40	96 1125	0 665	1 421	903 5	517 6	0 021253	0 498947	0 020833	0 060	0 0001396	0 016071	5 20436
83	30	96 1125	0 665	1 037	926 2	522 2	0 021334	0 485559	0 020950	0 044	0 0000743	0 016070	5 20471
84	20	96 1125	0 665	0 674	950 0	527 8	0 021420	0 472181	0 021102	0 029	0 0000314	0 016069	5 20509
85	10	96 1125	0 665	0 322	976 9	534 4	0 021517	0 457811	0 021285	0 014	0 0000072	0 016068	5 20551
86	0	96 1125	0 665	0	1020 0	547 0	0 021672	0 436300	0 021670	0 000	0 0000000	0 016066	5 20618
87													

CALCULATION NO: C11116-5 *ORIGINATOR:* PDesotelle *DATE:* 5/6/2004

CALCULATION REV: 0 *REVIEWER:* JWerner *DATE:* 5/11/2004

	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA
50														
51	**Hi Tave, 0% TP, MRIL, 78%**										**Hi Tave, 0% TP, MRIL, 78%**			
52						Minus								
53	PL-1	PL-2	PL-3	PL-Total	DP-XMTR	MDP DP	Actual	XMTR	TH	MDP + V	MDP + TH	TH only	MDP+V	MDP + TH
54	subcooled	sat water	sat steam		@ 78% LVL	+ Velocity	Level	CALIB DP	DP Error	DP Error	DP Error	%	%	%
55	PSI	PSI	PSI	PSI	PSI	PSI	@78% Ind	@ 78% LVL	PSI	PSI	PSI	Error	Error	Error
56														
57	0 85883	2 28823	0 03205	3 17911	2 02353	1 86057	76 18026	1 93079	0 0927	-0 1630	-0 07022	2 4034%	-4 2231%	-1 8197%
58	0 85655	2 28172	0 03276	3 17104	2 03186	1 88568	76 83115	1 93079	0 1011	-0 1462	-0 04510	2 6193%	-3 7881%	-1 1689%
59	0 85400	2 27503	0 03350	3 16253	2 04063	1 91227	77 52019	1 93079	0 1098	-0 1284	-0 01851	2 8467%	-3 3265%	-0 4798%
60	0 85109	2 26816	0 03427	3 15351	2 04992	1 93940	78 22321	1 93079	0 1191	-0 1105	0 00861	3 0875%	-2 8642%	0 2232%
61	0 84785	2 26079	0 03510	3 14374	2 05999	1 96633	78 92111	1 93079	0 1292	-0 0937	0 03554	3 3483%	-2 4272%	0 9211%
62	0 84415	2 25325	0 03597	3 13337	2 07066	1 99389	79 63549	1 93079	0 1399	-0 0768	0 06311	3 6251%	-1 9896%	1 6355%
63	0 84039	2 24547	0 03688	3 12273	2 08163	2 02177	80 35786	1 93079	0 1508	-0 0553	0 09098	3 9092%	-1 5513%	2 3579%
64	0 83564	2 23687	0 03790	3 11041	2 09430	2 05038	81 09928	1 93079	0 1635	-0 0439	0 11959	4 2376%	-1 1384%	3 0993%
65	0 82966	2 22793	0 03897	3 09656	2 10853	2 07956	81 85560	1 93079	0 1777	-0 0290	0 14878	4 6063%	-0 7507%	3 8556%
66	0 82244	2 21791	0 04019	3 08055	2 12496	2 11097	82 66957	1 93079	0 1942	-0 0140	0 18018	5 0322%	-0 3626%	4 6696%
67	0 80838	2 20203	0 04217	3 05259	2 15359	2 15359	83 77418	1 93079	0 2228	0 0000	0 22281	5 7742%	0 0000%	5 7742%
68														
69														
70	**Hi T Ave, 0% TP, HI-HI Setpoint 66.5%**										**HI T Ave, 0% TP, HI-HI Setpoint 66.5%**			
71						Minus								
72	PL-1	PL-2	PL-3	PL-Total	DP-XMTR	MDP DP	Actual	XMTR	TH	MDP + V	MDP + TH	TH only	MDP+V	MDP + TH
73	subcooled	sat water	sat steam		@ 66 5% LVL	+ Velocity	Level	CALIB DP	DP Error	DP Error	DP Error	%	%	%
74	PSI	PSI	PSI	PSI	PSI	PSI	@66 5% Ind	@66 5% LVL	PSI	PSI	PSI	Error	Error	Error
75														
76	0 85929	1 82702	0 04880	2 73512	2 46752	2 30456	64 68655	2 37453	0 0930	-0 1630	-0 06998	2 4097%	-4 2231%	-1 8134%
77	0 85697	1 82183	0 04988	2 72869	2 47421	2 32803	65 29491	2 37453	0 0997	-0 1462	-0 04650	2 5831%	-3 7881%	-1 2051%
78	0 85447	1 81649	0 05101	2 72196	2 48120	2 35264	65 93767	2 37453	0 1067	-0 1284	-0 02170	2 7642%	-3 3265%	-0 5623%
79	0 85156	1 81100	0 05218	2 71474	2 48869	2 37817	66 59421	2 37453	0 1142	-0 1105	0 00364	2 9585%	-2 8642%	0 0942%
80	0 84833	1 80512	0 05345	2 70690	2 49683	2 40317	67 24215	2 37453	0 1223	-0 0937	0 02864	3 1694%	-2 4272%	0 7422%
81	0 84464	1 79910	0 05477	2 69851	2 50553	2 42876	67 90522	2 37453	0 1310	-0 0768	0 05422	3 3948%	-1 9896%	1 4052%
82	0 84063	1 79288	0 05616	2 68987	2 51449	2 45463	68 57568	2 37453	0 1400	-0 0599	0 08009	3 6270%	-1 5513%	2 0757%
83	0 83615	1 78602	0 05771	2 67987	2 52484	2 48092	69 25692	2 37453	0 1503	-0 0439	0 10638	3 8953%	-1 1384%	2 7569%
84	0 83012	1 77888	0 05934	2 66834	2 53674	2 50777	69 95289	2 37453	0 1622	-0 0290	0 13324	4 2037%	-0 7507%	3 4530%
85	0 82297	1 77088	0 06120	2 65506	2 55045	2 53646	70 69633	2 37453	0 1759	-0 0140	0 16192	4 5590%	-0 3626%	4 1963%
86	0 80838	1 75820	0 06422	2 63080	2 57538	2 57538	71 70501	2 37453	0 2008	0 0000	0 20084	5 2050%	0 0000%	5 2050%
87														

CALCULATION NO: C11116-5 **ORIGINATOR:** PDesotelle **DATE:** 5/6/2004

CALCULATION REV: 0 **REVIEWER:** JWerner **DATE:** 5/11/2004

	A	B	C	D	E	F	G	H	I	J	K	L	M
88													
89	Hi TAVG, 0%TP, Programmed Level, 44%												
90													
91										Mid-Deck	Velocity		RL
92	POWER	SG LEVEL	SG Level	STM Flow	P-STM	TDC	V-F	V-G	V-DC	DP	Effect	V=RL	pressure
93	%	" above LT	%	PPH x 10E6	PSIA	DEG F	@ P-STM	@ P-STM		PSI	PSI		PSI
94													
95	100	63 5932	0 44	3 883	793 5	497 8	0 020855	0 574175	0 020363	0 164	0 0010422	0 016076	5 20263
96	90	63 5932	0 44	3 46	809 9	500 3	0 020915	0 561718	0 020419	0 147	0 0008275	0 016076	5 20289
97	80	63 5932	0 44	3 041	826 9	502 9	0 020976	0 549306	0 020478	0 129	0 0006392	0 016075	5 20316
98	70	63 5932	0 44	2 629	844 5	505 9	0 021040	0 536961	0 020547	0 111	0 0004777	0 016074	5 20343
99	60	63 5932	0 44	2 22	863 5	509 2	0 021108	0 524176	0 020625	0 094	0 0003407	0 016073	5 20373
100	50	63 5932	0 44	1 82	883 1	512 8	0 021179	0 511540	0 020712	0 077	0 0002290	0 016072	5 20404
101	40	63 5932	0 44	1 421	903 5	516 6	0 021253	0 498947	0 020806	0 060	0 0001396	0 016071	5 20436
102	30	63 5932	0 44	1 037	926 2	521 1	0 021334	0 485559	0 020921	0 044	0 0000743	0 016070	5 20471
103	20	63 5932	0 44	0 674	950 0	526 7	0 021420	0 472181	0 021070	0 029	0 0000314	0 016069	5 20509
104	10	63 5932	0 44	0 322	976 9	533 3	0 021517	0 457811	0 021254	0 014	0 0000072	0 016068	5 20551
105	0	63 5932	0 44	0	1020 0	547 0	0 021672	0 436300	0 021672	0 000	0 0000000	0 016066	5 20618
106													
107													
108	Hi T Ave, 0% TP, LO Setpoint 25.5%												
109													
110										Mid-Deck	Velocity		RL
111	POWER	SG LEVEL	SG Level	STM Flow	P-STM	TDC	V-F	V-G	V-DC	DP	Effect	V=RL	pressure
112	%	" above LT	%	PPH x 10E6	PSIA	DEG F	@ P-STM	@ P-STM		PSI	PSI		PSI
113													
114	100	36 8552	0 255	3 883	793 5	497 0	0 020855	0 574175	0 020344	0 164	0 0010422	0 016076	5 20263
115	90	36 8552	0 255	3 46	809 9	499 4	0 020915	0 561718	0 020397	0 147	0 0008275	0 016076	5 20289
116	80	36 8552	0 255	3 041	826 9	502 0	0 020976	0 549306	0 020455	0 129	0 0006392	0 016075	5 20316
117	70	36 8552	0 255	2 629	844 5	505 0	0 021040	0 536961	0 020524	0 111	0 0004777	0 016074	5 20343
118	60	36 8552	0 255	2 22	863 5	508 3	0 021108	0 524176	0 020602	0 094	0 0003407	0 016073	5 20373
119	50	36 8552	0 255	1 82	883 1	511 9	0 021179	0 511540	0 020688	0 077	0 0002290	0 016072	5 20404
120	40	36 8552	0 255	1 421	903 5	515 6	0 021253	0 498947	0 020780	0 060	0 0001396	0 016071	5 20436
121	30	36 8552	0 255	1 037	926 2	520 1	0 021334	0 485559	0 020895	0 044	0 0000743	0 016070	5 20471
122	20	36 8552	0 255	0 674	950 0	525 7	0 021420	0 472181	0 021043	0 029	0 0000314	0 016069	5 20509
123	10	36 8552	0 255	0 322	976 9	532 1	0 021517	0 457811	0 021218	0 014	0 0000072	0 016068	5 20551
124	0	36 8552	0 255	0	1020 0	547 0	0 021672	0 436300	0 021670	0 000	0 0000000	0 016066	5 20618
125													

