

June 21, 2016

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Limerick Generating Station, Units 1 and 2
Renewed Facility Operating License Nos. NPF-39 and NPF-85
NRC Docket Nos. 50-352 and 50-353

Subject: License Amendment Request - Supplement
Proposed Revision to Technical Specifications in Response to GE
Energy - Nuclear 10 CFR Part 21 Safety Communication SC05-03

- References:**
1. Letter from James Barstow (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "License Amendment Request – Proposed Revision to Technical Specifications in Response to GE Energy - Nuclear 10 CFR Part 21 Safety Communication SC05-03," dated January 15, 2016 (ADAMS Accession No. ML16015A316).
 2. Letter from David P. Helker (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "Response to Draft Request for Additional Information Regarding Proposed Revision to Technical Specifications in Response to GE Energy - Nuclear 10 CFR Part 21 Safety Communication SC05-03," dated April 19, 2016 (ADAMS Accession No. ML16110A392).

By letter dated January 15, 2016 (Reference 1), Exelon Generation Company, LLC (Exelon) submitted a license amendment request (LAR) for Limerick Generating Station (LGS), Units 1 and 2. The proposed amendment would reduce the reactor vessel steam dome pressure associated with the Technical Specifications (TS) Safety Limits (SLs) specified in TS 2.1.1 and TS 2.1.2. The amendment would also revise the setpoint and allowable value for the main steam line low pressure isolation function in TS Table 3.3.2-2. The proposed changes address a 10 CFR Part 21 issue concerning the potential to violate the SLs during a pressure regulator failure maximum demand (open) (PRFO) transient.

Reference 2 provided a response to a draft request for additional information (RAI). Upon review of the response, the NRC staff determined that a full copy of Loop Uncertainty Calculation LI-00032, "LU Calculation for PT-001-2N076C," portions of which were provided in Attachment 4 to the RAI response, was required to complete their review. The attachment to this letter provides a copy of the full calculation.

Exelon has reviewed the information supporting a finding of no significant hazards consideration, and the environmental consideration, that were previously provided to the NRC in Attachment 1 of the Reference 1 letter. Exelon has concluded that the information provided in this supplement does not affect the bases for concluding that the proposed license amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92. In addition, Exelon has concluded that the information in this supplement does not affect the bases for concluding that neither an environmental impact statement nor an environmental assessment needs to be prepared in connection with the proposed amendment.

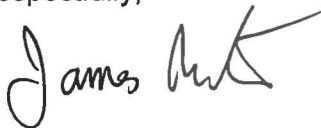
There are no regulatory commitments in this supplement.

In accordance with 10 CFR 50.91, "Notice for public comment; State consultation," paragraph (b), Exelon is notifying the Commonwealth of Pennsylvania of this supplement by transmitting a copy of this letter with its attachment to the designated State Official.

If you have any questions or require additional information, please contact Glenn Stewart at 610-765-5529.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 21st day of June 2016.

Respectfully,



James Barstow
Director, Licensing and Regulatory Affairs
Exelon Generation Company, LLC

Attachment: Loop Uncertainty Calculation LI-00032, "LU Calculation for PT-001-2N076C," Revision 0A

cc:	Regional Administrator - NRC Region I	w/ attachment
	NRC Senior Resident Inspector - Limerick Generating Station	"
	NRC Project Manager, NRR - Limerick Generating Station	"
	Director, Bureau of Radiation Protection - Pennsylvania	"
	Department of Environmental Protection	"

ATTACHMENT

**License Amendment Request - Supplement
Proposed Revision to Technical Specifications in Response to GE
Energy - Nuclear 10 CFR Part 21 Safety Communication SC05-03**

**Limerick Generating Station, Units 1 and 2
Docket Nos. 50-352 and 50-353**

**Loop Uncertainty Calculation LI-00032,
"LU Calculation for PT-001-2N076C," Revision 0A**

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1.0 PURPOSE

Update header with Orig.
Rev. Apr. and dates.

This section includes the Objective, Limitations, Conclusions, and the Applicability Statement of this calculation.

1.1 Objective

The objective of this calculation is to determine the Nominal Trip Setpoint (NTSP), Actual Trip Setpoint (ATSP) and the Allowable Value (AV) for the Main Steam Line Low Pressure Isolation Actuation Instrumentation as described in the Limerick Unit 2 Technical Specifications Table 3.3.2-2, Item 1.c (Ref. 4.2). This calculation analyzes the PT-001-2N076C instrumentation loop. This calculation was performed utilizing normal environmental conditions (see Section 2.2.3).

The normal NTSP, ATSP and AV results of this calculation are documented in Section 7.

Results of this "base calculation" are also applicable to the loops listed in Section 1.4.

1.2 Limitations

The Max and Min Acceptable Limits calculated in Section 7.8 are not authorized for use in the PECO maintenance program by this revision of the calculation.

This calculation is run for a normal environment and does not account for any uncertainties associated with accident scenarios (see Section 2.2.3).

The appropriate use of this calculation to support design or Station activities, other than those specified in Section 1.1 of this calculation, is the responsibility of the user.

1.3 Conclusions

821.00

The Allowable Value of ~~416.00~~ PSIG was calculated utilizing the IISCP Software and includes operational flexibility per Design Input 2.2 of this calculation. The Allowable Value is the result displayed in Section 7.7 of this calculation.

~~The Allowable Value and Analytical Limits utilized in this calculation are in accordance with the General Electric Design Specification Book Checks (Ref. 4.11).~~

The results of this calculation support the ~~current~~ ^{new} station setpoint of ~~356.00~~ PSIG.

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840.00

is based on TODI ES1400026 (Ref. 4.17) and General Electric Safety Concern SC05-03 (Ref. 4.18).

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The current station Loop Leave Alone Zone (LAZ) was calculated utilizing the Square Root of the Sum of the Squares Method (SRSS). The calculated LAZ is ± 6.708 PSIG. This LAZ has been evaluated and is consistent with both the IISCP Program Plan requirements (to provide at least one LAZ between AV and ATSP) and the Surveillance Test LAZ requirements (Ref. 4.4).

From the above statements it is concluded that the Loop LAZ (as documented on Attachment 4 of this calculation) and the current station setpoints are appropriate and acceptable for continued use at Limerick Generating Station.

1.4 Applicability

A data evaluation has been performed in order to determine which, if any, redundant/mirror instrument loops are bounded by the results of this calculation (the "base" calculation). The data evaluation results validate that this "base" calculation is applicable to the following Loop Affiliation Numbers:

- * PT-001-1N076A Configuration 01
- * PT-001-1N076B Configuration 01
- * PT-001-1N076C Configuration 01
- * PT-001-1N076D Configuration 01

- * PT-001-2N076A Configuration 01
- * PT-001-2N076B Configuration 01
- * PT-001-2N076D Configuration 01

The results of this "base" calculation are bounding values for the instrument loops listed above based on such factors as instrument manufacturer and model number, instrument location environmental parameters, actual installation and use of the instrument in the measurement of the process variable.

There is a difference in the model numbers for the transmitters listed above. The Unit 1 transmitters are Rosemount Model 1151GP9 and the Unit 2 transmitters are Model 1153GB9. A review of the vendor information indicates that the Model 1153GB9 has the more conservative parameters. Therefore a Unit 2 transmitter was chosen to represent the bounding case.

In addition, differences were found concerning the head corrections of the transmitters. The Master Calibration Sheets and Master Loop Sheets for the transmitters indicated the following for the head corrections: Unit 1, +5.2 PSIG; Unit 2, +4.4 PSIG (Ref. 4.8). These head corrections were not in agreement with the actual field

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installations which result in a head correction of +5.6 PSIG for both units. This was documented by the issuance of IISCP Anomaly No. 114, "Head Corrections for PT-001-1(2)N076A/B/C/D" (Ref. 4.14) which describes the issuance of Action Requests A0851879 (Ref. 4.15) and A0852289 (Ref. 4.16) (Type CM-NCR) for correcting these discrepancies. These discrepancies have no affect on this calculation as the head correction pertains only to the scaling of the transmitter. The scaling of PT-001-2N076C was done using +5.6 PSIG in accordance with the field installations.

2.0 DESIGN BASIS

This section includes the Technical Background and Design Input information relevant to the calculation.

2.1 Technical Background

Low steam pressure at the turbine inlet while the reactor is operating could indicate a malfunction of the steam pressure controller in which the turbine control valves or turbine bypass valves become fully open and cause rapid depressurization of the reactor vessel. Instrumentation is installed to monitor the steam line pressure in order to mitigate the consequences of this type of occurrence. The signals generated by this monitoring instrumentation input into the NSSSS isolation logic which automatically closes the Main Steam Isolation Valves (MSIVs) whenever the Mode Switch is in RUN. The MSIV isolation signal generated by the PT-001-2N076C loop is analyzed by this calculation.

2.2 Design Input

TODI ES1400026 (Ref. 4.17) and General Electric Safety Concern SC05-03 (Ref. 4.18).

805.00
 2.2.1 An Analytical/Process Limit of ~~720~~ PSIG has been utilized for this calculation based on ~~the low turbine throttle pressure setpoint (MSIV Fast Closure) parameter specified in the Final OPL 3 (Ref. 4.10).~~

~~The 720 PSIG limit is also in accordance with the General Electric Design Specification Data Sheets (Ref. 4.11).~~

2.2.2 This calculation includes any applicable System Rerate Design/Operating Conditions and Impacts as a result of the Power Rerate analyses per the guidelines contained in Specification NE-177 (Ref. 4.12).

2.2.3 This calculation was performed under normal

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environmental conditions based on the design information contained in Section 15.1.3 of the Limerick Generating Station Updated Final Safety Analysis Report (UFSAR) (Ref. 4.1). UFSAR Section 15.1.3 indicates that the design bases event for the isolation of the main steam line as a result of low steam line pressure is a failure of the main turbine pressure regulator. This failure will result in no release of steam to the Turbine Enclosure environment. Therefore PT-001-2N076C will not be subjected to any harsh environment effects when accomplishing its intended safety function.