CALCULATION NO: C11116-5 *ORIGINATOR:* PDesotelle *DATE:* 5/6/2004

CALCULATION REV: 0 *REVIEWER:* JWerner *DATE:* 5/11/2004

	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA
88														
89	**Hi TAVG, 0%TP, Programmed Level, 44%**										**Hi TAVG, 0%TP, Programmed Level, 44%**			
90						Minus								
91	PL-1	PL-2	PL-3	PL-Total	DP-XMTR	MDP DP	Actual	XMTR	TH	MDP + V	MDP + TH	TH only	MDP+V	MDP + TH
92	subcooled	sat water	sat steam		@ 44% LVL	+ Velocity	Level	CALIB DP	DP Error	DP Error	DP Error	%	%	%
93	PSI	PSI	PSI	PSI	PSI	PSI	@44% Ind	@ 44% LVL	PSI	PSI	PSI	Error	Error	Error
94														
95	0 86025	0 92467	0 08158	1 86650	3 33614	3 17318	42 1974	3 24274	0 0934	-0 1630	-0 06956	2 4205%	-4 2231%	-1 8026%
96	0 85791	0 92204	0 08338	1 86333	3 33956	3 19339	42 7211	3 24274	0 0968	-0 1462	-0 04935	2 5093%	-3 7881%	-1 2789%
97	0 85544	0 91933	0 08527	1 86005	3 34311	3 21475	43 2747	3 24274	0 1004	-0 1284	-0 02799	2 6013%	-3 3265%	-0 7253%
98	0 85255	0 91655	0 08723	1 85634	3 34710	3 23658	43 8403	3 24274	0 1044	-0 1105	-0 00616	2 7045%	-2 8642%	-0 1597%
99	0 84933	0 91358	0 08936	1 85227	3 35147	3 25781	44 3905	3 24274	0 1087	-0 0937	0 01507	2 8177%	-2 4272%	0 3905%
100	0 84576	0 91053	0 09156	1 84786	3 35618	3 27941	44 9504	3 24274	0 1134	-0 0768	0 03667	2 9400%	-1 9896%	0 9504%
101	0 84193	0 90739	0 09387	1 84320	3 36116	3 30130	45 5177	3 24274	0 1184	-0 0599	0 05856	3 0691%	-1 5513%	1 5177%
102	0 83731	0 90391	0 09646	1 83769	3 36703	3 32310	46 0827	3 24274	0 1243	-0 0439	0 08036	3 2210%	-1 1384%	2 0827%
103	0 83139	0 90030	0 09920	1 83088	3 37420	3 34524	46 6563	3 24274	0 1315	-0 0290	0 10250	3 4070%	-0 7507%	2 6563%
104	0 82420	0 89625	0 10231	1 82276	3 38275	3 36875	47 2657	3 24274	0 1400	-0 0140	0 12601	3 6284%	-0 3626%	3 2657%
105	0 80830	0 88984	0 10735	1 80549	3 40069	3 40069	48 0934	3 24274	0 1580	0 0000	0 15795	4 0934%	0 0000%	4 0934%
106														
107														
108	**HI T Ave, 0% TP, LO Setpoint 25.5%**											**Hi T Ave, 0% TP, LO Setpoint 25.5%**		
109						Minus								
110	PL-1	PL-2	PL-3	PL-Total	DP-XMTR	MDP DP	Actual	XMTR	TH	MDP + V	MDP + TH	TH only	MDP+V	MDP + TH
111	subcooled	sat water	sat steam		@25 5% LVL	+ Velocity	Level	CALIB DP	DP Error	DP Error	DP Error	%	%	%
112	PSI	PSI	PSI	PSI	PSI	PSI	@25 5% Ind	@ 25 5% LVL	PSI	PSI	PSI	Error	Error	Error
113														
114	0 86108	0 18273	0 10852	1 15233	4 05031	3 88735	23 70544	3 95660	0 0937	-0 1630	-0 06925	2 4286%	-4 2231%	-1 7946%
115	0 85884	0 18221	0 11093	1 15198	4 05092	3 90474	24 15623	3 95660	0 0943	-0 1462	-0 05185	2 4444%	-3 7881%	-1 3438%
116	0 85638	0 18167	0 11344	1 15149	4 05166	3 92330	24 63724	3 95660	0 0951	-0 1284	-0 03329	2 4638%	-3 3265%	-0 8628%
117	0 85350	0 18112	0 11605	1 15067	4 05276	3 94224	25 12797	3 95660	0 0962	-0 1105	-0 01436	2 4922%	-2 8642%	-0 3720%
118	0 85029	0 18054	0 11888	1 14971	4 05403	3 96037	25 59775	3 95660	0 0974	-0 0937	0 00377	2 5250%	-2 4272%	0 0977%
119	0 84674	0 17993	0 12181	1 14846	4 05556	3 97879	26 07507	3 95660	0 0990	-0 0768	0 02219	2 5646%	-1 9896%	0 5751%
120	0 84297	0 17931	0 12489	1 14717	4 05719	3 99733	26 55557	3 95660	0 1006	-0 0599	0 04073	2 6069%	-1 5513%	1 0556%
121	0 83837	0 17863	0 12833	1 14533	4 05939	4 01546	27 02558	3 95660	0 1028	-0 0439	0 05887	2 6639%	-1 1384%	1 5256%
122	0 83247	0 17791	0 13197	1 14235	4 06274	4 03377	27 50000	3 95660	0 1061	-0 0290	0 07717	2 7507%	-0 7507%	2 0000%
123	0 82560	0 17711	0 13611	1 13882	4 06669	4 05269	27 99047	3 95660	0 1101	-0 0140	0 09610	2 8531%	-0 3626%	2 4905%
124	0 80838	0 17584	0 14262	1 12704	4 07914	4 07914	28 67578	3 95660	0 1225	0 0000	0 12254	3 1758%	0 0000%	3 1758%
125														

	A	B	C	D	E	F	G	H	I	J	K	L	M
126													
127	Hi T Ave, 0% TP, LO-LO Setpoint 17%												
128													
129										Mid-Deck	Velocity		RL
130	POWER	SG LEVEL	SG Level	STM Flow	P-STM	TDC	V-F	V-G	V-DC	DP	Effect	V=RL	pressure
131	%	" above LT	%	PPH x 10E6	PSIA	DEG F	@ P-STM	@ P-STM		PSI	PSI		PSI
132													
133	100	24 5701	0 17	3 883	793 5	496 5	0 020855	0 574175	0 020333	0 164	0 0010422	0 016076	5 20263
134	90	24 5701	0 17	3 46	809 9	498 9	0 020915	0 561718	0 020386	0 147	0 0008275	0 016076	5 20289
135	80	24 5701	0 17	3 041	826 9	501 5	0 020976	0 549306	0 020444	0 129	0 0006392	0 016075	5 20316
136	70	24 5701	0 17	2 629	844 5	504 5	0 021040	0 536961	0 020513	0 111	0 0004777	0 016074	5 20343
137	60	24 5701	0 17	2 22	863 5	507 8	0 021108	0 524176	0 020590	0 094	0 0003407	0 016073	5 20373
138	50	24 5701	0 17	1 82	883 1	511 4	0 021179	0 511540	0 020676	0 077	0 0002290	0 016072	5 20404
139	40	24 5701	0 17	1 421	903 5	515 1	0 021253	0 498947	0 020767	0 060	0 0001396	0 016071	5 20436
140	30	24 5701	0 17	1 037	926 2	519 6	0 021334	0 485559	0 020880	0 044	0 0000743	0 016070	5 20471
141	20	24 5701	0 17	0 674	950 0	525 2	0 021420	0 472181	0 021027	0 029	0 0000314	0 016069	5 20509
142	10	24 5701	0 17	0 322	976 9	531 5	0 021517	0 457811	0 021199	0 014	0 0000072	0 016068	5 20551
143	0	24 5701	0 17	0	1020 0	547 0	0 021672	0 436300	0 021670	0 000	0 0000000	0 016066	5 20618
144													
145													
146	Hi T Ave, 0% TP, LO-LO Setpoint 13% (AMSAC)												
147													
148										Mid-Deck	Velocity		RL
149	POWER	SG LEVEL	SG Level	STM Flow	P-STM	TDC	V-F	V-G	V-DC	DP	Effect	V=RL	pressure
150	%	" above LT	%	PPH x 10E6	PSIA	DEG F	@ P-STM	@ P-STM		PSI	PSI		PSI
151													
152	100	18 7889	0 13	3 883	793 5	496 3	0 020855	0 574175	0 020327	0 164	0 0010422	0 016076	5 20263
153	90	18 7889	0 13	3 46	809 9	498 7	0 020915	0 561718	0 020380	0 147	0 0008275	0 016076	5 20289
154	80	18 7889	0 13	3 041	826 9	501 3	0 020976	0 549306	0 020438	0 129	0 0006392	0 016075	5 20316
155	70	18 7889	0 13	2 629	844 5	504 3	0 021040	0 536961	0 020507	0 111	0 0004777	0 016074	5 20343
156	60	18 7889	0 13	2 22	863 5	507 6	0 021108	0 524176	0 020584	0 094	0 0003407	0 016073	5 20373
157	50	18 7889	0 13	1 82	883 1	511 2	0 021179	0 511540	0 020670	0 077	0 0002290	0 016072	5 20404
158	40	18 7889	0 13	1 421	903 5	514 9	0 021253	0 498947	0 020761	0 060	0 0001396	0 016071	5 20436
159	30	18 7889	0 13	1 037	926 2	519 3	0 021334	0 485559	0 020872	0 044	0 0000743	0 016070	5 20471
160	20	18 7889	0 13	0 674	950 0	524 9	0 021420	0 472181	0 021020	0 029	0 0000314	0 016069	5 20509
161	10	18 7889	0 13	0 322	976 9	531 1	0 021517	0 457811	0 021190	0 014	0 0000072	0 016068	5 20551
162	0	18 7889	0 13	0	1020 0	547 0	0 021672	0 436300	0 021670	0 000	0 0000000	0 016066	5 20618
163													