2.2.4 Process consideration has been included to provide support for additional operational flexibility. This process consideration appears within the calculation as consideration S1. This consideration is based on engineering judgement and reflects an amount approximately twice the accuracy of the transmitter plus an additional amount which results in a conservatively rounded Allowable Value.

2.2.5 The delta between the Allowable Value (AV) and the Actual Trip Set Point (ATSP) within this calculation is ~~10~~ 19 PSIG which satisfies the IISCP Leave Alone Zone Requirement to provide at least one LAZ between AV and ATSP.

2.2.6 Additional margin of ~~10.345~~ 17.345 PSIG was added to this calculation to support the current station setpoint of this ~~10.345~~ 17.345 PSIG, 8.406 PSIG is "assigned margin" used to support the IISCP LAZ requirements as discussed in Section 2.2.5. The remaining 8.939 ~~9.939~~ PSIG is "unassigned margin" which is considered additional conservatism that may be utilized in future analyses.

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2.2.7 All other design inputs to this calculation are documented on the Supporting Data Sheet Attachments.

3.0 ASSUMPTIONS

~~3.1 Assumptions Not Requiring Confirmation~~

3.1.1 ~~The analytical/Process Limit for the Main Steam Line Low Pressure Isolation for Limerick 2 is assumed to be equivalent to the value in the Generic Unit 1 OPL 3 Form for Cycle 5 which~~

None.

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~~includes Power Berare information and is documented in Section 3.2.1 of this calculation. The basis of this assumption is IISCP Project Letter to File W P DE001-0152 (Ref. 4.13)~~

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3.2 Assumptions Requiring Confirmation

3.2.1 None

Current revision is 16 dated September 2012.

4.0 REFERENCES

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4.1 Limerick Generating Station Updated Final Safety Analysis Report (UFSAR), Revision ~~03~~ (dated ~~11/93~~)

-Section 7.3.1.1.2.4.5 "PCRVICS - Main Steam Line Low Pressure"

-Section 15.1.3 Pressure Regulator Failure - Open (Design Basis reference). 52

4.2 Limerick Generating Station Technical Specifications, Unit 2, Amendment ~~31~~, Table 3.3.2-2 Item 1.c (dated 02/17/94) (Operations and Surveillance requirements reference).

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4.3 Limerick Generating Station Units 1&2 System Design Baseline Document (DBD) L-S-16, Revision ~~0000~~, Section 3.2.9, Reactor Instrumentation System (Design Basis reference).

4.4 IISCP-PP-93-001, Revision 1 - Program Plan for the Implementation of Phase I of the PECO Improved Instrument Setpoint Control Program (IISCP) (Setpoint Methodology reference). 0017

4.5 M-171, Revision ~~0012~~ Limerick Generating Station Units 1&2 Environmental Service Conditions Specification (Location Data reference).

Deleted 4.6 ~~M-0600, Sheet 0001, Revision 0037 Limerick Generating Station Instrument Setpoint Incon Instrument Setpoint reference~~

Deleted 4.7 ~~M-4570, Sheet 0001, Revision 0000 Component Record List Limerick Generating Station (Instrument Data reference)~~

4.8 Master Calibration Sheets generated in accordance with PECO procedure IC-11-50014 for PT-001-2N076C dated 06/28/88, PIS-001-2N676C dated 01/16/87. Master Loop Sheet for PT-001-2N076C dated 06/28/88 (Applicability reference).

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- 4.9 Calculation M-75-12, Revision ~~0006~~ ⁰⁰¹⁷ - "Turbine Building Cooling Load" (Location Data reference).
- 4.10 Philadelphia Electric Company Letter from G.C. Storey to G.R. Hull General Electric Company, subject "Final OPL-3 for Limerick ARTS/MELLLA Analysis". This document contains Limerick 1 Reload 4 (Cycle 5) Resolved OPL-3 Forms that include ARTS/MELLLA at Rerate Conditions Dated 03/09/93. ~~Analytical/Process Limit reference~~ (Rev. 0 historical reference)
- 4.11 B21-4020-L-001, Revision 0022 - General Electric Nuclear Boiler System Design Specification Data Sheets (DSDS) ~~Design Input reference~~ (Rev. 0 historical reference)
- 4.12 NE-177, Revision 0000 - Nuclear Safety Related Specification for Limerick Generating Station Units 1&2 Power Rerate Operating Conditions (Power Rerate Information reference).
- 4.13 IISCP Project Letter to File M-P-PE001-0152 - Utilization of OPL-3 (Assumptions reference).
- 4.14 IISCP Project Anomaly No. 114, Head Corrections for PT-001-1(2)N076A/B/C/D (Applicability reference).
- 4.15 Action Request (Type CM NCR) A0851879 - Head Correction for PT-001-1N076A/B/C/D (Applicability reference).
- 4.16 Action Request (Type CM NCR) A0852289 - Head Correction for PT-001-2N076A/B/C/D (Applicability reference).