CALCULATION NO: C11116-5 ORIGINATOR: PDesotelle DATE: 5/6/2004

CALCULATION REV: 0 REVIEWER: JWerner DATE: 5/11/2004

	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA
126														
127	Hi T Ave, 0% TP, LO-LO Setpoint 17%							Hi T Ave, 0% TP, LO-LO Setpoint 17%						
128						Minus								
129	PL-1	PL-2	PL-3	PL-Total	DP-XMTR	MDP DP	Actual	XMTR	TH	MDP + V	MDP + TH	TH only	MDP+V	MDP + TH
130	subcooled	sat water	sat steam		@ 17% LVL	+ Velocity	Level	CALIB DP	DP Error	DP Error	DP Error	%	%	%
131	PSI	PSI	PSI	PSI	PSI	PSI	@17% Ind	@ 17% LVL	PSI	PSI	PSI	Error	Error	Error
132														
133	0 69930	0 00000	0 12091	0 82021	4 38243	4 21947	15 31254	4 28458	0 0978	-0 1630	-0 06511	2 5357%	-4 2231%	-1 6875%
134	0 69749	0 00000	0 12359	0 82107	4 38182	4 23565	15 73174	4 28458	0 0972	-0 1462	-0 04894	2 5199%	-3 7881%	-1 2683%
135	0 69550	0 00000	0 12638	0 82188	4 38128	4 25292	16 17942	4 28458	0 0967	-0 1284	-0 03166	2 5060%	-3 3265%	-0 8206%
136	0 69316	0 00000	0 12929	0 82245	4 38099	4 27046	16 63405	4 28458	0 0964	-0 1105	-0 01412	2 4983%	-2 8642%	-0 3660%
137	0 69056	0 00000	0 13244	0 82300	4 38073	4 28707	17 06443	4 28458	0 0961	-0 0937	0 00249	2 4917%	-2 4272%	0 0644%
138	0 68768	0 00000	0 13571	0 82339	4 38065	4 30368	17 49997	4 28458	0 0961	-0 0768	0 01929	2 4895%	-1 9896%	0 5000%
139	0 68468	0 00000	0 13914	0 82382	4 38054	4 32068	17 93551	4 28458	0 0960	-0 0599	0 03610	2 4868%	-1 5513%	0 9355%
140	0 68098	0 00000	0 14297	0 82395	4 38076	4 33684	18 35419	4 28458	0 0962	-0 0439	0 05225	2 4926%	-1 1384%	1 3542%
141	0 67620	0 00000	0 14702	0 82323	4 38186	4 35289	18 77027	4 28458	0 0973	-0 0290	0 06831	2 5210%	-0 7507%	1 7703%
142	0 67072	0 00000	0 15164	0 82236	4 38315	4 36916	19 19182	4 28458	0 0986	-0 0140	0 08458	2 5544%	-0 3626%	2 1918%
143	0 65616	0 00000	0 15911	0 81527	4 39091	4 39091	19 75546	4 28458	0 1063	0 0000	0 10632	2 7555%	0 0000%	2 7555%
144														
145														
146	Hi T Ave, 0% TP, LO-LO Setpoint 13% (AMSAC)							Hi T Ave, 0% TP, LO-LO Setpoint 13% (AMSAC)						
147						Minus								
148	PL-1	PL-2	PL-3	PL-Total	DP-XMTR	MDP DP	Actual	XMTR	TH	MDP + V	MDP + TH	TH only	MDP+V	MDP + TH
149	subcooled	sat water	sat steam		@ 13% LVL	+ Velocity	Level	CALIB DP	DP Error	DP Error	DP Error	%	%	%
150	PSI	PSI	PSI	PSI	PSI	PSI	@13% Ind	@ 13% LVL	PSI	PSI	PSI	Error	Error	Error
151														
152	0 53491	0 00000	0 12673	0 66164	4 54099	4 37804	11 42188	4 43893	0 1021	-0 1630	-0 06089	2 6450%	-4 2231%	-1 5781%
153	0 53352	0 00000	0 12954	0 66306	4 53983	4 39365	11 82664	4 43893	0 1009	-0 1462	-0 04528	2 6148%	-3 7881%	-1 1734%
154	0 53200	0 00000	0 13247	0 66447	4 53869	4 41033	12 25867	4 43893	0 0998	-0 1284	-0 02861	2 5852%	-3 3265%	-0 7413%
155	0 53022	0 00000	0 13552	0 66573	4 53770	4 42718	12 69539	4 43893	0 0988	-0 1105	-0 01175	2 5596%	-2 8642%	-0 3046%
156	0 52823	0 00000	0 13892	0 66705	4 53668	4 44302	13 10593	4 43893	0 0977	-0 0937	0 00409	2 5332%	-2 4272%	0 1059%
157	0 52603	0 00000	0 14225	0 66828	4 53576	4 45899	13 51976	4 43893	0 0968	-0 0768	0 02006	2 5093%	-1 9896%	0 5198%
158	0 52374	0 00000	0 14584	0 66958	4 53478	4 47492	13 93266	4 43893	0 0958	-0 0599	0 03599	2 4840%	-1 5513%	0 9327%
159	0 52094	0 00000	0 14986	0.67080	4 53392	4 48999	14 32321	4 43893	0 0950	-0 0439	0 05106	2 4616%	-1 1384%	1 3232%
160	0 51729	0 00000	0 15411	0 67140	4 53369	4 50472	14 70498	4 43893	0 0948	-0 0290	0 06579	2 4557%	-0 7507%	1 7050%
161	0 51313	0 00000	0 15895	0 67208	4 53343	4 51944	15 08644	4 43893	0 0945	-0 0140	0 08051	2 4491%	-0 3626%	2 0864%
162	0 50177	0 00000	0 16678	0 66855	4 53763	4 53763	15 55786	4 43893	0 0987	0 0000	0 09870	2 5579%	0 0000%	2 5579%
163														

	A	B	C	D	E	F	G	H	I	J	K	L	M
164													
165	**HI T Ave, 0% TP, Tech. Spec. 5%**												
166													
167													
168	POWER	SG LEVEL	SG Level	STM Flow	P-STM	TDC	V-F	V-G	V-DC	Mid-Deck DP	Velocity Effect	V=RL	RL pressure
169	%	" above LT	%	PPH x 10E6	PSIA	DEG F	@ P-STM	@ P-STM		PSI	PSI		PSI
170													
171	100	7 2265	0 05	3 883	793 5	495 8	0 020855	0 574175	0 020316	0 164	0 0010422	0 016076	5 20263
172	90	7.2265	0 05	3 46	809 9	498 2	0 020915	0 561718	0 020369	0 147	0 0008275	0 016076	5 20289
173	80	7 2265	0 05	3 041	826 9	500 8	0 020976	0 549306	0 020427	0 129	0 0006392	0 016075	5 20316
174	70	7 2265	0 05	2 629	844 5	503 8	0 021040	0 536961	0 020495	0 111	0 0004777	0 016074	5 20343
175	60	7 2265	0 05	2 22	863 5	507 1	0 021108	0 524176	0 020572	0 094	0 0003407	0 016073	5 20373
176	50	7 2265	0 05	1 82	883 1	510 7	0 021179	0 511540	0 020657	0 077	0 0002290	0 016072	5 20404
177	40	7 2265	0 05	1 421	903 5	514 4	0 021253	0 498947	0 020747	0 060	0 0001396	0 016071	5 20436
178	30	7 2265	0 05	1 037	926 2	518 8	0 021334	0 485559	0 020857	0 044	0 0000743	0 016070	5 20471
179	20	7 2265	0 05	0 674	950 0	524 3	0 021420	0 472181	0 021003	0 029	0 0000314	0 016069	5 20509
180	10	7 2265	0 05	0 322	976 9	530 4	0 021517	0 457811	0 021168	0 014	0 0000072	0 016068	5 20551
181	0	7 2265	0 05	0	1020 0	547 0	0 021672	0 436300	0 021670	0 000	0 0000000	0 016066	5 20618
182													
183													
184	**HI T Ave, 0% TP, Anaalytical Limit 0%**												
185													
186													
187	POWER	SG LEVEL	SG Level	STM Flow	P-STM	TDC	V-F	V-G	V-DC	Mid-Deck DP	Velocity Effect	V=RL	RL pressure
188	%	" above LT	%	PPH x 10E6	PSIA	DEG F	@ P-STM	@ P-STM		PSI	PSI		PSI
189													
190	100	0 0000	0	3 883	793 5	495 5	0 020855	0 574175	0 020309	0 164	0 0010422	0 016076	5 20263
191	90	0 0000	0	3 46	809 9	497 9	0 020915	0 561718	0 020362	0 147	0 0008275	0 016076	5 20289
192	80	0 0000	0	3 041	826 9	500 5	0 020976	0 549306	0 020420	0 129	0 0006392	0 016075	5 20316
193	70	0 0000	0	2 629	844 5	503 5	0 021040	0 536961	0 020488	0 111	0 0004777	0 016074	5 20343
194	60	0 0000	0	2 22	863 5	506 8	0 021108	0 524176	0 020565	0 094	0 0003407	0 016073	5 20373
195	50	0 0000	0	1 82	883 1	510 3	0 021179	0 511540	0 020648	0 077	0 0002290	0 016072	5 20404
196	40	0 0000	0	1 421	903 5	514 0	0 021253	0 498947	0 020738	0 060	0 0001396	0 016071	5 20436
197	30	0 0000	0	1 037	926 2	518 4	0 021334	0 485559	0 020848	0 044	0 0000743	0 016070	5 20471
198	20	0 0000	0	0 674	950 0	523 9	0 021420	0 472181	0 020991	0 029	0 0000314	0 016069	5 20509
199	10	0 0000	0	0 322	976 9	529 9	0 021517	0 457811	0 021154	0 014	0 0000072	0 016068	5 20551
200	0	0 0000	0	0	1020 0	547 0	0 021672	0 436300	0 021670	0 000	0 0000000	0 016066	5 20618
201													

CALCULATION NO: C11116-5 *ORIGINATOR:* PDesotelle *DATE:* 5/6/2004

CALCULATION REV: 0 *REVIEWER:* JWerner *DATE:* 5/11/2004

	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA
164														
165	Hi T Ave, 0% TP, Tech. Spec. 5%							Hi T Ave, 0% TP, Tech. Spec. 5%						
166						Minus								
167	PL-1	PL-2	PL-3	PL-Total	DP-XMTR	MDP DP	Actual	XMTR	TH	MDP + V	MDP + TH	TH only	MDP+V	MDP + TH
168	subcooled	sat water	sat steam		@ 5% LVL	+ Velocity	Level	CALIB DP	DP Error	DP Error	DP Error	%	%	%
169	PSI	PSI	PSI	PSI	PSI	PSI	@ 5% Ind	@ 5% LVL	PSI	PSI	PSI	Error	Error	Error
170														
171	0 20585	0 00000	0 13839	0 34423	4 85840	4 69544	3 64765	4 74763	0 1108	-0 1630	-0 05218	2 8708%	-4 2231%	-1 3523%
172	0 20531	0 00000	0 14146	0 34677	4 85612	4 70995	4 02358	4 74763	0 1085	-0 1462	-0 03768	2 8117%	-3 7881%	-0 9764%
173	0 20473	0 00000	0 14465	0 34938	4 85378	4 72541	4 42437	4 74763	0 1061	-0 1284	-0 02221	2 7509%	-3 3265%	-0 5756%
174	0 20405	0 00000	0 14798	0 35202	4 85141	4 74089	4 82537	4 74763	0 1038	-0 1105	-0 00674	2 6896%	-2 8642%	-0 1746%
175	0 20328	0 00000	0 15159	0 35487	4 84886	4 75520	5 19632	4 74763	0 1012	-0 0937	0 00758	2 6236%	-2 4272%	0 1963%
176	0 20245	0 00000	0 15533	0 35778	4 84626	4 76949	5 56649	4 74763	0 0986	-0 0768	0 02186	2 5561%	-1 9896%	0 5665%
177	0 20157	0 00000	0 15925	0 36082	4 84354	4 78367	5 93423	4 74763	0 0959	-0 0599	0 03605	2 4855%	-1 5513%	0 9342%
178	0 20051	0 00000	0 16364	0 36415	4 84057	4 79664	6 27026	4 74763	0 0929	-0 0439	0 04902	2 4086%	-1 1384%	1 2703%
179	0 19912	0 00000	0 16828	0 36740	4 83769	4 80872	6 58330	4 74763	0 0901	-0 0290	0 06109	2 3340%	-0 7507%	1 5833%
180	0 19756	0 00000	0 17356	0 37112	4 83439	4 82040	6 88587	4 74763	0 0868	-0 0140	0 07277	2 2485%	-0 3626%	1 8859%
181	0 19299	0 00000	0 18212	0 37511	4 83108	4 83108	7 16266	4 74763	0 0835	0 0000	0 08345	2 1627%	0 0000%	2 1627%
182														
183														
184	Hi T Ave, 0% TP, Anaalytical Limit 0%							Hi T Ave, 0% TP, Anaalytical Limit 0%						
185						Minus								
186	PL-1	PL-2	PL-3	PL-Total	DP-XMTR	MDP DP	Actual	XMTR	TH	MDP + V	MDP + TH	TH only	MDP+V	MDP + TH
187	subcooled	sat water	sat steam		@ 0% LVL	+ Velocity	Level	CALIB DP	DP Error	DP Error	DP Error	%	%	%
188	PSI	PSI	PSI	PSI	PSI	PSI	@ 0% Ind	@ 0% LVL	PSI	PSI	PSI	Error	Error	Error
189														
190	0 00000	0 00000	0 14567	0 14567	5 05696	4 89401	-1 20646	4 94056	0 1164	-0 1630	-0 04655	3 0167%	-4 2231%	-1 2065%
191	0 00000	0 00000	0 14890	0 14890	5 05399	4 90782	-0 84851	4 94056	0 1134	-0 1462	-0 03274	2 9396%	-3 7881%	-0 8465%
192	0 00000	0 00000	0 15227	0 15227	5 05089	4 92253	-0 46720	4 94056	0 1103	-0 1284	-0 01803	2 8593%	-3 3265%	-0 4672%
193	0 00000	0 00000	0 15577	0 15577	5 04767	4 93715	-0 08847	4 94056	0 1071	-0 1105	-0 00341	2 7758%	-2 8642%	-0 0885%
194	0 00000	0 00000	0 15956	0 15956	5 04417	4 95051	0 25780	4 94056	0 1036	-0 0937	0 00995	2 6850%	-2 4272%	0 2578%
195	0 00000	0 00000	0 16351	0 16351	5 04053	4 96376	0 60128	4 94056	0 1000	-0 0768	0 02320	2 5908%	-1 9896%	0 6013%
196	0 00000	0 00000	0 16763	0 16763	5 03673	4 97687	0 94087	4 94056	0 0962	-0 0599	0 03631	2 4922%	-1 5513%	0 9409%
197	0 00000	0 00000	0 17226	0 17226	5 03246	4 98853	1 24326	4 94056	0 0919	-0 0439	0 04797	2 3816%	-1 1384%	1 2433%
198	0 00000	0 00000	0 17714	0 17714	5 02795	4 99898	1 51406	4 94056	0 0874	-0 0290	0 05842	2 2648%	-0 7507%	1 5141%
199	0 00000	0 00000	0 18270	0 18270	5 02281	5 00882	1 76899	4 94056	0 0823	-0 0140	0 06826	2 1316%	-0 3626%	1 7690%
200	0 00000	0 00000	0 19170	0 19170	5 01448	5 01448	1 91566	4 94056	0 0739	0 0000	0 07392	1 9157%	0 0000%	1 9157%
201														