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5.0 ATTACHMENTS

- 5.1 See Supporting Data Sheet Attachments located within this calculation.

6.0 ANALYSIS

6.1 Loop Effects

- 6.1.1 Loop ID No. PT-001-2N076C Config 01
 - 6.1.2 Loop Function MAIN STEAM LINE C LOW PRESSURE - NS4 ISOLATION
 - 6.1.3 Configuration Description MN STN LN C PRESS INDICATION
 - 6.1.4 Loop Instrument List
- Add new references shown below.

- 4.17 Transmittal of Design Information (TODI) ES1400026, Rev. 0, "Low Pressure Isolation Setpoint for the Limerick Station Loop Uncertainty Calculation"
- 4.18 General Electric Safety Concern SC05-03, dated 3/29/2005, "Potential to exceed Low Pressure Technical Specification Safety Limit"

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Device	ID Number			
01	PT-001-2N076C	T		
02	PIS-001-2N676C	S		

6.1.5 Device Dependency

Device	Environment	Power	Calibration	Radiation
01	A	A	A	A
02	B	B	B	B

6.1.6 Device Dependency References

Environmental: N/A
Power: N/A
Calibration: N/A
Radiation: N/A

6.1.7 PMA and PEA Effects

Type	Magnitude	A/N	Sign
FMA	0.00000	N	
PMA	0.00000	N	
IR	0.00000	A	

References
PMA:
PEA:

6.1.8 Miscellaneous Random and Bias Effects

Type	Magnitude	Dependent Instrument	Dependent Uncertainty	A/N	Sign
S1	0.01300			N	R
S2	0.00000			N	
S3	0.00000			N	
R1	0.00000			N	
R2	0.00000			N	
R3	0.00000			N	

References
S1: SEE DESIGN INPUT 2.2.4
S2:
S3:
R1:
R2:
R3:

6.1.9 Basis

Point of Interest: 0.000
Accident: Normal
Pressure Effects: Independent

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6.2 Device Effects

6.2.1 Device Accuracy (CA)

CA = va/S or Setting Tolerance (whichever is greater)

Where:

va = vendor's stated accuracy
S = instrument's calibrated span
R = instrument's range

6.2.1.01 PT-001-2N076C

va = $(0.25\% * 0.66) * S$
S = 1200.00
R = 3000.00
Setting tolerance = 0.01
CA = 0.00500

6.2.1.02 PIS-001-2N676C

va = $(0.13\% * 0.66) * S$
S = 16.00
R = 20.00
Setting tolerance = 0.00
CA = 0.00250

6.2.2 Device M&TE Allowance

MTE = CA + margin

Where:

CA = device calibration accuracy
margin = additional margin supplied by calculation originator

6.2.2.01 PT-001-2N076C

CA = 0.00500 + 0.00000
MTE = 0.00500

6.2.2.02 PIS-001-2N676C

CA = 0.00250 + 0.00000
MTE = 0.00250

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6.2.3 Device Drift

$$D = vd * (\sqrt{(tc * 1.25 / td)}) / S$$

Where:

vd = vendor's stated drift specification

td = vendor's drift time specification

tc = instrument's calibration period

S = instrument's calibrated span

R = instrument's range

6.2.3.01 PT-001-2N076C

$$vd = 0.2\% * R$$

$$td = 900$$

$$tc = 731$$

$$S = 1200.00$$

$$R = 3000.00$$

$$D = 0.00504$$

6.2.3.02 PIS-001-2N676C

$$vd = 0.0$$

$$td = 1$$

$$tc = 731$$

$$S = 16.00$$

$$R = 20.00$$

$$D = 0.00000$$

6.2.4 Device Static Pressure

$$SPE = \sqrt{(SPz^2 * SPs^2)} \text{ (for independent pressure effects)}$$

$$SPE = SPz + SPs \text{ (for dependent pressure effects)}$$

$$SPz = spz * |Po - Pc| / S$$

$$SPs = sps * |Po - Pc| / S$$

Where:

spz = vendor's stated zero static pressure effect

sps = vendor's stated span static pressure effect

Po = normal operating pressure

Pc = calibrated pressure

S = instrument's calibrated span

R = instrument's range

NOTE: Static pressure effects are relevant
to sensors only.

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6.2.4.01 PT-001-2N076C

sps = 0.0
spz = 0.0
Po = 0.00
Pc = 0.00
S = 1200.00
R = 3000.00
SPs = 0.00000
SPz = 0.00000
SPE = 0.00000

6.2.4.02 PIS-001-2N676C

sps = 0.0
spz = 0.0
Po = 0.00
Pc = 0.00
S = 16.00
R = 20.00
SPs = 0.00000
SPz = 0.00000
SPE = 0.00000

6.2.5 Device Over Pressure

OPE = vope * |Pa - Pm| / S (for linear devices)
OPE = vope / S (for non-linear devices)

Where:

vope = vendor's stated over pressure effect
Pa = maximum operating pressure
Pm = instrument's design pressure
S = instrument's calibrated span
R = instrument's range
X = |Pa - Pm|

NOTE: Over pressure effects are relevant to sensors only, where the maximum operating pressure is greater than instrument's design pressure.

6.2.5.01 PT-001-2N076C

vope = (0.5%*0.66)*R/L

Pa = 0.00
Pm = 4500.00
S = 1200.00
R = 3000.00
OPE = 0.00000

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6.2.5.02 PIS-001-2N676C

vope = 0.0
Pa = N/A
Pm = N/A
S = 16.00
R = 20.00
OPE = 0.00000

6.2.6 Device Drift Temperature

DTE = vte + dT / S (for linear devices)
DTE = vte / S (for non-linear devices)

Where:

vte = vendor specified temperature effect
dT = (Normal Temp - 68° F)
S = instrument's calibrated span
R = instrument's range

6.2.6.01 PT-001-2N076C

vte = (((0.75%*R)+(0.5%*S))*0.66)/100
S = 1200.00
R = 3000.00
norm_temp = 104.00
DTE = 0.00564

6.2.6.02 PIS-001-2N676C

vte = {60<=X<=90,0.0%*S}{90<X<=210,(0.4%*0.66)*S}
S = 16.00
R = 20.00
norm_temp = 82.00
DTE = 0.00000

6.2.7 Device Accuracy Temperature

ATE = vte * dT / S (for linear devices)
ATE = vte / S (for non-linear devices)

Where:

vte = vendor specified temperature effect
dT = |accident temperature - normal temperature|
S = instrument's calibrated span
R = instrument's range

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6.2.7.01 PT-001-2N076C

vte = (((0.75%*R)+(0.5%*S))*0.66)/100
S = 1200.00
R = 3000.00
norm_temp = 104.00
accid_temp = 104.00
ATE = 0.00000

6.2.7.02 PIS-001-2N676C

vte = {60<=X<=90,0.0%*S}{90<X<=210,(0.4%*0.66)*S}
S = 16.00
R = 20.00
norm_temp = 82.00
accid_temp = 82.00
ATE = 0.00000

6.2.8 Device Humidity

HE = dH * vhe / S (for linear functions)
HE = vhe / S (for non-linear functions)

Where:

vhe = vendor's stated humidity specification
S = instrument's calibrated span
R = instrument's range
dH = |accident humidity - normal humidity|

6.2.8.01 PT-001-2N076C

vhe = 0.0
S = 1200.00
R = 3000.00
norm_h = 90.00
accid_h = 90.00
HE = 0.00000

6.2.8.02 PIS-001-2N676C

vhe = 0.0
S = 16.00
R = 20.00
norm_h = 90.00
accid_h = 90.00
HE = 0.00000

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6.2.9 Device Accuracy Radiation

ARE = vre * DeltaRad / S (for linear devices)
ARE = vre * / S (for non-linear devices)

Where:

vre = vendor specified radiation effect
DeltaRad = (accident radiation level - normal radiation level)
S = instrument's calibrated span
R = instrument's range

6.2.9.01 PT-001-2N076C

vre = {0<=X<5,1.0%*R}{5<=X<55,4.0%*R}
S = 1200.00
R = 3000.00
norm_rad = 0.00000
accid_rad = 0.00000
ARE = 0.00000

6.2.9.02 PIS-001-2N676C

vre = {0<=X<0.22,0.0%*S}{0.22<=X<55,0.5%*S}
S = 16.00
R = 20.00
norm_rad = 0.00018
accid_rad = 0.00018
ARE = 0.00000

6.2.10 Device Seismic

VSE = SRS * vse / S (for linear functions)
VSE = vse / S (for non-linear functions)

Where:

vse = vendor's stated seismic specification
S = instrument's calibrated span
R = instrument's range
SRS = seismic response envelope (see Attachment 7)

6.2.10.01 PT-001-2N076C

vse = {0<=X<4,0.0%*R}{4<=X<100,0.5%*R}
S = 1200.00
R = 3000.00
SRS = See Attachment 7
VSE = 0.00000

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6.2.10.02 PIS-001-2N676C

vse = 0.0
S = 16.00
R = 20.00
SRS = See Attachment 7
VSE = 0.00000

6.2.11 Device Power

$$PSE = pss * pse / S$$

Where:

pse = vendor's stated power supply specification
pss = device power supply stability
S = instrument's calibrated span
R = instrument's range

6.2.11.01 PT-001-2N076C

pse = (0.005%*0.66)*S/1
S = 1200.00
R = 3000.00
pss = 2.500
PSE = 0.00008

6.2.11.02 PIS-001-2N676C

pse = 0.0
S = 16.00
R = 20.00
pss = 2.500
PSE = 0.00000

7.0 RESULTS

7.1 AL

AL_norm = A + OPE + SP + PE
AL_accid = AL_norm + S, (for S > TE + RE + AHE)
AL_accid = AL_norm + TE + RE + AHE, (for S ≤ TE + RE + AHE)

where;