CALCULATION NO: C11116-5 ORIGINATOR: PDesotelle DATE: 5/6/2004

CALCULATION REV: 0 REVIEWER: JWerner DATE: 5/11/2004

	A	B	C	D	E	F	G	H	I	J	K	L	M
202													
203	**Low T Ave, 10% TP, MRIL, 78%**												
204													
205										Mid-Deck	Velocity		RL
206	POWER	SG LEVEL	SG Level	STM Flow	P-STM	TDC	V-F	V-G	V-DC	DP	Effect	V=RL	pressure
207	%	" above LT	%	PPH x 10E6	PSIA	DEG F	@ P-STM	@ P-STM		PSI	PSI		PSI
208													
209	100	112 7334	0 78	3 867	655 7	482 4	0 020349	0 702361	0 020045	0 164	0 0010422	0 016083	5 20047
210	90	112 7334	0 78	3 447	684 3	486 3	0 020456	0 671682	0 020124	0 146	0 0008275	0 016082	5 20092
211	80	112 7334	0 78	3 03	714 1	490 5	0 020566	0 642232	0 020212	0 128	0 0006392	0 016080	5 20139
212	70	112 7334	0 78	2 62	744 9	495 2	0 020678	0 614179	0 020313	0 111	0 0004777	0 016079	5 20187
213	60	112 7334	0 78	2 214	776 9	500 1	0 020795	0 587299	0 020422	0 094	0 0003407	0 016077	5 20237
214	50	112 7334	0 78	1 815	810 9	505 5	0 020918	0 560974	0 020546	0 077	0 0002290	0 016076	5 20291
215	40	112 7334	0 78	1 418	845 4	511 0	0 021043	0 536343	0 020676	0 060	0 0001396	0 016074	5 20345
216	30	112 7334	0 78	1 035	882 1	517 3	0 021176	0 512172	0 020831	0 044	0 0000743	0 016072	5 20402
217	20	112 7334	0 78	0 673	920 5	524 7	0 021314	0 488861	0 021023	0 029	0 0000314	0 016070	5 20463
218	10	112 7334	0 78	0 322	962 0	533 0	0 021463	0 465676	0 021250	0 014	0 0000072	0 016068	5 20528
219	0	112 7334	0 78	0	1020 0	547 0	0 021672	0 436300	0 021670	0 000	0 0000000	0 016066	5 20618
220													
221													
222	**Low T Ave, 10%TP, HI-HI Setpoint 66.5%**												
223													
224										Mid-Deck	Velocity		RL
225	POWER	SG LEVEL	SG Level	STM Flow	P-STM	TDC	V-F	V-G	V-DC	DP	Effect	V=RL	pressure
226	%	" above LT	%	PPH x 10E6	PSIA	DEG F	@ P-STM	@ P-STM		PSI	PSI		PSI
227													
228	100	96 1125	0 665	3 867	655 7	482 1	0 020349	0 702361	0 020037	0 164	0 0010422	0 016083	5 20047
229	90	96 1125	0 665	3 447	684 3	486 0	0 020456	0 671682	0 020117	0 146	0 0008275	0 016082	5 20092
230	80	96 1125	0 665	3 03	714 1	490 1	0 020566	0 642232	0 020203	0 128	0 0006392	0 016080	5 20139
231	70	96 1125	0 665	2 62	744 9	494 8	0 020678	0 614179	0 020303	0 111	0 0004777	0 016079	5 20187
232	60	96 1125	0 665	2 214	776 9	499 7	0 020795	0 587299	0 020412	0 094	0 0003407	0 016077	5 20237
233	50	96 1125	0 665	1 815	810 9	505 1	0 020918	0 560974	0 020534	0 077	0 0002290	0 016076	5 20291
234	40	96 1125	0 665	1 418	845 4	510 7	0 021043	0 536343	0 020667	0 060	0 0001396	0 016074	5 20345
235	30	96 1125	0 665	1 035	882 1	516 9	0 021176	0 512172	0 020819	0 044	0 0000743	0 016072	5 20402
236	20	96 1125	0 665	0 673	920 5	524 3	0 021314	0 488861	0 021010	0 029	0 0000314	0 016070	5 20463
237	10	96 1125	0 665	0 322	962 0	532 6	0 021463	0 465676	0 021236	0 014	0 0000072	0 016068	5 20528
238	0	96 1125	0 665	0	1020 0	547 0	0 021672	0 436300	0 021670	0 000	0 0000000	0 016066	5 20618
239													

	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA
202														
203	Low T Ave, 10% TP, MRIL, 78%							Low T Ave, 10% TP, MRIL, 78%						
204						Minus								
205	PL-1	PL-2	PL-3	PL-Total	DP-XMTR	MDP DP	Actual	XMTR	TH	MDP + V	MDP + TH	TH only	MDP+V	MDP + TH
206	subcooled	sat water	sat steam		@ 78% LVL	+ Velocity	Level	CALIB DP	DP Error	DP Error	DP Error	%	%	%
207	PSI	PSI	PSI	PSI	PSI	PSI	@78% Ind	@ 78% LVL	PSI	PSI	PSI	Error	Error	Error
208														
209	0 87392	2 34513	0 02620	3 24525	1 95522	1 79226	74 41006	1 93079	0 0244	-0 1630	-0 13852	0 6332%	-4 2231%	-3 5899%
210	0 87046	2 33295	0 02740	3 23080	1 97012	1 82495	75 25710	1 93079	0 0393	-0 1452	-0 10584	1 0193%	-3 7622%	-2 7429%
211	0 86669	2 32048	0 02865	3 21582	1 98557	1 85821	76 11918	1 93079	0 0548	-0 1274	-0 07258	1 4198%	-3 3006%	-1 8808%
212	0 86236	2 30781	0 02996	3 20013	2 00174	1 89122	76 97470	1 93079	0 0710	-0 1105	-0 03956	1 8389%	-2 8642%	-1 0253%
213	0 85777	2 29486	0 03133	3 18396	2 01841	1 92475	77 84364	1 93079	0 0876	-0 0937	-0 00603	2 2709%	-2 4272%	-0 1564%
214	0 85261	2 28133	0 03280	3 16674	2 03617	1 95940	78 74160	1 93079	0 1054	-0 0768	0 02862	2 7312%	-1 9896%	0 7416%
215	0 84722	2 26781	0 03431	3 14933	2 05411	1 99425	79 64482	1 93079	0 1233	-0 0599	0 06347	3 1961%	-1 5513%	1 6448%
216	0 84093	2 25364	0 03593	3 13049	2 07353	2 02961	80 56102	1 93079	0 1427	-0 0439	0 09882	3 6994%	-1 1384%	2 5610%
217	0 83326	2 23902	0 03764	3 10992	2 09471	2 06574	81 49736	1 93079	0 1639	-0 0290	0 13495	4 2481%	-0 7507%	3 4974%
218	0 82434	2 22345	0 03951	3 08731	2 11797	2 10397	82 48825	1 93079	0 1872	-0 0140	0 17319	4 8509%	-0 3626%	4 4883%
219	0 80838	2 20203	0 04217	3 05259	2 15359	2 15359	83 77418	1 93079	0 2228	0 0000	0 22281	5 7742%	0 0000%	5 7742%
220														
221														
222	Low T Ave, 10%TP, HI-HI Setpoint 66 5%							Low T Ave, 10%TP, HI-HI Setpoint 66 5%						
223						Minus								
224	PL-1	PL-2	PL-3	PL-Total	DP-XMTR	MDP DP	Actual	XMTR	TH	MDP + V	MDP + TH	TH only	MDP+V	MDP + TH
225	subcooled	sat water	sat steam		@ 65 5% LVL	+ Velocity	Level	CALIB DP	DP Error	DP Error	DP Error	%	%	%
226	PSI	PSI	PSI	PSI	PSI	PSI	@65 5% Ind	@ 65 5% LVL	PSI	PSI	PSI	Error	Error	Error
227														
228	0 87425	1 87246	0 03989	2 78660	2 41387	2 25091	63 29629	2 37453	0 0393	-0 1630	-0 12362	1 0194%	-4 2231%	-3 2037%
229	0 87079	1 86273	0 04172	2 77523	2 42569	2 28051	64 06339	2 37453	0 0512	-0 1452	-0 09402	1 3256%	-3 7622%	-2 4366%
230	0 86707	1 85277	0 04363	2 76347	2 43792	2 31056	64 84206	2 37453	0 0634	-0 1274	-0 06397	1 6427%	-3 3006%	-1 6579%
231	0 86278	1 84266	0 04562	2 75106	2 45081	2 34029	65 61261	2 37453	0 0763	-0 1105	-0 03424	1 9769%	-2 8642%	-0 8874%
232	0 85820	1 83232	0 04771	2 73823	2 46415	2 37049	66 39516	2 37453	0 0896	-0 0937	-0 00405	2 3224%	-2 4272%	-0 1046%
233	0 85308	1 82151	0 04995	2 72454	2 47837	2 40160	67 20133	2 37453	0 1038	-0 0768	0 02706	2 6909%	-1 9896%	0 7013%
234	0 84762	1 81072	0 05224	2 71058	2 49287	2 43301	68 01543	2 37453	0 1183	-0 0599	0 05848	3 0667%	-1 5513%	1 5154%
235	0 84142	1 79940	0 05471	2 69553	2 50849	2 46456	68 83318	2 37453	0 1340	-0 0439	0 09003	3 4715%	-1 1384%	2 3332%
236	0 83377	1 78774	0 05732	2 67882	2 52581	2 49684	69 66957	2 37453	0 1513	-0 0290	0 12230	3 9203%	-0 7507%	3 1696%
237	0 82487	1 77530	0 06017	2 66035	2 54493	2 53094	70 55325	2 37453	0 1704	-0 0140	0 15640	4 4159%	-0 3626%	4 0532%
238	0 80838	1 75820	0 06422	2 63080	2 57538	2 57538	71 70501	2 37453	0 2008	0 0000	0 20084	5 2050%	0 0000%	5 2050%
239														

CALCULATION NO: C11116-5 *ORIGINATOR:* PDesotelle *DATE:* 5/6/2004

CALCULATION REV: 0 *REVIEWER:* JWerner *DATE:* 5/11/2004

	A	B	C	D	E	F	G	H	I	J	K	L	M
240													
241	**Low Tave, 10%TP, Programmed Level 44%**												
242													
243										Mid-Deck	Velocity		RL
244	POWER	SG LEVEL	SG Level	STM Flow	P-STM	TDC	V-F	V-G	V-DC	DP	Effect	V=RL	pressure
245	%	" above LT	%	PPH x 10E6	PSIA	DEG F	@ P-STM	@ P-STM		PSI	PSI		PSI
246													
247	100	63 5932	0 44	3 867	655 7	481 4	0 020349	0 702361	0 020022	0 164	0 0010422	0 016083	5 20047
248	90	63 5932	0 44	3 447	684 3	485 2	0 020456	0 671682	0 020100	0 146	0 0008275	0 016082	5 20092
249	80	63 5932	0 44	3 03	714 1	489 4	0 020566	0 642232	0 020186	0 128	0 0006392	0 016080	5 20139
250	70	63 5932	0 44	2 62	744 9	494 0	0 020678	0 614179	0 020284	0 111	0 0004777	0 016079	5 20187
251	60	63 5932	0 44	2 214	776 9	498 9	0 020795	0 587299	0 020392	0 094	0 0003407	0 016077	5 20237
252	50	63 5932	0 44	1 815	810 9	504 2	0 020918	0 560974	0 020512	0 077	0 0002290	0 016076	5 20291
253	40	63 5932	0 44	1 418	845 4	509 7	0 021043	0 536343	0 020641	0 060	0 0001396	0 016074	5 20345
254	30	63 5932	0 44	1 035	882 1	515 9	0 021176	0 512172	0 020793	0 044	0 0000743	0 016072	5 20402
255	20	63 5932	0 44	0 673	920 5	523 3	0 021314	0 488861	0 020983	0 029	0 0000314	0 016070	5 20463
256	10	63 5932	0 44	0 322	962 0	531 5	0 021463	0 465676	0 021205	0 014	0 0000072	0 016068	5 20528
257	0	63 5932	0 44	0	1020 0	547 0	0 021672	0 436300	0 021670	0 000	0 0000000	0 016066	5 20618
258													
259													
260	**Low T ave, 10% TP, LO Setpoint 25.5%**												
261													
262										Mid-Deck	Velocity		RL
263	POWER	SG LEVEL	SG Level	STM Flow	P-STM	TDC	V-F	V-G	V-DC	DP	Effect	V=RL	pressure
264	%	" above LT	%	PPH x 10E6	PSIA	DEG F	@ P-STM	@ P-STM		PSI	PSI		PSI
265													
266	100	36 8552	0 255	3 867	655 7	480 8	0 020349	0 702361	0 020008	0 164	0 0010422	0 016083	5 20047
267	90	36 8552	0 255	3 447	684 3	484 5	0 020456	0 671682	0 020084	0 146	0 0008275	0 016082	5 20092
268	80	36 8552	0 255	3 03	714 1	488 6	0 020566	0 642232	0 020169	0 128	0 0006392	0 016080	5 20139
269	70	36 8552	0 255	2 62	744 9	493 2	0 020678	0 614179	0 020266	0 111	0 0004777	0 016079	5 20187
270	60	36 8552	0 255	2 214	776 9	498 0	0 020795	0 587299	0 020371	0 094	0 0003407	0 016077	5 20237
271	50	36 8552	0 255	1 815	810 9	503 3	0 020918	0 560974	0 020492	0 077	0 0002290	0 016076	5 20291
272	40	36 8552	0 255	1 418	845 4	508 8	0 021043	0 536343	0 020619	0 060	0 0001396	0 016074	5 20345
273	30	36 8552	0 255	1 035	882 1	514 9	0 021176	0 512172	0 020768	0 044	0 0000743	0 016072	5 20402
274	20	36 8552	0 255	0 673	920 5	522 2	0 021314	0 488861	0 020954	0 029	0 0000314	0 016070	5 20463
275	10	36 8552	0 255	0 322	962 0	530 4	0 021463	0 465676	0 021172	0 014	0 0000072	0 016068	5 20528
276	0	36 8552	0 255	0	1020 0	547 0	0 021672	0 436300	0 021670	0 000	0 0000000	0 016066	5 20618
277													

CALCULATION NO: C11116-5 ORIGINATOR: PDesotelle DATE: 5/6/2004

CALCULATION REV: 0 REVIEWER: JWerner DATE: 5/11/2004

	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA
240														
241	Low Tave, 10%TP, Programmed Level 44%							Low Tave, 10%TP, Programmed Level 44%						
242						Minus								
243	PL-1	PL-2	PL-3	PL-Total	DP-XMTR	MDP DP	Actual	XMTR	TH	MDP + V	MDP + TH	TH only	MDP+V	MDP + TH
244	subcooled	sat water	sat steam		@ 44% LVL	+ Velocity	Level	CALIB DP	DP Error	DP Error	DP Error	%	%	%
245	PSI	PSI	PSI	PSI	PSI	PSI	@44% Ind	@ 44% LVL	PSI	PSI	PSI	Error	Error	Error
246														
247	0 87489	0 94766	0 06669	1 88923	3 31124	3 14828	41 55199	3 24274	0 0685	-0 1630	-0 09446	1 7751%	-4 2231%	-2 4480%
248	0 87153	0 94274	0 06973	1 88400	3 31692	3 17175	42 16020	3 24274	0 0742	-0 1452	-0 07099	1 9224%	-3 7622%	-1 8398%
249	0 86781	0 93770	0 07293	1 87844	3 32295	3 19559	42 77799	3 24274	0 0802	-0 1274	-0 04715	2 0786%	-3 3006%	-1 2220%
250	0 86360	0 93258	0 07626	1 87244	3 32943	3 21891	43 38240	3 24274	0 0867	-0 1105	-0 02383	2 2466%	-2 8642%	-0 6176%
251	0 85903	0 92735	0 07975	1 86613	3 33624	3 24258	43 99591	3 24274	0 0935	-0 0937	-0 00016	2 4231%	-2 4272%	-0 0041%
252	0 85400	0 92188	0 08349	1 85937	3 34353	3 26676	44 62262	3 24274	0 1008	-0 0768	0 02403	2 6122%	-1 9896%	0 6226%
253	0 84867	0 91641	0 08733	1 85241	3 35104	3 29118	45 25538	3 24274	0 1083	-0 0599	0 04844	2 8067%	-1 5513%	1 2554%
254	0 84245	0 91069	0 09145	1 84459	3 35943	3 31551	45 88582	3 24274	0 1167	-0 0439	0 07277	3 0242%	-1 1384%	1 8858%
255	0 83483	0 90478	0 09581	1 83542	3 36920	3 34023	46 52663	3 24274	0 1265	-0 0290	0 09748	3 2774%	-0 7507%	2 5266%
256	0 82609	0 89849	0 10058	1 82516	3 38011	3 36612	47 19749	3 24274	0 1374	-0 0140	0 12338	3 5601%	-0 3626%	3 1975%
257	0 80838	0 88984	0 10735	1 80557	3 40061	3 40061	48 09141	3 24274	0 1579	0 0000	0 15787	4 0914%	0 0000%	4 0914%
258														
259														
260	Low T ave, 10% TP, LO Setpoint 25.5%							Low T ave, 10% TP, LO Setpoint 25.5%						
261						Minus								
262	PL-1	PL-2	PL-3	PL-Total	DP-XMTR	MDP DP	Actual	XMTR	TH	MDP + V	MDP + TH	TH only	MDP+V	MDP + TH
263	subcooled	sat water	sat steam		@ 25 5% LVL	+ Velocity	Level	CALIB DP	DP Error	DP Error	DP Error	%	%	%
264	PSI	PSI	PSI	PSI	PSI	PSI	@25 5% Ind	@ 25 5% LVL	PSI	PSI	PSI	Error	Error	Error
265														
266	0 87551	0 18727	0 08872	1 15149	4 04898	3 88602	23 67094	3 95660	0 0924	-0 1630	-0 07058	2 3941%	-4 2231%	-1 8291%
267	0 87220	0 18630	0 09277	1 15127	4 04965	3 90448	24 14940	3 95660	0 0931	-0 1452	-0 05212	2 4116%	-3 7622%	-1 3506%
268	0 86853	0 18530	0 09702	1 15086	4 05053	3 92317	24 63379	3 95660	0 0939	-0 1274	-0 03342	2 4344%	-3 3006%	-0 8662%
269	0 86437	0 18429	0 10146	1 15012	4 05175	3 94123	25 10177	3 95660	0 0952	-0 1105	-0 01537	2 4660%	-2 8642%	-0 3982%
270	0 85992	0 18326	0 10610	1 14928	4 05310	3 95944	25 57366	3 95660	0 0965	-0 0937	0 00284	2 5009%	-2 4272%	0 0737%
271	0 85486	0 18218	0 11108	1 14811	4 05480	3 97802	26 05533	3 95660	0 0982	-0 0768	0 02143	2 5449%	-1 9896%	0 5553%
272	0 84959	0 18110	0 11618	1 14686	4 05658	3 99672	26 53995	3 95660	0 1000	-0 0599	0 04013	2 5913%	-1 5513%	1 0399%
273	0 84349	0 17997	0 12166	1 14512	4 05891	4 01498	27 01309	3 95660	0 1023	-0 0439	0 05839	2 6514%	-1 1384%	1 5131%
274	0 83601	0 17880	0 12746	1 14227	4 06235	4 03339	27 49007	3 95660	0 1058	-0 0290	0 07679	2 7408%	-0 7507%	1 9901%
275	0 82736	0 17755	0 13381	1 13873	4 06655	4 05255	27 98680	3 95660	0 1100	-0 0140	0 09596	2 8494%	-0 3626%	2 4868%
276	0 80838	0 17584	0 14282	1 12704	4 07914	4 07914	28 67578	3 95660	0 1225	0 0000	0 12254	3 1758%	0 0000%	3 1758%
277														