A = $\sum CA^2$
TE = $\sum ATE^2$
OP = $\sum OPE^2$
SP = $\sum SPE^2$
RE = $\sum ARE^2$
AHE = $\sum HE^2$
S = $\sum SE^2$
PE = $\sum PSE^2$
AL = 0.00003

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0A

7.2 DL

$$DL = DE + DT$$

where:

$$DE = \Sigma D^2$$

$$DT = \Sigma DTE^2$$

$$DL = 0.00006$$

7.3 CL

$$CL = V + M$$

where:

$$V = \Sigma (\text{setting tolerance})^2$$

$$M = \Sigma MTE^2$$

$$CL = 0.00006$$

7.4 TLU

$$(\text{Positive})TLUp = \{IR + PMap + PEAp + PCp + PMAo + PEAo + PCo + \sqrt{(AL + CL + DL + PMAr + PEAr + PCr)}\} * \text{Loop span}$$

$$(\text{Negative})TLUn = \{- PMAo - PEAo - PCo + \sqrt{(AL + CL + DL + PMAr + PEAr + PCr)}\} * \text{Loop span}$$

All other variables as previously defined.

$$TLUp = 21.47 \text{ PSIG}$$

$$TLUn = -21.47 \text{ PSIG}$$

7.5 NTSP

$$(\text{increasing}) NTSP = \text{limit} + \{- PMAo - PEAo - PCo + (1.645 / \text{sigma}) * \sqrt{(AL + CL + DL + PMAr + PEAr + PCr)}\} * \text{Loop span}$$

$$(\text{decreasing}) NTSP = \text{limit} + \{IR + PMap + PEAp + PCp + PMAo + PEAo + PCo + (1.645 / \text{sigma}) * \sqrt{(AL + CL + DL + PMAr + PEAr + PCr)}\} * \text{Loop span}$$

where:

limit = loop analytical or process limit

$$\text{limit} = \del{720.00} \text{ PSIG}$$

where:

$$\text{sigma} = 2 \quad \swarrow \text{805.00}$$

$$NTSP = \del{722.66} \text{ PSIG}$$

$$\swarrow \text{822.66}$$

0A

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OA

7.6 ATSP

(increasing) ATSP = NTSP + margin
 (decreasing) ATSP = NTSP - margin

where:

margin = additional margin supplied by calculation originator

margin = ~~18.345~~ ← -17.345
 ATSP = ~~156.60~~ PSIG

7.7 Allowable Value

← 840.00

(Decreasing) AV = limit + [IR + PMap + PEAp + PCp + PMAo + PEAo +
 PCo + (1.645 / sigma) * √(AL + CL + PMAr +
 PEAr + PCr)] * Loop span
 (Increasing) AV = limit + [- PMAn - PEAn - PCn - PMAo - PEAo -
 PCo + (1.645 / sigma) * -√(AL + CL + PMAr +
 PEAr + PCr)] * Loop span

All other variables as previously defined.

AV = ~~836.00~~ PSIG
 ← 821.00

7.8 Acceptable Limits

Max = ATSP + [(√DL) * Loop span]
 Min = ATSP - [(√DL) * Loop span]

All other variables as previously defined

Max = ~~765.078~~ PSIG ← 849.078
 Min = ~~746.923~~ PSIG
 ← 830.923

OA

OA

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ATTACHMENT 1: Session Data

Calculation Number LI-00032
 Station LG Unit 2
 Initiating SCR: 00 Rev
 Responsible Branch SEEI
 Safety Related (Y/N) Y
 Description NSSSS-MAIN STEAM LINE LOW PRESSURE: PT-001-2N076C LOOP

System Number 001
 Structure TURB. ENCL
 Component PIS-001-2N676C
 Revision A
 Description N/A
 Vendor Calc Number N/A Revision NA
 Other Calculations N
 Provides info TO N/A

Receives info FROM M-75-12

Supercedes N/A

Nuclear Group	LU CALCULATION FOR	01	Calc No LI-00032	Rev 00 OA
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OA

ATTACHMENT 2: Calculation Results

Device		Accuracy	Temperature	Humidity	Tol.	Pwr Supp
			Norm	Accid	Accid	
PT-001-2N076C	T	0.00500	0.00564	0.00000	0.00000	0.00008
PIS-001-2N676C	S	0.00250	0.00000	0.00000	0.00000	0.00000

Device		SPE	Rad.	M&TE	Drift	Over Pres	Seismic
			Accid				
PT-001-2N076C	T	0.00000	0.00000	0.00500	0.00504	0.00000	0.00000
PIS-001-2N676C	S	0.00000	0.00000	0.00250	0.00000	0.00000	0.00000

Process Concerns:	NORMAL			ACCIDENT		
	Positive	Negative	Offsetting	Positive	Negative	Offsetting
PMA	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
PEA	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
IR				0.00000		
Other	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

OA

Loop Results:	NORMAL		ACCIDENT	
	Increasing	Decreasing	Increasing	Decreasing
TLU*	-21.4656	21.46566	-21.4656	21.46566
AL	0.00003		0.00003	
NTSP*	N/A	737.6555	N/A	737.6555
AV*	N/A	735.9990	N/A	735.9990
Acc Limits				
Min*:	N/A -17.3450	746.9227	N/A	746.9227
Max*:	N/A	765.0781	N/A	765.0781
ATSP*	N/A	756.0004	N/A	756.0004

Additional Margin: ~~-18.3450~~ DL: 0.00006 CL: 0.00006

* These values are in PSIG

See section 2.2.6.