CALCULATION NO: C11116-5 *ORIGINATOR:* PDesotelle *DATE:* 5/6/2004

CALCULATION REV: 0 *REVIEWER:* JWerner *DATE:* 5/11/2004

	A	B	C	D	E	F	G	H	I	J	K	L	M
278													
279	**Low T ave, 10% TP, LO-LO Setpoint 17%**												
280													
281													
282	POWER	SG LEVEL	SG Level	STM Flow	P-STM	TDC	V-F	V-G	V-DC	Mid-Deck DP	Velocity Effect	V=RL	RL pressure
283	%	" above LT	%	PPH x 10E6	PSIA	DEG F	@ P-STM	@ P-STM		PSI	PSI		PSI
284													
285	100	24 5701	0 17	3 867	655 7	480 5	0 020349	0 702361	0 020002	0 164	0 0010422	0 016083	5 20047
286	90	24 5701	0 17	3 447	684 3	484 2	0 020456	0 671682	0 020076	0 146	0 0008275	0 016082	5 20092
287	80	24 5701	0 17	3 03	714 1	488 3	0 020566	0 642232	0 020161	0 128	0 0006392	0 016080	5 20139
288	70	24 5701	0 17	2 62	744 9	492 8	0 020678	0 614179	0 020256	0 111	0 0004777	0 016079	5 20187
289	60	24 5701	0 17	2 214	776 9	497 6	0 020795	0 587299	0 020361	0 094	0 0003407	0 016077	5 20237
290	50	24 5701	0 17	1 815	810 9	502 9	0 020918	0 560974	0 020482	0 077	0 0002290	0 016076	5 20291
291	40	24 5701	0 17	1 418	845 4	508 3	0 021043	0 536343	0 020607	0 060	0 0001396	0 016074	5 20345
292	30	24 5701	0 17	1 035	882 1	514 4	0 021176	0 512172	0 020754	0 044	0 0000743	0 016072	5 20402
293	20	24 5701	0 17	0 673	920 5	521 7	0 021314	0 488861	0 020940	0 029	0 0000314	0 016070	5 20463
294	10	24 5701	0 17	0 322	962 0	529 8	0 021463	0 465676	0 021154	0 014	0 0000072	0 016068	5 20528
295	0	24 5701	0 17	0	1020 0	547 0	0 021672	0 436300	0 021670	0 000	0 0000000	0 016066	5 20618
296													
297													
298	**Low T Ave, 10% TP, LO-LO Setpoint 13% (AMSAC)**												
299													
300													
301	POWER	SG LEVEL	SG Level	STM Flow	P-STM	TDC	V-F	V-G	V-DC	Mid-Deck DP	Velocity Effect	V=RL	RL pressure
302	%	" above LT	%	PPH x 10E6	PSIA	DEG F	@ P-STM	@ P-STM		PSI	PSI		PSI
303													
304	100	18 7889	0 13	3 867	655 7	480 3	0 020349	0 702361	0 019999	0 164	0 0010422	0 016083	5 20047
305	90	18 7889	0 13	3 447	684 3	484 0	0 020456	0 671682	0 020072	0 146	0 0008275	0 016082	5 20092
306	80	18 7889	0 13	3 03	714 1	488 1	0 020566	0 642232	0 020156	0 128	0 0006392	0 016080	5 20139
307	70	18 7889	0 13	2 62	744 9	492 6	0 020678	0 614179	0 020252	0 111	0 0004777	0 016079	5 20187
308	60	18 7889	0 13	2 214	776 9	497 4	0 020795	0 587299	0 020356	0 094	0 0003407	0 016077	5 20237
309	50	18 7889	0 13	1 815	810 9	502 7	0 020918	0 560974	0 020476	0 077	0 0002290	0 016076	5 20291
310	40	18 7889	0 13	1 418	845 4	508 1	0 021043	0 536343	0 020601	0 060	0 0001396	0 016074	5 20345
311	30	18 7889	0 13	1 035	882 1	514 2	0 021176	0 512172	0 020748	0 044	0 0000743	0 016072	5 20402
312	20	18 7889	0 13	0 673	920 5	521 5	0 021314	0 488861	0 020933	0 029	0 0000314	0 016070	5 20463
313	10	18 7889	0 13	0 322	962 0	529 4	0 021463	0 465676	0 021145	0 014	0 0000072	0 016068	5 20528
314	0	18 7889	0 13	0	1020 0	547 0	0 021672	0 436300	0 021670	0 000	0 0000000	0 016066	5 20618
315													

	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA
278														
279	**Low T ave, 10% TP, LO-LO Setpoint 17%**							**Low T ave, 10% TP, LO-LO Setpoint 17%**						
280						Minus								
281	PL-1	PL-2	PL-3	PL-Total	DP-XMTR	MDP DP	Actual	XMTR	TH	MDP + V	MDP + TH	TH only	MDP+V	MDP + TH
282	subcooled	sat water	sat steam		@ 17% LVL	+ Velocity	Level	CALIB DP	DP Error	DP Error	DP Error	%	%	%
283	PSI	PSI	PSI	PSI	PSI	PSI	@17% Ind	@17% LVL	PSI	PSI	PSI	Error	Error	Error
284														
285	0 71086	0 00000	0 09884	0 80970	4 39077	4 22781	15 52864	4 28458	0 1062	-0 1630	-0 05678	2 7518%	-4 2231%	-1 4714%
286	0 70825	0 00000	0 10335	0 81160	4 38932	4 24414	15 95200	4 28458	0 1047	-0 1452	-0 04044	2 7142%	-3 7622%	-1 0480%
287	0 70527	0 00000	0 10809	0 81337	4 38802	4 26066	16 38000	4 28458	0 1034	-0 1274	-0 02392	2 6806%	-3 3006%	-0 6200%
288	0 70195	0 00000	0 11303	0 81498	4 38689	4 27637	16 78712	4 28458	0 1023	-0 1105	-0 00821	2 6514%	-2 8642%	-0 2129%
289	0 69834	0 00000	0 11820	0 81654	4 38583	4 29217	17 19660	4 28458	0 1012	-0 0937	0 00759	2 6238%	-2 4272%	0 1966%
290	0 69422	0 00000	0 12375	0 81797	4 38494	4 30817	17 61120	4 28458	0 1004	-0 0768	0 02358	2 6008%	-1 9896%	0 6112%
291	0 68999	0 00000	0 12943	0 81943	4 38402	4 32416	18 02565	4 28458	0 0994	-0 0599	0 03953	2 5770%	-1 5513%	1 0256%
292	0 68510	0 00000	0 13554	0 82064	4 38338	4 33945	18 42202	4 28458	0 0988	-0 0439	0 05487	2 5604%	-1 1384%	1 4220%
293	0 67904	0 00000	0 14201	0 82105	4 38358	4 35461	18 81475	4 28458	0 0990	-0 0290	0 07003	2 5655%	-0 7507%	1 8147%
294	0 67215	0 00000	0 14908	0 82122	4 38405	4 37006	19 21512	4 28458	0 0995	-0 0140	0 08547	2 5778%	-0 3626%	2 2151%
295	0 65616	0 00000	0 15911	0 81527	4 39091	4 39091	19 75546	4 28458	0 1063	0 0000	0 10632	2 7555%	0 0000%	2 7555%
296														
297														
298	**Low T Ave, 10% TP, LO-LO Setpoint 13% (AMSAC)**							**Low T Ave, 10% TP, LO-LO Setpoint 13% (AMSAC)**						
299						Minus								
300	PL-1	PL-2	PL-3	PL-Total	DP-XMTR	MDP DP	Actual	XMTR	TH	MDP + V	MDP + TH	TH only	MDP+V	MDP + TH
301	subcooled	sat water	sat steam		@ 17% LVL	+ Velocity	Level	CALIB DP	DP Error	DP Error	DP Error	%	%	%
302	PSI	PSI	PSI	PSI	PSI	PSI	@13% Ind	@ 13% LVL	PSI	PSI	PSI	Error	Error	Error
303														
304	0 54370	0 00000	0 10360	0 64730	4 55317	4 39021	11 73747	4 43893	0 1142	-0 1630	-0 04872	2 9606%	-4 2231%	-1 2625%
305	0 54172	0 00000	0 10834	0 65006	4 55086	4 40569	12 13860	4 43893	0 1119	-0 1452	-0 03324	2 9008%	-3 7622%	-0 8614%
306	0 53945	0 00000	0 11330	0 65275	4 54864	4 42128	12 54249	4 43893	0 1097	-0 1274	-0 01765	2 8431%	-3 3006%	-0 4575%
307	0 53691	0 00000	0 11848	0 65538	4 54649	4 43596	12 92312	4 43893	0 1076	-0 1105	-0 00297	2 7874%	-2 8642%	-0 0769%
308	0 53415	0 00000	0 12390	0 65805	4 54432	4 45066	13 30409	4 43893	0 1054	-0 0937	0 01173	2 7313%	-2 4272%	0 3041%
309	0 53102	0 00000	0 12972	0 66074	4 54217	4 46540	13 68590	4 43893	0 1032	-0 0768	0 02647	2 6755%	-1 9896%	0 6859%
310	0 52780	0 00000	0 13567	0 66347	4 53998	4 48012	14 06741	4 43893	0 1010	-0 0599	0 04119	2 6187%	-1 5513%	1 0674%
311	0 52406	0 00000	0 14208	0 66613	4 53789	4 49396	14 42622	4 43893	0 0990	-0 0439	0 05503	2 5646%	-1 1384%	1 4262%
312	0 51943	0 00000	0 14885	0 66828	4 53635	4 50738	14 77380	4 43893	0 0974	-0 0290	0 06845	2 5245%	-0 7507%	1 7738%
313	0 51422	0 00000	0 15626	0 67048	4 53479	4 52080	15 12170	4 43893	0 0959	-0 0140	0 08187	2 4843%	-0 3626%	2 1217%
314	0 50177	0 00000	0 16678	0 66855	4 53763	4 53763	15 55786	4 43893	0 0987	0 0000	0 09870	2 5579%	0 0000%	2 5579%
315														

	A	B	C	D	E	F	G	H	I	J	K	L	M
316													
317	**Low T Ave, 10% TP, Tech Spec Limit 5%**												
318													
319										Mid-Deck	Velocity		RL
320	POWER	SG LEVEL	SG Level	STM Flow	P-STM	TDC	V-F	V-G	V-DC	DP	Effect	V=RL	pressure
321	%	" above LT	%	PPH x 10E6	PSIA	DEG F	@ P-STM	@ P-STM		PSI	PSI		PSI
322													
323	100	7 2265	0 05	3 867	655 7	480 0	0 020349	0 702361	0 019991	0 164	0 0010422	0 016083	5 20047
324	90	7 2265	0 05	3 447	684 3	483 6	0 020456	0 671682	0 020064	0 146	0 0008275	0 016082	5 20092
325	80	7 2265	0 05	3 03	714 1	487 7	0 020566	0 642232	0 020147	0 128	0 0006392	0 016080	5 20139
326	70	7 2265	0 05	2 62	744 9	492 2	0 020678	0 614179	0 020242	0 111	0 0004777	0 016079	5 20187
327	60	7 2265	0 05	2 214	776 9	497 0	0 020795	0 587299	0 020347	0 094	0 0003407	0 016077	5 20237
328	50	7 2265	0 05	1 815	810 9	502 2	0 020918	0 560974	0 020464	0 077	0 0002290	0 016076	5 20291
329	40	7 2265	0 05	1 418	845 4	507 6	0 021043	0 536343	0 020588	0 060	0 0001396	0 016074	5 20345
330	30	7 2265	0 05	1 035	882 1	513 7	0 021176	0 512172	0 020734	0 044	0 0000743	0 016072	5 20402
331	20	7 2265	0 05	0 673	920 5	520 9	0 021314	0 488861	0 020917	0 029	0 0000314	0 016070	5 20463
332	10	7 2265	0 05	0 322	962 0	528 7	0 021463	0 465676	0 021124	0 014	0 0000072	0 016068	5 20528
333	0	7 2265	0 05	0	1020 0	547 0	0 021672	0 436300	0 021670	0 000	0 0000000	0 016066	5 20618
334													
335													
336	**Low T Ave, 10% TP, Analytical Limit 0%**												
337													
338										Mid-Deck	Velocity		RL
339	POWER	SG LEVEL	SG Level	STM Flow	P-STM	TDC	V-F	V-G	V-DC	DP	Effect	V=RL	pressure
340	%	" above LT	%	PPH x 10E6	PSIA	DEG F	@ P-STM	@ P-STM		PSI	PSI		PSI
341													
342	100	0 0000	0	3 867	655 7	479 7	0 020349	0 702361	0 019985	0 164	0 0010422	0 016083	5 20047
343	90	0 0000	0	3 447	684 3	483 4	0 020456	0 671682	0 020060	0 146	0 0008275	0 016082	5 20092
344	80	0 0000	0	3 03	714 1	487 4	0 020566	0 642232	0 020142	0 128	0 0006392	0 016080	5 20139
345	70	0 0000	0	2 62	744 9	491 9	0 020678	0 614179	0 020237	0 111	0 0004777	0 016079	5 20187
346	60	0 0000	0	2 214	776 9	496 7	0 020795	0 587299	0 020341	0 094	0 0003407	0 016077	5 20237
347	50	0 0000	0	1 815	810 9	501 9	0 020918	0 560974	0 020457	0 077	0 0002290	0 016076	5 20291
348	40	0 0000	0	1 418	845 4	507 2	0 021043	0 536343	0 020579	0 060	0 0001396	0 016074	5 20345
349	30	0 0000	0	1 035	882 1	513 3	0 021176	0 512172	0 020725	0 044	0 0000743	0 016072	5 20402
350	20	0 0000	0	0 673	920 5	520 5	0 021314	0 488861	0 020906	0 029	0 0000314	0 016070	5 20463
351	10	0 0000	0	0 322	962 0	528 2	0 021463	0 465676	0 021109	0 014	0 0000072	0 016068	5 20528
352	0	0 0000	0	0	1020 0	547 0	0 021672	0 436300	0 021670	0 000	0 0000000	0 016066	5 20618
353													

CALCULATION NO: C11116-5 ORIGINATOR: PDesotelle DATE: 5/6/2004

CALCULATION REV: 0 REVIEWER: JWerner DATE: 5/11/2004

	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA
316														
317	Low T Ave, 10% TP, Tech Spec Limit 5%							Low T Ave, 10% TP, Tech Spec Limit 5%						
318						Minus								
319	PL-1	PL-2	PL-3	PL-Total	DP-XMTR	MDP DP	Actual	XMTR	TH	MDP + V	MDP + TH	TH only	MDP+V	MDP + TH
320	subcooled	sat water	sat steam		@ 5% LVL	+ Velocity	Level	CALIB DP	DP Error	DP Error	DP Error	%	%	%
321	PSI	PSI	PSI	PSI	PSI	PSI	@ 5% Ind	@ 5% LVL	PSI	PSI	PSI	Error	Error	Error
322														
323	0 20920	0 00000	0 11313	0 32233	4 87814	4 71519	4 15930	4 74763	0 1305	-0 1630	-0 03244	3 4824%	-4 2231%	-0 8407%
324	0 20843	0 00000	0 11830	0 32673	4 87419	4 72902	4 51774	4 74763	0 1266	-0 1452	-0 01861	3 2800%	-3 7622%	-0 4823%
325	0 20757	0 00000	0 12372	0 33129	4 87009	4 74273	4 87322	4 74763	0 1225	-0 1274	-0 00489	3 1738%	-3 3006%	-0 1268%
326	0 20660	0 00000	0 12937	0 33597	4 86590	4 75538	5 20096	4 74763	0 1183	-0 1105	0 00775	3 0652%	-2 8642%	0 2010%
327	0 20554	0 00000	0 13529	0 34083	4 86154	4 76788	5 52498	4 74763	0 1139	-0 0937	0 02026	2 9522%	-2 4272%	0 5250%
328	0 20436	0 00000	0 14164	0 34600	4 85691	4 78014	5 84254	4 74763	0 1093	-0 0768	0 03251	2 8321%	-1 9896%	0 8425%
329	0 20313	0 00000	0 14815	0 35128	4 85217	4 79231	6 15802	4 74763	0 1045	-0 0599	0 04468	2 7093%	-1 5513%	1 1580%
330	0 20170	0 00000	0 15514	0 35683	4 84719	4 80326	6 44187	4 74763	0 0996	-0 0439	0 05564	2 5802%	-1 1384%	1 4419%
331	0 19993	0 00000	0 16254	0 36247	4 84216	4 81319	6 69906	4 74763	0 0945	-0 0290	0 06556	2 4498%	-0 7507%	1 6991%
332	0 19798	0 00000	0 17063	0 36861	4 83667	4 82268	6 94495	4 74763	0 0890	-0 0140	0 07505	2 3076%	-0 3626%	1 9449%
333	0 19299	0 00000	0 18212	0 37511	4 83108	4 83108	7 16266	4 74763	0 0835	0 0000	0 08345	2 1627%	0 0000%	2 1627%
334														
335														
336	Low T Ave, 10% TP, Analytical Limit 0%							Low T Ave, 10% TP, Analytical Limit 0%						
337						Minus								
338	PL-1	PL-2	PL-3	PL-Total	DP-XMTR	MDP DP	Actual	XMTR	TH	MDP + V	MDP + TH	TH only	MDP+V	MDP + TH
339	subcooled	sat water	sat steam		@ 0% LVL	+ Velocity	Level	CALIB DP	DP Error	DP Error	DP Error	%	%	%
340	PSI	PSI	PSI	PSI	PSI	PSI	@ 0% Ind	@ 0% LVL	PSI	PSI	PSI	Error	Error	Error
341														
342	0 00000	0 00000	0 11908	0 11908	5 08139	4 91843	-0 57356	4 94056	0 1408	-0 1630	-0 02213	3 6496%	-4 2231%	-0 5736%
343	0 00000	0 00000	0 12452	0 12452	5 07640	4 93122	-0 24196	4 94056	0 1358	-0 1452	-0 00934	3 5203%	-3 7622%	-0 2420%
344	0 00000	0 00000	0 13023	0 13023	5 07115	4 94379	0 08380	4 94056	0 1306	-0 1274	0 00323	3 3844%	-3 3006%	0 0838%
345	0 00000	0 00000	0 13618	0 13618	5 06569	4 95517	0 37855	4 94056	0 1251	-0 1105	0 01461	3 2428%	-2 8642%	0 3786%
346	0 00000	0 00000	0 14241	0 14241	5 05996	4 96630	0 66705	4 94056	0 1194	-0 0937	0 02574	3 0943%	-2 4272%	0 6671%
347	0 00000	0 00000	0 14910	0 14910	5 05381	4 97704	0 94535	4 94056	0 1132	-0 0768	0 03648	2 9349%	-1 9896%	0 9454%
348	0 00000	0 00000	0 15595	0 15595	5 04750	4 98764	1 22017	4 94056	0 1069	-0 0599	0 04708	2 7715%	-1 5513%	1 2202%
349	0 00000	0 00000	0 16330	0 16330	5 04072	4 99679	1 45731	4 94056	0 1002	-0 0439	0 05623	2 5957%	-1 1384%	1 4573%
350	0 00000	0 00000	0 17109	0 17109	5 03353	5 00457	1 65872	4 94056	0 0930	-0 0290	0 06400	2 4095%	-0 7507%	1 6587%
351	0 00000	0 00000	0 17961	0 17961	5 02567	5 01167	1 84291	4 94056	0 0851	-0 0140	0 07111	2 2055%	-0 3626%	1 8429%
352	0 00000	0 00000	0 19170	0 19170	5 01448	5 01448	1 91566	4 94056	0 0739	0 0000	0 07392	1 9157%	0 0000%	1 9157%
353														

CALCULATION NO: C11116-5 ORIGINATOR: PDesotelle DATE: 5/6/2004

CALCULATION REV: 0 REVIEWER: JWerner DATE: 5/11/2004

	A	B	C	D	E	F	G	H	I	J	K	L	M
354													
355	**Downcommer temperatures from Reference 6**												
356	0%	10%	20%	30%	40%	50%	60%	70%	80%				
357	Level	Level	Level	Level	Level	Level	Level	Level	Level				
358	Lo Tave	Lo Tave	Lo Tave	Lo Tave	Lo Tave	Lo Tave	Lo Tave	Lo Tave	Lo Tave				
359	°F	°F	°F	°F	°F	°F	°F	°F	°F				
360													
361	479 7	480 2	480 6	480 9	481 3	481 6	481 9	482 2	482 5				
362	483 4	483 8	484 3	484 7	485 1	485 4	485 8	486 1	486 4				
363	487 4	487 9	488 4	488 8	489 2	489 6	490 0	490 2	490 6				
364	491 9	492 4	492 9	493 4	493 8	494 2	494 6	494 9	495 3				
365	496 7	497 2	497 7	498 2	498 7	499 1	499 5	499 8	500 2				
366	501 9	502 5	503 1	503 5	504 0	504 4	504 8	505 2	505 6				
367	507 2	507 9	508 5	509 0	509 5	509 9	510 4	510 8	511 1				
368	513 3	514 0	514 6	515 2	515 7	516 2	516 6	517 0	517 4				
369	520 5	521 3	521 9	522 5	523 1	523 6	524 0	524 4	524 8				
370	528 2	529 2	530 0	530 7	531 3	531 8	532 3	532 7	533 1				
371	547	547 0	547 0	547 0	547 0	547 0	547 0	547 0	547 0				
372													
373													
374													
375	**Interpolation of downcommer temperature to various levels**												
376	5 0%	13 0%	17 0%	25 5%	44 0%	66 5%	78 0%						
377	Lo Tave	Lo Tave	Lo Tave	Lo Tave	Lo Tave	Lo Tave	Lo Tave						
378													
379	479 950	480 320	480 480	480 765	481 420	482 095	482 440						
380	483 600	483 950	484 150	484 520	485 220	485 995	486 340						
381	487 650	488 050	488 250	488 620	489 360	490 130	490 520						
382	492 150	492 550	492 750	493 175	493 960	494 795	495 220						
383	496 950	497 350	497 550	497 975	498 860	499 695	500 120						
384	502 200	502 680	502 920	503 320	504 160	505 060	505 520						
385	507 550	508 080	508 320	508 775	509 560	510 660	511 040						
386	513 650	514 180	514 420	514 930	515 900	516 860	517 320						
387	520 900	521 480	521 720	522 230	523 300	524 260	524 720						
388	528 700	529 440	529 760	530 385	531 500	532 560	533 020						
389	547 000	547 000	547 000	547 000	547 000	547 000	547 000						

CALCULATION NO: C11116-5 ORIGINATOR: PDesotelle DATE: 5/6/2004

CALCULATION REV: 0 REVIEWER: JWerner DATE: 5/11/2004

Downcommer temperatures from Reference 6

0% Level Hi Tave °F	10% Level Hi Tave °F	20% Level Hi Tave °F	30% Level Hi Tave °F	40% Level Hi Tave °F	50% Level Hi Tave °F	60% Level Hi Tave °F	70% Level Hi Tave °F	80% Level Hi Tave °F
495 5	496 1	496 7	497 2	497 6	498 1	498 5	498 9	499 3
497 9	498 5	499 1	499 6	500 1	500 5	500 9	501 4	501 7
500 5	501 1	501 7	502 2	502 7	503 2	503 6	504 0	504 4
503 5	504 1	504 7	505 2	505 7	506 2	506 6	507 0	507 4
506 8	507 4	508 0	508 5	509 0	509 4	509 9	510 3	510 7
510 3	511 0	511 6	512 1	512 6	513 1	513 6	514 0	514 4
514	514 7	515 3	515 9	516 4	516 9	517 3	517 8	518 1
518 4	519 1	519 8	520 4	520 9	521 4	521 9	522 3	522 7
523 9	524 7	525 4	526 0	526 5	527 0	527 5	528 0	528 3
529 9	530 9	531 7	532 4	533 1	533 6	534 1	534 5	534 9
547	547 0	547 0	547 0	547 0	547 0	547 0	547 0	547