Replace with new IISCP software calculation results.

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ATTACHMENT 3: Loop Data

Affiliation Number PT-001-2N076C

Instruments	Function	Instruments	Function
PT-001-2N076C	T		
PIS-001-2N676C	S		
PIS-001-2N676C	I		

Loop Description

MAIN STEAM LINE C LOW PRESSURE - NS4 ISOLATION

Originator HUMPHREYS GD 05/09/94 Reviewer WHITE AJ 06/01/94

Loop ID(*)	Component ID(*)	Configurations(*)									
		1	2	3	4	5	6	7	8	9	10
PT-001-2N076C	T	X	X								
PIS-001-2N676C	S	X									
PIS-001-2N676C	I		X								

- Configuration Descriptions(*):
- 1: MN STM LN C LO PRESS NS4 ISOL 6:
 - 2: MN STN LN C PRESS INDICATION 7:
 - 3: 8:
 - 4: 9:
 - 5: 10:

Nuclear Group	LU CALCULATION FOR	01	Calc No LI-00032	Rev -00 0A
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0A

ATTACHMENT 4: Loop Calibration Data

Process Temperature Units
 Min 0.00 Max 0.00 Normal 0.00 Trip 0.00

Process Radiation Units
 Min 0.000e+000 Max 0.000e+000 Normal 0.000e+000 Trip 0.000e+000

Process Humidity Units
 Min 0.00 Max 0.00 Normal 0.00 Trip 0.00

Process Pressure Units
 Min 0.00 Max 0.00 Normal 0.00 Trip 0.00

Loop Span: Min 0.00 Max 1200.00 Units PSIG
 Sigma 2

Setpt: ~~756.00~~ Units: PSIG Reset: 0.00 Units: Allw: ~~736.00~~ Units PSIG

Des/Sfty Lmt: 0.00 Units Calibration Frequency 731

Loop Setting Tolerance : 0.000 Loop Leave Alone Zone : 6.708

Loop Cal Acc: 0.000 Analytical/Proc Lmt: ~~730.00~~ Units PSIG
 805.00

Originator HUMPHREYS GD 05/09/94 Reviewer WHITE AJ 06/01/94

840.00

821.00

0A

Replace 720.00 with
 805.00 (New Analytical
 Limit from TODI).

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ATTACHMENT 5: Instrument Data

UNIT-SYSTEM : LG2 001
CMP TYPE : I T Function T
CMP NUMBER : PT-001-2N076C
CMP DESCRIPT : MAIN STEAM LINE C
(B21)
Manufacturer Code R369 Model Number 1153GB9RJ
Serial Number 418005
Location 005239461 Power Supply Requirements 24.000
Power Supply Tolerance 2.500

QA Class Q
Operating Time N/A
DBE/Transient 23
REG GDE 1.97 N
Service Life 000
Environmental Qualification N
Seismic Class
Installation Detail M-0830 SHT 0001 REVISION 0140
DETAIL P044
Originator HUMPHREYS GD 05/09/94 Reviewer WHITE AJ 06/08/94

UNIT-SYSTEM : LG2 001
CMP TYPE : I T Function T
CMP NUMBER : PT-001-2N076C
CMP DESCRIPT : MAIN STEAM LINE C
Loop Diagram N/A Purchase Order Number M-206-AC
Surveillance Proc N/A Calibration Proc ST-2-001-411-2
Tech Spec Reference T3.3.2-2 ITEM 1.C Computer Addr N/A
Mod Number Rev

	P&ID	Electrical Schematic	Electrical Location Drwg
Number	M-0001	E-0101	E-1209
Facility	LG	LG	LG
Sheet	0003	0001	0001
Subtype	DWG	DWG	DWG
Rev	0010	0023	0020
	Location Drawing	Board Location	Foreign Print Number
Number	M-1508	N/A	B21-1090-E-027
Facility	LG		LG
Sheet	0001		0006A
Subtype	DWG		DWG
Rev	0010		0005

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ATTACHMENT 5: Instrument Data

Component ID PT-001-2N076C

Function T

Input Range:	Min	Max	Units	Head Correction:	5.600
Output Range:	0.00	1200.00	PSIG	Setting Tolerance:	0.00500
HC Corrected:	4.00	20.00	MADC	Leave Alone Zone:	0.00500
SP Corrected:				Additional Margin:	0.00000
MTE Device	MTE Accuracy			Period:	731

Head Correction Reference: MASTER CAL SHEET

Static Pressure Correction Reference: N/A

Originator HUMPHREYS GD 05/09/94 Reviewer WHITE AJ 06/08/94

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ATTACHMENT 5: Instrument Data

UNIT-SYSTEM : LG2 001
CMP TYPE : I S Function I S
CMP NUMBER : PIS-001-2N676C
CMP DESCRIPT : (B21) MAIN STEAM LINE C PRESSURE

Manufacturer Code R369 Model Number 510DU1
Serial Number 9458
Location 008289542 Power Supply Requirements 24.000
Power Supply Tolerance 2.500

QA Class Q
Operating Time N/A
DBE/Transient 23
REG GDE 1.97 N
Service Life 000
Environmental Qualification N
Seismic Class
Installation Detail N/A

Originator HUMPHREYS GD 05/09/94 Reviewer WHITE AJ 06/01/94

UNIT-SYSTEM : LG2 001
CMP TYPE : I S Function I S
CMP NUMBER : PIS-001-2N676C
CMP DESCRIPT : (B21) MAIN STEAM LINE C PRESSURE

Loop Diagram N/A Purchase Order Number M001
Surveillance Proc ST-2-041-659-2 Calibration Proc ST-2-001-411-2
Tech Spec Reference T3.3.2-2 ITEM 1.C Computer Addr N/A
Mod Number Rev

	P&ID	Electrical Schematic	Electrical Location Drwg
Number	M-0001	E-0101	E-1183
Facility	LG	LG	LG
Sheet	0003	0001	0002
Subtype	DWG	DWG	DWG
Rev	0010	0023	0021
	Location Drawing	Board Location	Foreign Print Number
Number	M-0603	H12-P609-C-012	B21-1090-E-027
Facility	LG	LG	LG
Sheet	0001	0001	0006A
Subtype	DWG	DWG	DWG
Rev	0014	0009	0005

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ATTACHMENT 5: Instrument Data

Component ID PIS-001-2N676C

Function S

Input Range:	Min	Max	Units	Head Correction:	0.000
Output Range:	4.00	20.00	MADC	Setting Tolerance:	0.00250
HC Corrected:	0	1		Leave Alone Zone:	0.00250
SP Corrected:				Additional Margin:	0.00000
MTE Device	MTE Accuracy			Period:	731

Head Correction Reference: N/A

Static Pressure Correction Reference: N/A

Originator HUMPHREYS GD 05/09/94 Reviewer WHITE AJ 06/01/94

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ATTACHMENT 7: Location Data

Location Code: 005239461
Description: COOLING WATER EX & PP

	Min	Normal	LOCA	TRIP HELB	MSLB	Max
Temp	65.00	104.00	104.00	104.00	104.00	104.00
Rad	0.000e+000	0.000e+000	0.000e+000	0.000e+000	0.000e+000	0.000e+000
Humid	10.00	90.00	90.00	90.00	90.00	90.00
Press	14.70	14.70	14.70	14.70	14.70	14.70

Seismic Response Envelope: 0.00

Originator HUMPHREYS GD 05/02/94 Reviewer WHITE AJ 06/01/94

Location Code: 008289542
Description: ROOM 542, AUXILIARY EQUIPMENT ROOM

	Min	Normal	LOCA	TRIP HELB	MSLB	Max
Temp	60.00	82.00	82.00	82.00	82.00	82.00
Rad	5.000e-004	1.760e+002	1.890e+002	1.760e+002	1.760e+002	1.760e+002
Humid	30.00	90.00	90.00	90.00	90.00	90.00
Press	14.70	14.70	14.70	14.70	14.70	14.70

Seismic Response Envelope: 0.00

Originator THOMAS RT 03/31/93 Reviewer CRABBS BL 05/05/94

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ATTACHMENT 8: Process Concerns

Consideration	Contribution to Uncertainty	Sign	A/N		
1 PMA	0.00000		N		
2 PEA	0.00000		N	Dependent	Dependent
3 IR	0.00000			Device	Uncertainty
4 S1	0.01300	R	N		
5 S2	0.00000		N		
6 S3	0.00000		N		
7 R1	0.00000		N		
8 R2	0.00000		N		
9 R3	0.00000		N		

Consideration References

- 1
- 2
- 3
- 4 SEE DESIGN INPUT 2.2.4
- 5
- 6
- 7
- 8
- 9

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ATTACHMENT 9: Device Dependencies

Devices		Dependency				Calibration Conditions/Data		
		Env	Pwr	Cal	Rad	Static Press	Calib Humid	Sensor
PT-001-2N076C	T	A	A	A	A	0	90	Y
PIS-001-2N676C	S	B	B	B	B	0	90	

Dependency References

EnvN/A Cal N/A

PwrN/A Rad N/A

Cal Cond Reference N/A

Just Maximum Normal Humidity for the Location Code