Interpolation of downcommer temperature to various levels

5 0% Hi Tave	13 0% Hi Tave	17 0% Hi Tave	25 5% Hi Tave	44 0% Hi Tave	66 5% Hi Tave	78 0% Hi Tave
495 800	496 280	496 520	496 975	497 800	498 760	499 220
498 200	498 680	498 920	499 375	500 260	501 225	501 640
500 800	501 280	501 520	501 975	502 900	503 860	504 320
503 800	504 280	504 520	504 975	505 900	506 860	507 320
507 100	507 580	507 820	508 275	509 160	510 160	510 620
510 650	511 180	511 420	511 875	512 800	513 860	514 320
514 350	514 880	515 120	515 630	516 600	517 625	518 040
518 750	519 310	519 590	520 130	521 100	522 160	522 620
524 300	524 910	525 190	525 730	526 700	527 825	528 240
530 400	531 140	531 460	532 085	533 300	534 360	534 820
547 000	547 000	547 000	547 000	547 000	547 000	547 000

Velocity Effects

power %	Flow E6 PPH	% Flow	% DP	velocity psi
100	3 883	0 8687	0 7546	0 001042
90	3 46	0 7740	0 5992	0 0008275
80	3 041	0 6803	0 4628	0 0006392
70	2 629	0 5881	0 3459	0 0004777
60	2 22	0 4966	0 2467	0 0003407
50	1 82	0 4072	0 1658	0 0002290
40	1 421	0 3179	0 1011	0 0001396
30	1 037	0 2320	0 0538	0 0000743
20	0 674	0 1508	0 0227	0 0000314
10	0 322	0 0720	0 0052	0 0000072
0	0	0 0000	0 0000	0 0000000

50.59 APPLICABILITY REVIEW

(Is the activity excluded from 50.59 review?)

1. Document/Activity number: C11116, Revision 0

2. Brief description of proposed activity (what is being changed and why):

This calculation supercedes calculation C11116-1, Revision 0, C11116-2, Revision 1 and C11116-3, Revision 1.Calculation C11116, Revision 0 develops the Channel Statistical Allowance (CSA) values associated with Kewaunee's Unit 1 Steam Generator Hi Level Turbine Trip and Feedwater Isolation, Low Level Coincidence with Steam Flow/Feed Flow Mismatch Reactor Trip, and the Low- Low Reactor Trip functions. This calculation supports Kewaunee's conversion to Improved Technical Specifications (ITS).

3. Does the proposed activity involve or change any of the following documents or processes? Check YES or NO for EACH applicability review item. Explain in comments if necessary. [Ref. USA 50.59 Resource Manual]

NOTE: If you are unsure if a document or process may be affected, contact the process owner.

	Yes ✓	No ✓	Document or Process	Applicable Regulation	Contact/Action
a	☐	☒	Technical Specifications or Operating License	10CFR50.92	Process change per LI-AA-101. Contact Licensing.
b	☐	☒	Activity/change previously approved by NRC in license amendment or NRC SER	10CFR50.90	Identify NRC letter in comments below. Process change. Contact Licensing for assistance.
c	☐	☒	Activity/change covered by an existing approved 10CFR50.59 review, screening, or evaluation.	10CFR50 Appendix B	Identify screening or evaluation in comments below. Process change.
d	☐	☒	Dominion Quality Assurance Program Description (DOM-QA-1)	10CFR50.54(a)	Contact QA. Refer to NO-AA-101.
e	☐	☒	Emergency Plan	10CFR50.54(q)	Contact EP. Refer to FP-R-EP-02.
f	☐	☒	Security Plan	10CFR50.54(p)	Contact Security. Refer to FP-S-SPE-01.
g	☐	☒	IST Plan	10CFR50.55a(f)	Contact IST process owner. Refer to ER-AA-IST-10.
h	☐	☒	ISI Plan	10CFR50.55a(g)	Contact ISI process owner. Refer to ER-AA-NDE-122, NAD-01.05, and NAD-05.11.
i	☐	☒	ECCS Acceptance Criteria	10CFR50.46	Contact Licensing.
j	☐	☒	USAR or any document incorporated by reference - Check YES only if change is editorial (see Attachment A).	10CFR50.71	Process USAR change per NEP-05.02. Contact USAR process owner for assistance.
k	☐	☒	Commitment - Commitment changes associated with a response to Generic Letters and Bulletins, or if described in the USAR require a pre-screening.	10CFR50 Appendix B	Contact Licensing. Refer to LI-AA-110.
l	☐	☒	Maintenance activity or new/revised maintenance procedure - Check YES only if clearly maintenance and equipment will be restored to its as-designed condition within 90 days (see Attachment C).	10CFR50.65	Evaluate under Maintenance Rule. Refer to ER-AA-MRL-10, ER-AA-MRL-100, and NAD-08.21.
m	☐	☒	New/revised administrative or managerial directive/procedure (e.g., NAD, GNP, Fleet Procedure) or a change to any procedure or other controlled document (e.g., plant drawing) which is clearly editorial/administrative. See Attachments A and B.	10CFR50 Appendix B	Process procedure/document revision.
n	☐	☒	Fire Plan	10CFR50.48	Fire Protection Program Document Change Control, GNP-05.30.01.
o	☐	☒	Independent Spent Fuel Storage Installation (ISFSI)	10CFR72.48	Implement DNAP-3004, starting with Applicability.

4. Conclusion. Check one of the following:

☒ All documents/processes listed above are checked NO. 10CFR50.59 applies to the proposed activity. A 50.59 pre-screening shall be performed.

☐ One or more of the documents/processes listed above are checked YES, AND controls all aspects of the proposed activity. 10CFR50.59 does NOT apply. Process the change under the applicable program/process/procedure.

☐ One or more of the documents/processes listed above are checked YES, however, some portion of the proposed activity is not controlled by any of the above processes. 10CFR50.59 applies to that portion. A 50.59 pre-screening shall be performed.

5. Comments:
ET-CEE-09-0009, Rev. 0 will transmit the 50.59/72.48 Evaluation and program/document updates.

6. Print name followed by signature. Attach completed form to document/activity/change package.

Prepared by: Andrew W. Baugus (print/sign) Date: 10/14/2009

Reviewed by: D. M. McGrath (print/sign) Date: 10-14-09

50.59 PRE-SCREENING

(Is a 50.59 screening required?)

1. Document/Activity number: C11116, Revision 0

2. Brief description of proposed activity (what is being changed and why):

This calculation supercedes calculation C11116-1, Revision 0, C11116-2, Revision 1 and C11116-3, Revision 1.Calculation C11116, Revision 0 develops the Channel Statistical Allowance (CSA) values associated with Kewaunee's Unit 1 Steam Generator Hi Level Turbine Trip and Feedwater Isolation, Low Level Coincidence with Steam Flow/Feed Flow Mismatch Reactor Trip, and the Low- Low Reactor Trip functions. This calculation supports Kewaunee's conversion to Improved Technical Specifications (ITS).

3. Does the proposed activity involve or change any of the following documents or processes? Explain in Comments if necessary.

Check YES or NO for EACH pre-screening item. [Ref. USA 50.59 Resource Manual]
NOTE: If you are unsure if a document or process may be affected, contact the process owner.
NOTE: An asterisk (*) indicates that the document is incorporated by reference in the USAR or is implicitly considered part of the USAR.
NOTE: Check NO if activity/change is considered editorial, administrative, or maintenance as defined in Attachments A, B, and C. Explain in Comments if necessary.

	Yes ✓	No ✓	Document/Process	Directive/ Procedure
a	☐	☒	Updated Safety Analysis Report (USAR)	NEP-05.02
b	☐	☒	* Technical Specifications Bases or Technical Requirements Manual (TRM)	LI-AA-101, LI-AA-101-1001
c	☐	☒	* Commitments made in response to NRC Generic Letters and Bulletins, and those described in the USAR	LI-AA-110
d	☐	☒	* Environmental Qualification (EQ) Plan	NAD-01.08
e	☐	☒	* Regulatory Guide 1.97 (RG 1.97) Accident Monitoring Instrumentation Plan	NAD-05.22
f	☐	☒	* Fire Plan	NAD-01.02
g	☐	☒	* Appendix R Design Description	NAD-01.02
h	☐	☒	* Fire Protection Program Analysis (FPPA)	NAD-01.02
i	☐	☒	* Offsite Dose Calculation Manual (ODCM)	NAD-05.13
j	☐	☒	* Radiological Environmental Monitoring Manual (REMM)	NAD-05.13
k	☐	☒	* Station Blackout Design Description	
l	☐	☒	* Control Room Habitability Study	
m	☐	☒	Plant Drawing Changes/Discrepancies-Check YES only if: 1) the change adds information to, deletes information from, or alters the configuration of a drawing that is incorporated in the USAR, or 2) configures an SSC differently than described or credited in USAR text.	NAD-05.01
n	☐	☒	Calculations/Evaluations/Analyses/Computer Software - Check YES only if: 1) It affects a method of evaluation described in the USAR, or 2) It independently (i.e., not part of a modification) affects the licensing or design basis.	Various
o	☐	☒	Permanent Plant Physical Changes - All require a screening.	NAD-04.03
p	☐	☒	Temporary Plant Physical Changes (TCRs) - Check No only if installed for maintenance AND in effect for less than 90 days at power conditions.	NAD-04.03
q	☐	☒	QA Typing Determinations - Check YES only if reduction in classification, or affects design function as described in USAR.	NAD-01.01
r	☐	☒	Setpoint or Acceptance Criteria - Check YES only if change affects plant monitoring, performance, or operation.	Various
s	☐	☒	Plant Procedures/Revisions - Check YES only if the change directly or indirectly involves operating, controlling or configuring an SSC differently than described or credited in USAR.	NAD-03.01
t	☐	☒	Engineering Specifications - Check YES only if a design function or design requirement may be affected.	NAD-05.03
u	☐	☒	Operations Night Orders or Operator Work Arounds - Check YES only if SSCs are operated or configured differently than described in USAR.	GNP-03.30.01
v	☐	☒	Temporary plant alterations (e.g., jumpers, scaffolding, shielding, barriers) - Check YES only if installed (or in effect) for maintenance for longer than 90 days at power conditions.	NAD-08.14, GMP-127, GNP-01.23.04, FPP-08-09
w	☐	☒	Temporary plant alterations - Check YES only if not associated with maintenance.	
x	☐	☒	Corrective/Compensatory Actions - Check YES only if degraded/non-conforming plant condition accepted "as-is" or compensatory action taken.	OP-AA-102

4 Conclusion. Check one of the following:

☒ All of the documents or processes listed above are checked NO. A 50.59 screening is NOT required. Process change in accordance with the applicable program/process/procedure.

☐ One or more of the documents or processes listed above are checked YES. A 50.59 screening shall be performed.

5 Comments:
ET-CEE-09-0009, Rev. 0 will transmit the 50.59/72.48 Evaluation and program/document updates.

6 Print name followed by signature. Either the preparer or reviewer shall be 50.59 screening qualified. Attach completed form to document/activity/change package.

Prepared by: Andrew W. Baugus (print/sign) Date: 10/14/2009

Reviewed by: J.D. Desrochers (print/sign) Date: 10-14-09